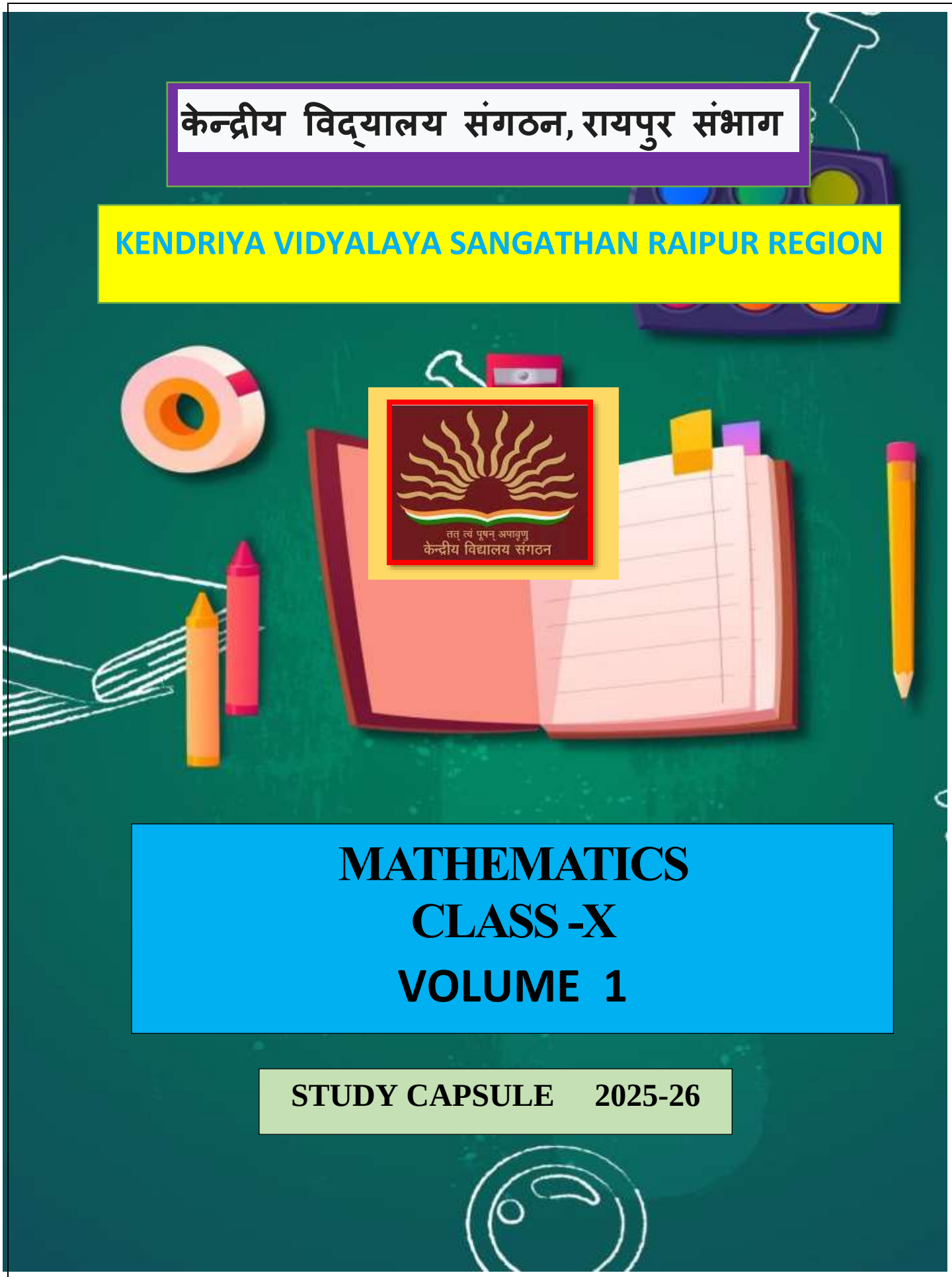
केन्द्रीय विद्यालय संगठन, रायपुर संभाग

KENDRIYA VIDYALAYA SANGATHAN RAIPUR REGION



MATHEMATICS
CLASS -X
VOLUME 1

STUDY CAPSULE 2025-26

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यथा शिखा मयूराणां नागानां मणयो यथा।
तद्वद् वेदांगशास्त्राणां गणितं मूर्ध्नि संस्थितम्॥

जैसे मोरों में शिखा और नागों में मणि का स्थान सबसे उपर है, वैसे ही सभी वेदांग और शास्त्रों मे गणित का स्थान सबसे उपर है ।

Just as the crest on the heads of peacocks and the gems on the heads of serpents is in the highest position, in the same way the place of mathematics in the Vedangashastras is at the top.

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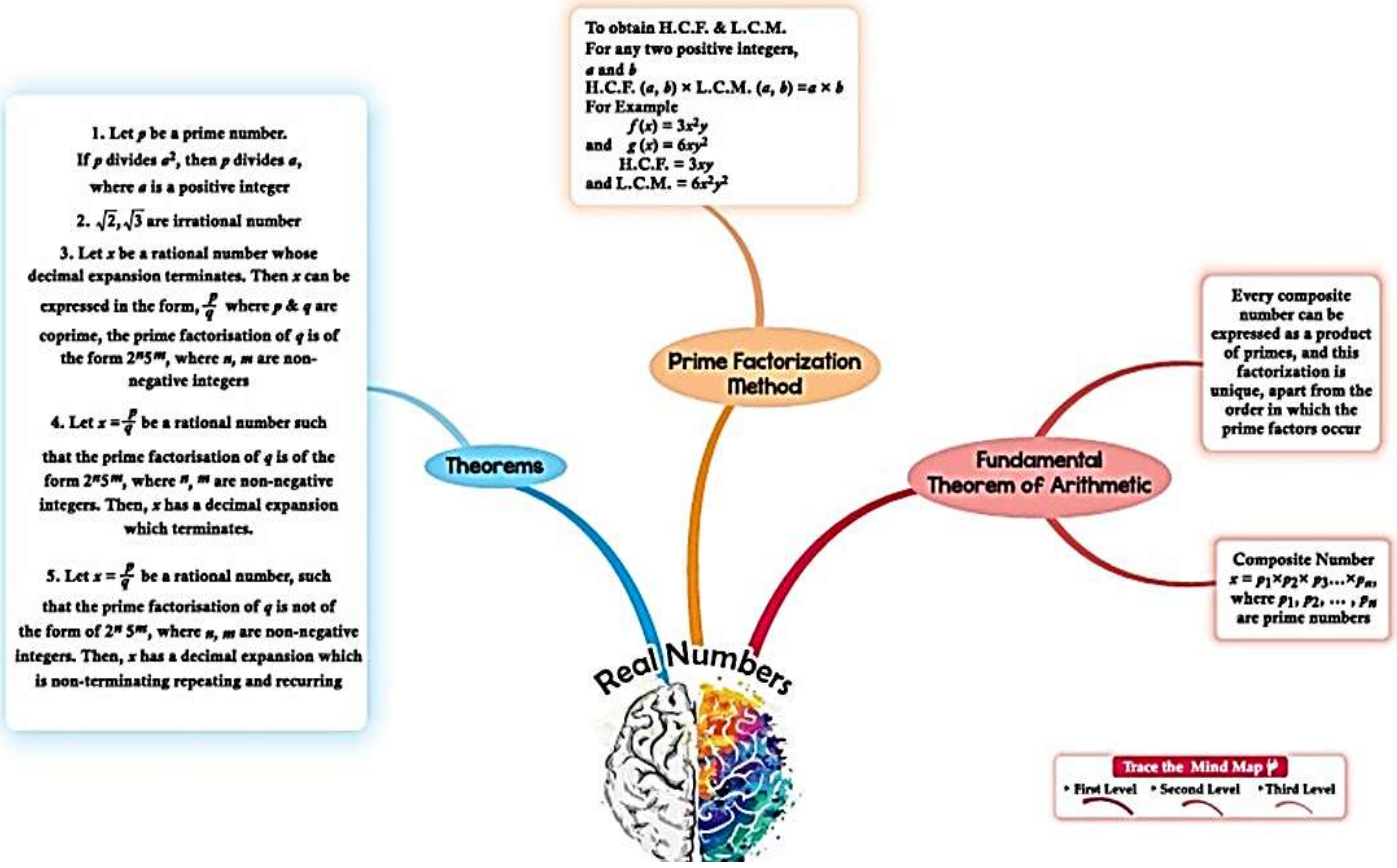
CHAPTER -1
REAL NUMBERS



GIST OF THE CHAPTER

1. Real Numbers: Include both rational and irrational numbers.
2. Fundamental Theorem of Arithmetic: Every Composite number can be expressed as a product of primes, and the factorisation is unique except for the order of the prime factors.
3. Prime Factorization Applications: Useful for finding HCF and LCM.
4. Rational Numbers
5. Irrational numbers and it's properties.
DEFINITION
1. Real Numbers: Set of numbers that can be represented on number line. Include both rational numbers and irrational numbers.
2. Natural numbers (1, 2, 3,.....), Whole numbers (0, 1, 2, 3,.....), Integers (...., -2, -1, 0, 1, 2, ...)
3.Rational numbers: Number that can be expressed in the form of p/q where q ≠0
4. Irrational numbers: Numbers that cannot be expressed as p/q , like π,√2
FORMULAE
HCF AND LCM FORMULA (For two numbers)
HCF × LCM = Product of two numbers
HCF (a, b) × LCM (a, b) = a × b
HCF AND LCM FORMULA (For three numbers)

HCF (a, b, c) = HCF (HCF (a, b), c)
LCM (a, b, c) = LCM (LCM (a, b), c)
Step 1: Find HCF /LCM of any two numbers (say, a and b)
Step 2: Find HCF/LCM of that result with the third number (c).

MULTIPLE CHOICE QUESTIONS (1 MARK)

1. Which of the following is an irrational number?
(a) 0.25 (b) 0.333... (c) √9 (d) √7
Answer: (d) √7
2. The HCF of 12 and 18 is:
(a) 2 (b) 6 (c) 12 (d) 36
Answer: (b) 6
3. If HCF and LCM of two numbers are 4 and 9696, then product of two numbers is:
(a)9696 (b) 24242 (c)38784 (d) 4848
Answer: (c) 38784
4. If the product of two numbers is 72 and their HCF is 6, then their LCM is:
(a) 6 (b) 12 (c) 18 (d) 72
Answer: (b) 12
5. Which of the following is a rational number?
(a) √3 (b) π (c) $\frac{22}{7}$ (d) √5
Answer: (c) $\frac{22}{7}$
6. The prime factorization of 24 is:
(a) 2 x 12 (b) 3 x 8 (c) 2 x 2 x 2 x 3 (d) 4 x 6
Answer: (c) 2 x 2 x 2 x 3
7. The smallest composite number is:
(a) 1 (b) 2 (c) 3 (d) 4
Answer: (d) 4
8. If $a = 2^3 \times 3^2$ and $b = 2^2 \times 3^3$, then HCF (a, b) is:
(a) $2^2 \times 3^2$ (b) $2^3 \times 3^3$ (c) $2^2 \times 3^3$ (d) $2^3 \times 3^2$
Answer: (a) $2^2 \times 3^2$

ASSERTION REASON QUESTIONS (1 MARKS)

DIRECTIONS: -Questions 9 and 10 are Assertion (A) and Reason (R) type, there are four options. Choose the correct option -
A) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
B) Both Assertion and Reason are true but the reason is not the correct explanation of the Assertion.
C) Assertion is true but Reason is false.
D) Assertion is false but Reason is true.
Q.9 Assertion (A): The number $2\sqrt{2}$ is irrational.
Reason (R): The square root of every natural number is irrational.
Answer: (C) Assertion is true but Reason is false.
(Because only square roots of non-perfect squares are irrational.)
Q.10Assertion (A): The decimal expansion of every irrational number is non-terminating non-repeating.
Reason (R): Irrational numbers cannot be expressed as a ratio of integers.
Answer: (A) Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.

VERY SHORT ANSWERS QUESTIONS (2 MARKS)

Q1 Find the HCF of 56 and 72.
Answer: $56= 2x2x2x7=2^3x7$

72= 2x2x2x3x3= 2^3x3^2

So, HCF(56, 72) = 2^3 =8

Q2.Find LCM of 20 and 28 using prime factorization.

Answer:

Prime factorization:

20=2x2x5=2^2x5

28= 2x2x7=2^2x7

LCM = 2^2×5×7=140

Q3.Show that √3 is an irrational number?

Answer:

Assume √3 is rational.

Then√3 = $\frac{p}{q}$ where p, q are co-prime and q≠0

Squaring on both sides:

3=$\frac{p^2}{q^2}$ ⇒p^2=3q^2

So, p^2 is divisible by 3 ⇒p is also divisible by 3. [If p divides a^2 then p divides a also]

Let p=3k.where k is an integer

Then p^2=9k^2=3q^2 ⇒q^2=3k^2

So q^2 is divisible by 3 ⇒ q is also divisible by 3

This contradicts the statement that p and q are co-prime numbers.

This is due to our wrong assumption.

Hence √3 is **irrational**.

Q4. Find the least number that is divisible by 12, 15, and 20.

Answer:

LCM of 12, 15, and 20

12 = 2^2×3

15 = 3×5

20 = 2^2×5

LCM = 2^2×3×5 = 60

Q5. Explain why 3x5x7+7 is a composite number?

Answer: 3x5x7+7 =7 (3x5+1)

=7x16 =7 x 4 x4

3x5x7+7 has two factors7 and 4 other than1 and the number itself, so it is a composite number .

SHORT ANSWER QUESTIONS (3 MARKS)

Q1. Find the HCF and LCM of 60 and 72, and verify that HCF × LCM = product of the numbers.

Answer: Prime factorization:

60 = 2^2×3×5 72 = 2^3×3^2

HCF = 2^2×3=12 LCM = 2^3×3^2×5=360

HCF × LCM = 12×360=4320

Product of numbers = 60 × 72 = 4320

⇒ HCF × LCM = product of the numbers

Q2. Find the least number which is divisible by 6, 15, and 20 and leaves remainder 5 in each case.

Answer: First, find LCM of 6, 15, 20:

6 = 2×3, 15 = 3×5 20 = 2^2×5

LCM = 2^2×3×5=60

Required number = LCM + 5 = 60+5= 65

Q3. Find a number between 1 and 100 that is divisible by 3, 4, 5, and 6.
Answer: Find LCM of 3, 4, 5, and 6:
3 = 3
4 = 2^2
5 = 5
6 = 2×3
LCM = 2^2×3×5=60
Q 4. Show that 6^n can end with the digit 0 for any natural number n.
Answer: For a number to end with the digit 0, it must be divisible by 10. This means it must have both 2 and 5 as prime factors.
6 = 2 x 3.
$(6)^n = (2 \times 3)^n = 2^n \times 3^n$
The prime factorization of 6^n will always be in the form $2^n \times 3^n$. So, by uniqueness of Fundamental theorem of Arithmetic guarantees that there are no other primes in the prime factorization of 6^n.
Therefore, 6^n can never end with the digit 0 for any natural number n.
Q. 5. Prove that √5 is irrational.
Answer:
Let's assume that √5 is rational.
$\sqrt{5} = \frac{a}{b}$, where a and b are integers, and b ≠ 0. Also, a and b have no common factors (other than 1).

Squaring on both sides of the equation we get, $5 = \frac{a^2}{b^2}$.
⇒ $a^2 = 5b^2$
⇒ 5 divides a^2, then 5 divides a also. [If p divides a^2 then p divides a also]
Let a = 5k, where k is some integer.
Substituting a = 5k in the equation we get $a^2 = 5b^2$ ⇒ $(5k)^2 = 5b^2$ ⇒ $25k^2 = 5b^2$ ⇒ $5k^2 = b^2$.
This shows that b^2 is also divisible by 5, and so, b is also divisible by 5.
⇒ 5 is a common factor of both a and b.
It contradicts our initial assumption that a and b have no common factors other than 1.
This contradiction is due to our wrong assumption.
So, √5 is irrational.

LONG ANSWER QUESTIONS (5 MARKS)

Q. 1 A sweet seller has 420 Kajubarfis and 130 badam barfis. He wants to pack them in boxes such that each box has the same number of barfis of only one type. Find the number of boxes and number of barfis in each box.
Answer:
We need to find the maximum number of boxes such that both 420 and 130 are divisible by the same
Number ⇒ Find HCF.
HCF (420, 130):
420 = 2^2×3×5×7
130 = 2×5×13
Common prime factors = 2×5=10
So, number of boxes = **10**
Barfi per box:
Kaju barfi per box = 420÷10=42
Badam barfi per box = 130÷10=13

Q.2 Find the LCM and HCF of 306 and 657 by the prime factorization method. Also verify that HCF × LCM = Product of the numbers.

Answer:

Prime factorization:

$306 = 2\times3\times3\times17 = 2\times3^2\times17$

$657 = 3\times3\times73 = 3^2\times73$

$HCF(306,657) = 3\times3 = 3^2 = 9$

$LCM(306,657) = 2\times3^2\times17\times73 = 22338$

Check:

$HCF \times LCM = 9\times22338 = 201042$

$306 \times 657 = 201042$ Verified.

Q.3 If d is the HCF of 30 and 72, find the value of x and y satisfying d= 5x+12y

Solution: 30=2x3x5

72= 2x2x2x3x3

HCF (30, 72) =2x3=6

d=6(Given)

Here x and y not unique

Putting different values of x find corresponding value of y in integer form.

If x=5 and y= -2 is one solution.

CASE BASED QUESTIONS (4 MARKS)

Q.1 Teaching Mathematics through activities is a powerful approach that enhances students understanding and engagement. Keeping this in mind, Ms. Mukta planned a prime number game for class 5 students. She announces the number 2 in her class and asked the first student to multiply it by a prime number and then pass it to second student. Second student also multiplied it by a prime number and passed it to third student. In this way by multiplying to a prime number, the last student got 173250.

(i) What is the least prime number used by students?

(ii) Which prime number has been used maximum times?

(iii) (a) How many students are in the class?

(b) What is the highest prime number used by students?

ANSWER: (i) prime factorization is $2^1\cdot3^2\cdot5^3\cdot7^1\cdot11^1$ so least prime number is 3 used by students.

(ii) 5

(iii) (a) 2+3+1+1=7 students (b) 11

Q.2 Aadya has 143 stamps; she gives away 11 stamps and divides the remaining equally into groups. Sumit has

220 stamps; he gives away 11 stamps and divides the remaining equally into groups. They end up with the

same number of groups.

(i) What is the number of groups?

(ii) What is the number of stamps in Aadya's and Sumit's group ?

(iii) What is the difference of number of stamps in Aadya's and Sumit's group ?

ANSWER: (i)143-11=132= 11x12

220-11=209= 11x19

Same no. of groups = 11

(ii) Aadya 143-11=132 Sumit 220-11=209

(iii) Each group made by Aadya has12 stamps and each group made by Sumit has19 stamps.

So 19-12=7

CHAPTER: REAL NUMBERS
Worksheet – 1

Answer the following Questions:

Q1. Two tankers contain 850 litres and 680 litres of petrol respectively. The maximum capacity of a container which can measure the petrol of either tanker in exact number of times is _____.

(a) 170 (b) 161 (c) 147 (d) 192

Q2. If the least prime factor of 'a' is 5 and the least prime factor of 'b' is 13, then the least prime factor of
a + b is _____.

(a) 2 (b) 3 (c) 5 (d) 11

Q3. If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3b$, where a,b are prime numbers, then the LCM of p and q is _____.

(a) ab (b) a^2b^2 (c) a^3b^2 (d) a^3b^3

Q4. Assertion (A) & Reason (R) type Question:

A: 0 is a rational number.
R: Any integer divided by 0 gives a rational number.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. Two numbers are in the ratio 2:3 and their LCM is 180. What is the HCF of these numbers?

Q6. If xy = 180 and HCF (x, y) = 3, then find the LCM (x, y).

Q7. Explain why (7x11x13) + 13 is a composite number.

Q8. Three numbers are in the ratio 2:5:7. Their LCM is 490. Find the square root of the largest number present among them.

Q9. Find the smallest number, which when increased by 14 is exactly divisible by 165 and 770.

Q10. Prove that $\sqrt{5}$ is an irrational number.

Q11. **Case Study Based Question:**

A seminar is being conducted by an educational organisation, where the participants will be the educators of different subjects. The number of participants for the subjects Hindi, English and Mathematics are 60, 84 and 108 respectively. Based on the information provided, answer the questions provided below:

(a) In each room the same no. of participants are to be seated and all of them should be from the same subject. Hence, find the maximum no. of participants that can be accommodated in each room.

(b) What is the minimum number of rooms required for the seminar?

(c) (i) Find the product of HCF and LCM of 60, 84 and 108.

[or]

(ii) Check Whether HCF(60, 84, 108) x LCM(60, 84, 108) = 60 x 84 x 108

CHAPTER: REAL NUMBERS
WORKSHEET – 2

Q1. If HCF of 144 and 180 is expressed in the form of 13m – 3, then the value of m is _____

(a) 1 (b) 2 (c) 3 (d) 4

Q2. The sum of exponents of the prime factors in the prime factorization of 250 is _____.

(a) 3 (b) 4 (c) 5 (d) 6

Q3. The smallest irrational no. by which $\sqrt{20}$ should be multiplied to get a rational number is ___

(a) $\sqrt{20}$ (b) $\sqrt{2}$ (c) $\sqrt{5}$ (d) $\sqrt{4}$

Q4. Assertion (A) & Reason (R) type Question:

A: A number q is prime factorized as 3^2 X 7^2 X b, where b is a prime number other than 3 and 7. So, q is definitely an odd number.

R: 3^2 X $7^2$is an odd number.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. Given that $\sqrt{3}$ is irrational, prove that $5 + 2\sqrt{3}$ is irrational.

Q6. 576 boys and 448 girls have attended an event where they are to be divided into equal teams of either boys or girls alone. Find the total number of teams thus formed.

Q7. If two positive integers p and q are written as $p = a^2b^3$ and $q = a^3b$, where a, b are prime numbers, then verify that LCM x HCF = pq.

Q8. A forester wants to plant 66 apple trees, 88 banana trees and 110 mango trees. He wants to plant equal number of trees in each row. Also, he wants to plant only one type of trees in one row. Find the minimum number of rows required.

Q9. LCM of two numbers is 10 times their HCF. Sum of HCF and LCM is 495. If one number is 90, then find the other number.

Q10.Find the greatest number that will divide 445, 572 and 690 leaving 4, 5 and 6 respectively.

Q11.**Case Study Based Question:**

To enhance the reading skills of grade x students, the school nominated you and two of your friends to set up a library. There are two sections – Section A and Section B of grade X. There are 32 students in Section A and 36 students in Section B. Based on the information provided, answer the questions given below:

(a) What is the minimum number of books you will acquire for the class library, so that they can be distributed equally among the students of Section A or Section B?

(b) If the product of two positive integers is equal to the product of their HCF and their LCM, then find the HCF of 32 & 36.

(c) (i) If class IX is also considered for book distribution, having 80 students, then what is the minimum number of books you will acquire for the class library so that they can be distributed equally among all the students of class IX and the sections of class X taken separately?

[or]

(ii) If we have to consider the situation provided in case of c(i), how many books can be distributed equally among the students of class IX?

CHAPTER-1: REAL NUMBERS
WORKSHEET – 3

Answer the following Questions:

Q1. Three bulbs blue, green and yellow flash at intervals of 80, 90 and 110 seconds. If all the three bulbs flash together at 8:00 AM, they will flash again together at _____.

(a) 9:00 AM (b) 9:12 AM (c) 10:00 AM (d) 10:12 AM

Q2. The HCF and the LCM of two numbers are 33 and 264 respectively. When the first number is completely divided by 2, the quotient is 33. The other number is _____.

(a) 162 (b) 32 (c) 66 (d) 132

Q3. A pair of irrational numbers whose product is a rational number is _____.

(a) $\sqrt{5}$ and $\sqrt{8}$ (b) $\sqrt{3}$ and $\sqrt{14}$ (c) $\sqrt{3}$ and $\sqrt{27}$ (d) $\sqrt{4}$ and $\sqrt{16}$

Q4. Assertion (A) & Reason (R) type Question:

A: 2 is a prime number.
R: The Square of an irrational number is always a prime number.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. Show that 21^n can not end with the digits 0, 2, 4, 6 and 8 for any natural number n.

Q6. Determine the values of p and q so that the prime factorization of 2520 is expressible as $2^3 \times 3^p \times q \times 7$.

Q7. Find the largest integer that divides 2053 and 967 leaving remainders 5 and 7 respectively.

Q8. Anusha decided to distribute milk in an orphanage on her birthday. The supplier brought two milk containers which contain 398 litres and 436 litres of milk. The milk is transferred to another container so that 7 litres and 11 litres of milk is left in the given containers respectively. For this transfer purpose, she used a jar. What is the maximum possible capacity of the jar that can transfer the milk of both the containers in exact number of times?

Q9. An army contingent of 1000 members is to march behind an army band of 56 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march?

Q10. Prove that $\sqrt{2}$ is an irrational number. Use this to show that $\frac{3+2\sqrt{2}}{5}$ is also irrational.

Q11.**Case Study Based Question:**

Ashish supplies bread and jam to a hospital and a school. Bread and Jam are supplied in equal number of pieces. Bread comes in a packet of 8 pieces and jam comes in a pack of 6 pieces. On a particular day, Ashish has supplied 'x' packets of bread and 'y' packets of jam to the school. On the same day, Ashish has supplied '3x' packets of bread along with sufficient packets of jam to the hospital. It is known that the number of students in the school are between 500 and 550.

(a) How many students are there in the school? (or)
How many packets of bread are supplied to the school?
(b) How many packets of bread are supplied to the hospital?
(c) How many packets of jam are supplied to the school?

CHAPTER: REAL NUMBERS
WORKSHEET – 4

Answer the following Questions:

Q1. If the LCM of 'a' and 18 is 36 and the HCF of 'a' and 18 is 2, then the value of 'a' is _____.

(a) 1 (b) 2 (c) 3 (d) 4

Q2. If A = 2n + 13 and B = n + 7, where n is a natural number, then the HCF(A, B) is _____.

(a) 1 (b) 2 (c) 3 (d) 4

Q3. The HCF of 2472, 1284 and a third number N is 12. If their LCM is $2^3 \times 3^2 \times 103 \times 107$, then the value of N is _____.

(a) 120 (b) 180 (c) 240 (d) 270

Q4. Assertion (A) & Reason (R) type Question:

A: $\sqrt{2}$ is an irrational number.

R: If m is a natural number which is not a perfect square, then $\sqrt{m}$ is irrational.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. Check whether 6^n can end with the digit 0 for any natural number n.

[

Q6. The HCF of two numbers is 29 and other two factors of their LCM are 16 and 19. Find the larger of the two numbers.

Q7. Prove that $(3 - 2\sqrt{5})$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

Q8. On a morning walk, three people step off together and their steps measure 40 cm, 42 cm and 45 cm respectively. What is the minimum distance each should walk, so that each can cover the same distance in complete steps?

Q9. The LCM of two numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one number is 280, then find the other number.

Q10. Prove that $15 + 17\sqrt{3}$ is an irrational number.

Q11. **Case Study Based Question:**

Teaching Mathematics through activities is a powerful approach that enhances students understanding and engagement. Keeping this in mind, Ms. Mukta planned a prime number game for class 5 students. She announces the number 2 in her class and asked the first student to multiply it by a prime number and then pass it to the second student. Second student also multiplied by a prime number and passed it to the third student. In this way, by multiplying to a prime number, the last student got 173250. Based on this information, answer the questions provided below:

(a) What is the least prime number used by the students? (or)
How many students are there in the class?
(b) What is the highest prime number used by the students?
(c) Which prime number has been used maximum times? (

CHAPTER: REAL NUMBERS
WORKSHEET – 5

Answer the following Questions:

Q1. If HCF(a, b) = 45 and a x b = 30375, then LCM (a, b) is _____.

(a) 1875 (b) 1350 (c) 625 (d) 675

Q2. If the prime factorisation of a natural number is 2^4 x 3^4 x 5^3 x 7, then the number of consecutive zeroes in N are _____.

(a) 5 (b) 4 (c) 3 (d) 2

Q3. The LCM of two prime numbers p and q (p > q) is 221. Then the value of 3p – q is _____

(a) 4 (b) 28 (c) 38 (d) 48

Q4. Assertion (A) & Reason (R) type Question:

A: If LCM of two numbers is 2475 and their product is 12375, then their HCF is 5.

R: HCF(a,b) x LCM(a,b) = a + b

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. A merchan

Q10. National Art convention got registrations from students from all parts of the country, of which 60 are interested in Music, 84 are interested in Dance and 108 students are interested in Handicrafts. For optimum cultural exchange, organisers wish to keep them in minimum number of groups such that each group consists of students interested in the same art form and the number of students in each group is the same. Find the number of students in each group. Find the number of groups in each artform. How many rooms are required if each group will be allotted a room?

Q11. **Case Study Based Question:**

A Fruit vendor has 732 apples and 942 oranges. He distributes them among the students of an orphanage, such that each of them gets either only apples or only oranges in equal number. We have to find the least possible number of students in which these fruits can be distributed in that way.

(a) Which concept should be used to solve this problem?
(b) What is the number of students that got apples?
(c) What is the number of students that got oranges? (or)
What is the least number of students present at the orphanage?

ANSWERS

Key – Worksheet 1:

Q1. (a) 170 Q2. (a) 2 Q3. (c) a^3b^2 Q4. (c) A is true but R is false

Q5. Given numbers are 30 and 90. HCF (30, 90) is 30

Q6. LCM = $\frac{xy}{HCF} = \frac{180}{3} = 60$

Q7. (7 x 11 x 13) + 13 = 13(7 x 11) + 13(1) = 13(78) + 13(1) = 13(78 + 1) = 13(79)

⇨ Given number has more than 2 factors (other than 1 & number itself)

⇨ It is a composite number.

Q8. Let the numbers be 2x, 5x and 7x. => LCM = 2(5)(7)(x) = 490 => x = 7

Then, √(7x) = √(7 x 7) = 7

Q9. LCM(165, 770) = 2310

⇨ Required Number is 2310 – 14 = 2296

Q10. Proof – Method of Contradiction

Q11. (a) HCF = 12 (b) 5 + 7 + 9 = 21

(c) (i) HCF x LCM = 12 x 3780 = 45360 [or] (ii) HCF X LCM ≠ Product of the given three numbers.

Key – Worksheet 2:

Q1. (c) 3. Q2. (b) 4. Q3. (c) √5. Q4. (d) A is false but R is true

Q5. Proof – Method of Contradiction

Q6. No. of Members in each team = HCF(448, 576) = 64

No. of teams formed = 7 + 9 = 16

Q7. LCM = a^3b^3 and HCF = a^2b.

Here, pq = a^5b^4

⇨ LCM x HCF = pq

Q8. No. of trees in each row = HCF(66, 88, 110) = 11

⇨ Minimum no. of rows required = 6 + 8 + 10 = 24

Q9. LCM = 450; HCF = 45; a = 90 =>b = 225

Q10. Required Number = HCF (445 – 4, 572 – 5, 690 – 6) = HCF (441, 567, 684) = 9

Q11. (a) LCM (32, 36) = 288 (b) HCF = 4

(c) (i) LCM (32, 36, 80) = 1440 [or] (ii) $\frac{1440}{80} = 23$

Key – Worksheet 3:

Q1. (d) 10:12 AM. Q2. (d) 132. Q3. (c) √3 and √27. Q4. (c) A is true but R us false

Q5. Prime factorisation of the given number doesn't have 2 as its prime factor. So, it can never end with an even digit (0,2,4,6,8)

Q6. 2520 = 2^3 x 3^2 x 5 x 7 = 2^3 x 3^k x q x 7

⇨ p = 2 and q = 5

Q7. Required Number = HCF (967 – 7, 2053 – 5) = HCF (960, 2048) = 64

Q8. Required Number= HCF (398 – 7, 436 – 11) = HCF (391, 425) = 17

Q9. Required number of Columns = HCF (56, 1000) = 8

Q10. Proof – Method of Contradiction

Q11. (a) LCM (6,8) = 24. Multiples of 24 between 500 and 550 are 504 and 528.

⇨ No. of students in the school = 504(or) $\frac{504}{8}$= 63.

(b) 3 x 63 = 189 (c) $\frac{504}{6} = 84$

Key – Worksheet 4:

Q1. (d) 4. Q2. (a) 1. Q3. (b) 180

Q4. (a) Both A and R are true and R is the correct explanation of A.

Q5. Given no. do not have 5 as its prime factor along with 2. So, it can't end in 0 for any natural number 'n'.

Q6. Here the numbers given are 29 x 16 = 464 and 29 x 19 = 551.
Larger of the given two numbers = 551
Q7. Proof – Method of Contradiction
Q8. Minimum distance to be covered = LCM(40, 42, 45) = 2520 cm = 25.2 m
Q9. HCF = 40; LCM = 560; a = 40 then, b = 560
Q10. Proof – Method of Contradiction
Q11. $173250 = 2 \times 3^2 \times 5^3 \times 7 \times 11$
(a) 3 (or) 7 (b) 11 (c) 5

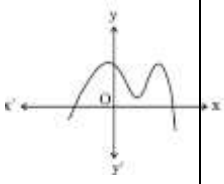
Key – Worksheet 5:

Q1. (d) 675 Q2. (c) 3 Q3. (c) 38 Q4. (c) A is true but R is false
Q5. Greatest volume of tin = HCF(120, 180) = 60 litres
Q6. Required number = HCF(615 – 6, 963 – 6) = HCF(609, 957) = 87
Q7. HCF = 6; LCM = 360
Q8. Proof – Method of Contradiction
Q9. Required Number = HCF(76 – 4, 112 – 4, 172 – 4, 184 – 4) = HCF(72, 108, 168, 180) = 12
⇨ $k^2 \times 3 = 12$
⇨ $k = 2$
Q10. Number of students in each group = HCF(60, 84, 108) = 12
No. of groups in each art form: Music – 5, Dance – 7, Handicrafts – 9
No. of rooms required = 5 + 7 + 9 = 21
Q11. (a) Highest Common Factor (HCF) (b) 122 (c) 157 (or) 122 + 157 = 279

CHAPTER-2
POLYNOMIALS

MULTIPLE CHOICE QUESTIONS

Q1. In the given figure number of zeros are



(a) 4 (b) 3 (c) 2 (d) 1

Answer: (c) 2

Q2. Which of the following is a quadratic polynomial?

(a) $2x + 3$ (b) $x^3 + 2x^2 + 1$ (c) $x^2 + 5$ (d) 7

Hint- quadratic polynomial have degree 2 .

Answer: (c) $x^2 + 5$

Q3. If the sum of the zeroes of a quadratic polynomial is (-3) and the product is (-10), then the polynomial is:

(a) $x^2 - 3x + 10$ (b) $x^2 + 3x - 10$ (c) $x^2 - 3x - 10$ (d) $x^2 + 3x + 10$

Hint- Quadratic polynomial $= x^2 -$(sum of roots)$x +$ product of roots

Answer: (b) $x^2 + 3x - 10$

Q4. If $(x-2)$ is a factor of $x^2 - 4x + 4$, then the other factor is:

(a) $x+2$ (b) $x-2$ (c) $x-1$ (d) $x+1$.

Answer: (b) $x-2$

Q5. Which of the following polynomials has only one zero?

(a) x^2+1 (b) x (c) x^2-1 (d) x^3-3x

Answer: (b) x

Q6. If a polynomial has 3 zeroes, it is at most of degree:

(a) 1 (b) 2 (c) 3 (d) 4

Answer: (c) 3

Q7. If $p(x)=x^2-3x+2$, then which of the following is a zero of the polynomial?

(a) 3 (b) 2 (c)4 (d) 5

Answer : (b) 2

Q8. The graph of $y=p(x)$ is shown in the figure for some polynomial $p(x)$.The number of zeroes of $p(x)$ is /are :

a) 2 (b) 3 (c) 0 (d)1

Answer: (b) 0

ASSERTION REASON QUESTIONS (1 MARKS)

Directions : Question 9 & 10 (A& R) consists of two statements, Assertion (A) and Reason (R), answer these questions selecting the appropriate option given below :-

(a) Both assertion and reason are correct, and reason explains the assertion.

(b) Both assertion and reason are correct, but reason does not explain the assertion.

(c) Assertion is correct, but reason is incorrect.

(d) Assertion is incorrect, but reason is correct:

Q9. Assertion (A): Degree of a zero polynomial is not defined.

Reason(R): Degree of a non –zero constant polynomial is 0.

Answer: (b) Both assertion and reason are correct, but reason does not explain the assertion

Q10. Assertion: x^2+4x+5 has two zeroes.
Reason: A quadratic polynomial can have at the most two zeroes.
Answer: (d) Assertion is incorrect, but reason is correct.

VERY SHORT ANSWER QUESTIONS (2X5=10)

Q1. If zeroes of the polynomial $x^2+4x+2a$ are ß and $\frac{2}{ß}$, then find the value of a?

Hint and answer: Let $p(x) = x^2+4x+2a$ and ß and $\frac{2}{ß}$ are zeroes of p(x).

$\therefore$ Product of zeroes = $\frac{Constant\ term}{coefficient\ of\ x2}$

ß.$\frac{2}{ß} = \frac{2a}{1} \Rightarrow 2=2a \Rightarrow a=1$

Q2. Find a quadratic polynomial whose sum and product of zeroes are 1,-2 respectively?
Hint and answer :-Given sum of zeroes =1 and product of zeroes= 1
$\therefore p(x)= k\ [x^2 -(\text{sum of zeroes})x+ \text{product of zeroes}]$
$= k\ [x^2 -(1)x+(-2)]= x^2-x-2$

Q3. Find zeroes of quadratic polynomial $5x^2-8x-4$ by factorization method .
Hint and answer : $5x^2-8x-4 = 5x^2 -10x+2x -4$
$=(5x^2-10x)+(2x-4)$
$= 5x(x-2) +2 (x-2)$
$=(x-2)(5x+2)$
$x=2$ and $x= \frac{-2}{5}$

Q4. If α and β are the zeroes of polynomial $p(x) =x^2+3x+2$, find a quadratic polynomial whose zeroes are $\alpha + 1, \beta + 1$.
Answer: α+ β =-3 and αβ = 2
Now α+1+ β+1= α+ β+2= -3+2= -1
(α+1)(β+1)= α+ β+ αβ+1= -3+2+1=0
So new quadratic polynomial $x^2+x+0= x^2+x$

Q5. Find the sum and product of zeroes of $p(x)= 2(x^2-3)+x$
Answer: $p(x)= 2(x^2-3)+x=2x^2-3x+x =2x^2-2x$
Here a=2 , b= -2 ,c=0
Sum of zeroes = $\frac{-b}{a} = \frac{-(-2)}{2} = 1$
Product of zeroes = $\frac{c}{a} = \frac{0}{2} =0$

SHORT ANSWER QUESTIONS (3 MARKS)

Q1. Find zeroes of (x^2-15) and verify the relationship between zeroes and coefficients.
Hint and answer: For zeroes $p(x)=0$
$x^2-15=0$
$x^2 = 15$
Take the square root of both sides:
$x=\pm\sqrt{15}$.
The zeroes are
$\alpha=\sqrt{15}$ and $\beta=-\sqrt{15}$
Compare x^2-15 with ax^2+bx+c
The coefficient of $x^2 = 1$ or a=1 , the coefficient of x= 0 or b=0 the constant term c =15
The sum of the zeroes:
$\alpha+\beta=\sqrt{15}+(-\sqrt{15})=0$
The sum of zeroes equals = $\frac{-b}{a}$= 0, so the relationship is verified.
The product of zeroes equals = $\frac{c}{a}$ = -15, so the relationship is verified.

Q.2 If the product of the zeroes of the polynomial ax^2-6x-6 is 4.Then find the value of a, also find the sum of the zeroes of the polynomial?

Answer: In polynomial ax^2-6x-6

Product of zeroes = $\frac{Constant\ term}{coefficient\ of\ x^2} = \frac{-6}{a} = 4$ so $a=\frac{-3}{2}$

Now sum of zeroes $= \frac{-coefficient\ of\ x}{coefficient\ of\ x^2}$ = -(-6)/ $\frac{-3}{2}$=-4

Q3. If α and β are the zeroes of polynomial $p(x) =5x^2-7x+1$, then find the value of $(\frac{\alpha}{\beta}+\frac{\beta}{\alpha})$.

Answer: $\alpha+\beta= \frac{-b}{a} = \frac{7}{5}$

and $\alpha\beta = \frac{c}{a} = \frac{1}{5}$

here a= 5 ,b= -7 and c= 1

$\frac{\alpha}{\beta}+\frac{\beta}{\alpha} = \frac{\alpha^2+\beta^2}{\alpha\beta} = \frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}$

$= \frac{39}{25} / \frac{1}{5} = \frac{39}{5}$

Q4. Does the polynomial $a^4 + 4a^2 + 5$ have real zeroes?

Answer: In the given polynomial $a^4 + 4a^2 + 5$, let $a^2 = x$.

Now, the polynomial becomes,

$x^2 + 4x + 5$

Comparing with $ax^2 + bx + c$,

Here, $b^2 – 4ac = 4^2 – 4(1)(5) = 16 – 20 = -4$

So, $D = b^2 – 4ac < 0$

As the discriminant (D) is negative, the given polynomial does not have real roots or zeroes.

Q5. Find the quadratic polynomial whose zeroes are 0, √5.

Answer: A quadratic polynomial can be written using the sum and product of its zeroes as:

$x^2 – (α + β)x + αβ$, where α and β are the roots of the polynomial

Here, α = 0 and β = √5

So, the polynomial will be:

$x^2 – (0 + √5)x + 0(√5)$

$= x^2 – √5x$

LONG ANSWER QUESTIONS (5 MARKS)

Q1. Find the quadratic polynomial whose zeroes are 1 and – 3. Verify the relation between the coefficients and the zeroes of the polynomial.

Answer:

∵The given zeroes are 1 and – 3.

∴ Sum of the zeroes = 1 + (- 3) = – 2

Product of the zeroes = 1 × (- 3) = – 3

A quadratic polynomial p(x) is given by

x^2 – (sum of the zeroes) x + (product of the zeroes)

∴ The required polynomial is

$x^2 – (- 2)x + (-3)$

⇒ $x^2 + 2x – 3$

Verification of relationship

∵ Sum of the zeroes = ∴ 1 + (- 3) ⇒ – 2 = – 2

i.e., LHS = RHS

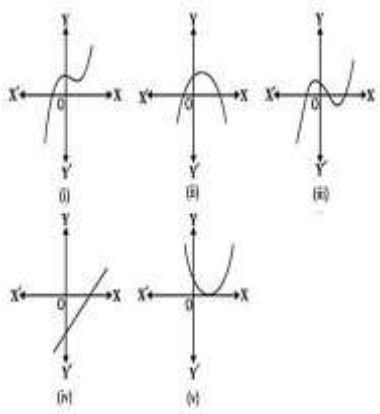
⇒ The sum of zeroes is verified.

∵ Product of the zeroes = ∴ 1 × (- 3) ⇒ – 3 = – 3

i.e., L.H.S. = R.H.S.

⇒The product of zeroes is verified.

Q2. Find the number of zeroes in the each given figure:



Answer: (i)1 (ii)2 (iii) 3 (iv) 1 (v) 1

Q3. If α and β are the zeroes of quadratic polynomial $f(x) = 6x^2+x-2$, then find the value of $\alpha\beta^2+ \alpha^2\beta$

Answer : $\alpha\beta^2+ \alpha^2\beta = \alpha\beta(\alpha+\beta)= \frac{-1}{3}x\frac{-1}{6} = \frac{1}{18}$

$\alpha+\beta = -1/6$

$\alpha\beta = -2/6 = -1/3$

CASE BASED QUESTIONS (4X2=8)

Q1. A quadratic polynomial $p(x) = ax^2 + bx + c$ has zeroes at x = 2 and x = -5.

(a) Find the values of a, b, and c in terms of k, if $p(x) = k(x - 2)(x + 5)$.

(b) Find the value of the polynomial at x = 0 (i.e., p(0)).

(c) If the graph of the polynomial intersects the y-axis at -10, what is the value of k?

Answers:

(a) $p(x) = k(x^2 + 3x - 10)$. So, a = k, b = 3k, and c = -10k.

(b) p(0) = -10k

(c) Since p(0) = -10, we have -10k = -10, which gives k = 1.

Q2. The revenue (in ₹) of a firm is represented by the polynomial $R(x)= 5x^3+4x^2+7$, and the expenditure (in ₹) of the firm is represented by the polynomial $E(x) = 3x^3+2x-1$, where x is the number of items produced by the firm in a year .

Based on the above information answer the following questions:-

(i) Find the revenue if x=10.

(ii) Find the expenditure if x=10.

(iii) Whichis greater revenue or expenditure 0n 10 items

Answer : (i)$P(10)= 5(10)^3+4(10)^2+7 =5000+400+7=$₹ 5407

(ii)$E(10) = 3(10)^3++2(10)-1 = 3000+20-1=$ ₹ 3019

(iii) ₹ 5407is a bigger than ₹ 3019 so revenue is greater than expenditure on 10 items.

CHAPTER -2: POLYNOMIALS

(Worksheet 1)

One mark questions

Q.1 If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

(a) 10 (b) -10 (c) 5 (d) -5

Q.2 If the zeroes of the quadratic polynomial $x^2 + (a + 1) x + b$ are 2 and -3, then

(a) a = -7, b = -1 (b) a = 5, b = -1

(c) a = 2, b = -6 (d) a – 0, b = -6

Q.3What is the quadratic polynomial whose sum and the product of zeroes is $\sqrt{2}$, ⅓ respectively?

(a) $3x^2 - 3\sqrt{2}x + 1$ (b) $3x^2 + 3\sqrt{2}x + 1$

(c) $3x^2 + 3\sqrt{2}x - 1$ (d) None of the above

Q.4 Assertion $p(x) = 4x^3-2x^2 +8x^4 +7x -3$ is a polynomial of degree 3.

Reason: The highest power of x in the polynomial p(x) is the degree of the polynomial

(a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Assertion is incorrect but Reason is correct.

Two marks questions

Q.5 Write a quadratic polynomial; sum of whose zeroes is $2\sqrt{3}$ and their product is 2

Q.6 Form a quadratic polynomial whose zeroes are $3 + \sqrt{2}$ and $3 – \sqrt{2}$.

Three marks questions

Q.7 Find the quadratic polynomial whose zeroes are -2 and -5. Verify the relationship between zeroes and coefficients of the polynomial

Q.8 If α and β are zeroes of the quadratic polynomial $4x^2 + 4x + 1$ then form a quadratic polynomial whose zeroes are 2α and 2β ?

CASE STUDY QUESTIONS: Four marks questions

Q 9. Ramesh was asked by one of his friends Anirudh to find the polynomial whose zeroes are $-2/\sqrt{3}$ and $\sqrt{3}/4$. He obtained the polynomial by following steps which are as shown below:

Let $\alpha = \frac{-2}{\sqrt{3}}$ and $\beta = \frac{\sqrt{3}}{4}$, then $\alpha + \beta = \frac{-2}{\sqrt{3}} + \frac{\sqrt{3}}{4} = \frac{(-8+1)}{4\sqrt{3}} = \frac{(-7)}{4\sqrt{3}}$

And $\alpha\beta = = \frac{-2}{\sqrt{3}} \times \frac{\sqrt{3}}{4} = \frac{-1}{2}$

Required polynomial $= x^2 - (\alpha+\beta)\, x + \alpha\beta$

$= x^2 - \left(\frac{-7}{4\sqrt{3}}\right) x + \left(\frac{-1}{2}\right)$

$= x^2 + \frac{7x}{4\sqrt{3}} - \frac{-1}{2} = 4\sqrt{3}\, x^2 + 7\, x - 2\sqrt{3}$

His another friend kavita pointed out that the polynomial obtained is not correct. Based on the above information, solve the following questions:

Q 1. Is the claim of kavita correct?

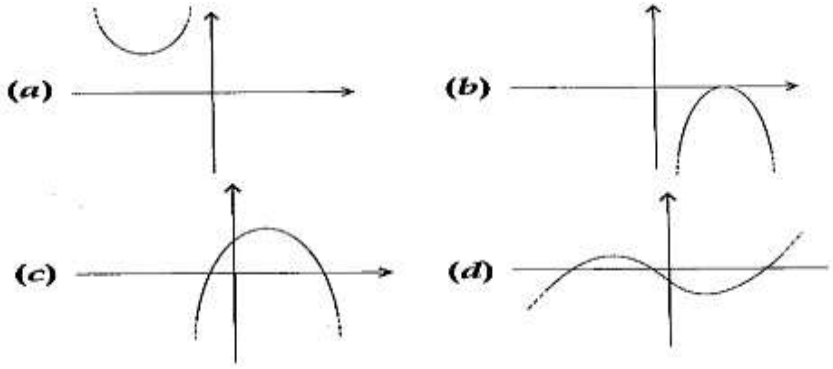
Q 2. If given polynomial is incorrect, then find the correct quadratic polynomial

Q3. Find the value of $\alpha^2 + \beta^2$ Or If (x -2) is a factor of correct polynomial p(x), then find p (2)

POLYNOMIALS (WORKSHEET-2)

One Mark Questions

Q.1Which of the following is not the graph of quadratic polynomial?



Q.2 **A polynomial of degree n has:**
(a) Only one zero (b) At least n zeroes (c) More than n zeroes (d) At most n zeroes
Q.3If the zeroes of the quadratic polynomial $ax^2 + bx + c$, $c \neq 0$ are equal, then
(a) c and a have opposite signs (b) c and b have opposite signs
(c) c and a have the same sign (d) c and b have the same sign
Q.4 Assertion: A linear polynomial can have at most one zero
Reason: The graph of a linear polynomial is a straight line which intersects the x-axis at most once
(a)Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Assertion is incorrect but Reason is correct.

Two Marks Questions

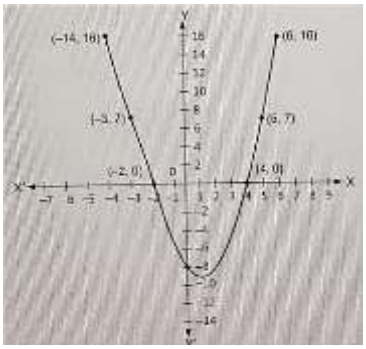
Q.5 If one zero of the polynomial $5z^2 + 13z - p$ is reciprocal of the other, then find p.
Q.6 If 1 and –1 are zeroes of polynomial $Lx^4 + Mx^3 + Nx^2 + Rx + P$, show that L + N + P = M + R = 0

Three Marks Questions

Q.7 If α and β are the zeroes of the polynomial $6y^2 - 7y + 2$, find a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$
Q.8 α, β, γ are zeroes of polynomial $x^3 + px^2 + qx + 2$ such that $\alpha.\beta + 1 = 0$. Find the value of $2p + q + 5$

CASE STUDY QUESTIONS Four Marks Questions

Q.9:Based on the above graph solve the following questions



(a) What is the shape of graph of a quadratic polynomial
(b)Find the zeroes of given quadratic polynomial
(c)The graph of given quadratic polynomial cut at which point on x-axis?
Or

The graph of the given quadratic polynomial cut at which point on y - axis

POLYNOMIALS – WORKSHEET 3

One Mark Questions

1. If one zero of the quadratic polynomial $x^2 + 6x + k$ is -3, then the value of k is:

   (a) 9 (b) -9 (c) 6 (d) -6

2. If the zeroes of the quadratic polynomial $x^2 + (a - 2)x + b$ are 1 and -2, then:

   (a) $a = 1, b = -2$ (b) $a = -1, b = -2$ (c) $a = 3, b = -2$ (d) $a = 1, b = 2$

3. What is the quadratic polynomial whose sum and product of zeroes are -1 and 4 respectively?

- (a) $x^2 + x + 4$ (b) $x^2 - x + 4$ (c) $x^2 + x - 4$ (d) $x^2 - x - 4$

4. Assertion: $p(x) = x^4 + 2x^3 - x + 1$ is a polynomial of degree 4. Reason: The degree of a polynomial is the highest power of x.

- (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (b) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- (c) Assertion is correct but Reason is incorrect.
- (d) Assertion is incorrect but Reason is correct.

Two Marks Questions

1. Write a quadratic polynomial, the sum of whose zeroes is $-\sqrt{2}$ and their product is 5.

2. Form a quadratic polynomial whose zeroes are $4 + \sqrt{3}$ and $4 - \sqrt{3}$.

Three Marks Questions

1. Find the quadratic polynomial whose zeroes are 2 and 5. Verify the relationship between zeroes and coefficients.

2. If α and β are the zeroes of $2x^2 + x - 3$, form a polynomial whose zeroes are $-\alpha$ and $-\beta$.

Four Marks Question (Case Study)

Anita was asked to find a polynomial whose zeroes are $-\sqrt{5}$ and $\sqrt{5}/2$. She computed as follows:
Let $\alpha = -\sqrt{5}$ and $\beta = \sqrt{5}/2$
$\alpha + \beta = -\sqrt{5} + \sqrt{5}/2 = (-2\sqrt{5} + \sqrt{5})/2 = -\sqrt{5}/2$
$\alpha\beta = -\sqrt{5} \times \sqrt{5}/2 = -5/2$
Required polynomial $= x^2 - (\alpha + \beta)x + \alpha\beta = x^2 + (\sqrt{5}/2)x - 5/2$
Her friend Ayesha pointed out a mistake in the result.
Q1. Is Ayesha correct?
Q2. Find the correct polynomial.
Q3. Find $\alpha^2 + \beta^2$ or if $(x - 1)$ is a factor of the polynomial, find p(1).

POLYNOMIALS – WORKSHEET 4

One Mark Questions

5. If one zero of the quadratic polynomial $x^2 – 4x + k$ is 3, then the value of k is:
   (a) 3 (b) 6 (c) -3 (d) -6
6. If the zeroes of the quadratic polynomial $x^2 – (a – 1)x + b$ are –1 and 4, then:
   (a) a = 3, b = –4 (b) a = 5, b = –4 (c) a = –3, b = 4 (d) a = 2, b = –4
7. What is the quadratic polynomial whose sum and product of zeroes are 1 and –4 respectively?
   (a) $x^2 – x – 4$ (b) $x^2 + x – 4$ (c) $x^2 – x + 4$ (d) $x^2 + x + 4$
8. Assertion: $p(x) = 6x^2 – x^5 + 2x^3 + 4$ is a polynomial of degree 5. Reason: The degree is the highest exponent of the variable.

- (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (b) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- (c) Assertion is correct but Reason is incorrect.
- (d) Assertion is incorrect but Reason is correct.

Two Marks Questions

1. Write a quadratic polynomial, the sum of whose zeroes is –5 and their product is 6.
2. Form a quadratic polynomial whose zeroes are $\sqrt{5}$ and $-\sqrt{5}$.

Three Marks Questions

1. Find the quadratic polynomial whose zeroes are 1/2 and –3/2. Verify the relationship between zeroes and coefficients.
2. If α and β are the zeroes of $3x^2 – 6x + 2$, form a polynomial whose zeroes are $\alpha/2$ and $\beta/2$.

Four Marks Question (Case Study)

Rohit was solving a problem to find a polynomial whose zeroes are $-1/\sqrt{2}$ and $\sqrt{2}/3$. He tried this:

Let $\alpha = -1/\sqrt{2}$ and $\beta = \sqrt{2}/3$

$\alpha + \beta = -1/\sqrt{2} + \sqrt{2}/3 = (-3 + 2)/3\sqrt{2} = -1/3\sqrt{2}$

$\alpha\beta = -1/\sqrt{2} \times \sqrt{2}/3 = -1/3$

Required polynomial: $x^2 – (\alpha + \beta)x + \alpha\beta = x^2 + (1/3\sqrt{2})x – 1/3$

His friend Shalini said his answer was wrong.

Q1. Is Shalini correct?

Q2. Find the correct polynomial.

Q3. Find $\alpha^2 + \beta^2$ or if (x + 1) is a factor of the polynomial, find p(–1).

POLYNOMIALS – WORKSHEET- 5

One Mark Questions

Q.1 If one zero of the quadratic polynomial $x^2 - 5x + k$ is 3, then the value of k is
(a) 6 (b) 15 (c) 2 (d) None of these
Q.2 If the zeroes of the polynomial $x^2 + (k + 4)x + 5$ are -2 and -3, then the value of k is
(a) -3 (b) 1 (c) 3 (d) -1
Q.3 What is the quadratic polynomial whose sum and product of zeroes are 3 and -2 respectively?
(a) $x^2 - 3x - 2$ (b) $x^2 + 3x - 2$ (c) $x^2 - 3x + 2$ (d) None of these
Q.4 Assertion: The polynomial $p(x) = x^3 + 2x^2 - x + 5$ has three zeroes.
Reason: The degree of the polynomial gives the number of zeroes.
(a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Assertion is incorrect but Reason is correct.

Two Marks Questions

Q.5 Write a quadratic polynomial; sum of whose zeroes is 4 and their product is 1.
Q.6 Form a quadratic polynomial whose zeroes are $2 + \sqrt{5}$ and $2 - \sqrt{5}$.

Three Marks Questions

Q.7 Find the quadratic polynomial whose zeroes are 1 and -4. Verify the relationship between zeroes and coefficients of the polynomial.
Q.8 If α and β are zeroes of the polynomial $x^2 - 4x + 3$, then find a polynomial whose zeroes are $1/\alpha$ and $1/\beta$.

Four Marks Question (Case Study)

Q.9 In a school exhibition, students prepared a model to demonstrate the relationship between the shape of a parabolic bridge and polynomial equations. The arch of the bridge follows a parabolic curve represented by a quadratic polynomial.
The polynomial describing the height h(x) (in meters) of the bridge at a horizontal distance x (in meters) from one end is:
$h(x) = -x^2 + 6x$
Answer the following questions:
Q1. At what value(s) of x does the bridge touch the ground?
Q2. What is the maximum height of the bridge and at what distance from the starting point does this occur?
Q3. Factorize the polynomial h(x).
Q4. Write the zeroes of h(x) and verify the relationship between zeroes and coefficients.

ANSWER KEY WORK SHEET 1

1. (b) -10 2 (d) a = 0, b = -6 3 (a) $3x^2 - 3\sqrt{2}x + 1$

4(d) Assertion is incorrect but Reason is correct.

5 Let the polynomial be **$p(x) = x^2$ - (sum of zeroes) x + product of zeroes**

$x^2 - (2\sqrt{3})\ x + 2$

6 Sum of zeroes, $(3 + \sqrt{2}) + (3 - \sqrt{2}) = 6$

Product of zeroes, $(3 + \sqrt{2}) \times (3 - \sqrt{2}) = (3)^2 - (\sqrt{2})^2 = 9 - 2 = 7$

Quadratic polynomial $x^2 - 6x + 7$

7 Sum of zeroes, S = (-2) + (-5) = -7

Product of zeroes, P = (-2)(-5) = 10

Quadratic polynomial is $x^2 - Sx + P = 0$

$= x^2 - (-7)x + 10$

$= x^2 + 7x + 10$

Verification:

Here a = 1, b = 7, c = 10

Sum of zeroes = (-2) + (-5) = 7 , $\frac{-b}{a} = -7$

Product of zeroes = (-2) x (-5) =10, $\frac{c}{a} = 10$

Hence verified

8 $p(x) = 4x^2 + 4x + 1$

$\alpha + \beta = \frac{-b}{a} = -1$ and $\alpha\beta = \frac{c}{a} = \frac{1}{4}$

Quadratic polynomial whose zeroes are 2α and 2β is

$x^2 - (2\alpha + 2\beta)\ x + 2\alpha . 2\beta$

$x^2 - 2(\alpha + \beta)\ x + 4\alpha\beta$

$x^2 - 2(-1)\ x + 4(\frac{1}{4}) = x^2 + 2x + 1$ Ans

9 (1) Yes, the claim of Kavita is **correct**

(2) $4\sqrt{3}\ x^2 + 5x - 2\sqrt{3}$ (k= $\frac{1}{4\sqrt{3}}$)

(3) $\frac{73}{48}$ OR p (2) = $4\sqrt{3} + 10$

ANSWERS – WORKSHEET 2

1. (d) 2 (d) At most n zeroes 3(c) c and a have the same sign

4(a) both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

5 Let zeroes of the polynomial $5z^2 + 13z - p$ is α and $\frac{1}{\alpha}$ then

Product of zeroes = $\frac{c}{a}$

$\alpha \times \frac{1}{\alpha} = \frac{-p}{5}$, p= -5

6 Sol: Given 1 and –1 are zeroes of polynomial

So p (1) = 0, substituting x = 1 in the given polynomial we get

$L(1)^4 + M(1)^3 + N(1)^2 + R(1) + P = 0$

L + N + P = M + R = 0

Hence proved

7 Given: $6y^2 - 7y + 2$

Here a = 6, b = -7, c = 2 Required polynomial is $\frac{1}{2}(2x^2 - 7x + 6)$.

8 $\alpha . \beta + 1 = 0$, $\alpha . \beta = -1$

$\alpha\beta\gamma = -2$ so $\gamma = \frac{-2}{\alpha\beta} = 2$

α+ β+ γ = -p, α+ β =-p-2

α β + β γ+ αγ = q = -2p -4 =q +1 = 2p + q + 1proved

9 (a)Parabola (b)(-2, 4) (c)(2,0) (4, 0) Or y -axis at (0, -8)

ANSWERS WORKSHEET 3

1. (a) 9 2. (c) a = 3, b = –2 3. (d) $x^2 – x – 4$

4. (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

Two Mark Q1: $x^2 + \sqrt{2}x + 5$ Q2: $x^2 – 8x + 13$

Three Mark Q1: $x^2 – 7x + 10$ Q2: $x^2 + (–1/2)x – 3$

Case Study:

Q1: Yes, Ayesha is correct.

Q2: Multiply through by 2 to remove denominators: $2x^2 + \sqrt{5}x – 5$

Q3: $\alpha^2 + \beta^2 = 5 + 25/4 = 45/4$

ANSWER KEY WORK SHEET 4

1. (d) 2 (d) At most n zeroes 3(c) c and a have the same sign

4(a) both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

5 Let zeroes of the polynomial $5z^2 + 13z – p$ is α and $\frac{1}{\alpha}$ then

Product of zeroes = $\frac{c}{a}$

$\alpha \times \frac{1}{\alpha} = \frac{-p}{5}$, p= -5

6 Sol: Given 1 and –1 are zeroes of polynomial

So p (1) = 0, substituting x = 1 in the given polynomial we get

$L (1)^4 + M (1)^3 + N (1)^2 + R (1) + P = 0$

L + N + P = M + R = 0 Hence proved

ANSWERS WORK SHEET 5

1. (b) 15 2. (d) -1 3. (d) None of these

4. (b) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

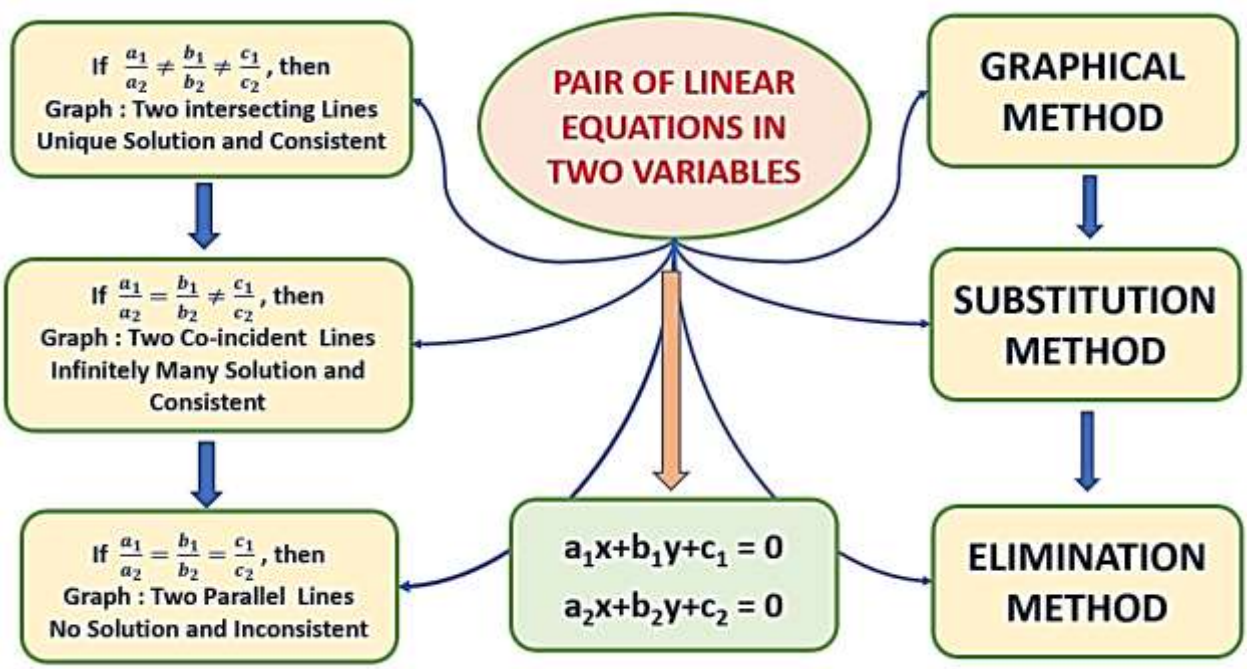
5. $x^2 − 4x + 1$ 6. $x^2 − 4x + 1$ 7. $x^2 + 3x − 4$; Verified: Sum = -3, Product = -4

8. $x^2 − (\alpha + \beta)/\alpha\beta\, x + 1/(\alpha\beta) = x^2 − (4/3)x + 1/3$

9. Q1. x = 0 and x = 6 Q2. x = 3, height = 9 meters

Q3. h(x) = -x(x − 6) Q4. Zeroes: 0 and 6; Sum = 6, Product = 0

CHAPTER -3
PAIR OF LINEAR EQUATION IN TWO VARIBLES



1. **Standard Form:**
   $a_1x+b_1y+c_1=0$
   $a_2x+b_2y+ c_2 =0$
2. **Types of Solutions:**
   - **Unique Solution** (Intersecting lines):
     $a_1/a_2 \neq b_1/b_2$
   - **No Solution** (Parallel lines):
     $a_1/a_2=b1/b2 \neq c_1/c_2$
   - **Infinite Solutions** (Coincident lines):
     $a_1/a_2=b_1/b_2=c_1/c_2$
3. **Methods of Solving:**
   - Graphical Method
   - Substitution Method
   - Elimination Method
   - Cross-Multiplication Method

MULTIPLE CHOICE QUESTIONS (1 MARKS)

Q1. The graph of the pair of equations 2x + 3y = 5 and 4x + 6y = 10 will be:
a) Parallel lines b) Intersecting lines c) Coincident lines d) Perpendicular lines
Answer: c) Coincident lines
Q2. If a pair of linear equations has a unique solution, then the lines represented are:
a) Intersecting at one point b) Parallel c) Coincident d) None of these
Answer: a) Intersecting at one point
Q3. The solution of the pair of equations x + y = 6 and x − y = 4 is:
a) (4, 2) b) (3, 3) c) (5, 1) d) (2, 4)
Answer: c) (5, 1)

Q4. The substitution method is best used when:

a) Coefficients of x or y are 1 b) Equations are complex

c) Variables are hard to eliminate d) All of the above

Answer: d) All of the above

Q5. The pair of equations $3x - 2y = 6$ and $6x - 4y = 12$ have:

a) One solution b) No solution c) Infinite solutions d) Two solutions

Answer: c) Infinite solutions

Q6. The pair of equations $x+y=5$ and $2x+2y=10$ has

a) No solution b) Unique solution c) Infinite solutions d) Two solutions

Answer: c) Infinite solutions

Q7. Equations $2x+3y=5$ and $4x+6y=7$ are

a) Consistent and dependent b) Inconsistent

c) Consistent and independent d) Coincident

Answer: b) Inconsistent

Q8. A pair of linear equations is given as $3x+2y=12$ and $6x+4y=24$. Which method will give you the solution fastest and why?

Answer: Any method; the equations are multiples → use comparison/substitution to confirm infinite solutions quickly.

REASON ASSERTION QUESTIONS (1 MARKS)

Directions: Each of the following questions consists of two statements: an **Assertion (A)** and a **Reason (R)**. Answer them by selecting the correct option:

(a) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

Q9. Assertion (A): The substitution method can be used to solve a pair of linear equations.

Reason (R): In substitution, one variable is expressed in terms of the other.

Answer: Option (a) is correct.

Explanation: This is the basic definition of the substitution method. The variable expression is substituted in the second equation

Q10. Assertion (A): Graphically, two coincident lines represent a pair of inconsistent equations.

Reason (R): Coincident lines have infinite points of intersection.

Answer: Option (c) is correct.

Explanation: Coincident lines represent **consistent** equations with **infinite solutions**, so the assertion is false but the reason is true.

VERY SHORT ANSWER QUESTIONS (2 MARKS)

Q11. A shop sells 2 pencils and 3 pens for ₹30. Another shop sells 4 pencils and 6 pens for ₹60. What can be said about the prices of pens and pencils?

Answer: Infinite solutions → prices not uniquely determinable (equations are equivalent).

Q12. A father is 5 times as old as his son. After 10 years, he will be 3 times as old as his son. Find their present ages.

Answer: Let son's age be x, father's = 5x.
5x+10=3,(x+10) → solve to get son = 10, father = 50.
Q13. A two-digit number is such that the digit at the tens place is double the digit at units place. If the digits are reversed, the new number is 36 less than the original. Find the number.
Answer: 82
Q14. The sum of two numbers is 9 and their difference is 3. Form the equations and find the numbers.
Answer: x+y=9, x -y=3 → solving gives x=6, y=3
Q15. A boat takes 2 hours to travel 40 km downstream and 4 hours to travel the same distance upstream. Find the speed of the boat in still water and the speed of the current.
Answer: Let boat speed = x, current = y
Equations: $\frac{40}{x+y} = 2$ and $\frac{40}{x-y} = 4$ so the equations are x + y = 20 and x - y = 10
Solution: x=15 km/h, y=5 km/h

SHORT ANSWER QUESTIONS (3 MARKS)

Q16. Show that the equations 3x+4y=103x + 4y = 103x+4y=10 and 6x+8y=206x + 8y = 206x+8y=20 have infinite solutions, and write two such solutions.
Answer: Multiply first by 2 → both equations become the same.
Solutions: (0, 2.5), (2, 0.5)
Q17. If the pair of equations x+ay=b and ax + y = b has a unique solution, find the condition on $a \neq \pm 1$
Answer: $a^2 \neq 1$
Q18. A and B each write two different linear equations with the same solution. What condition must their equations satisfy?
Answer: Both equations must intersect at the same unique point.
Q19. An equation in the form ax+by=c is given. What happens to the line if the value of c is increased while keeping a and b constant?
Answer: The line shifts parallel upward or downward depending on sign.
Q20. You are given the equations 2x+3y =12 and 4x+6y = c. For which value of c will the equations be coincident?
Answer: c=24

LONG ANSWER QUESTIONS (5 MARKS)

Q21. The cost of 2 kg apples and 3 kg bananas is ₹180. The cost of 4 kg apples and 6 kg bananas is ₹360. Find the price per kg of apples and bananas.
Answer: Infinite solutions (equations are multiples), price can't be determined uniquely.
Q22. A number consists of two digits. The sum of digits is 9. If we interchange the digits, the new number is 27 more than the original number. Find the number.
Answer: 36
Q23. Two numbers differ by 5 and their sum is 25. Form the equations and solve.
Answer: x+y=25, x−y=5 → x=15, y=10

CASE BASED QUESTIONS (4 MARKS)

Q24. A coaching institute of Mathematics conducts classes in two batches I and II and fees for rich and poor children are different. In batch I, there are 20 poor and 5 rich children, whereas in batch II, there are 5 poor and 25 rich children. The total monthly collection of fees from batch I is ₹ 9000 and from batch II is ₹ 26000. Assume that each poor child pays ₹ x per

month and each rich child pays ₹ y per month.

Based on the given information, solve the following questions:

1. Represent the information given above in terms of x and y.
2. If there are 10 poor and 20 rich children in batch II, what is the total monthly collection of fees from batch II?
3. Find the monthly fee paid by a poor child.

Or

Find the difference in the monthly fee paid by a poor child and a rich child.

Answers

1.20x+5y=9000(1), 5x+25y=26000(2)

2. Storybooks cost ₹150 each. He collected ₹8,500 in total.

3. Multiplying eq. (1) by 5 and subtracting from eq. (2):(5x+25y)–5(20x+5y)=26000–5×9000⇒5x+25y–100x–25y=26000–45000⇒−95x=−19000⇒x=−19000−95=200

OR

∴Monthly fee paid by a rich child is ₹1000.

Putting the value of y in eq. (1), we get:

20x+5×1000=9000⇒20x=9000–5000=4000⇒x=400020=200

Monthly fee paid by a poor child is ₹200.

The difference in the monthly fee is ₹ (1000 – 200) = ₹800.

Q25. A seller sold 40 books comprising novels and storybooks. Novels cost ₹250 each and storybooks cost ₹150 each. He collected ₹8,500 in total.

1. Form two linear equations in x and y (number of novels and storybooks).

Ans. Here is the equations:

- x + y = 40
- 250x + 150y = 8500

2. Eliminate y to solve for x.

Ans. multiply first equation by 150 and subtract

150x + 150y = 6000

(250x + 150y) – (150x + 150y) = 8500 – 6000

⇒ 100x = 2500 ⇒ x = 25

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
WORKSHEET-1
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q1. The pair of equations x + 2y = 3 and 2x + 4y = 8 has:

A. Unique solution B. No solution

C. Infinitely many solutions D. None of these

Q2. One equation of a pair of dependent linear equation is -5x+7y=2: The second equation can be

A. 10x+14 y +4 = 0 B . -10x=14y+4

C. -10x+14y+4=0 D. 10x-14y=-4

Q3. If two lines are coincident, then the pair of equations has:

A. No solution B. Exactly one solution

C. Two solutions D. Infinitely many solutions Assertion &

Q4. Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false D. A is false, R is true

Assertion (A): The equations x + 2y = 7 and 2x + 4y = 14 are dependent.

Reason (R): The ratio of coefficients is equal for both equations.

SHORT ANSWER TYPE QUESTIONS (2 MARKS EACH)

Q5. Find the value of p and q for which the following system of equations have infinite number of solutions:

2x+3y=7, (p+q)x+(2p-q)y=21

Q6. Find the value of 'k' so that the pair of equations 2x + 3y = 7 and 4x + ky = 14 is inconsistent.

SHORT ANSWER TYPE QUESTIONS (3 MARKS EACH)

Q7. Solve the pair of equations using elimination method:

101x+99y=499, 99x+101y=501

Q8. The sum of two-digit number and the number formed by interchanging the digit is 132. If 12 is added to the number, the new number becomes 5 times the sum of the digits. Find the number.

CASE STUDY BASED QUESTION (4 MARKS)

Q9. Context: A theatre sold 200 tickets for two shows – one for children and one for adults. A children's ticket costs ₹50 and an adult ticket costs ₹120. The total money collected was ₹16,000.

(i) Form a pair of linear equations.

(ii) Find the number of children's and adult tickets sold.

(iii) Interpret the solution.

LONG ANSWER TYPE QUESTION (5 MARKS)

Q10. Calculate the area of triangle formed by the lines so drawn and the X axis. Lines are given by the equations x+2y=3 and 2x-3y=-8

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
WORKSHEET-2
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q1 For what value of k, do the equations $3x – y + 8 = 0$ and $6x – k y = –16$ represent Coincident lines?

(A) 2 (B) -2 (C) 1 (D) 7

Q2. A pair of linear equation which has a unique solution x=2 and y= -3 is

(A) X+Y= -1 and2X-3Y=-5 (B) 2x+5y=-11 and 4X+10Y=-22

(C) 2x-y=1 and 3x+2y=0 (D) x-4y-14 =0 and 5x-y-13 =0

Q3. If two lines are intersecting, then the pair of equations has:

A. No solution B. Exactly one solution

C. Two solutions D. Infinitely many solutions

Q4. Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

Assertion (A): The equations $x + 2y = 7$ and $2x + 4y = 14$ are dependent.

Reason (R): The ratio of coefficients is equal for both equations.

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

Q5. The angle of a triangle are x, y and 40, the difference between the two angles x and y is 30. Find the value of x and y.

Q6. Solve the system of equations: 2x+3y= 11 and 4x-y=5 and find the value of x and y.

SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q7. Solve the following system of linear equation graphically: x+2y= 3 and 2x-3y+8=0

Q8. Two years ago, a father was five times as old as his son. Two years later his age will be 8 more than three times the age of the son. Find the present ages of father and son.

CASE STUDY BASED QUESTION (4 MARKS)

Q9. Sohan got a field from his father, the field is connected with the road and the road is like a straight line, Sohan find the two boundry lines like two linear equations such as x-y+2=0 and 4x-y-4=0 . Calculate the area of triangle formed by the lines and the road.

LONG ANSWER TYPE QUESTION (5 MARKS)

Q10 Places A and B are 180 km apart on a highway. One car starts from A and another from B at the same time, if the car travels in the same direction at different speeds, they meet in 9hours, if they travel towards each other with the same speeds as before, they meet in an hour. What are the speed of the two cars?

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
WORKSHEET-3
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q 1. If x = a, y = b is the solution of the equation's x – y = 2 and x + y = 4, then the values of a and b are respectively

(A) 3 and 5 (B) 5 and 3 (C) 3 and 1 (D) –1 and –312.

Q2. Aruna has only Re 1 and Rs 2 coins with her. If the total number of coins that she has is 50 and the amount of money with her is Rs 75, then the number of Re 1 and Rs 2 coins are, respectively

(A) 35 and 15 (B) 35 and 20 (C) 15 and 35 (D) 25 and 25

Q3. The father's age is six times his son's age. Four years hence, the age of the father will be four times his son's age. The present ages, in years, of the son and the father are respectively

(A) 4 and 24 (B) 5 and 30 (C) 6 and 36 (D) 3 and 24

Q4. Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

Assertion (A): The pair of equations x + y = 1 and 2x + 2y = 3 has no solution.

Reason (R): These two lines are parallel.

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

Q 5. For which value of p and q, will the following pair of linear equations have infinitely many solutions? $4x+5y=2$ and $(2p+7q)\,x+(p+8q)\,y=2q-p+1$

Q 6. Find the value of k for which the following pair of equations have no solution. Equations are $kx+3y=k-3$ and $12x+ky=k$

SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q7. Solve the linear equations: $21x+47y=110$ and $47x+21y=162$ and find the value of x and y.

Q8. A boat takes 4 hours to go 44 km downstream and comes back in 5.5 hours. Find the speed of the boat in still water and the speed of the stream.

CASE STUDY BASED QUESTION (4 MARKS)

Q9. Dipesh bought 3 notebooks and 2 pens for Rs. 80. His friend Ramesh said that price of each notebook could be Rs. 25. Then three notebooks would cost Rs.75, the two pens would cost Rs. 5 and each pen could be for Rs. 2.50. Another friend Amar felt that Rs. 2.50 for one pen was too little. It should be at least Rs. 16. Then the price of each notebook would also be Rs.16.

Aditya also bought the same types of notebooks and pens as Dipesh. He paid 110 for 4 notebooks and 3 pens.

i. Whether the estimation of Ramesh and Amar is applicable for Aditya? 1

ii. Let the cost of one notebook be x and that of pen be y. Which of the following set describe the given problem? 1

iii. What is the exact cost of the notebook? 2ORWhat is the exact cost of the pen? What is the total cost if they purchase the same type of 15 notebooks and 12 pens. 2

LONG ANSWER TYPE QUESTION (5 MARKS)

Q10.A fraction becomes 9/11, If 2 is added to both the numerator and the denominator. If, 3 is added to both the numerator and the denominator it becomes 5/6 . Find the fraction.

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
WORKSHEET 4
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q 1. The pair of equations $ax + 2y = 9$ & $3x + by = 18$ represent parallel lines, where a, b are integers if

a) $a = b$ b) $3a = 2b$ c) $2a = 3b$ d) $ab = 6$

Q 2. The pair of equations $2kx + 5y = 7$, $6x - 5y = 11$ has a unique solution, if

a) $k \neq -3$ b) $k \neq 23$ c) $k \neq 5$ d) $k \neq 29$

Q 3. Which of the following value of k should be selected so that the pair of equations $x + 2y = 5$ and $3x + ky + 15 = 0$ has a unique solution?

a) $k \neq 5$ b) $k \neq 6$ c) $k = 5$ d) $k = 6$

ASSERTION AND REASONING (1 MARK EACH)

Q4.

Assertion (A): The pair of equations x -y = 1 and 2x + 2y = 3 has unique solution.

Reason (R): These two lines are parallel.

Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

Q 5. Determine the values of a and b for which the following system of linear equations has infinite number of solutions: $2x - (a - 4)y = 2b + 1$ and $4x - (a - 1)y = 5b - 1$.

Q 6 . Two rails are represented by the equations x+2y-4=0 and 2x+4y-12 =0. will the rails cross each other? Justify your answer.

SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q7. Solve the linear equations: 0.2x+0.3y=1.3 and 0.4x+0.5y=2.3 find the value of x and y.

Q8. A boat takes 4 hours to go 44 km downstream and comes back in 5.5 hours. Find the speed of the boat in still water and the speed of the stream.

CASE STUDY BASED QUESTION (4 MARKS)

Theme: Operation Sindoor – India's Strategic Response

After a terror attack in Pahalgam, the Indian Army launched Operation Sindoor to give a fitting reply. Two types of defence units – drones and ground commandos – were deployed strategically. Let the number of drones used be x and the number of commandos be y.

According to the operation report:

1. The combined cost of deploying 3 drones and 4 commandos was ₹1.4 crore.
2. The cost of deploying 5 drones and 2 commandos was ₹1.6 crore.

Based on this data, answer the following questions:

Q1. Write the pair of linear equations representing the situation.

Q2. Find the cost of deploying one drone and one commando.

Q3.. If 6 drones and 5 commandos are deployed in another mission, what would be the total cost based on the values of x and y you found?

Q4. Interpret the meaning of the solution in the context of Operation Sindoor.

LONG ANSWER QUESTION (5 MARKS)

Q10. Calculate the area of triangle formed by the lines so drawn and both the axis. The lines are x+3y=6 and 2x-3y=12

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PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
WORKSHEET--5
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q 1. The pair of equations 3x+y= 81 and 81x-y= 3 has

a) No solution b) unique solution c) infinitely many solutions d) x = 17/8, y = 15/8

Q 2. The pair of linear equations $2x + 3y = 5$ and $4x + 6y = 10$ is

a) Inconsistent b) dependent consistent c) Consistent d) none of these

Q 3. The two-digit number which becomes $5th/6$ of itself when its digits are reversed. The difference in the digits of the number being 1, then the two-digit number is

a) 45 b) 54 c) 36 d) 63

Q4. Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

Assertion (A): The pair of equations x -y = 1 and 2x + 2y = 3 has unique solution.

Reason (R): These two lines are parallel.

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

Q 5. Determine the values of a and b for which the following system of linear equations has infinite number of solutions: $2x - (a - 4)\ y = 2b + 1$ and $4x - (a - 1)\ y = 5b - 1$.

Q 6. Solve the pair of linear equations: 3x/2 – 5y/3 = -2 and x/3 + y/2 = 13/6 and find the value of 2x+y

SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q7. Solve the linear equations: 0.2x+0.3y=1.3 and 0.4x+0.5y=2.3 find the value of x and y.

Q8. A boat takes 4 hours to go 44 km downstream and comes back in 5.5 hours. Find the speed of the boat in still water and the speed of the stream.

CASE STUDY BASED QUESTION (4 MARKS)

Q9. After a terror attack in Pahalgam, the Indian Army launched Operation Sindoor to give a fitting reply. Two types of defence units – drones and ground commandos – were deployed strategically. Let the number of drones used be x and the number of commandos be y. According to the operation report:

The combined cost of deploying 3 drones and 4 commandos was ₹1.4 crore.

The cost of deploying 5 drones and 2 commandos was ₹1.6 crore.

Based on this data, answer the following questions:

(i) Write the pair of linear equations representing the situation.

(ii)Find the cost of deploying one drone and one commando.

(iii)(a) If 6 drones and 5 commandos are deployed in another mission, what would be the total cost based on the values of x and y you found? OR

(b)Interpret the meaning of the solution in the context of Operation Sindoor.

LONG ANSWER QUESTION (5 MARKS)

Q10. The students of a class are made to stand equally in rows. If 3 students are extra in each row, there would be one row less. If 3 students are less in a row, there would be 2 more rows,. Find the number of students in the class.

ANSWER KEY OF WORKSHEET -1 (LETV)

Q1. B, Q2. D, Q3. D, Q4. A, Q5. P=5, q=1, Q6. K=6, Q 7. X=2, y=3, Q 8. 48

Q 9. The system of equations:

(i) x +y =200x + y = 200x+y=200 (ii) 50x+120y=16000

has a **unique solution**, but it does **not give whole numbers** for x and y. This suggests that **with 200 tickets sold**, it is **not possible** to collect **exactly ₹16,000** if all children's tickets cost ₹50 and adult tickets ₹120.

🔍 **Interpretation**:The theatre must have either:Collected a different total amount, or

- Sold a different number of tickets, or Used different ticket prices.

Q 10. x =-1, y=2 do it graphically.

ANSWER KEY OF WORKSHEET 2 (LETV)

Q1. A, Q 2. D, Q3. D, Q4. A, Q5 x=85and y=55,

Q 6. X=13/7 and y=17/7

Q 7. X= -1 and y=2 (solve it graphically)

Q 8. Son's present age = 10years, Father's present age = 42 years.

Q 9. The area of the triangle formed by the two lines and the road (x-axis) is 6 square units

Q 10. Speed of car A = 100 km/h, speed of car B = 80 km/hr .

ANSWER KEY OF WORKSHEET-3 (LETV)

Ans 1. C Ans 2. D Ans 3. C Ans 4. D Ans 5. P=-1, q= 2

Ans 6 K=+- 6 Ans 7 x=3, y=1

Ans 8. Speed of boat in still water= 9.5 km/hr , speed of stream = 1.5 km/hr

Ans 9. (i) No, neither Ramesh's nor Amar's estimation works for Aditya.

(ii) Equations: 3x+2y=80 and 4x+3y= 110

iv. cost of notebook = rs 20 and cost of pen = rs 10

iv. 15 notebooks and 12 pens cost = ₹420

Ans 10 7/9

ANSWER KEY OF WORKSHEET-4 (LETV)

Ans 1. d Ans 2 . a Ans 3. b Ans 4. c Ans 5. a=7, b= 3

Ans 6 no two rails will not cross each other because lines have no solution.

Ans 7 x=2, y=3

Ans 8. Speed of boat in still water= 9.5 km/hr , speed of stream = 1.5 km/hr

Ans 9. (i) 3x+4y=1.4 and 5x+2y= 1.6 where cost of deploying 1 drone= Rs x crore and cost of deploying 1 commando = Rs y crore

(ii) x= 0.257 crore and y= 0.157 crore (iii) Total cost 6x+5y= 2.327 crore

(iv) The cost of deploying one drone is ₹0.257 crore and one commando is ₹0.157 crore. Using this cost structure, the Indian Army planned its resources efficiently during Operation Sindoor, showcasing strategic use of manpower and technology in national defense.

Ans 10 Area of triangle is 18-unit square.

ANSWER KEY OF WORKSHEET -5 (LETV)

Ans 1. d Ans 2 . b Ans 3. b Ans 4. c Ans 5. a=7,b= 3

Ans 6 x=2 and y=3 2x+3y=13 . Ans 7 x=2, y=3

Ans 8. Speed of boat in still water= 9.5 km/hr , speed of stream = 1.5 km/hr

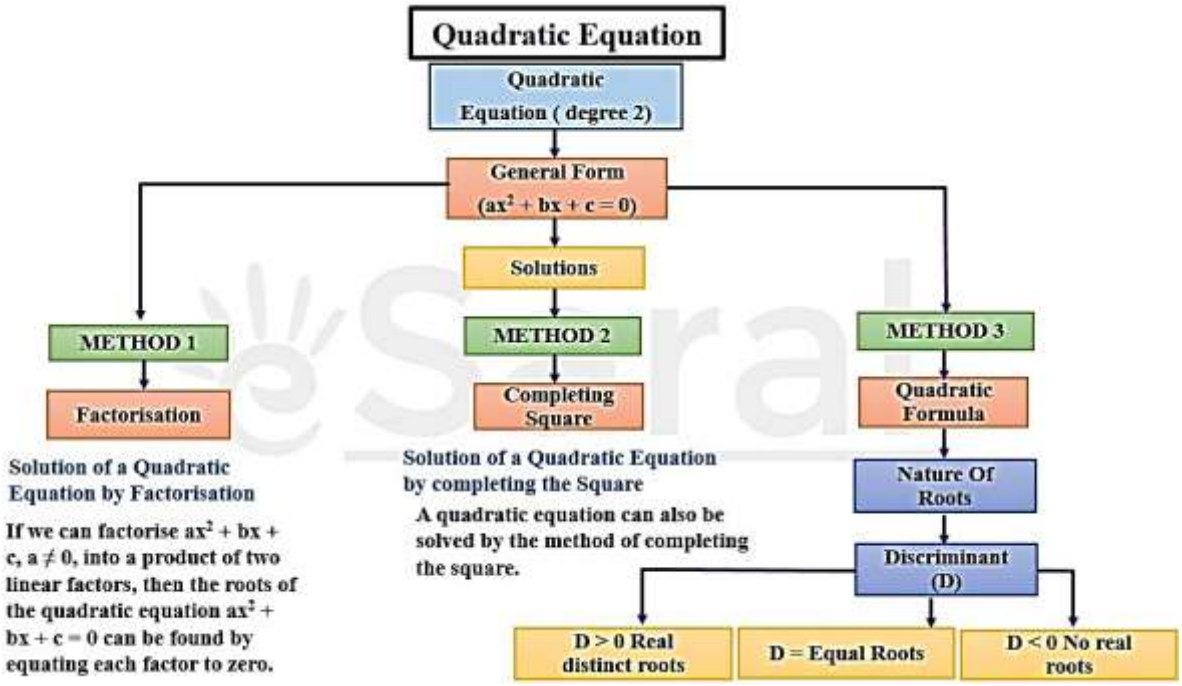
Ans 9. (i) 3x+4y=1.4 and 5x+2y= 1.6 where cost of deploying 1 drone= Rs x crore and cost of deploying 1 commando = Rs y crore

(ii) x= 0.257 crore and y= 0.157 crore (iii) Total cost 6x+5y= 2.327 crore

(iv) The cost of deploying one drone is ₹0.257 crore and one commando is ₹0.157 crore. Using this cost structure, the Indian Army planned its resources efficiently during Operation Sindoor, showcasing strategic use of manpower and technology in national defense.

Ans 10 total number of students are 36

CHAPTER- 4
QUADRATIC EQUATIONS



- **Standard Form of Quadratic Equations:** Any equation in the form $ax2+bx+c=0$ is a quadratic equation where a, b, and c are constants.
- **Roots of a Quadratic Equation**: The values of x that satisfy the equation$ax2+bx+c=0$ are called the roots or solutions of the quadratic equation.
- **Nature of Roots**: The discriminant ($D = b^2 - 4ac$) determines the nature of the roots:

(a). If D > 0: two distinct real roots.

(b). If D = 0: two equal real roots.

(c). If D < 0: two complex roots (no real solutions).

MULTIPLE CHOICE QUESTIONS (1 MARK)

Q1. The discriminant of the quadratic equation. is $2x^2 + 5x + 3 = 0$ is

A) 0 B) -1 C) 1 D) 5

ANS C) 1

Q2. Value of k, if equation is $x^2 + kx + 4 = 0$ have equal real roots

A) ±2 B) ±3 C) ±1 D) ±4

ANS:- D) ±4

Q3. The Eq. $2x + 32x= 1$ ($x \neq 0$) is expressed as a quadratic equation in the form of $ax^2 + bx + c = 0$. The value of a + 5b + 2c is

A) 0 B) 1 C) 2 D) 3

ANS:- A) 0

Q4. Which of the following eq. is a quadratic eq.?

A) $x^2 = (x+1)^2$. B) $(x-1)(x+2) = 2x + 1$

C) $(x+2)^3 = 2x(x^2 - 1)$. D) $\sqrt{x} = x^2$

ANS:- B) (x - 1)(x + 2) = 2x + 1

Q5.Which of the following equation has 2 as its root?

A) $x^2-4x+5 =0$. B) $x^2 +3x-12 = 0$

C) $2x^2-7x+6 = 0$. D) $3x^2-6x-2 =0$

ANS:- C $2x^2-7x+6 = 0$

Q6. Equation $y^2 + y + 1 = 0$ has:

A) one real root. B) two real roots
C) no real roots. D) infinite real roots
ANS:- C) no real roots
Q7. The roots of $100x^2 - 20x + 1 = 0$ is:
(A) 1/20 and 1/20. (B) 1/10 and 1/20
(C) 1/10 and 1/10 . (D) None of the above
ANS: (c) 1/10 and 1/10
Q8. If one root of equation $4x^2-2x+(k-4)=0$ is reciprocal of the other. The value of k is:
(A) -8. (B) 8. (C) -4. (D) 4
ANS (B) 8

ASSERTION REASON QUESTIONS (1 MARKS)

Directions (Q9 to 10): In Assertion - Reason based questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option:
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is NOT the correct explanation of A
(C) A is true but R is false
(D) A is false and R is True
Q9. **Assertion (A):** If the coefficient of x^2 and the constant term of a quadratic equation have opposite signs, then the quadratic equation has real roots.
Reason (R): Every quadratic equation has at least two roots.
Ans. C
Q10. **Assertion** (A): One solution of the quadratic equation $(x - 1)^2 - 5(x - 1) - 6 = 0$ is 0.
Reason (R): Other solution of the equation $(x - 1)^2 - 5(x - 1) - 6 = 0$ is 7.
Ans. : A

VERY SHORT ANSWERS QUESTIONS (2 MARKS)

Q11. Express the equation. $1x - 1x-2 = 3$ $(x \neq 0, 2)$ as a quadratic equation in standard form.
Sol. Simplify and rearrange, $-2 = 3x^2 - 6$, $0 = 3x^2 - 6x + 2$
Q12. Find discriminant of equation: $p^2x^2 + (p^2 - 9^2)x - 9^2 = 0$ $(p \neq 0)$
Sol. $D = (p^2 - 9^2)^2 - 4\ p^2\ (-9^2)$, $D = (p^2 + 81)^2$, $D = (p^2 + 9^2)^2$
Q13. Find nature of roots of the equation: $3x^2 - 4\sqrt{3}x + 4 = 0$
Sol. The discriminant is given by the formula $D = b^2-4ac$
$D = (-4\sqrt{3})^2-4\times3\times4 = 0$ Equal real roots
Q14. Solve the equation $2x^2 + 5x + 3 = 0$ using quadratic formula
Sol. x = -3/2 , -1
Q15. Find the roots of quadratic equation: $x^2 - 0.09 = 0$
Sol. $x^2 - 0.09 = 0$, $x^2- (0.3)^2 = 0$
$(x-0.3)(x + 0.3) = 0$, $x = \pm0.3$

SHORT ANSWER QUESTIONS (3 MARKS)

Q16.Find the value of k for which the roots of the quadratic equation $(k- 4)x^2+ 2(k - 4)x + 2 = 0$ are equal real roots
Sol. $D = b^2 - 4ac = 0$, $[2(k - 4)]^2 - 4(k - 4)(2) = 0$
$4(k - 4)^2 - 8(k - 4) = 0$, $4(k - 4)[(k - 4) - 2] = 0$
$4(k - 4)(k - 6) = 0$, $k = 4,6$
Q17. If the sum of two natural numbers is 8 and their product is 15, find the numbers.
Sol. Let the two numbers be: x and y
$x + y = 8$ …. (1) , $x \times y = 15$…… (2)
$y = 8 - x$, $x \times(8 - x) = 15$, $8x - x^2 = 15$
$x^2 - 8x + 15 = 0$ Now solve this quadratic equation:
$x^2 - 8x + 15 =$, Factor: $(x - 3)(x - 5) = 0$, So, $x = 3$ or $x = 5$, Then $y = 5$ or $y = 3$

Q18. A two digit number is four times the sum of the digits. It is also equal to 3 times the product of digits. Find the number.

Sol. Let the two-digit number be:

Let the tens digit be x and the units digit be y

So, the number = 10x + y

ATQ. $10x + y = 4(x + y)$ ……(1): , $10x + y = 3xy$ ……. (2)

By eq 1. $10x - 4x + y - 4y = 0$, $6x - 3y = 0$ $2x = y$ ……(3)

By eq 2: $10x + y = 3xy$, Substitute $y = 2x$: , $10x + 2x = 3x * 2x$

$12x = 6x^2$, $x(x - 2) = 0$, So, $x = 0$ or $x = 2$

But $x = 0$ is not valid (since it's a two-digit number. So, $x = 2$, Then $y = 2x = 4$

Q19. Find the roots of the quadratic equation $3x^2 - 2\sqrt{6}x + 2 = 0$.

Sol. Given $3x^2 - 2\sqrt{6}x + 2 = 0$

$3x^2 - \sqrt{6}x - \sqrt{6}x + 2 = 0$, $\sqrt{3}\sqrt{3}x^2 - \sqrt{2}\times 3\,x - \sqrt{2}\times 3x + \sqrt{2}\times\sqrt{2} = 0$

$\sqrt{3}x(\sqrt{3}x-\sqrt{2}) - \sqrt{2}(\sqrt{3}x-\sqrt{2})=0$, $(\sqrt{3}x-\sqrt{2})^2=0$, $x= \sqrt{2}/3$, $\sqrt{2}/3$

Q20. For what value of k, are the roots of the quadratic equation $kx(x - 2) + 6 = 0$ equal?

Sol. Given $kx(x - 2) + 6 = 0$

$kx^2 - 2kx + 6 = 0$, ATQ Equal roots $D = 0$, $(-2k)^2 - 4(k)(6) = 0$

$4k^2 - 24k = 0$, $4k(k - 6) = 0$, $k = 0,6$

LONG ANSWER QUESTIONS (5 MARKS)

Q21. If a man had walked 1 km/h faster, he would have taken 15 minutes less to walk 3 km. Find the rate at which he was walking.

Ans:- The usual speed is 3 km/h

Q22. A motor boat whose speed is 24 km/h in still water takes 1 hours more to go 32 km upstream than to return downstream to the same spot. Find the speed of the stream.

Ans: - Speed of stream is 8 km/h

Q23. The sum of a number and its reciprocal is 10/3, find the number(s).

Solution: - Let the number be x.

$x + 1x = 103$, $3x^2 + 3 = 10x$

$3x^2 - 10x + 3 = 0$, $3x^2 - 1x - 9x + 3 = 0$, $(3x-1)(x-3) = 0$, $x= 3$, 13

CASE BASED QUESTIONS (4 MARKS)

Q24. Raj and Ajay are very close friends. Both the families decide to go to Ranikhet by their own cars. Raj's car travels at a speed of x km/h while Ajay's car travels 5 km/h faster than Raj's car. Raj took 4 hours more than Ajay to complete the journey of 400 km.

a) What will be the distance Covered by Ajay's Car in two hours?

b) What is speed of Raj's Car?

c) How much time is taken by Ajay to travel 400 km?

Ans: - a) $2(x+5)$, b) 20 km/hr. , c) 16 hours

Q25. Generally, new methods such as aquaponics, Raised-bed gardening, raised beds and cultivation under glass are used. Marketing can be done locally in farmers markets, traditional markets or farmers can contract their whole crops to wholesalers, canners or retailers. A farmer wishes to grow a 100 m^2 rectangular vegetable garden. Since he has with the only 30 m barbed wire, he fences three sides of the rectangular garden letting compound wall of his house act as the fourth side-fence.

a) Length of vegetable garden?

b) Represent given problem in Quadratic Equation?

c) If length of the vegetable garden is 5m, then find the breadth?

Ans: - a) 5 m or 10m, b) x^2-15x-50 = 0 , c) 20m

QUADRATIC EQUATION
WORKSHEET-1
(1 MARK)

1. If *a* and *b* are the roots of the equation $x^2 + ax - b = 0$, then find *a* and *b*.
   (a) $a = -1$ and $b = 2$ (b) $a = 1$ and $b = 2$
   (c) $a = -2$ and $b = 1$ (d) $a = 2$
   $b = 1$
2. Which of the following are the roots of the quadratic equation, $x^2 - 9x + 20 = 0$?
   (a)3,4 (b)4, 5 (c)5,6 (d)6, 7
3. If the roots of equation $3x^2 + 2x + (p+2)(p-1) = 0$ are of opposite sign then which of the following cannot be the value of p?
   (a)0 (b)–1 (c)2 (d)–3

4. If $(1 - p)$ is a root of the equation $x^2 + px + 1 = 0$ then roots are
   (a)0,1 (b)–1,1 (c) 0, –1 (d)–1,2

5. In the following questions a statement of assertion(A)is followed statement of reason (R).Mark the correct choice as:
(a)Both assertion(A)and reason(R)are true and reason(R)is the correct explanation of assertion (A).
(b)Both assertion(A) and reason(R) are true but reason(R) is not the correct explanation of assertion(A). (c)Assertion (A) is true but reason (R) is false.
(d)Assertion(A)is false but reason(R)istrue.

Assertion(A): If one root of the quadratic equation $6x^2 - x - k = 0$ is 2, then the value of k is 2.
Reason(R): The quadratic equation $ax^2 + bx + c = 0, a \neq 0$ has almost two roots.

2 MARKS QUESTIONS

1. Find the value of such that the quadratic equation $(\alpha - 12)x^2 + 2(\alpha - 12)x + 2 = 0$, has equal roots.
2. Find the value of p,for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other.

3 MARKS QUESTIONS

4. If the equation $(1+m^2)x^2 + 2mcx + c^2 - a^2 = 0$ has equal roots , then show that $c^2 = a^2(1+m^2)$.
5. If –5is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of *k*.

5 MARKS QUESTIONS

6. John and Jivanti are playing with the marbles. They together have 45 marbles. Both of them lost 5 marbles each, and the product of the number of marbles they now have is 124.

   (a) Find the quadratic equation related to the given problem
   (b) Find the Number of marbles John has

QUADRATIC EQUATION
WORKSHEET -2
1 MARK QUESTIONS

1. Values of k for which the quadratic equation $2x^2–kx+k=0$ has equal roots, is:

(a)0 only (b)4 (c)8 only (d)0, 8

2. Which of the following is not a quadratic equation?

(a) $2(x–1)^2=4x^2–2x+1$ (b) $2x–x^2=x^2+5$

(c)$(\sqrt{2}x+\sqrt{3})^2+x^2=3x^2–5x$ (d)$(x^2+2x)^2=x^4+3+4x^3$

3. $(x^2+1)^2–x^2=0$ has

(a) four real roots (b) two real roots (c) no real roots (d)onerealroot

4. If the equation $x^2–(2+m)x+(–m^2–4m–4)=0$ has coincident roots, then

(a)m=0,m= 1 (b)m=2,m=2 (c)m=–2,m=–2 (d)m=6,m=1

5. In the following questions a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion(A) and reason(R) are true and reason(R) is the correct explanation of assertion (A).

(b) Both assertion(A) and reason(R)are true but reason(R) is not the correct explanation of assertion (A).

(c) Assertion(A)is true but reason (R)is false.

(d) Assertion (A)is false but reason(R)is true.

Assertion(A) : The value of k=2, if one root of the quadratic equation $6x^2–x–k=0$is 2/3.

Reason(R) : The quadratic equation $ax^2+bx+c=0$, $a\neq0$ has two roots.

2 MARKS QUESTIONS

6. Solve the quadratic equation: $x^2+2\sqrt{2}x−6=0$for x

7. Find the value of 'k' for which the quadratic equation $2kx^2–40x+25=0$ has real and equal roots.

3 MARKS QUESTIONS

8.If one of the roots of $x^2+px−4=0$ is– 4,then find the product of its roots and the value of p.

9. Find discriminate of the quadratic equation $3x^2+4x−5=0$.What type of roots does the given quadratic equation have?

Case Study Based Questions

10 Japan's LO series Maglev is the fastest train in the world, with a speed record of 602 km/h. It could go the distance from New York City to Montreal in less than an hour. China has half of the eight fastest trains and the world's largest high speed railway network. Suppose a fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/h less than that of the fast train, then answer the following questions:

(a) Find the speed of slow train.

(b) Find the speed of fast train.

(c) How much time taken by the slow train to cover the distance 600 km?

QUADRATIC EQUATION
WORKSHEET- 3

Questions carry 1 mark each.

Complete the following

Quadratic Equations	a	b	c	b^2-4ac	$b^2-4ac>0$	$b^2-4ac>0$	$b^2-4ac=0$	Nature of roots
$3x^2-5x+2=0$								
$9x^2+3x+5=0$								
$x^2+2x-143=0$								
$x^2-5x+6=0$								
$x^2+4x+5=0$								

2 MARKS QUESTIONS

1. Find the value of α such that the quadratic equation $(\alpha - 12)x^2 + 2(\alpha - 12)x + 2 = 0$, has equal roots.
2. Find the value of 'p' for which the quadratic equation $p(x - 4)(x - 2) + (x - 1)^2 = 0$ has real and equal roots.

3 MARKS QUESTIONS

3. If the equation $(1+m^2)\,x^2+2mcx+c^2-a^2=0$ has equal roots, then show that $c^2 = a^2(1+m^2)$.
4. In a flight of 600 km, an aircraft was slowed due to bad weather. Its average speed for the trip was reduced by 200km/hr and time of flight increased by 30 minutes. Find the original duration of flight.

5 MARKS QUESTIONS

5. Raj and Ajay are very close friends. Both the families decide to go to Ranikhet by their own cars. Raj's car travels at a speed of x km/h while Ajay's car travels 5 km/h faster than Raj's car. Raj took 4 hours more than Ajay to complete he journey of 400 km.

i. What will be the distance covered by Ajay's car in two hours?

ii. Which of the following quadratic equation describe the speed of Raj's car?

iii. What is the speed of Raj's car?

QUADRATIC EQUATION
WORKSHEET- 4
1 MARK QUESTIONS

1) If one of the root of $5x^2 + 13x + k = 0$ is reciprocal of the other then k=

(a) 0 (b) 5 (c) 1/6 (d) 6

2) The root of the equation $x^2 - x - 3 = 0$ are

(a) Imaginary (b) Rational (c) irrational (d) none of these

3) The difference between two numbers is 5 and the difference of their squares is 65. The larger number is

(a) 9 (b) 10 (c) 11 (d) 12

4) The sum of the ages of father and the son is 45 yrs. Five years ago, the product of their age was 4 times the age of the father at that time. The present age of the father is

(a) 30 yrs (b) 31yrs (c) 36 yrs (d) 41 yrs

5) If one of the roots of the quadratic equation is 2 + then find the quadratic equation

(a) $x^2 - (2 + \sqrt{3})x + 1 = 0$ (b)$x^2 + (2 + \sqrt{3})x + 1=0$

© $x^2 - 4x + 1 = 0$ (d) $x^2 + 4x - 1 = 0$

2 MARK QUESTIONS

6.Find the value of k for which quadratic equation $(k - 2)x^2 + 2(2k - 3)x + 5k - 6 = 0$ has equal roots.

7. The length of a right triangle are %x +2,5x and 3x-1. If x>0 find the length of each side.

3 MARK QUESTIONS

8. The numerator of a fraction is less than its denominator. If 3 is added to each of the numerator and denominator, the fraction is increased by 3/28.Find the fraction.

9. Solve the quadratic equation $(x - 1)/(x - 2) - (x - 2)/(x - 3) = (x - 5)/(x - 6) - (x - 6)/(x - 7)$

5 MARK QUESTIONS

10. Solve the following equation for x $9x^2 - 9(a + b) x + (2a^2 + 5ab + 2b^2) = 0$

QUADRATIC EQUATION
WORKSHEET- 5
1 MARK QUESTIONS

In the following questions statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A). (c)Assertion (A) is true but reason (R) is false.
(d)Assertion (A) is false but reason (R) is true.

1. **Assertion (A):** The roots of the quadratic equation $x^2 + 2x + 2 = 0$ are imaginary
   Reason (R): If discriminant $D = b^2 – 4ac < 0$ then the roots of quadratic equation $ax^2 + bx + c = 0$ are imaginary.
2. **Assertion(A):** If one root of the quadratic equation $6x^2 –x–k=0$ is $\underline{2}/3$, then the value of k is 2.
   Reason(R): The quadratic equation$ax^2+bx+c=0$, $a\neq0$hasalmosttworoots.
3. **Assertion(A):**The roots of the quadratic equation $x^2+2x+2=0$ are imaginary
   Reason (R): If discriminant $D=b^2– 4ac<0$ then the roots of quadratic equation ax^2 +bx +c= 0 are imaginary.
4. **Assertion (A) :** The equation $x^2 + 3x + 1 = (x – 2)^2$ is a quadratic equation.
   Reason (R) : Any equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$, is called a quadratic
5. **Assertion (A) :** The value of $k = 2$, if one root of the quadratic equation $6x^2 – x – k = 0$ is 2/3.
   Reason (R) : The quadratic equation $ax^2 + bx + c = 0$, $a \neq 0$ has two roots.

2 MARK QUESTIONS

6. The sum of the squares of three consecutive positive integers is 50. Find the integers.
7. Find the value of p, for which one root of the quadratic equation $px^2 – 14x + 8 = 0$ is 6 times the other

3 MARK QUESTIONS

8. The sum of two numbers is 34. If 3 is subtracted from one number and 2 is added to another, the product of these two numbers becomes 260. Find the numbers.
9. If α and β are roots of the quadratic equation $x^2 – 7x + 10 = 0$, find the quadratic equation whose roots are α^2 and β^2.

5 MARK QUESTIONS

10. Generally, new methods such as aquaponics Raised-bed gardening raised beds and cultivation under glass are used. Marketing can be done locally in farmers markets, traditional markets or farmers can contract their whole crops to wholesalers, canners or retailers.
A farmer wishes to grow a 100 m^2 rectangular vegetable garden. Since he has with the only 30 m barbed wire, he fences three sides of the rectangular garden letting compound wall of his house act as the fourth side-fence.

(a) Represent given problem in quadratic form. (2)
(b) Find the length of the vegetable garden. (1)
(c) If length of the vegetable garden is 5 m, then find the breadth.

ANSWER KEY

WORKSHEET-1

	Section A
1	(a) $a = -1$ and b = 2
2	(b)4, 5
3	(d)–3
4	(c) 0, –1
5	(a)
	Section B
1	14
2	3
	Section C
1	$c^2=a^2(1+m^2)$
2	7/4
	Section D
	$x^2–45x+324=0$
	9 or 36.

WORKSHEET-2

	Section A
1	(d)0, 8
2	(c) $(\sqrt{2}\,x + \sqrt{3})^2 + x^2 = 3x^2 – 5x$
3	(c) no real roots
4	(c) m = –2, m = –2
5	(a)
	Section B
1	$x = -3\sqrt{2}$ or $x = \sqrt{2}$.
2	8
	Section C
1	-4
2	Real and irrational
	Section D
a	40 km/h
b	50 km/h
c	15 hrs

WORKSHEET-3

	Section B
1	14
2	0 or 3
	Section C
3	$c^2 = a^2(1+ m^2)$
4	I hr
5	Section D
a	50 km
b	2(x+5)km
c	20 km / hr

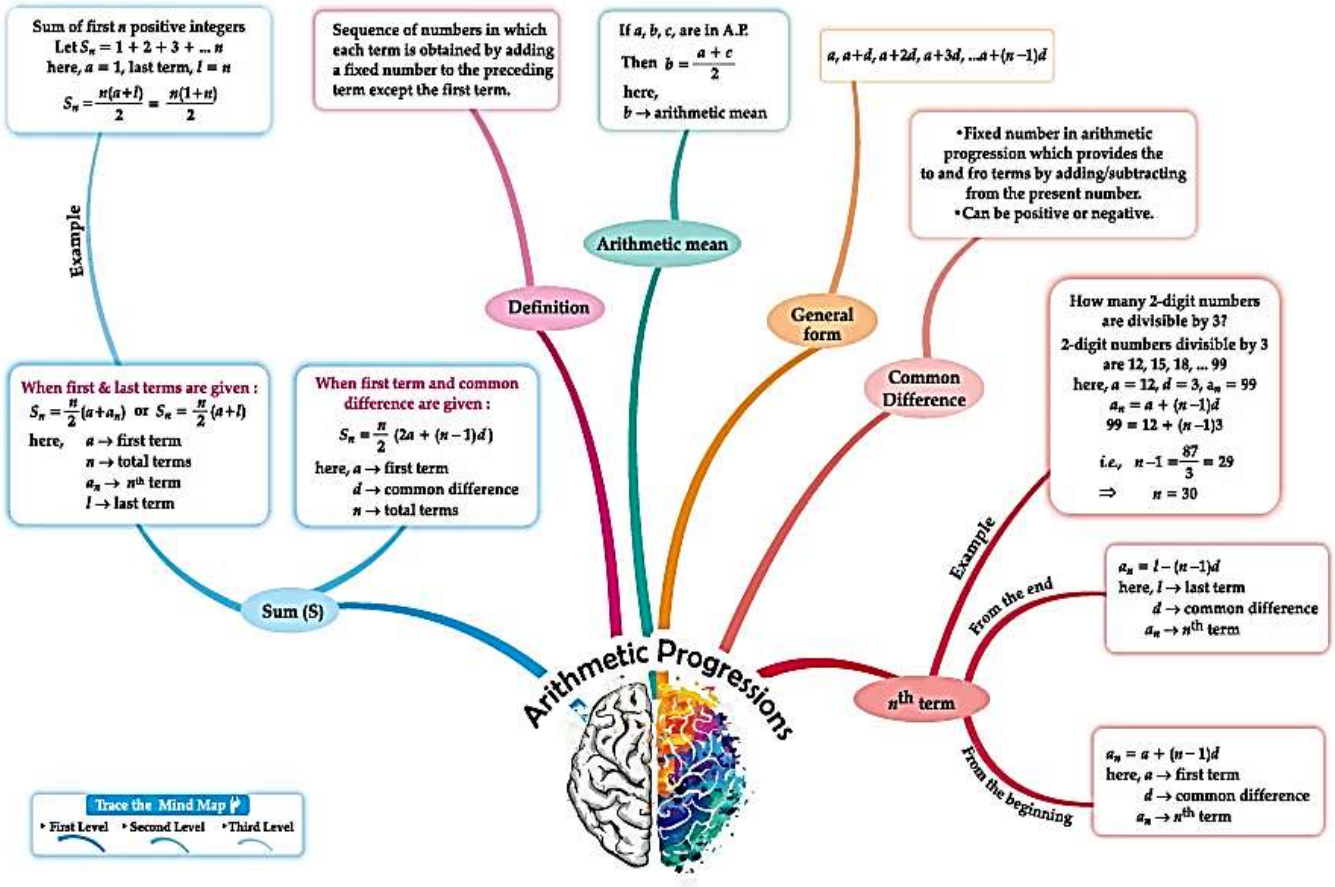
WORKSHEET-4

	Section A
1	b
2	c
3	a
4	c
5	c
	Section B
1	k =3 or 1
2	17,15,8
	Section C
1	$\frac{3}{4}$
2	$\frac{9}{2}$
	Section D
1	1. 2a+b/3 , a+2b/3

WORKSHEET-5

	Section A
1	(a)
2	(a)
3	(a)
4	(d)
5	(b)
	Section B
1	when $x = 3$ integers are 3, 3 + 1, 3 + 2 i.e. 3, 4 and 5.
2	0
	Section C
1	either 23 and 11 or 16 and 18.
2	$x^2 - 29x + 100 = 0$
	Section D
a	$y = 30 - 2x$
b	5 m or 10 m.
c	20 m.

CHAPTER-5
ARITHMETIC PROGRESSION



Gist of the chapter-

1. An arithmetic progression (AP) is a list of numbers in which each term is obtained by adding a fixed number d to the preceding term, except the first term. The fixed number d is called the common difference.
2. The general form of an AP is a, a + d, a + 2d, a + 3d, . . .
3. In an AP with first term a and common difference d, the n^{th} term (or the general term) is given by

$$a_n = a + (n - 1)\, d.$$

4. The sum of the first n terms of an AP is given by : $S_n = \frac{n}{2}\{2a + (n-1)d\}$
5. If l is the last term of the finite AP, say the n^{th} term, then the sum of all terms of the AP is given by :

$$S = \frac{n}{2}(a + l)$$

MULTIPLE CHOICE QUESTIONS (1 MARK)

1. If p – 1, p + 3, 3p – 1 are in AP, then p is equal to _____.

(a) 3 (b) 4 (c) 2 (d) none of these

Ans (b) =4

Solution: ∵ p – 1, p + 3 and 3p – 1 are in AP.

∴ 2(p + 3) = p – 1 + 3p – 1

⇒ 2p + 6 = 4p –2.

⇒ –2p = –8

⇒ p = 4.

2.In an AP ,if the first term a= -16 and the common difference d = -2,then the sum of first 10 terms is

(a) -200 (b) -70 (c) -250 (d) 250

Ans. (c)

Solution. We have a= -16, Common difference = -2

$S_n = \frac{n}{2}\{2a + (n-1)d\}$

$= \frac{10}{2}\{2(-16) + (10-1)(-2)\}$

$= 5\{-32 + (9)(-2)\}$

$= 5\{-32 - 18)\}$

= 5 X (-50)

= -250

3. In an AP, if d = -4, n = 7, a_n = 4, then a is

(a) 6 (b) 7 (c) 20 (d) 28

Ans: (d) 28

Solution; Given, d = -4, n = 7, a_n = 4

We know that, $a_n = a + (n-1)d$

4= a + (7 – 1) (-4)

4= a + 6(-4)

4= a – 24

∴ a = 4 + 24 = 28.

4. If the common difference of an AP is 5, then what is $a_{18} - a_{13}$?

(a) 5 (b) 20 (c) 25 (d) 30

Ans .(c)25

Solution:

Given, d =5

Here, a_{18} = a+(18-1)d =a+17d=a+17 × 5= a+85

a_{13} = a+(13-1)d=a+12d =a+12×5 = a+60

Now, a_{18}- a_{13}= a+85- (a+60)

= a+85- a-60

=85-60 =25.

5. The first term of AP is p and the common difference is q, then its 12th term is

(a) q+ 11p (b) p-11q (c) 2p+11q (d) p+11q

Ans. (d)

Solution – We have a = p and d = q

a_{12} = a+(12 -1) d

∴a_{12}= p +11q.

6. The sum of first five multiples of 3 is

(a) 45 (b) 55 (c) 65 (d) 75

Ans. (a) 45

Solution: First five multiples of 3 are 3,6,9,12,15.

Here a=3, d= 6-3 = 3 ,n=5

Now, $S_n = \frac{n}{2}\{2a + (n-1)d\}$

$= \frac{5}{2}\{2X3 + (5-1)3\}$

$= \frac{5}{2}\{6 + 12\}$

$= \frac{90}{2}$ =45.

7. The famous mathematician associated with finding the sum of the first 100 natural numbers is

(a) Pythagoras (b) Euclid (c) Gauss (d) Newton

Ans. (c) Gauss

8. Which term of the AP: 21, 42, 63, 84,... is 210?

(a) 9th (b) 10th (c) 11th (d) 12^{th}

Ans. .(c)10^{th} term.

Solution: Here , a = 21 ,d =42-21 = 21 and a_n =210

Now , a_n = a+(n-1) d

210= 21+ (n-1) 21

210=21+21n-21

∴ n = $\frac{210}{21}$ = 10.

(ASSERTION-REASONING, 1 MARK EACH)

DIRECTION: In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option

a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

c) Assertion (A) is true but reasons (R) is false.

d) Assertion (A) is false but reasons (R) is true.

9. Assertion (A) : Common difference of the A.P.: −5,−1,3,7,……. Is 4.

Reason (R) : Common difference of the A.P. ,a+d, a+2d, …., is given by d =2nd term −1st term**.**

Ans.(a)

10. Assertion (A) : The sum of first n even natural numbers is n(n+1)

Reason (R) : The sum of first n odd natural numbers is n(n-1)

Ans.(c)

VERY SHORT ANSWER TYPE QUESTIONS, 2 MARKS EACH)

11. If the numbers n – 2, 4n – 1 and 5n + 2 are in AP, find the value of n.

Ans .1

Solution : As n – 2, 4n – 1, 5n + 2 are in AP,

So, (4n – 1) – (n – 2) = (5n + 2) – (4n – 1) i.e, 3n + 1 = n + 3

3n –n = 3-1, Therefore , n = 1.

12. Find the 10th term of the AP: 2, 7, 12, . . .

Solution : Here, a = 2, d = 7 – 2 = 5 and n = 10.

We have a_n = a + (n – 1) d

So, a_{10} = 2 + (10 – 1) × 5

= 2 + 45 = 47, Therefore, the 10^{th} term of the given AP is 47.

13. Determine the AP whose 3^{rd} term is 5 and the 7^{th} term is 9.

Solution : We have a_3 = a + (3 – 1) d = a + 2d = 5 ……(1)

and a_7 = a + (7 – 1) d = a + 6d = 9……..(2)

Solving the pair of linear equations (1) and (2),

a + 6d- (a + 2d) = 9-5

a + 6d- a - 2d = 4, 4d = ∴ d = 1

From the equation (1) , a+2×1 = 5 ∴a = 5-2= 3

We get a = 3, d = 1 Hence, the required AP is 3, 4, 5, 6, 7, . .

4. Which term of the AP: 121, 117, 113……., is its first negative term?

Solution: Given a =121, Common difference of AP is d = 117-121= -4

Now, a_n = a+(n-1) d = 121+(n-1) (-4)

a_n = 121 -4n+4 = 125 -4n

Here, We have to find smallest number n for which a_n< 0, So, a_n< 0

125- 4n < 0, n <$\frac{125}{4}$, n < 31.25

Since n must be a whole number, so first negative term is 32^{th} term.

15. How many three-digit numbers are divisible by 7?

Solution: First 3-digit number divisible by 7 is 105 and last 3-digit number divisible by 7 is 994

then a= 105 ,d= 7 and a_n = 994, Now , a_n= a+(n-1)d

994= 105 + (n-1) 7, 105+(n-1) 7 =994, (n-1) 7 = 994-105 ∴n = $\frac{896}{7}$ = 128

Therefore, there are 128 three-digit numbers divisible by 7.

SHORT ANSWER QUESTIONS (3 MARKS)

16. The sum of four consecutive numbers in AP is 32 and the ratio of the product of the first and last terms to the product of two middle terms is 7:15.Find the number?

Solution: a is first term and d is common difference then

Four consecutive numbers be (a – 3d) ,(a-d),(a+d) and (a+3d)

Given Sum of the number =32, (a – 3d) +(a-d)+(a+d) +(a+3d) =32

4a =32 ∴a=8

ATQ

$\frac{(a-3d)(a+3d)}{(a-d)(a+d)} = \frac{7}{15}$

$15(a-3d)(a+3d) = 7(a-d)(a+d)$

$15(a^2-9d^2) = 7(a^2-d^2)$

$15\ a^2-135d^2 = 7a^2-7d^2$

$15\ a^2 - 7a^2 = 135\ d^2-7d^2$

$8\ a^2 = 128\ d^2$

$128\ d^2 = 8x8^2$ [∵ a= 8]

$d^2 = \frac{512}{128} = 4$ ∴d = 2. The numbers are 2,6,10,14.

17. How many terms of the AP: 24, 21, 18, . . . must be taken so that their sum is 78?

Solution: Here, a = 24, d = 21 – 24 = –3, S_n = 78. We need to find n.

We know that $S_n = \frac{n}{2}\{2a + (n-1)d\}$

$78 = \frac{n}{2}\{48 + (n-1)(-3)\}$

$78 = \frac{n}{2}\{51 - 3n\}$, $3n^2-51n+156 = 0$, $n^2-17n+52 = 0$, n =4 or 13

Both values of n are admissible. So, the number of terms is either 4 or 13.

18. Which term of the AP is 3, 12,21,30……will be 90 more than its 50th term?

Solution : Let the first term be a ,common difference be d and n^{th} term be a_n

Here , a = 3 , d= 9 , Now , n^{th} term a_n= a+(n-1)d =3+(n-1)9

50^{th} term a_{50} = 3+(50-1)9 = 3+441=444

ATQ $a_n - a_{50}$ =90

3+(n-1)9 -444 =90, (n-1)9 -441 =90

9n -450 =90

(n-1)9 =90+441

n -1= $\frac{531}{9}$, Therefore, n = 59+1=60.

19. Find the sum of the odd numbers between 0 and 50.

Solution: Odd numbers between 0 and 50 be 1,3,5,7……..,49.

Here, a = 1, d=2 and a_n = 49.

Now . a_n= a+(n-1)d

49 = a+(n-1) d, a+(n-1)d =49

1+(n-1)2 =49, 2n – 2 =49-1, Therefore, n=$\frac{50}{2}$ = 25.

Now, $S_n = \frac{25}{2}[a + a_{25}]$ = 625

20. If the 3rd and the 9th terms of an AP are 4 and – 8 respectively, which term of this AP is zero?

Solution: Given, a_3 = 4 and a_9 = -8 to find, a_n= 0, here, a_3= a+(3-1) d

and $a_9 = a+(9-1)d$, $-8 = a+8d$ ……(1)

On putting the value of a in equation (1), we get $-8 = 4-2d+8d$, $\therefore d = -2$.

(LONG ANSWER TYPE QUESTIONS,5 MARKS EACH)

21. The first term of AP is 22, the last term is -6 and the sum of all the terms is 64.Find the number of terms of the AP.Also find the common difference.

Solution: Given **,** First term $a = 22$, $a_n = -6$ $S_n = 64$

Now, Sum of an AP $S_n = \frac{n}{2}\{a + a_n\}$

$64 = \frac{n}{2}\{22 + (-6)\}$

$64 = \frac{n}{2}(16)$

$16\,n = 64 \times 2$

$\therefore n = \frac{128}{16} = 8$

and $a_n = a+(n-1)\,d$

$-6 = 22+(8-1)\,d$

$-6 = 22+7d$

$7d = -6-22$ -28

$\therefore d = \frac{-28}{7} = -4$

Therefore, number of terms in an AP is 8 and common difference is -4.

22. In an AP if sum of its first n terms is $3n^2+5n$ and its k^{th} term is 164, find the value of k.

Solution: The sum of I^{st} n terms is $3n^2+5n$

$S_n = 3n^2+5n$

Change n to n -1

$S_{n-1} = 3(3n-1)^2+5(n-1)$

$= 3n^2 +3 -6n +5n-5$

$=3n^2 -n-2$

n^{th} term $= S_n - S_{n-1}$

$=3n^2+5n -(3n^2 -n-2) =$

$6n+2$

So, k^{th} term $= 6k+2$

$164 = 6k+2$

$6k = 162$

$\therefore k = 27$.

23. A manufacturer of TV sets produced 720 TV sets in the fourth year and 880 TV sets in the eighth year. Assuming that the production increases uniformly by a fixed number every year, find the production in the tenth year and the total production in the first seven years.

Solution. Let first term= a and common difference = d

Production in 4^{th} year = 720

$a_4 = 720$

$\Rightarrow a + 3d = 720$ _____ (i)

Production in 8^{th} year = 880

$a_8 = 880$

$\Rightarrow a + 7d = 880$ _____ (ii)

Solving (i) and (ii)

$d = 40$ and $a = 600$

$\Rightarrow$ Production in 10th year $= a_{10} = 600 + 9 \times 40 = 960$

Total Production in the first seven years $= S_7 = \frac{7}{2}[2(600) + 6(40)] = 5040$

(CASE BASED QUESTIONS,4 MARKS EACH)

24. A woman borrowed 10,00,000 from her friend and promised to return the borrowed money in monthly installments beginning from the next month. After one month, she returned 10,000, the next month she returned 15,000, the third month she returned 20,000 and so on, thereby increasing the monthly installment uniformly.



Based on the above information, answer the following questions:

(i) Find the amount of installment paid in the tenth month.

(ii) In which installment did she pay Rs. 40,000?

(iii) (a) If she returned Rs.11, 50,000 in all, how many installments did she pay?

Or

(b) By which installment has she returned a total amount of Rs.3, 25,000 ?

Solution: i) Rs. 55000, Here a=Rs.10000, d =Rs.5000 , Now, a_{10} = 10000+(10-1) 5000

= 10000+9 X 5000

= 10000+45000, a_{10}=55000

(ii) Here , a_n= Rs. 40000, a=Rs.10000 ,d =Rs.5000 , Now, a_n= a+(n-1)d

40000 = 10000+(n-1)5000, n-1 = $\frac{30000}{5000}$, n-1 = 6 ∴n = 6+1= 7.

25. In the month of April to June 2022, the exports of passenger cars from India increased by 26% in the corresponding quarter of 2021–22, as per a report. A car manufacturing company planned to produce 1800 cars in 4th year and 2600 cars in 8th year. Assuming that the production increases uniformly by a fixed number every year.

Based on the above information answer the following questions.

(i) Find the production in the 1st year.

(ii) Find the production in the 12th year.

(iii) (a) Find the total production in first 10 years.

OR

(b) In how many years will the total production reach 31200 cars?

Solution. Production in 4th year a+3d = 1800……(i)

Production in 8th year a+7d = 2600……..(ii)

Subtracting equation (i) from (ii)

a+7d –(a+3d) = 2600-1800

a+7d –a-3d = 800, d = 200, a+ 3×200 = 1800, a= 1200

(i) Production of first year 1200

(ii) Sum of production 12th year $S_{12} = \frac{12}{2}\{1200 + 11\ X\ 200\}$

= 6 (1200+2200) = 6 X 3200 =19200

(iii) a) Sum of production 10th year $S_{10} = \frac{10}{2}\{1200 + 9\ \times 200\}$

= 5 ×(3000)

= 15000

b) S_n = 31200

$S_n = \frac{n}{2}\{1200 + (n-1) \times\ 200\}$

$31200 = \frac{n}{2}\{1200 + (n-1) \times 200\}$

$n\{1200 + (n-1) \times 200\} = 31200 \times 2$

$1200\,n + 200\,n^2 - 200 = 62400$

$200\,n^2 + 1200 - 62400 - 200 = 0$

$n^2 + 11n - 312 = 0$

$(n-16)(n+19.5) = 0$

By solving this equation

$\therefore n = 16.$

Arithmetic progression

WORKSHEET 1

Q.1 In an AP, if a = 3.5, d = 0, n = 101, then an will be

(A) 0 (B) 3.5 (C) 103.5 (D) 104.5

Q.2The 21st term of the AP whose first two terms are –3 and 4 is

(A) 17 (B) 137 (C) 143 (D) –143

Q.3The sum of first 16 terms of the AP: 10, 6, 2,... is

(A) –320 (B) 320 (C) –352 (D) –400

Q.4 This question is Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Assertion(A):In an A.P. ,the difference between 99^{th} term and 100^{th} term is same as that between 999^{th} term and 1000^{th} term

Reason®: Difference between two consecutive terms of an A.P. is always same.

Q.5Determine k so that k2+ 4k + 8, 2k2 + 3k + 6, 3k2 + 4k + 4 are three consecutive terms of an AP.

Q.6How many numbers lie between 10 and 300, which when divided by 4 leave a remainder 3?

Q.7The sum of the first three terms of an AP is 33. If the product of the first and the third term exceeds the second term by 29, find the AP.

Q.8 Find the 20th term of the AP whose 7th term is 24 less than the 11th term, first term being 12

Q.9 A woman borrowed 10,00,000 from her friend and promised to return the borrowed money in monthly instalments beginning from the next month. After one month, she returned 10,000, the next month she returned 15,000, the third month she returned 20,000 and so on, thereby increasing the monthly instalment uniformly.

Based on the above information, answer the following questions :

(i) Find the amount of instalment paid in the tenth month

(ii) . In which instalment did she pay Rs. 40,000 ?

(iii) (a) If she returned 11,50,000 in all, how many instalments did she pay ?

OR

(b) By which instalment has she returned a total amount of 3,25,000 ?

Q.10 If the sum of 7 terms of an A.P. is 49 and that of 17 terms is 289, find the sum of n terms.

WORKSHEET 2 (ARITHMETIC PROGRESSION)

Q.1 The first four terms of an AP, whose first term is -2 and the common difference is -2, are

(A) -2, 0, 2, 4 (B) -2, 4, -8, 16 (C) -2, -4, -6, -8 (D) -2, -4, -8, -16

Q.2 The 21st term of the AP whose first two terms are -3 and 4 is

(A) 17 (B) 137 (C) 143 (D) -143

Q,3If the first term of an AP is -5 and the common difference is 2, then the sum of the first 6 terms is

(A) 0 (B) 5 (C) 6 (D) 15

Q.4 This question is Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true

Assertion (A) : 184 is the 50^{th} term of the sequence 3, 7,11,…….

Reason (R) : The nth term of A.P .is given by $an = a + (n - 1)d$

Q.5 Is 0 a term of the AP: 31, 28, 25, …? Justify your answer.

Q.6 The angles of a triangle are in AP. The greatest angle is twice the least. Find all the angles of the triangle.

Q.7 Determine the AP whose fifth term is 19 and the difference of the eighth term from the thirteenth term is 20.

Q.8 Find the sum of first 17 terms of an AP whose 4^{th} and 9^{th} terms are -15 and -30 respectively.

Q.9 Kanika was given her pocket money on Jan 1st, 2008. She puts ₹ 1 on Day 1, ₹ 2 on Day 2, ₹ 3 on Day 3, and continued doing so till the end of the month, from this money into her piggy bank. She also spent ₹ 204 of her pocket money and found that at the end of the month she still had ₹ 100 with her.

(i)How much money she had saved for the month?

(ii)How much money was saved by her at the end of 15^{th} of January 2008 ?

(iii) How much was her pocket money for the month?

Q.10 The sum of the first n terms of an AP whose first term is 8 and the common difference is 20 is equal to the sum of first 2n terms of another AP whose first term is –30 and the common difference is 8. Find n.

WORKSHEET – 3 Arithmetic Progression

1 The flower arrangement of Raman sadan follows an AP in the order 10,6, 2,…… . then, the sum of the 16 terms is ……..

(a) -320 (b) 320 (c)-352 (d) -400

2 PT madam arranged the students of class 7 in an order, so that it followed an AP. Find the 10th term of the A.P. 4, 9,14, …, 254

(a) 41 (b) 44 (c) 46 (d) 49

3 The nth term of an A.P. is given by an = 3 + 4n. The common difference is

(a) 7 (b) 3 (c) 4 (d) 1

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

4 **ASSERTION (A):** Sum of natural number from 1 to 100 is 5050

REASON (R): The formula of general term an is an = a + (n− 1)d] **Ans: (c)**

VERY SHORT ANSWER QUESTION (2 Marks)

5 Which term of the AP 4. 9, 14, …. is 254?

6 Find the missing terms in the given AP 2, ---, 26, ---

7 Find the common difference of an AP in which a18 – a14 = 32.

SHORT ANSWER QUESTION (3 Marks)

8 An A.P. consists of 60 terms. If the first and the last terms are 7 and 125, respectively. Find the 32^{nd} term.

9 Show that the sequence defined by $a_n = 5n – 7$ is an A.P., find its common difference.

LONG ANSWER QUESTION (5 Marks)

10 If the 10th term of an A.P. is 52 and the 17th term is 20 more than the 13th term, find A.P

CASE BASED QUESTIONS (4 Marks)

11. In a society, a yoga instructor was hired to train the people of the society to live a healthy lifestyle. Yoga sessions were held daily from 5 p.m. to 7 p.m. in the society park. On day one, 5 people joined the yoga session, on day two, 3 more people joined, on day three, another 3 people joined and in this manner every next day, 3 more people kept on joining.

Based on the given information, answer the following questions :

(i) On which day did 59 people join the yoga session ?

(ii) How many people joined the yoga session on the 31st day ?

(iii) What was the total amount earned by the yoga instructor in 16 days ?

WORKSHEET -4 (ARITHMETIC PROGRESSION)

Q.1 The n^{th} term of an A.P. is given by $a_n = 3 + 4n$. The common difference is

(a) 7 (b) 3 (c) 4 (d) 1

Q.2 If p, q, r and s are in A.P. then r – q is

(a) s – p (b) s – q **(**c) s – r (d) none of these

Q.3 The 10^{th} term from the end of the A.P. -5, -10, -15,…, -1000 is

(a) -955 (b) -945 (c) -950 (d) -965

Q.4 **Directions:**

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(c) If Assertion is correct but Reason is incorrect.

(d) If Assertion is incorrect but Reason is correct.

Assertion : If S_n is the sum of the first n terms of an A.P., then its nth term an is given by $a_n = S_n – S_{n-1}$.

Reason : The 10th term of the A.P. 5, 8, 11, 14, ……. is 35.

Q.5 In an A.P. if S,, = $4n^2$ - n, then (i) find the first term and common difference.

Q.6 In an A.P., if the first term a = 7, nth term an = 84 and the sum of first n terms ,Sn=$\frac{2093}{2}$ then ,find n.

Q.7 How many terms are there in A.P. whose first and fifth term are -14 and 2, respectively and the last term is 62.

Q.8 The sum of the 5th and the 9th terms of an A.P. is 30. If its 25th term is three times its 8th term, find the A.P.

Q.9 The school auditorium was to be constructed to accommodate at least 1500 people. The chairs are to be placed in concentric circular arrangement in such a way that each succeeding circular row has 10 seats more than the previous one.

(i) If the first circular row has 30 seats, how many seats will be there in the 10th row?

(ii) If there were 17 rows in the auditorium, how many seats will be there in the middle row?

(iii) For 1500 seats in the auditorium, how many rows need to be there? OR

If 1500 seats are to be arranged in the auditorium, how many seats are still left to be put after 10th row?

Q.10 The ratio of the 11th term to 17th term of an A.P. is 3 4. Find the ratio of 5th term to 21st term of the same A.P. Also, find the ratio of the sum of first 5 terms to that of first 21 terms

WORKSHEET -5 (ARITHMETIC PROGRESSION)

Q.1 The n^{th} term of the AP a, 3a , 5a , ... is

(a) n a (b) (2n-1)a (c) (2n+1)a (d) 2na

Q.2The first term of AP is p and the common difference is q, then its 10th term is

(a) q+9p (b) p+9p (c) p+9q (d) 2 p- 9q

Q.3 If the common difference of an AP is 5, then what is a a 18 13-?

(a) 5 (b) 20 (c) 25 (d) 30

Q.**4 Assertion(A) : Common difference of the AP 5-, 1-, 3, 7, ... is 4.**

Reason(R) : Common difference of the AP , , ,..... a ,a +d ,a+2d …. is given by d =a_2 -a_1

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

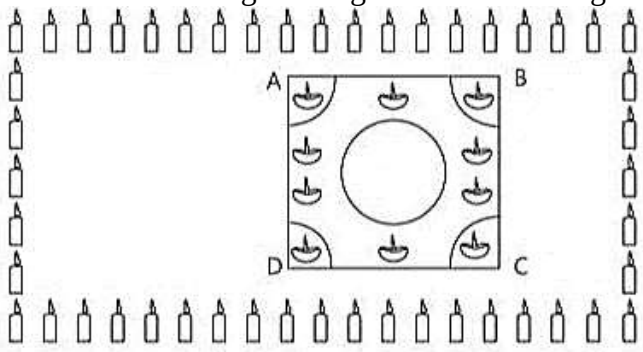
Q,5 Find the sum of all 11 terms of an AP whose middle term is 30.

Q,6 If 4 times the 4th term of an AP is equal to 18 times the 18th term, then find the 22nd term.

Q.7 The sum of four consecutive number in AP is 32 and the ratio of the product of the first and last term to the product of two middle terms is 7 : 15. Find the numbers.

Q.8 The sum of the first 7 terms of an AP is 63 and that of its next 7 terms is 161. Find the AP

Q.9 Interschool Rangoli Competition was organized by one of the reputed schools of odissa. The theme of the Rangoli Competition was Diwali celebrations where students were supposed to make mathematical designs. Students from various schools participated and made beautiful Rangoli designs. One such design is given below.



Based on the above information, solve the following questions:

Q1. What is the area of square ABCD?

Q 2. Find the area of the circle.

Q3. If the circle and the four quadrants are cut off from the square ABCD and removed, then find the area of remaining portion of square ABCD.Or

Find the combined area of 4 quadrants and the circle, removed.

Q.10 How many terms of the Arithmetic Progression 45, 39, 33, ... must be taken so that their sum is 180? Explain the double answer.

ANSWERS

WORK SHEET 1

Q.1	(B) 3.5	**Q.2**	(B) 137	**Q.3**	**(A) -320**
Q.4	**(A)**	**Q.5**	**K=0**	**Q.6**	**73**
Q.7	**2,11,20**	**Q.8**	**126**	**Q.9(i)**	**Rs.55000**
Q.9(ii)	**7th**	**Q.9(iii)**	**N=20 or n= 10**	**Q.10**	**N^2**

WORK SHEET 2

Q.1	D) -2, -4, -8, -16	**Q.2**	(B) 137	**Q.3**	(A) 0
Q.4	**(D)**	**Q.5**	**No**	**Q.6**	**80˚ ,40˚**
Q.7	**3,7,11, ……**	**Q.8**	**-510**	**Q.9(i)**	**Rs 496**
Q.9(ii)	**Rs.120**	**Q.9(iii)**	**Rs 800**	**Q.10**	**11**

WORKSHEET 3

1	2	3	4	5	6	7	8	9	10	11
a	d	c	b	51 th term	14,38	d =8	67	d= 5	7,12,17,22,...	19^{th} day, 95 ,440

WORKSHEET4

Q.1	c) 4	**Q.2**	(c) s – r	**Q.3**	(a) -955
Q.4	**{b)**	**Q.5**	**A=3, d=8**	**Q.6**	**23**
Q.7	**20**	**Q.8**	**3,5,7,9, ,,,**	**Q.9(i)**	**120**
Q.9(ii)	**110 seats**	**Q.9(iii)**	**N=15 ,or 750**	**Q.10**	**3:73 , 1:189**

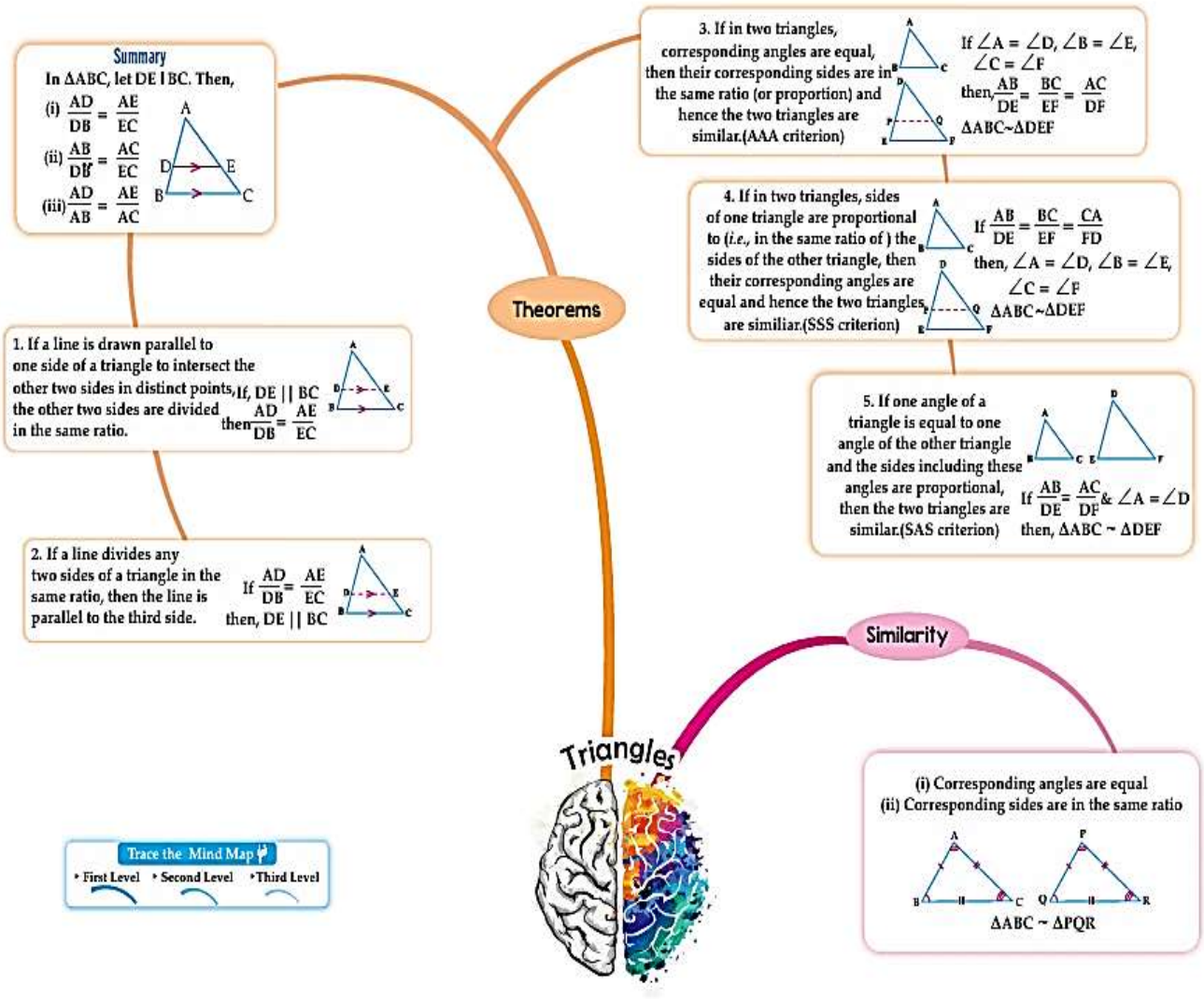
WORKSHEET 5

Q.1	(b) (2n-1)a	**Q.2**	(c) p+9q	**Q.3**	(c) 25
Q.4	**(a)**	**Q.5**	**330**	**Q.6**	**0**
Q.7	**2,6,10,14**	**Q.8**	**3,5,7,9**	**Q.9(i)**	**1600 cm^2**
Q.9(ii)	**314 cm^2**	**Q.9(iii)**	**1600.628972cm^2 628 cm^2**	**Q.10**	**6 or 10**

CHAPTER- 6

SIMILAR TRIANGLES

Mind Map



Gist of the chapter -

Similar Triangles : Two Triangles are said to be similar if

a) Their corresponding angles are equal .

b) Ratio of their corresponding sides are equal /proportional

All congruent figures are similar but similar figures may/may not congruent.

Conditions for similarty of two Triangles :-

a) AAA criterion / AA criterion

b) SAS similarity criterion

c) SSS similarity criterion.

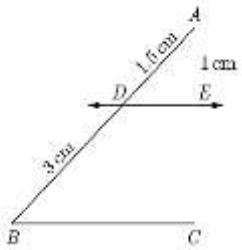
BP Theorem and its based questions.

Pythagoras Theorem based questions .

MULTIPLE CHOICE QUESTIONS (1 MARK)

Q.1 In the given figure, DE ll BC . The value of EC

(a) 1.5 cm b) 3 cm (c) 2 cm (d) 1 cm



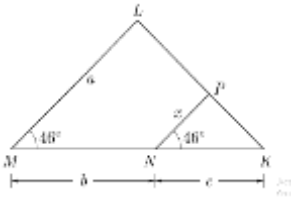
SOL. Since DE ‖ BC ,Then $\frac{AD}{DB} = \frac{AE}{EC}$

$\frac{1.5}{3} = \frac{1}{EC}$, EC= 2 cm

Thus (c) is the correct answer.

Q.2 In the given figure, x is

(a)$\frac{ab}{a+b}$ (b) $\frac{ac}{b+c}$ (c) $\frac{bc}{b+c}$ (d) $\frac{ac}{a+c}$



SOL. In Δ KPN and Δ KLM ,∠K is common and we have ∠KNP = ∠ KML =46 °,Thus by A –A criterion of similarities Δ KNP ~ Δ KML ,$\frac{KN}{KM} = \frac{NP}{ML}$

$\frac{c}{b+a} = \frac{x}{a}$, x = $\frac{ac}{b+a}$. Thus (b) is the correct option.

Q.3 Triangle ABC is an equilateral triangle with each side of length 2p. If AD ⊥ BC then the value of AD is

(a) 3 (b) 3 p (c) 2p (d) 4p

SOL. We have AB=BC =CA =2p and AD ⊥ BC.

In Δ ADB , $AB^2 = AD^2 + BD^2$

$(2p)^2 = AD^2 + p^2$, $AD^2 = \sqrt{3}\,p$

Thus (b) is the correct answer.

Q.4. If ΔABC~ ΔRPQ ,AB=3 cm ,BC=5cm ,AC=6 cm,RP=6cm and PQ =10cm,then find QR

(a) 4cm (b) 8 cm (c) 12 cm (d) 10 cm.

SOL. Δ ABC ~ Δ RPQ ,

Then $\frac{AB}{RP} = \frac{BC}{PQ} = \frac{AC}{RQ}$ (Proportional sides of similar triangles)

$\frac{3}{6} = \frac{5}{10} = \frac{6}{QR}$, QR =12 cm

Thus answer (c) is correct.

Q.5 In, Δ ABC ,PQ ‖ BC , P is the mid point of AB and Q is the mid point of AC.If PB =6 cm,AP= 4 cm, AQ =8 cm,find the length of AC.

(a) 15 cm (b)10 cm (c) 8 cm (d) 20 cm

SOL. Since PQ ll BC,Then $\frac{AP}{AB} = \frac{AQ}{AC}$, $\frac{4}{10} = \frac{8}{X}$, X= 20 cm

Thus (d) is the correct answer .

Q6. ΔABC is such that AB = 3 cm, BC = 2 cm, CA = 2.5 cm. If ΔABC ~ΔDEF and EF = 4 cm, then perimeter of ΔDEF is

(a) 7.5 cm (b) 15 cm (c) 22.5 cm (d) 30 cm

SOL. Option (b) 15cm

Q7. In the ΔABC ,D and E are points on the side AB and AC respectively such that **DE** ‖ BC, If AE=2 cm,AD =3 cm and BD=4.5 cm.then find CE .

(a) 4 cm (b) 3 cm (c) 5 cm (d) 2 cm

SOL. Option (b) 3

Q8. In Δ DEW , AB ‖EW,If AD =4 cm, DE =12cm and DW =14CM,then find the value of DB

(a) 8 cm (b) 10 cm (c) 12 cm (d) 9 cm.

SOL. Option (a) 8

ASSERTION AND REASON QUESTION

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false
(d) Assertion (A) is false but reason (R) is true.

Q9. **Assertion**: In the ΔABC, AB = 24 cm, BC = 10 cm and AC = 26 cm, then ΔABC is a right angle triangle.
Reason: If in two triangles, their corresponding angles are equal, then the triangles are similar.
AB = 24 cm BC = 10 cm AC = 26 cm
SOL. Let's assume that the longest side is the hypotenuse. The longest side here is AC = 26 cm.

$$AB^2 + BC^2 = AC^2$$
$$24^2 + 10^2 = 26^2$$
$$576 + 100 = 676$$
$$676 = 676$$

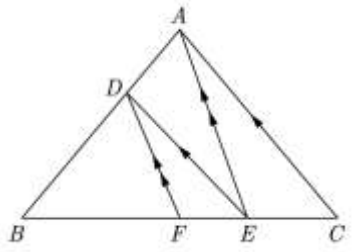
Assertion is CORRECT
This is the AA (Angle-Angle) similarity criterion, which is a correct statement**.**
Reason is CORRECT**.**
Ans. Option B: Both **Assertion** and **Reason** are true, but **Reason is not the correct explanation** of the Assertion.

Q.10 Assertion (A): The sides of two similar triangles are in the ratio 2 : 5, then the areas of these triangles are in the ratio 4 : 25.
Reason (R): The ratio of the areas of two similar triangles is equal to the square of the ratio of their sides.
SOL. Assertion (A):
The sides of two similar triangles are in the ratio 2 : 5, then the areas of these triangles are in the ratio 4 : 25.
This statement is correct if the triangles are similar, because in similar triangles, the ratio of areas is equal to the square of the ratio of corresponding sides:
Area ratio = $(\frac{Side1}{Side2})^2 = (\frac{2}{5})^2 = (\frac{4}{25})^2$
So, the assertion is **true**.
Reason (R):
The ratio of the areas of two similar triangles is equal to the square of the ratio of their sides.
This is a **true** geometric property.
So, the reason is also **true**.
Ans.Option A: Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).

VERY SHORT ANSWER – 5 (2 MARKS EACH)

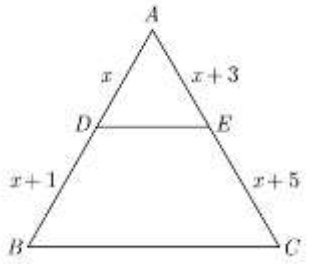
Q.11 In the given figure, DE ll AC and DF ll AE. Prove that $\frac{BF}{FE} = \frac{BE}{EC}$

SOL. In ΔABC , DE ll AC,
By BPT $\frac{BD}{DA} = \frac{BE}{EC}$ …(1)
In ΔABE, DF ll AE
In BPT $\frac{BD}{DA} = \frac{BF}{FE}$ …(2)
From (1) and (2), we have
$\frac{BF}{FE} = \frac{BE}{EC}$



Q.12 In ΔABC, DE ll BC find the value of x.

SOL. . In the given figure DE ll BC , thus



$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{x}{x+1} = \frac{x+3}{x+5}$$

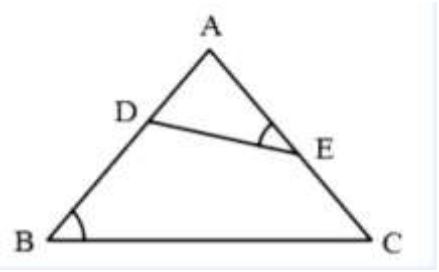
$x^2 + 5x = x^2 + 4x + 3$

x = 3

Q.13 In the given Fig., D and E are points on sides AB and CA of △ABC such that △B = ∠AED. Show that $\Delta ABC \sim \Delta AED$

SOL. Given: DE || BC

To Prove: ΔABC ~ ΔAED



Proof:

In ΔABC and ΔAED:

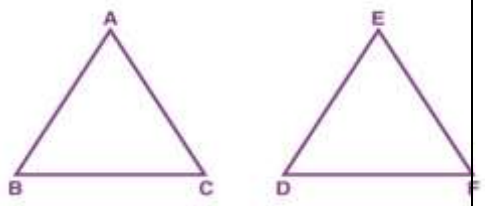
∠A = ∠A (Common angle)

∠AED = ∠ABC (Corresponding angles, since DE || BC)

∠ADE = ∠ACB (Corresponding angles, since DE || BC)

Therefore, ΔABC ~ ΔAED (by AA similarity criterion)

Q.**14 It is given that ΔABC ~ ΔEDF, such that AB = 5cm AC = 7cm DF = 15 cm and DE = 12 cm. Find the lengths of the remaining sides of the triangles.**



SOL. . Given, AB = 5cm and AC = 7cm

DF = 15cm and DE = 12cm

ΔABC ~ AEDF

From the property of similar triangles, we have:

$\frac{AB}{ED} = \frac{AC}{EF} = \frac{BC}{DF}$.... (i)

Now, $\frac{AB}{ED} = \frac{AC}{EF}$

Now, $\frac{5}{12} = \frac{7}{EF}$

EF = (7 x 12)/5 = 16.8cm

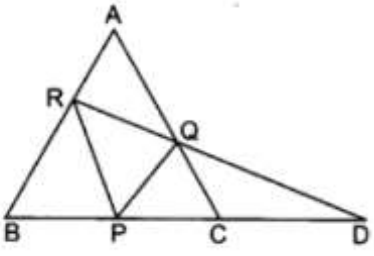
Also, $\frac{AB}{ED} = \frac{BC}{DF}$

$\frac{5}{12} = \frac{BC}{15}$

BC = 6.25 cm

Therefore, EF = 16.8cm and BC = 6.25 cm

Q.15 In the given figure PQ || BA; PR || CA. If PD = 12 cm. Find BD × CD.



SOL. In ΔBRD,

BR ll PQ

$\frac{BD}{PD} = \frac{RD}{QD}$

In ΔRDP,

PR ll QC

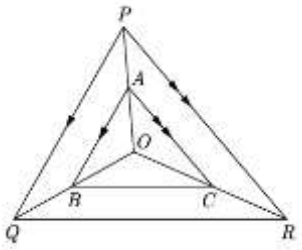
$\frac{RD}{QD} = \frac{PD}{CD}$

From (i) and (ii), we get $\frac{PD}{CD} = \frac{BD}{PD}$

BD × CD = PD × PD = $12 \times 12 = 144\ cm^2$

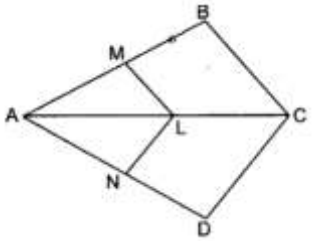
SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q.16 In the given figure , AB and C are points on , OP,OQ and OR respectively such that AB ll PQ and AC ll PR Prove that BC ll QR.



SOL. In Δ POQ, AB ||PQ
By BPT $\frac{AO}{AP} = \frac{OB}{BQ}$ …(1)
In ΔOPR, AC ll PR
In BPT $\frac{OA}{AP} = \frac{OC}{CR}$ …(2)
From (1) and (2), we have
$\frac{OB}{BQ} = \frac{OC}{CR}$
By converse of BPT we have , BC ||QR Hence, proved.

Q.17 In the given figure, if LM || CB and LN|| CD, prove that $AM \times AD = AB\ X\ AN$.



SOL. Given:
LM ll CB
LN ll CD

To prove : AM x AD = AB x AN
Proof: In ΔBAC,
LM ll BC

$\frac{AM}{MB} = \frac{AL}{LC}$ …(1)

In ΔDAC,
LN ll CD

$\frac{AN}{ND} = \frac{AL}{LC}$ …(2)

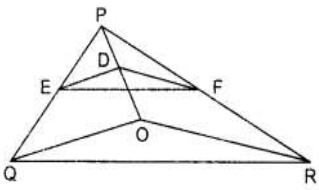
From (i) and (ii)
$\frac{AM}{MB} = \frac{AL}{LC}$

$\frac{MB}{AM} = \frac{ND}{AN}$

$\frac{MB}{AM} + 1 = \frac{ND}{AN} + 1$

$\frac{MB+AM}{AM} = \frac{ND+AN}{AN}$
$\frac{AB}{AM} = \frac{AD}{AN}$
AM x AD = AB x AN

Q.18 In the given figure, DE || OQ and DF || OR. Show that EF || QR.



SOL. In ΔPOQ,
DE ll OQ

$\frac{PE}{EQ} = \frac{PD}{DO}$ …(1)

In ΔPOR,
DF ll OR

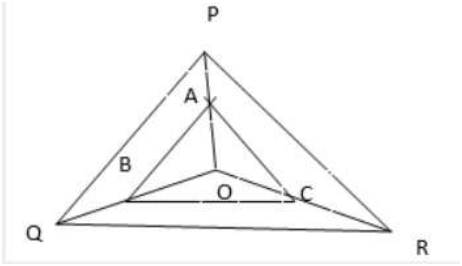
$\frac{PF}{FR} = \frac{PD}{DO}$ …(2)

From (i) and (ii)

$\frac{PE}{EQ} = \frac{PF}{FR}$

EF ll QR

Q.19 In the given figure, A, B and C are points on OP, OQ and OR respectively such that AB || PQ and AC || PR. Show that BC || QR.



SOL. AB ll PQ

$\frac{OA}{AP} = \frac{OB}{BQ}$ …(1) [By BPT]

AC ll PR

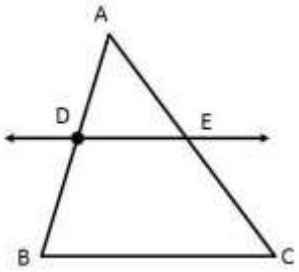
$\frac{OA}{AP} = \frac{OC}{CR}$ …(2)

From (i) and (ii)

$\frac{OB}{AP} = \frac{OC}{CR}$

BC ll QR [By converse of BPT]

Q.20 If a line intersects sides AB and AC of a A ABC at D and E respective and is parallel to BC, prove that $\frac{AD}{AB} = \frac{AE}{AC}$



SOL. DE ll BC

$\frac{AD}{DB} = \frac{AE}{EC}$

$\frac{DB}{AD} = \frac{EC}{AE}$ [By BPT]

$\frac{DB}{AD} + 1 = \frac{EC}{AE} + 1$

$\frac{AB}{AD} = \frac{AC}{AE}$

$$\frac{AD}{AB} = \frac{AE}{AC}$$

LONG ANSWER QUESTIONS (5 MARKS EACH)

Q.21 State and prove basic proportionality theorem BPT.

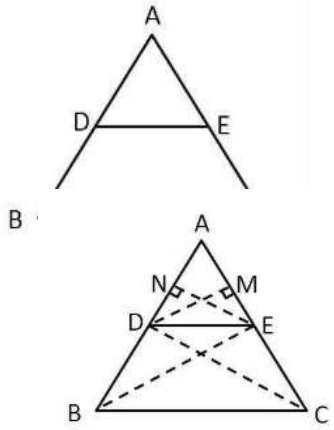
SOL. Basic Proportionality Theorem States that, if a line is parallel to a side of a triangle which intersects the other side into two distinct point, then the line divides those sides of the triangle on proportion.

Given: ΔABC where DE ll BC

To Prove: $\frac{AD}{DB} = \frac{AE}{EC}$

Construction: Join BE and CD

Draw DM⊥AC and EN⊥AB



Proof: ar (ADE) $= \frac{1}{2}$ x Base x Height X 2

$= \frac{1}{2}$x AD x EN …(1)

ar (BDE) = $\frac{1}{2}$x Base x Height

$= \frac{1}{2}$**x** DB x EN …(2)

Divide (1) and (2)

$\frac{ar\Delta ADE}{ar\Delta BDE} = \frac{\frac{1}{2}XAD\ X\ EN}{\frac{1}{2}XDB\ X\ EN}$ ……

$\frac{ar\Delta ADE}{ar\Delta BDE} = \frac{\frac{1}{2}XAD\ X\ EN}{\frac{1}{2}XDB\ X\ EN}$

$\frac{ar\Delta ADE}{ar\Delta BDE} = \frac{AD}{DB}$ **…….(3)**

Simililarly $\frac{ar\Delta ADE}{ar\Delta DEC}$ = $\frac{AE}{EC}$ **……..(4)**

From equation (3) and (4)

$\frac{AD}{DB}$ =$\frac{AE}{EC}$ **Hence Proved**

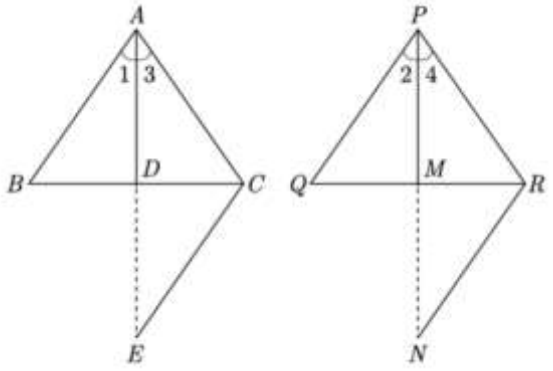
Q.22 Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle . PQR Show that $\Delta ABC \sim \Delta PQR$.

SOL. It is given that in ΔABC and , ΔPQR AD and PM are their medians,

such that $\frac{AB}{PQ}$ =$\frac{AD}{PM}$=$\frac{AC}{PR}$

We have produce AD to E such that AD = DE and produce PM to N such that . PM = MN. We join CE and . RN As per given condition

we have drawn the figure below.



In ΔABD and ΔEDC,

AD = DE (By construction)

ΔADB = ΔEDC (VOA)

BD = DC (AD is a median)

By SAS congruency

$\Delta ABD \cong \Delta EDC$

AB = CE (By CPCT)

Similarly, PQ = RN = and ∠A =∠ 2

$\frac{AB}{PQ} = \frac{AD}{PM} = \frac{AC}{PR}$

$\frac{CE}{RN} = \frac{2AD}{2PM} = \frac{AC}{PR}$

$\frac{CE}{RN} = \frac{AE}{PN} = \frac{AC}{PR}$

By SSS similarity, we have

$\Delta AEC \cong \Delta PNR$

$\angle 3 = \angle 4$

$\angle 1 = \angle 2$

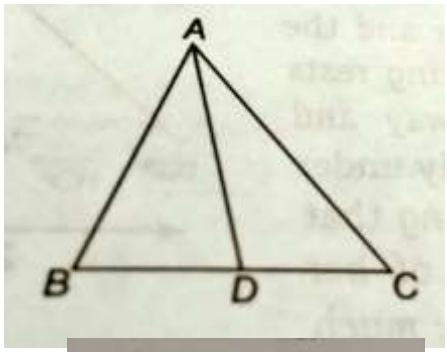
$\angle 1 + \angle 3 = \angle 2 + \angle 4$

By SAS similarity, we have

$\Delta ABC \sim \Delta PQR$.

Hence Proved

Q.23 **In figure, D is a point on side BC of ΔABC such that $\frac{BD}{CD} = \frac{AB}{AC}$. Prove that AD is the bisector of ∠BAC.**

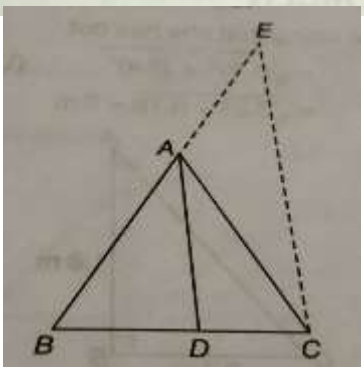


SOL. Given that, D is a point on side BC of ΔABC such that $\frac{BD}{CD} = \frac{AB}{AC}$.

Now, from BA produce cut off AE = A. Join CE.

$\frac{BD}{CD} = \frac{AB}{AC}$.

$\frac{BD}{CD} = \frac{AB}{AE}$.



In ΔBCE

AD ll CE

∠BAD= ∠AEC. (i)

$\angle CAD = \angle ACE$ ... (ii)

AC = AE

$\angle AEC = \angle ACE$ …(iii)

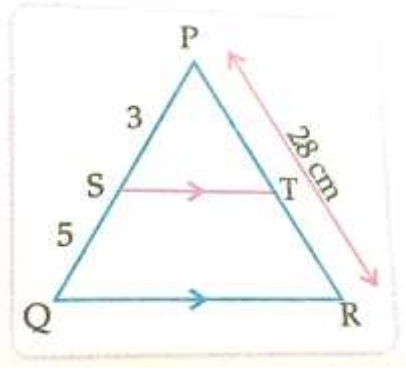
Using eqs (i),(ii),(iii)

$\angle BAD = \angle CAD$ i.e., AD is the bisector of ∠BAC.

CASE BASED QUESTIONS (4 MARKS EACH)

Q. 25 **The triangle proportionality theorem is a geometric law stating that when you draw line parallel to one side of a triangle, it will intersect the other two sides of the triangles and divide them proportionally. In the given ΔPQR, ST||QR $\frac{PS}{SQ} = \frac{3}{5}$ and PR=28 cm.**

(i) What is the length of PQ and PT ?



SOL. Length of PQ = PS + SQ = 3+5 = 8 cm

ST || QR (Given)

$\frac{PS}{PQ} = \frac{PT}{PR}$

$\frac{3}{8} = \frac{PT}{28}$

PT= $\frac{3}{8} \times 28$

= 10.5 cm

(ii) Which property used in the given case?

SOL. BPT i.e., Basic Proportionality Theorem.

Q.3 If QR = 32 cm, then find ST. Also find TR.

SOL. From the figure,

In ΔPQR, $\frac{PS}{PQ} = \frac{PT}{PR}$ And $\angle P$ is common

ΔPST~ΔPQR , $\frac{PS}{PQ} = \frac{ST}{QR}$

$\frac{3}{8} = \frac{ST}{32}$

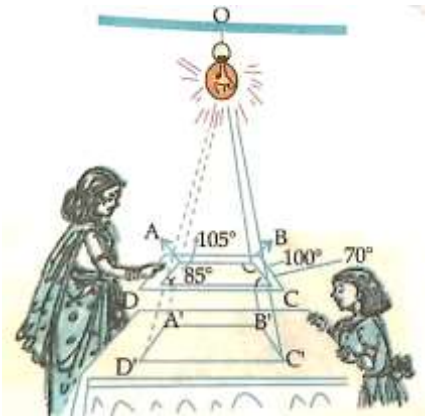
ST = 12 cm

TR = PR – PT = (28-10.5)cm

TR = 17.5cm

Q.24 Seema placed a light bulb at point O on the ceiling and directly below it placed a table. Now, she put a cardboard of shape ABCD between table and lighted bulb. Then a shadow of ABCD is cast on the table as A'B'C'D' (see figure). Quadrilateral A'B'C'D' in an enlargement of ABCD with scale factor 1 : 2, Also, AB = 1.5 cm, BC = 25 cm, CD = 2.4 cm and AD = 2.1 cm; ∠A = 105°, ∠B = 100°, ∠C = 70° and ∠D = 85°.

(i) What is the measurement of angle A'?



SOL. Quadrilateral A'B'C'D' is similar to ABCD.

⇒ ∠A' = ∠A

∠A' = 105°

(ii) . What is the length of A'B' ?

SOL. Given scale factor is 1:2

A'B' = 2AB

A'B' = 2 x 1.5 = 3 cm

(iii) What is the ratio of sides A'B' and A'D' ?

SOL. A'B' = 3 cm

A'D' = 2AD

2x 2.1 4.2 cm

$\frac{A'B'}{A'D'} = \frac{3}{4.2} = \frac{30}{42} = \frac{5}{7}$ **or 5:7**

CHAPTER-6

SIMILAR TRIANGLES
WORKSHEET-1
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q1. Two polygons are similar if:
A) Their corresponding angles are equal B) Their corresponding sides are equal
C) Their corresponding sides are proportional D) Both A and C.

Q2. In ΔABC and ΔDEF, ∠A = ∠D, ∠B = ∠E, and $\frac{AD}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$. Then ΔABC ~ ΔDEF by:
A) AA similarity B) SAS similarity C) SSS similarity D) RHS similarity

Q3. If in two triangles, one angle is equal and the sides including these angles are in the same ratio, the triangles are:
A) Not similar B) Congruent C) Similar by SAS D) Similar by SSS

Q4.Assertion (A): If two angles of one triangle are respectively equal to two angles of another triangle, then the triangles are similar.
Reason (R): Two triangles are similar if their corresponding angles are equal.
Options:
A) Both A and R are true, and R is the correct explanation of A.
B) Both A and R are true, but R is not the correct explanation of A.
C) A is true but R is false. D) A is false but R is true.

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

Q5. In ΔPQR, ∠P = ∠R. Show that $\frac{PQ}{PR} = \frac{QR}{QP}$.

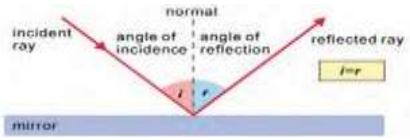
Q6. E is a point on the side AD produced of a parallelogram $ABCD$ and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$.

SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q7. In triangle ABC, D and E are points on sides AB and AC respectively, such that DE ∥ BC. Prove that: $\frac{AD}{AB} = \frac{AE}{AC}$

Q8. E and F are points on the sides PQ and PR respectively of a Δ PQR. State whether EF || QR PE = 5 cm, QE = 4.5 cm, PF = 10 cm and RF = 9 cm.

CASE BASED QUESTION (4 MARKS)



Case Study: The law of reflection states that when a ray of light reflects off a surface, the angle of incidence is equal to the angle of reflection.
Maulik places a mirror on level ground to determine the height of a pole (with traffic light fired on it). He stands at a certain distance so that he can see the top of the pole reflected from the mirror. Maulik's eye level is 1.5 m above the ground. The distance of Maulik and the pole from the mirror are 1.8 m and 6 m respectively.

Q9 (a) Which criterion of similarity is applicable to similar triangles? (1 mark)
(I) SSA (II) ASA (III) SSS (IV) AA

Q9 (b) What is the height of the pole? (1 mark)
(I) 6 m (II) 8 m (III) 5 m (IV) 4 m

Q9 (c) Now Maulik move behind such that distance between pole and Maulik is 13 meters. He place mirror between him and pole to see the reflection of light in right position. What is the distance between mirror and Maulik? (2 mark)
(I) 7 m (II) 3 m (III) 5 m (IV) 4 m

LONG ANSWER QUESTION (5 MARKS)

Q10.A famous Greek mathematician Thales gave an important truth relating to two equiangular triangles which is as follows: "The ratio of any two corresponding sides in two equiangular triangles is always the same". Later on, this relation is modified in some way and known as one of the significant theorem of geometry named as Thales Theorem.
(a) State and prove the above given theorem.

(b)Write one difference between Congruency in Triangles and similarity in Triangles.

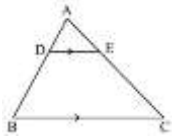
SIMILAR TRIANGLES
WORKSHEET-2
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q1. Which of the following is *not* a criterion for similarity of triangles?

A) SSS B) SAS C) AAA D) SSA

Q2. In the given figure, if in D ABC, DE || BC, then which of the following equality holds?

(A) $\frac{AD}{AB} = \frac{AE}{CE}$ (B) $\frac{AD}{AB} = \frac{AE}{AC}$ (C) $\frac{AD}{BD} = \frac{AE}{AC}$ (D) $\frac{AD}{AB} = \frac{AC}{AE}$



Q3. If two triangles are similar, the ratio of their corresponding altitudes is:

A) Square of the ratio of corresponding sides. B) Same as the ratio of corresponding sides.

C) Cube of the ratio of sides. D) Reciprocal of side ratio.

ASSERTION AND REASONING (1 MARK)

Q4. Assertion (A): In two similar triangles, the corresponding medians are in the same ratio as the corresponding sides.

Reason (R): Medians divide a triangle into two congruent triangles.

Options:

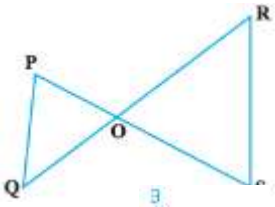
A) Both A and R are true, and R is the correct explanation of A

B) Both A and R are true, but R is not the correct explanation of A

C) A is true but R is false

D) A is false but R is true

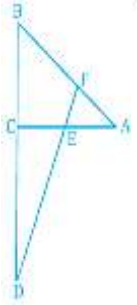
VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)



Q5. In figure, if PQ || RS, prove that Δ POQ ~ Δ SOR.

Q6. In ΔDEF and ΔPQR, ∠D = ∠P and ∠F = ∠R. Are the triangles similar? Justif answer.

SHORT ANSWER QUESTIONS (3 MARKS EACH)

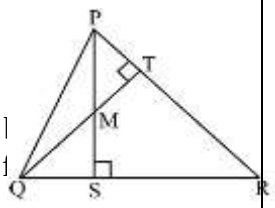


Q7. In Fig. below, line segment DF intersect the side AC of a triangle ABC at the point E such that E is the mid-point of CA and ∠AEF = ∠AFE .

Prove that $\frac{BD}{CD} = \frac{BF}{CE}$.

[Hint: Take point G on AB such that CG DF.]

Q8. In the given figure, PQR is a triangle in which PS and QT are altitudes from P and Q respectively, intersecting each other at M. Prove that ΔQSM ~ ΔPTM.



CASE BASED QUESTION (4 MARKS)

A surveyor is trying to measure the width of a river. He locates a point A on one l places a point B directly across it on the other side. From point C, 60 meters away measures ∠ACB = 90° and ∠CAB = 30°.

Q9 (a) Which triangles can be considered similar here? (1 mark)

Q9 (b) Which similarity criterion applies? (1 mark)

Q9 (c) Find the width of the river (length AB) using trigonometry or similarity. (2 marks)

LONG ANSWER QUESTION (5 MARKS)

Q10. In ΔXYZ, a line parallel to side YZ intersects sides XY and XZ at points P and Q respectively. Prove that: $\frac{XP}{PY} = \frac{XQ}{QZ}$

If XP = 3 cm, PY = 6 cm, and XQ = 4 cm, find QZ.

CHAPTER-6

SIMILAR TRIANGLES
WORKSHEET-3
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q1. Which of the following conditions is sufficient to prove two triangles similar?

A) Two pairs of equal angles B) One angle equal and one side proportional

C) All sides equal D) One pair of sides proportional

Q2. In ΔABC and ΔPQR, if $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$, then triangles are similar by:

A) AAA similarity B) SSS similarity C) SAS similarity D) RHS similarity

Q3. Two equilateral triangles are:

A) Congruent B) Not similar C) Always similar D) Sometimes similar

ASSERTION AND REASONING (1 MARK)

Q4.Assertion (A): Two similar triangles are always congruent.

Reason (R): If areas of two similar triangles are equal, then the triangles are congruent.

Options:

A) Both A and R are true, and R is the correct explanation of A

B) Both A and R are true, but R is not the correct explanation of A

C) A is true but R is false

D) A is false but R is true

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

Q5. In ΔABC and ΔDEF, if ∠A = ∠D, ∠C = ∠F, and AB/DE = AC/DF, prove that ΔABC ~ ΔDEF.

Q6. In Δ's ABC and DEF, ∠A = ∠D, ∠B = ∠E. Is Δ ABC ~ Δ DEF? Give reason.

SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q7. Foot of a 10 m long ladder leaning against a vertical wall is 6 m away from the base of the wall. Find the height of the point on the wall where the top of the ladder reaches.

Q8. Legs (sides other than the hypotenuse) of a right triangle are of lengths 16cm and 8 cm. Find the length of the side of the largest square that can be inscribed in the triangle.

CASE BASED QUESTION (4 MARKS)

A student wants to find the height of a flagpole. He places a mirror flat on the ground 3 m from the base of the pole. He moves back until he sees the top of the flagpole in the mirror, standing 1.2 m tall himself and 1.5 m away from the mirror.

Q9 (a) Which triangles are formed in this setup? (1 mark)

Q9 (b) Why are the triangles similar? (1 mark)

Q9 (c) Using similarity, find the height of the flagpole. (2 marks)

LONG ANSWER QUESTION (5 MARKS)

Q10. Prove the Basic Proportionality Theorem (Thales' Theorem):

Statement: If a line is drawn parallel to one side of a triangle to intersect the other two sides, then it divides those two sides in the same ratio.

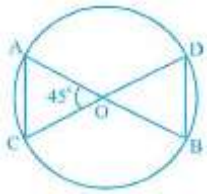
Also, use the theorem to find the value of x, if in ΔPQR, a line divides sides PQ and PR at points A and B such that: $\frac{PA}{AQ} = \frac{3}{5}$, and PR = 16 cm, PB = x cm, BR = 10 cm.

SIMILAR TRIANGLES
WORKSHEET-4
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q1. Two triangles are similar if their:
A) Corresponding sides are equalB) Corresponding angles are equal
C) Sides are equal in lengthD) Areas are equal

Q2. Which of the following is correct if ΔABC ~ ΔPQR?
A) $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$B) $\frac{AB}{PQ} = \frac{QR}{BC} = \frac{AC}{PR}$
C) $\frac{AB}{QR} = \frac{BC}{PQ} = \frac{AC}{PR}$D) None of these

Q3. In given figure, O is the point of intersection of two chords AB and CD such that OB = OD, then triangles OAC and ODB are:



A) equilateral but not similar B) isosceles but not similar
C) equilateral and similar D) isosceles and similar

ASSERTION AND REASONING (1 MARK)

Q4. Assertion (A): All equilateral triangles are similar.
Reason (R): All equilateral triangles have equal angles and sides in the same ratio.
Options:
A) Both A and R are true, and R is the correct explanation of A
B) Both A and R are true, but R is not the correct explanation of A
C) A is true but R is false
D) A is false but R is true.

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

Q5. In ΔABC, DE ∥ BC, and D and E lie on AB and AC respectively. Prove that: $\frac{AD}{DB} = \frac{AE}{EC}$

Q6. P and Q are the points on the sides DE and DF of a triangle DEF such that DP = 5 cm, DE = 15 cm, DQ= 6 cm and QF = 18 cm. Is PQ EF? Give reasons for your answer.

SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q7. In triangle XYZ, a line parallel to side YZ intersects sides XY and XZ at points A and B respectively. Show that ΔXAB ~ ΔXYZ and find $\frac{AB}{YZ}$, if XA = 3 cm and XY = 6 cm.

Q8. A 15 m high tower casts a shadow 24 m long at a certain time and at the same time, a telephone pole casts a shadow 16 m long. Find the height of the telephone pole.

CASE BASED QUESTION (4 MARKS)

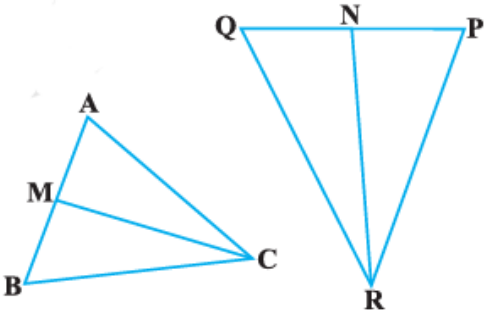
Case Study:A tree and its shadow form a right-angled triangle with the ground. At the same time, a lamp post nearby casts a shadow of 2.5 m and has a height of 5 m. The tree's shadow is 4.5 m.

Q9 (a) What similarity criterion justifies the triangles formed? (1 mark)
Q9 (b) Write the proportionality relation between corresponding sides. (1 mark)
Q9 (c) Find the height of the tree. (2 marks)

LONG ANSWER QUESTION (5 MARKS)

Q10. In Fig. 6.33, CM and RN are respectively the medians of Δ ABC and Δ PQR.
If Δ ABC ~ Δ PQR, prove that:

(i) Δ AMC ~ Δ PNR
(ii) $\frac{CM}{RN} = \frac{AB}{PQ}$
(iii) Δ CMB ~ Δ RNQ



SIMILAR TRIANGLES
WORKSHEET-5
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q1. Which of the following is a correct condition for similarity of two triangles?
A) One pair of sides equal
B) Corresponding angles equal and corresponding sides proportional
C) Only one angle equal
D) All sides unequal

Q2. In ΔABC and ΔDEF, ∠A = ∠D, $\frac{AB}{DE} = \frac{AC}{DF}$. Which similarity criterion is applicable?
A) AAA B) SSS C) SAS D) RHS

Q3. If ABC ~ EDF and ΔABC is not similar to ΔDEF, then which of the following is not true?
A) BC.EF = AC.FD B) AB.EF = AC.DE C) BC.DE = AB.EF D) BC.DE = AB.FD

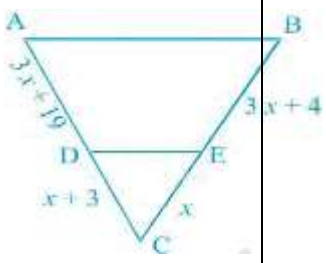
ASSERTION AND REASONING (1 MARK)

Q4. Assertion (A): If two triangles are similar, then their corresponding sides are in the same ratio.
Reason (R): The corresponding angles of similar triangles are equal.
Options:
A) Both A and R are true, and R is the correct explanation of A
B) Both A and R are true, but R is not the correct explanation of A
C) A is true but R is false
D) A is false but R is true

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

Q5. A and B are respectively the points on the sides PQ and PR of a triangle PQR such that PQ = 12.5 cm, PA = 5 cm, BR= 6 cm and PB = 4 cm. Is AB QR? Give reasons for your answer.

Q6. Find the value of x for which DE || AB in given below figure:

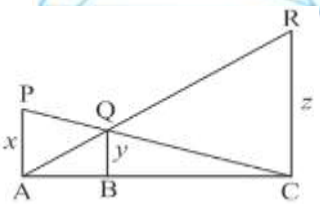


SHORT ANSWER QUESTIONS (3 MARKS EACH)

Q7. In Fig. below, if AB || DC and AC and PQ intersect each other at the point O, prove that OA. CQ = OC. AP

Q8. In the given figure PA, QB and RC are each perpendicular to AC.

If AP = x, BQ = y and CR = z, then $\frac{1}{y} = \frac{1}{x} + \frac{1}{z}$



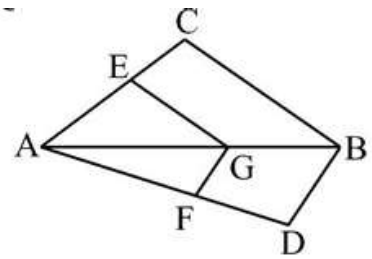
CASE BASED QUESTION (4 MARKS)

Case Study:
A building and a pole cast shadows at the same time of the day. The pole is 4 m tall and casts a shadow 2.5 m long. The shadow of the building is 10 m long.
Q9 (a) Are the triangles formed by the building and its shadow and the pole and its shadow similar? Give reason. (1 mark)
Q9 (b) What is the similarity criterion used? (1 mark)
Q9 (c) Find the height of the building. (2 marks)

LONG ANSWER QUESTION (5 MARKS)

Q10. State and prove Basic Proportionality Theorem.
Use the above result to prove the following: In the given figure,

if EG || CB and FG ||DB, then prove that $\frac{AE}{EC} = \frac{AF}{FD}$



ANSWER KEY:

WORSHEET -1

Q1.D) Both A and C Q2.B) SAS similarity Q3.C) Similar by SAS

Q4. A) Both A and R are true, and R is the correct explanation of A.

Q5. Given: $\angle P = \angle R$

By Angle-Angle (AA) criterion, $\Delta PQR \sim \Delta RQP$

So, corresponding sides are proportional:

$PQ/PR = QR/QP$

Q6. In ΔABE and ΔCFB:

$\angle ABE = \angle CFB$ (Vertically opposite angles)

$\angle BAE = \angle BCF$ (Alternate interior angles, since AB ∥ CD and BE is a transversal)

So, by AA similarity criterion, $\Delta ABE \sim \Delta CFB$

Q7. Given: DE ∥ BC

By Basic Proportionality Theorem (Thales Theorem), $AD/DB = AE/EC$

Adding 1 on both sides: $(AD + DB)/DB = (AE + EC)/EC$

$\Rightarrow AB/DB = AC/EC$

Taking reciprocal: $DB/AB = EC/AC$

Subtracting from 1: $AD/AB = AE/AC$

Hence proved.

Q8. Check PE/PQ and PF/PR:

$PQ = PE + QE = 5 + 4.5 = 9.5$ cm

$PR = PF + RF = 10 + 9 = 19$ cm

$PE/PQ = 5/9.5$

$PF/PR = 10/19$

But $5/9.5 = 10/19 = 0.526$

So, $PE/PQ = PF/PR$ $\therefore$ EF ∥ QR by converse of BPT.

Yes, EF || QR

Q8 (IV) AA

Q8 (b)(III) 5 m

Height of pole / 1.5 = 6 / 1.8

Height of pole = (6 / 1.8) × 1.5 = 5 m

Q8 (c)(II) 3 metres

New total distance between pole and Maulik = 13 m

Let distance from Maulik to mirror = x

Then distance from mirror to pole = 13 − x

Using similar triangles:

1.5 / x = h / (13 − x), h = 5

$\Rightarrow$ 1.5 / x = 5 / (13 − x)

Cross-multiply:

1.5(13 − x) = 5x

19.5 − 1.5x = 5x

19.5 = 6.5x

x = 3

Q9 (a)Thales Theorem (Basic Proportionality Theorem): Prove given in NCERT.

(b)

Congruency	**Similarity**
All corresponding sides and angles are equal.	Corresponding angles are equal and sides are in the same ratio.
Shape and size are the same.	Only shape is the same, size may differ.

ANSWER KEY:
WORSHEET -2

Q1.D) SSA Q2.B) AD/AB = AE/AC
Q3.B) Same as the ratio of corresponding sides. Q4.C) A is true but R is false

Q5. Given: PQ ∥ RS
⇒∠POQ = ∠SOR (Vertically opposite angles)
⇒∠P = ∠S and ∠Q = ∠R (Alternate interior angles)
So, ΔPOQ ~ ΔSOR by AAA similarity.
Q6. Yes, by AA similarity
Since two pairs of corresponding angles are equal (∠D = ∠P and ∠F = ∠R), triangles are similar by AA criterion.
Q7. Let G be a point on AB such that CG ∥ DF
Since ∠AEF = ∠AFE ⇒ ΔAEF is **isosceles**⇒ AE = AF
CG ∥ DF and E is midpoint ⇒ G is midpoint of AB (by mid-point theorem)
⇒ AG/GB = AE/EC ⇒ AG = GB and AE = EC
Now in ΔBGF and ΔCGF:

- ∠BFG = ∠CFG (vertically opposite)
- AG = GB and AE = EC
  ⇒ ΔBGF ~ ΔCGF
  Hence, BD/CD = BF/CE

Q8. In ΔQSM and ΔPTM:

- ∠QSM = ∠PTM = 90° (Both are altitudes)
- ∠SMQ = ∠TMP (Vertically opposite angles)
  ⇒ By AA similarity, ΔQSM ~ ΔPTM

Q9 (a):ΔABC and standard 30°–60°–90° triangle
Q9 (b):AA similarity(∠ACB = 90°, ∠CAB = 30° ⇒∠CBA = 60°)
Q9 (c):Answer:AB ≈ 34.6 m
Using ∠CAB = 30°, AC = 60 m
⇒ tan(30°) = AB / 60
⇒ 1/√3 = AB / 60
⇒ AB = 60 / √3 = 60√3 / 3 **= 20√3 ≈ 34.64 meters**

Q10. (a) Prove by using BPT Theorem as mentioned in NCERT.
(b) XP = 3 cm, PY = 6 cm ⇒ XP/PY = 3/6 = ½, XQ = 4 cm
Let QZ = x ⇒XQ/QZ = 4/x
Since XP/PY = XQ/QZ ⇒ 1/2 = 4/x ⇒ x = 8 cm
QZ = 8 cm

ANSWER KEY:
WORSHEET -3

Q1. A) Two pairs of equal angles Q2. B) SSS similarity
Q3. C) Always similar Q4. D) A is false but R is true.
Q5. Given: ∠A = ∠D, ∠C = ∠F, AB/DE = AC/DF. By AA similarity, ΔABC ~ ΔDEF.
Q6. Yes **Reason:** Two pairs of angles are equal ⇒ third pair will also be equal. So, **by AA similarity,** ΔABC ~ ΔDEF.
Q7. Height = 8 meters It forms a right triangle:
Let height = h Use Pythagoras Theorem:
On solving, h^2=64, h=8 m
Q8. Side of square = 16/3 cm or approx 5.33 cm
Q9 (a): Δ (Flagpole, Mirror, Top of Flagpole) and Δ (Observer, Mirror, Eyes)
Q9 (b): By AA similarity:Both have a right angle (from mirror on ground),

Angle of elevation is same (reflected ray) ⇒ So triangles are similar by **AA**
Q9 (c): Let height of flagpole = h
Using similar triangles:Height of flagpole = 2.4 meters
Q10. (a) Prove of BPT as given in NCERT.
(b) PA/AQ = 3/5, PR = 16 cm, BR = 10 cm
Let PB = x Since A and B divide sides in same ratio:
PB = 6 cm (using BPT theorem).

ANSWER KEY:
WORSHEET -4

Q1.B) Corresponding angles are equal Q2.A) AB/PQ = BC/QR = AC/PR
Q3.D) Isosceles and similar by AA similarity.
Q4. A) Both A and R are true, and R is the correct explanation of A
Q5. Using BPT theorem.
Q6.PQ is not parallel to EF since ratios are not equal,
Q7. 21 (BPT theorem)
Q8. Height of telephone pole = **10 m**
Q9 (a):AA similarity(One right angle and one common angle due to same sunlight direction)
Q9 (b):

$$\frac{\text{Height of Tree}}{\text{Hright of Lamp}} = \frac{\text{Shadow of Tree}}{\text{Shadow of Lamp}}$$

Q9 (c):I
Q10.(i) A = ∠P, ∠C = ∠R
Median$\frac{h}{5} = \frac{4.5}{2.5}$r triangles, and angles at vertex C = R are equal.
⇒ ΔAMC ~ ΔPNR by **AA similarity**
(ii) In similar triangles, **corresponding medians are in the same ratio as sides**
⇒ CM/RN = AB/PQ
(iii)Similar argument as above: angles at C = R, and angles at B = Q (since ΔABC ~ ΔPQR)
⇒ ΔCMB ~ ΔRNQ by **AA similarity.**

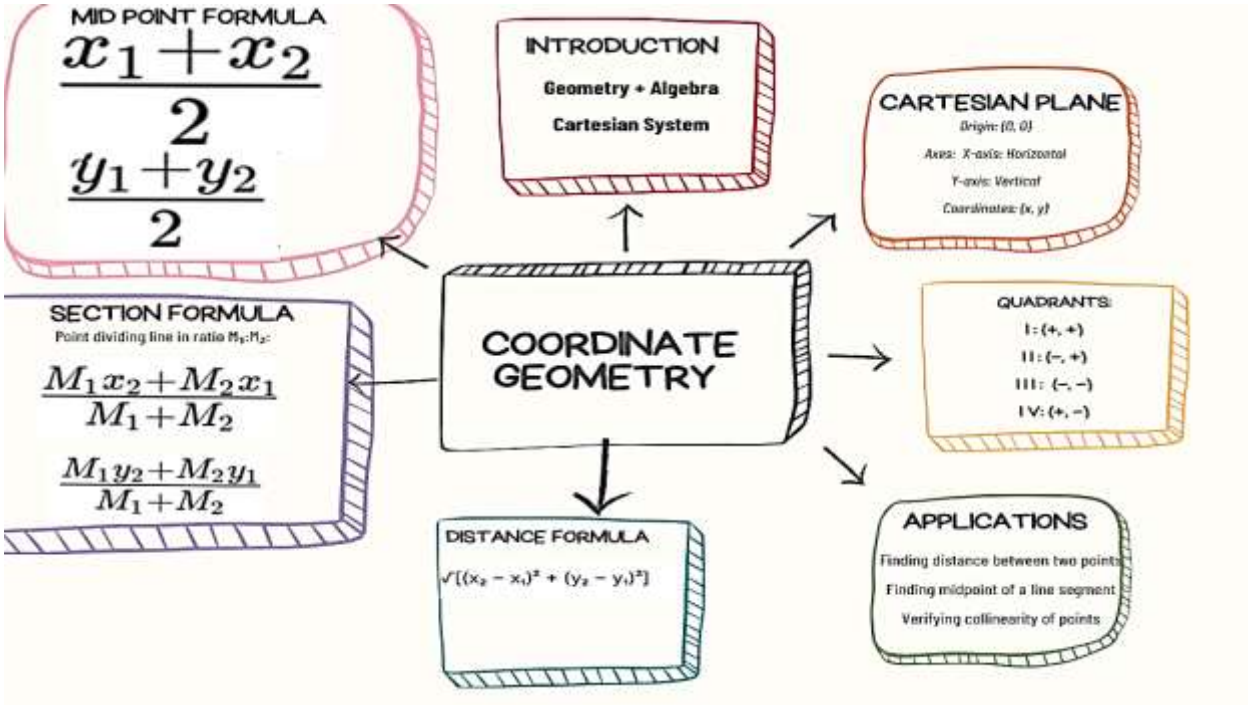
ANSWER KEY:
WORSHEET -5

Q1.B) Corresponding angles equal and corresponding sides proportional.
Q2.C) SAS (Side-Angle-Side) similarity
Q3.D) BC.DE = AB.FD
Q4.B) Both A and R are true, but R is not the correct explanation of A.
Q5. Yes, AB ∥ QR by Converse of Basic Proportionality Theorem.
Q6. Use BPT Theorem to get the value of x=2.
Q7.
Since AB ∥ DC ⇒∠OAB = ∠OCD and ∠OBA = ∠ODC (corresponding angles)
⇒ Triangles OAB ~ ODC (by AA similarity)
Prove it by property of similar triangles:
Q8. Given: AP = x, BQ = y, CR = z and all perpendiculars to AC
Triangles are similar: ΔAPC, ΔBQC, ΔCRB form right triangles sharing the same angles
Using geometric mean property in similar right triangles to prove the same.
Q9 (a): Yes⇒AA similarity
Q9 (b):AA similarity
Q9 (c): Height of building = 16 meters
Q10. (a) Prove BPT theorem as mentioned in NCERT.
(b) Use application of BPT theorem as mentioned in NCER

CHAPTER 7

CO-ORDINATE GEOMETRY

FOR LOW ACHIEVERS



GIST OF THE CHAPTER

1. Cartesian Coordinate system: two axes x axis (horizontal) and y axis (vertical)
   Intersection point is called as origin (0, 0)
2. Quadrants: Coordinate plane is divided into four quadrants.
3. Distance formula
4. Section formula and mid-point formula.

DEFINITION

1. Coordinate Geometry: The study of geometry using the coordinate system.
2. Cartesian System: A plane divided into four quadrants by x axis and y axis.
3. Origin: The point where x axis and y axis intersect (0, 0)
4. Abscissa: The x-coordinate of a point.
5. Ordinate: The y-coordinate of a point.
6. Quadrant: The four regions of Cartesian plane. Quadrants: I (+,+), II (-, +), III (-, -), IV (+, -)

FORMULA

1. Distance formula: To find the distance between two points A (x_1, y_1) and B(x_2 , y_2):

   Distance (AB) = $\sqrt{(x_2-x_2)^2+(y_2-y_1)^2}$

Section formula: To find the coordinate of point P(x,y) that divides the line joining A (x_1,y_1) and B(x_2,y_2) in the ration m_1:m_2

   P(x,y) = $(\frac{m1x2+m2x1}{m1+m2}, \frac{m1y2+m2y1}{m1+m2})$

3. Midpoint formula: When $m_1 = m_2$, The point divides the segment equally

   Midpoint: $(\frac{x1+x2}{2}, \frac{y1+y2}{2})$

MULTIPLE CHOICE QUESTIONS (1 MARK)

Q1. The distance of the point (1,3) from the x-axis is

(a) 2 (b) 3 (c) 1 (d) 5

Ans. (b)3

Q2. The distance of the point P(-6,8) from the origin is

(a) 6 (b) 3 (c) 10 (d) 8

Ans. (c)10

Q3. The distance between the points A(0,6) and B(0,-2) is

(a) 6 (b) 8 (c) 4 (d) 2

Ans. (b)8

Q4. The distance between the points (0,5) and (-5,0) is

(a) 5 (b) $5\sqrt{2}$ (c) $2\sqrt{5}$ (d) 10

Ans. (c)$5\sqrt{2}$

Q5. If the distance between the points (2,-2) and (-1,y) is 5, then the value of y is

(a) -2 (b) 2 (c) -1 (d) 1

Ans.(b)-6,2

Q6. If the distance between the points (4,p) and (1,0) is 5, then value of p is

(a) 4 only (b) ±4 (c) -4 only (d) 0

Ans.(b)± 4

Q7. The mid-point of the line segment joining the points A(-2,8) and B(- 6,-4) is

(a) (-4,-6) (b) (2,6) (c) (-4,2) (d) (4,2)

Ans.(c)(-4,2)

Q8. If P(a/3,4) is the mid-point of the line segment joining the points Q(-6,5) and R(-2,3), then the value of a is

(a) -4 (b) -12 (c) 12 (d) -6

Ans.(b)-12

ASSERTION REASON QUESTIONS (1 MARK)

Direction: In the following question, a statement of Assertion (A) is followed by a statement of Reason (R). Marks the correct choice as:

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is NOT the correct explanation of A.
(c) A is true but R is false.
(d)A is false and R is true

Q9. **Assertion (A)**: The point (0,5) lies on y axis.

Reason (R): The x co-ordinate on the y axis is zero.

Ans. (a)

Q10. **Assertion (A)**: The mid-point of the segment joining A(2,-3) and B(4,5) is (3,1)

Reason (R): The mid-point formula is $\left(\frac{x_1-x_2}{2},\frac{y_1-y_2}{2}\right)$

Ans. (c)

VERY SHORT ANSWER QUESTIONS (2 MARK)

Q11.Find the distance between the points P(4,- 5) and Q(12,4)

Ans. Distance formula= $\sqrt{(X_2-X_1)^2+(Y_2-Y_1)^2} = \sqrt{(12-8)^2+(4+5)^2} = \sqrt{145}$

Q12. Find the value of x for which the distance between the points P(4,- 5) and Q(12,x) is 10 units.

Ans. Given the points P (4,-5) and Q(12,x) such that PQ=10 ,

PQ2 = 100
(12-4)2 + (x + 5)2 =100
82 + (x + 5)2 = 100
(x + 5)2 = 100-64 =36 =62
x + 5 = 6 or x + 5 = -6
x = 1 or x = -11

Q13. Find a point on x-axis which is equidistant from the points (7,6) and (-3,4).
Ans. Let P(x,0) be a point on x-axis equidistant from the points A(7,6) and B(-3,4).
Then, PA=PB
PA2 = PB2 (x-7)2 +(0-6)2=(x+3)2 + (0-4)2
x2 -14x +49+36=x2 +6x+9+16
-20x = - 60
x = 3
Hence, the required point is P(3,0).

Q14. Find a relation between x and y such that the point P (x,y) is equidistant from the points A(2,5) and B(-3,7).
Ans. As the point P(x,y) is equidistant from the points A(2,5) and B(-3,7). So , PA=PB
PA2 = PB2
(x-2)2 +(y-5)2=(x+3)2 + (y-7)2
x2 +4-4x+y2 +25-10y=x2+9 +6x+y2 +49-14y
10x-4y+29=0
Hence it is the required relation between x and y

Q15. In which ratio does the point P(2,-5) divide the line segment joining A(-3,5) and B(4,-9)?
Ans. Let the point P(2,-5) divide AB in the ratio k:1.
$\frac{(4k-3)}{k+1}$ =2
4k-3=2k+2
2k=3+2
2k=5
K=$\frac{5}{2}$

SHORT ANSWER QUESTION (3 MARK)

Q16. If the points A(4,3) and B(x,5) are on the circle with the centre O(2,3), find the value of x.
Ans. As points A(4,3) and B(x,5) are on the circle,
OA=OB
$OA^2=OB^2$
$(2-4)^2+(3-3)^2=(2-x)^2+(3-5)^2$
$4+0=(2-x)^2+4$
$(2-x)^2=0$
2-x=0
x = 2

Q17. Find the coordinates of the point which divides the line segment joining the points (4,-3) and (8,5) in the ratio 3:1.
Ans. Let P (x,y) be the required point. Using section formula,
x =$\frac{3\times8+1\times4}{3+1}$= 7, y=$\frac{3\times5+1\times(-3)}{3+1}$ =3

Hence, the required point is (7,3).
Q18. Show that the points (5,6),(1,5),(2,1) and (6,2) are the vertices of a square

Ans. Distance between the given points = $\sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$

The length of AB $\sqrt{17}$
The length of BC$\sqrt{17}$
The length of CD$\sqrt{17}$
The length of DA$\sqrt{17}$
AB = BC = CD = DA = $\sqrt{17}$
Diagonal, AC= $\sqrt{34}$
Diagonal, BD= $\sqrt{34}$
The two diagonals of quadrilateral ABCD are equal. Hence , the quadrilateral ABCD is a square
Q19. The mid-points of the sides of a triangle are (3,4), (4,6) and (5,7). Find the coordinates of vertices of the triangle
Ans. Let A(X_1,Y_1), A(X_2,Y_2) and C(X_3,Y_3) be the vertices of ΔABC, and D(3,4), E(4,6) and F(5,7) be the mid-points of sides BC, CA and AB respectively.
As D is the mid-point of BC, so
$X_2+X_3=6$ ……(i) $Y_2+Y_3=4$ ……(ii)
As E is the mid-point of CA, so
$X_1+X_3=8$ ……(iii) Y2+Y3=12 ……(iv)
As F is the mid-point of AB, so
$X_1+X_3=10$ ……(v) $Y_2+Y_3=14$ ……(vi)
Adding (i),(iii) and (v) , we get $2(X_1 + X_2 + X_3) = 6+8+10$
$X_1 + X_2 + X_3 = 12$ …….(vii) from (i) and (vii), $x_1=12-6 = 6$ from (iii) and (vii), $X_2=12-8 = 4$ from (v) and (vii), $X_3=12-10 = 2$
$2(y_1 + y_2 + y_3) = 8+12+14$
$Y_1 + Y_2 + Y_3 = 17$ …….(viii) from (ii) and (viii), $y_1=17-8 = 9$ from (iv) and (viii), $y_2=17-12 = 5$ from (vi) and (viii), $Y_3=17-14 = 3$
Hence, three vertices of ΔABC are A(6,9), B(4,5), C(2,3).
Q20Determine the ratio in which the line $2x + 3y – 5 = 0$ divides the line segment joining the points (8,-9) and (2,1). Also find the coordinates of the point of division.

Ans. Let the line $2x + 3y – 5 = 0$ divide the line segment joining A(8,-9) and 2,1) in the ratio k:1. Then the coordinates of the point of
intersection P will be $\left(\frac{2k+8}{k+1}, \frac{k-9}{k+1}\right)$
As the point P lies on the line $2x + 3y – 5 = 0$, so
$2\left(\frac{2k+1}{k+1}\right) + 3\left(\frac{k-9}{k+1}\right) – 5 = 0$
⇨ $4k + 16 + 3k – 27 – 5k – 5 = 0$
⇨ 2k = 16
⇨ k=8
Hence, the required ratio is 8:1.
The coordinates of the point of division are
$\left(\frac{2*8+8}{8+1}, \frac{8-9}{8+1}\right) = \left(\frac{24}{9}, \frac{-1}{9}\right)$

LONG ANSWER QUESTIONS (5 MARK)

Q21 Find the coordinates of the point equidistant from three given points A(5,1), B(-3,-7) and C(7,-1).
Ans. Let P(x, y) be the point equidistant from the three points A(5,1), B(- 3,-7) and C(7,-1). Then

PA=PB=PC

$PA^2 = PB^2 = PC^2$

Taking $PA^2 = PB^2$

$(x-5)^2 + (y-1)^2 = (x+3)^2 + (y+7)^2$

$x^2 -10x +25 + y^2 -2y + 1 = x^2 +6x + 9 + y^2 +14y + 49$

$-16x-16y =32$

$x + y = -2$ (i)

Now taking, $PB^2 = PC^2$

$(x+3)^2 + (y+7)^2 = (x-7)^2 + (y+1)^2$

$x^2 +6x + 9 + y^2 +14y + 49 = x^2 -14x + 49 + y^2 +2y + 1$

$20x+12y =-8$

$5x + 3y=-2$ (ii)

Multiplying (i) by 5 and then subtracting (ii), we get $2y=-8$

$y=-4$

using value of y in (i),we get $x-4=-2$

$x=2$

Hence, the required point is P(2,-4).

Q22 If A(4, 3), B(-1, y) and C(3, 4) are the vertices of a right triangle ABC, right-angled at A, then find the value of y.

Ans.

We have A(4, 3), B(-1, y) and C(3, 4). In right angled triangle ABC,

$(BC)^2 = (AB)^2 + (AC)$…. [Pythagoras theorem

$\Rightarrow (-1 – 3)^2 + (y – 4)^2 = (4 + 1)^2 + (3 – y)^2 + (4 – 3)^2 + (3 – 4)^2$ …(using distance formula

$\Rightarrow (-4)^2 + (y^2 – 8y + 16)$

$\Rightarrow (5)^2 + (9 – 6y + y^2) + (1)^2 + (-1)^2$

$\Rightarrow y^2 – 8y + 32 = y^2 – 6y + 36 = 0$

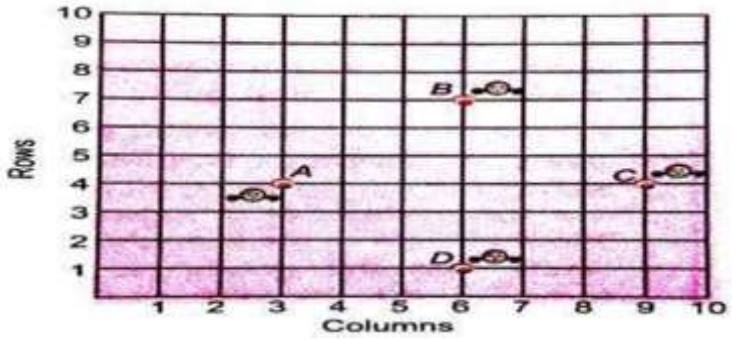
$\Rightarrow -8y + 6y + 32 – 36$

$\Rightarrow -2y – 4 = 0 \Rightarrow -2y = 4$

$\therefore y = -2$

CASE BASED QUESTIONS (4 MARK)

Q23In a classroom, four friends are seated at the points A, B, C and D as shown below. All the friends are observing this seating arrangement and ask different questions to each other. Observe the seating arrangement and help them to answer the following questions



(i)The co-ordinates of point A and point B respectively are ?

Ans. (3,4) and (6,7)

(ii) What is the distance between two friends seating at point A and B?

Ans.$3\sqrt{2}$ units

(iii)What is the distance between two friends seating at point A and C?

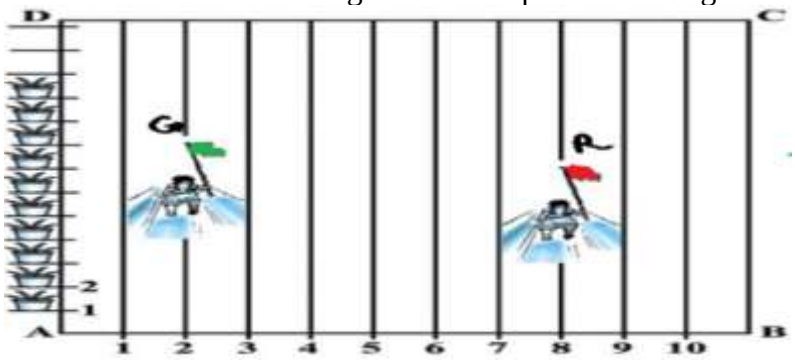
Ans.6 units

or

What is the shape of seating arrangement ?

Ans. Square

Q24. In order to conduct Sports Day activities in your School, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground ABCD, 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in given figure below. Niharika runs 1/4 th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5th distance AD on the eighth line and posts a red flag.



(i) Find the position of green flag?
Ans.(2,25)
(ii) Find the position of red flag?
Ans. (8,20)
(iii)What is the distance between both the flags?
Ans $\sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$

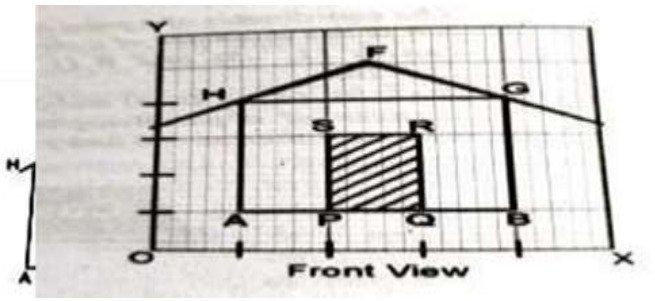
$\sqrt{(25-20)^2 + (8-2)^2}$

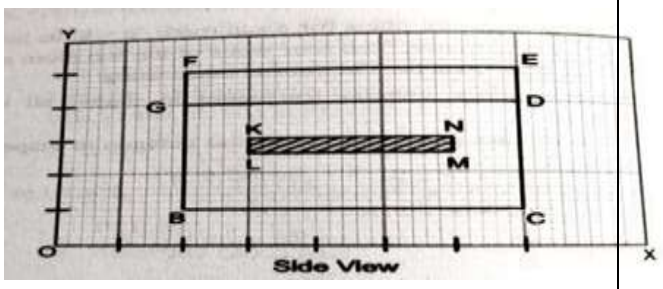
$\sqrt{(5)^2 + (6)^2}$

$\sqrt{25+36}$

$= \sqrt{61}$

Q25. Ravi decided to construct a three-dimensional model. The model of the hut has been shown below along with its front and side view. So that the construction can be understood





clearly

Observe the above situation and answer the questions
(i)What is the distance of point F from x-axis? [Refer to front view]
Ans.5
(ii)What is the distance between B and E? [Refer to side view]
Ans.$\sqrt{41}$
(iii)If a point V(x, y) is equidistant from F(2,5) and E(7,5), then:
Ans.2x-9=0
(iv)Find the coordinates of the point which divides the line segment joining A (1,1) and B(4,1) in the ratio 1:2 internally.[Refer to front view]
Ans.(2,1)

WORK SHEET- 1
CO-ORDINATE GEOMETRY
MULTIPLE CHOICE QUESTIONS (1 mark each)

1. .If (k,3) is the point of intersection of the lines represented by x + py = 6 and = 15, then (k,p) will be:

(a) (15, 3) (b) (15, -3) (c) (3,15) (d) (15,3)

2. The point on x – axis which is equidistant from the points (5, -3) and (4,2) is :

(a) (4.5,0) (b) (7,0) (c) (0.5,0) (d) (-7,0)

3. The ratio in which the line segment joining the points A (-2, -3) and B (3,7) is divided by y- axis is

(a) 2 : 3 (b) 1 : 3 (c) 1 : 2 (d) 3 :1

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.

4.Assertion: If the points A(4, 3) and B(x, 5) lies on a circle with centre (2,3), then the value of x is 2.

Reason: Centre of the circle is the mid-point of each chord of the circle.

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

5. The coordinates of the centre of a circle are (2a, a-7). Find the values of 'a' if the circle passes through the point (11, -9) and has diameter 10 $\sqrt{2}$ units.

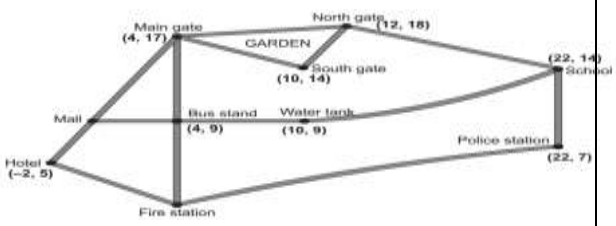
6. Find the length of the median through the vertex B of Δ ABC with vertices A (9, -2), B (-3,7) and C(-1,10).

SHORT ANSWER QUESTIONS (3 MARKS EACH)

7. Find the coordinates of the points which divide the line segment joining A (-2,2) and B (2,8) into four equal parts.

8. If the points A (6,1) B (p,2) C (9,4) and D (7,q) are the vertices of a parallelogram ABCD, then find the values of p and q. Hence, check whether ABCD is a rectangle or not.

CASE BASED QUESTIONS (4 MARKS)



Above is the map of a girl's neighborhoods. Girl did a survey and of his neighborhoods and collected the following information.

The hotel, mall and the main gate of the garden lie in a straight line.The distance between the hotel and the mall is half the distance between the mall and the main gate of the garden.The bus stand is exactly midway between the main gate of the garden and the fire station.The mall, bus stand and the water tank lie in a straight line.

Now answer the following questions.

1. What is the x- coordinate of the Mall's location ?
2. What are the coordinates of the fire station ?
3. Girl proposed a plan to make a triangular pathway by joining the mid points of the sides of the triangular garden. What will be the area, in square units , enclosed by the triangular pathway?

SECTION E: LONG ANSWER QUESTIONS (5 MARKS)

10 . ABCD is a rectangle formed by the points A (-1, -1), B(-1,4) C (5,4) and D (5, -1). P, Q, R and S are the mid points of AB, BC, CD and DA repectively . Check whether quadrilateral PQRS is a square or a rhombus ?

WORK SHEET- 2

SECTION A: MULTIPLE CHOICE QUESTIONS (1 mark each)

1. The distance between the points A(3, 4) and B(0, 0) is:

A) 5 units B) 7 units C) 6 units D) 4 units

2.The coordinates of the midpoint of the line segment joining A(4, –3) and B(2, 1) are:

A) (6, –2) B) (3, –1) C) (2, –2) D) (3, –2)

3. The point which divides the line segment joining the points A(2, –2) and B(3, 7) in the ratio 3:2 internally is:

A) (2.6, 2.8) B) (2.8, 2.6) C) (2.4, 3.0) D) (3, 2)

ASSERTION REASON TYPE QUESTIONS (1 MARK)

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). *Mark the correct choice as:*

(c) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(d) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.

4.Assertion: The coordinates of a point dividing the line segment joining (–1, 2) and (3, 6) in the ratio 1:1 are (1, 4).

Reason : The midpoint of a line segment joining (x_1, y_1) and (x_2, y_2) is given by $\frac{x1+x2}{2}, \frac{y1+y2}{2}$

.

SECTION B: VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

5. Find the distance between the points A(–3, 7) and B(4, 1).

6. Find the coordinates of a point that divides the line joining A(–4, 5) and B(6, –3) in the ratio 2:3.

SECTION C: SHORT ANSWER QUESTIONS (3 MARKS EACH)

7. If the point P(x, 2) is equidistant from the points A(2, –3) and B(–4, 1), find the value of x.

8. Check whether the points A(1, –1), B(4, 2), and C(–1, 3) are the vertices of a right-angled triangle

SECTION D: CASE BASED QUESTIONS (4 MARKS)

9. A school plans to redesign its rectangular playground. The four corners of the playground are marked as follows in the coordinate plane A(2, 3), B(10, 3), C(10, 8), and D(2, 8)
They want to install CCTV cameras at all corners, lay tiles along the perimeter, and plant trees at the midpoints of each side.

Questions:

1. Calculate the length of each side of the playground.
2. What is the perimeter of the playground?
3. Find the coordinates of the midpoint of side AB.

SECTION E: LONG ANSWER QUESTIONS (5 MARKS)

10 . The vertices of triangle ABC are A(4, –6), B(3, –2), and C(5, 2).

a. Find the length of all sides of the triangle.

b. Find the coordinates of the midpoint of side BC.

WORK SHEET- 3

MULTIPLE CHOICE QUESTIONS (1 mark each)

1. What is the distance between the points A(2, 3) and B(6, 7)?

a) 4 b) $\sqrt{16}$ c) 8 d) $\sqrt{32}$

2. The coordinates of the point which divides the line joining (4, –3) and (8, 5) in the ratio 1:3 internally are:

a) (5, –1) b) (6, 3) c) (7, 2) d) (6, 1)

3.If the coordinates of a point are (x, y), then the distance of the point from the origin is:

a) x + y b) $\sqrt{(x^2 + y^2)}$ c) $x^2 + y^2$ d) 2x + 2y

ASSERTION REASON TYPE QUESTIONS (1 MARK)

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). *Mark the correct choice as:*

(a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

4. Assertion :The coordinates of the midpoint of the line segment joining (3, 4) and (5, –6) is (4, –1).

Reason (R): : The midpoint of a line segment joining (x_1, y_1) and (x_2, y_2) is given by $\frac{x1+x2}{2}, \frac{y1+y2}{2}$.

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

5. Find the distance between the points P(–2, 3) and Q(1, –1).

6. Find the coordinates of the point that divides the line joining (2, –2) and (4, 3) in the ratio 3:2.

SHORT ANSWER QUESTIONS (3 MARKS EACH)

7. Show that the points A(1, 2), B(4, 6), and C(7, 10) lie on the same straight line.

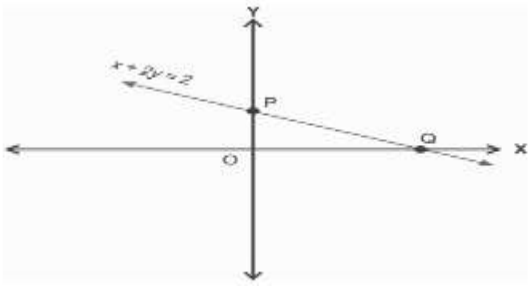
8. Find the co-ordinates of the centre of the circle if the coordinates of two end points of diameter is (7,-3) and (5, 4).

CASE BASED QUESTIONS (4 MARKS)

The line x + 2y =2 forms a triangle OPQ , with the coordinate axes.

(i) What are the co-ordinates of P and Q.

(ii) What is the area of ΔOPQ?



SECTION E: LONG ANSWER QUESTIONS (5 MARKS)

10. The vertices of a quadrilateral ABCD are A(1, 2), B(4, 4), C(6, 1), and D(3, 3).

a) Find the lengths of all sides of the quadrilateral.

b) Check whether ABCD is a rhombus or not

WORK SHEET- 4
MULTIPLE CHOICE QUESTIONS (1 mark each)

1. What is the distance between the points (–1, 2) and (3, –2)?
   a) 4 b) √20 c) √32 d) √16
2. The midpoint of the line joining A(–6, 4) and B(2, –8) is:
   a) (–2, –2) b) (–4, –2) c) (–2, –4) d) (–4, 2)
3. The point which divides the line joining (1, 5) and (7, 11) in the ratio 1:2 internally is:
   a) (3, 7) b) (5, 9) c) (4, 8) d) (2, 6)

ASSERTION REASON TYPE QUESTIONS (1 MARK)

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). *Mark the correct choice as:*

(a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

4. Assertion : The point on the x - axis which is equidistant from (2, -5) and (-2, 9) is (8,0)
   Reason: Points lies on the y- axis are always of the form (0,y).

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

5. Find the coordinates of the point that divides the line joining (–5, 2) and (5, –3) in the ratio2:3.

6.Find the length of the line joining the points (–3, 7) and (1, –5).

SHORT ANSWER QUESTIONS (2 MARKS EACH)

7. Show that the points A(2, 3), B(4, 7), and C(6, 11) lie on a straight line.

8. The vertices of triangle ABC are A(1, 2), B(4, 6), and C(7, 10). Show that triangle ABC is isosceles.

CASE BASED QUESTIONS (4 MARKS)

9. A rectangular field has corners marked as P(2, 2), Q(10, 2), R(10, 6), and S(2, 6). A tree is to be planted at the midpoint of each side.

Answer the following:
i) Find the coordinates of the midpoints of PQ, QR, RS, and SP.
ii) Find the length of the diagonal PR.
iii) What is the area of the rectangle?

10. he vertices of quadrilateral ABCD are A(2, 3), B(6, 5), C(7, 1), and D(3, –1).
a) Find the lengths of all sides.
b) Check whether ABCD is a parallelogram.

WORK SHEET- 5

MULTIPLE CHOICE QUESTIONS (1 mark each)

1. The measure of angles between the lines x = 2, y = -3 and the co-ordinates of the point of intersection of these lines are respectively.

(a) 180^0 (2, -3) (b) 90^0 , (2, -3) (c) 90^0 (-3 ,2) (d) 90^0 (2 ,3)

2. The mid point of the line segment joining the points P (-4,5) and (4,6) lies on :

(a) x - axis (b) y - axis (c) origin (d) neither x – axis nor y- axis.

3. The equation of a line parallel to the x- axis and at a distance of 3 units below x- axis is :

(a) x = 3 (b) x = -3 (c) y = -3 (d) y = 3

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). *Mark the correct choice as:*

(a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

4.Assertion : Point P (0,2) is the point of intersection of y- axis with the line 3 x + 2 y = 4.

Reason: The distance of the point P (0,2) from x – axis is 2 units.

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

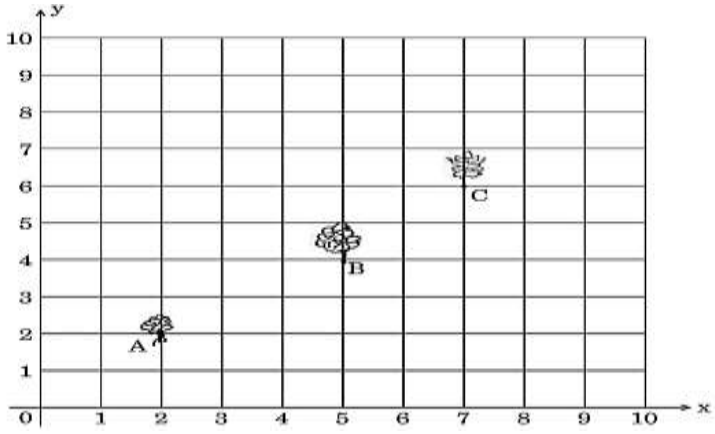
5. Prove that abscissa of a point P which is equidistant from the points with coordinates A (7, 1) and B (3, 5) is 2 more that its ordinate.
6. Find the ratio in which the point P ($\frac{3}{4}$, $\frac{5}{12}$) divides the line segment joining the points A ($\frac{1}{2}$, $\frac{3}{2}$)and B(2, -5).

SHORT ANSWER QUESTIONS (2 MARKS EACH)

7. If (-4,0) and (4,0) are two vertices of an equilateral triangle, find the co-ordinstes of its third vertex.
8. Find the coordinates of the points which divide the line segment joining A (-2,2) and B (2,8) into four equal parts.

CASE BASED QUESTIONS (4 MARKS)

9. Seema has a 10 m × 10 m kitchen garden attached to her kitchen. She divides it into a 10 ×10 grid and wants to grow some vegetables and herbs used in the kitchen. She puts some soil and manure in that and sow a green chilly plant at A, a coriander plant at B and a tomato plant at C. Her friend Kusum visited the garden and praised the plants grown there. She pointed out that they seem to be in a straight line. See the below diagram carefully and answer the following questions:



(i) What is the distance between the chilly plant and coriander plant.

(ii) Kusum wanted to grow a rose plant in just a middle point of B and C. Find the coordinates of the point in which the rose plant will grow ?

(iii) Find the ratio in which the line segment AC divided by point B.

10. If the points A (-2, k) B (3, -4) and C(7, 10) are the vertices of a right angled isosceles triangle, find the value of k and hence find the area of Δ ABC, given that ∠A = 9

SOLUTION WORK SHEET -1

Answer **(1) :** (b) **(15, -3)** **Answer (2):** (a) **(4.5, 0)**
Answer (3): (a) **2:3** **Answer (4):** (c) **Assertion is true but reason is false**
Answer(5): a= 5 0r 3 **Answer(6):** $\sqrt{58}$
Answer (7) (-1, 3.5) (0,5) (1,6.5) **Answer (8) p= 8, q = 3. ABCD is not a rectangle**
Answer (9) (i) 0, (ii) (4,1) (iii) 3.75 **Answer (10) Rhombus**

SOLUTION WORK SHEET -2

Answer (1) : A) 5 units **Answer (2):** B) (3, –1)
Answer (3): A) (2.6, 2.8)**Answer (4):** A) Both A and R are true and R is the correct explanation of A
Answer(5): Distance = $\sqrt{[(4 + 3)^2 + (1 – 7)^2]} = \sqrt{[49 + 36]} = \sqrt{85}$ units
Answer(6) (0, 1.8) **Answer (7): x= 1**
Answer (8): No
Answer (9)(i) AB = 8 cm, BC = 5 cm, CD = 8 cm, AD = 5 cm. (ii) 26 cm (iii) (6,3)
Answer (10): AB = $\sqrt{17}$ **, BC=** $\sqrt{20}$ **AC=** $\sqrt{65}$ **mid-point of BC = (4,0)**

SOLUTION WORK SHEET -3

Answer (1) : d) $\sqrt{32}$ **Answer (2):** a) (5, –1)
Answer (3): b) $\sqrt{(x^2 + y^2)}$ **Answer (4):** (a)
Answer(5): 5 unit **Answer(6): (4, 1)**
Answer (7): Find AB, BC and AC. **Answer (8): (6, 0.5)**
Answer (9): P (0,1) Q (2, 0)
Answer (10) (i) AB=$\sqrt{13}$**, BC=**$\sqrt{13}$**,CD =**$\sqrt{13}$**, AD =** $\sqrt{5}$
(ii)Yes, ABCD is a parallelogram

SOLUTION WORK SHEET -4

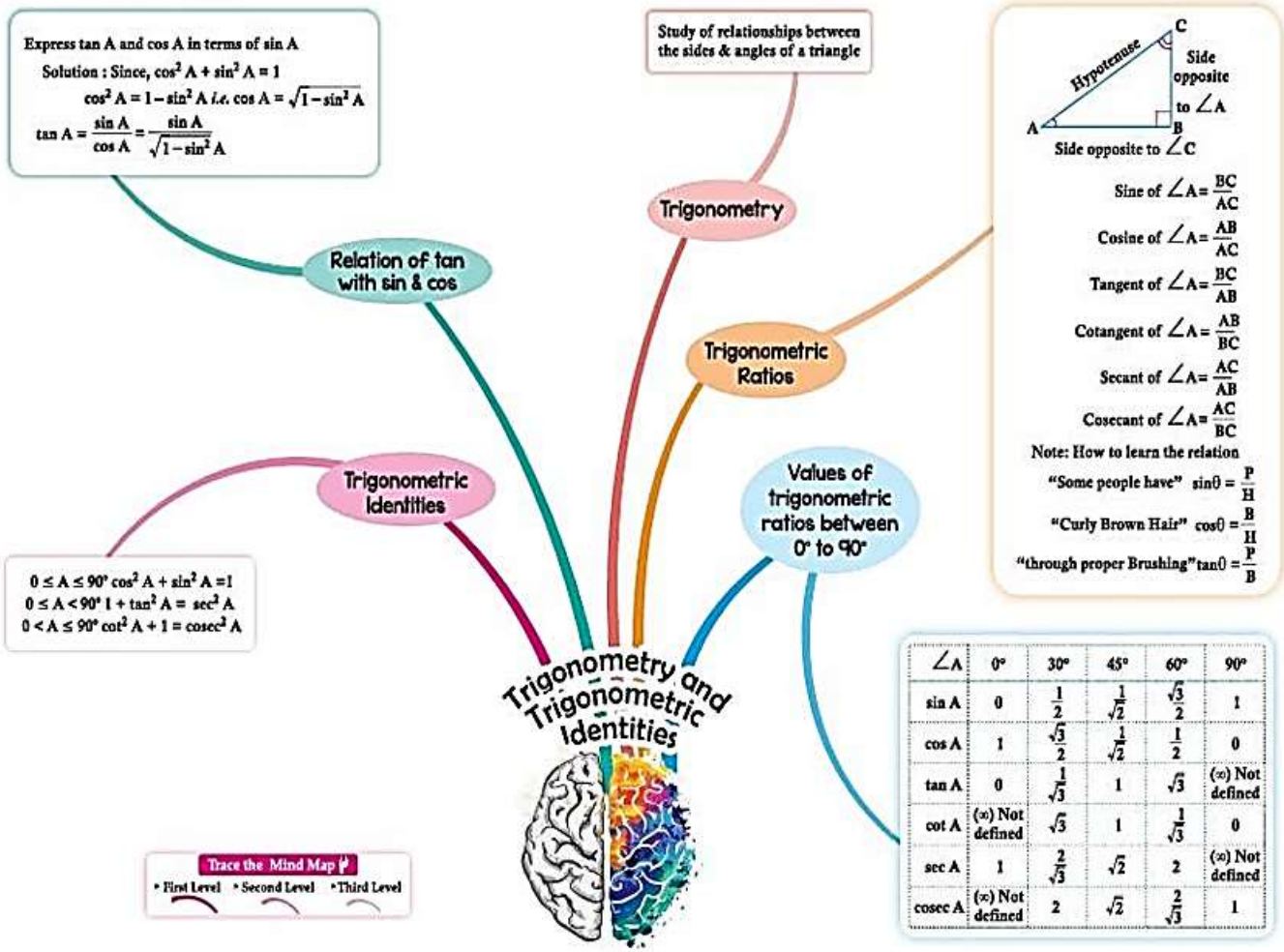
Answer (1) : c) $\sqrt{32}$ **Answer (2):** a) (–2, –2)
Answer (3): c) (4, 8) **Answer (4):** b)
Answer(5): (–1, 0.2) **Answer(6):** $4\sqrt{10}$
Answer (7): Slope of AB = (7–3)/(4–2) = 2,
Slope of BC = (11–7)/(6–4) = 2 ⇒ Same slope ⇒ Points lie on same line.
Answer (8): AB = BC = 5 ⇒ Isosceles
Answer (9): Midpoints: PQ (6,2), QR (10,4), RS (6,6), SP (2,4)
ii) Diagonal PR = $\sqrt{[(10–2)^2 + (6–2)^2]} = \sqrt{(64 + 16)} = \sqrt{80} = 4\sqrt{5}$
iii) Area = length × breadth = 8 × 4 = 32 sq. units

Answer (10) : AB = $\sqrt{20}$ BC = $\sqrt{17}$ CD = $\sqrt{20}$ DA = $\sqrt{17}$

SOLUTION WORK SHEET -5

1. (b) 90^0 , (2, -3)
2. (b) y - axis
3. (c) y = -3
4. (b)
5. By distance formula it can be proved.
6. 1:5
7. $(0, \pm 4\sqrt{3})$
8. 8. (- 1, 3.5) (0. 5) (1, 6.5)
9. 3:2
10. K = 5 area = 54 sq. m.

CHAPTER-8
INTRODUCTION TO TRIGONOMETRY

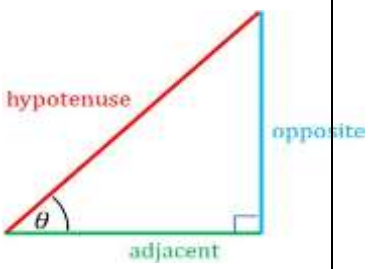


∠A	0°	30°	45°	60°	90°
sin A	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos A	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan A	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	(∞) Not defined
cot A	(∞) Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
sec A	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	(∞) Not defined
cosec A	(∞) Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

GIST OF THE CHAPTER

1. TRIGONOMETRY is the branch of mathematics that deals with the relationship between the angles and sides of a right angled triangle.
2. Trigonometric ratios-Sine(Sin),Cosine(Cos),Tangent(Tan),Co-secant(Cosec),Secant(Sec), Co-tangent (Cot)
3. Trigonometric ratios of specific angles 0º, 30º, 45º, 60º, 90º
4. Trigonometric identities

FORMULA



$\text{Sin } \theta = \frac{opposite\ side}{hypotenuse}$

$\text{Cos } \theta = \frac{adjacent\ side}{hypotenuse}$

$\text{Tan } \theta = \frac{opposite\ side}{adjacent\ side}$

$\text{Cosec } \theta = \frac{hypotenuse}{opposite\ side} = \frac{1}{sin\ \theta}$

$\text{Sec } \theta = \frac{hypotenuse}{adjacent\ side} = \frac{1}{cos\ \theta}$

Cot θ = $\frac{adjacent\ side}{opposite\ side} = \frac{cos\ \theta}{sin\ \theta}$

TRIGNOMETRIC IDENTITIES

1. $Sin^2A + Cos^2A = 1$
2. $Sec^2A = 1 + tan^2A$
3. $Cosec^2A = 1 + Cot^2A$

MULTIPLE CHOICE QUESTIONS (1 MARK)

In triangle ABC, right angled at B, If tan A = $\frac{4}{3}$, then the value of cosC is

(a) $\frac{3}{5}$ (b) $\frac{4}{5}$ (c) 1 (d) none of these

Answer:(a) $\frac{3}{5}$

1. In ΔOPQ, right-angled at P, OP = 7 cm and OQ – PQ = 1 cm, then the values of sin Q.

(a) $\frac{7}{25}$ (b) $\frac{24}{25}$ (c) 1 (d) none of these

Answer:(a) $\frac{7}{25}$

2. In ΔPQR, right-angled at Q, PR + QR = 25 cm and PQ = 5 cm, then the value of sin P is

(a) $\frac{5}{13}$(b) $\frac{12}{13}$(c) $\frac{3}{5}$(d) $\frac{4}{5}$.

Answer: (d) $\frac{4}{5}$.

3. P and Q are acute angles such that P>Q then which of the following is definitely true?

(a)sinP<sinQ(b) tanP>tanQ (c) cosP>cosQ (d) cosP>sinQ

Answer:(b) tan P > tan Q

4. If 3cot θ = 2, then the value of $\frac{(4sin\theta - 3cos\theta)}{(2sin\theta + 6cos\theta)}$ is

(a) $\frac{3}{2}$(b) $\frac{1}{2}$ (c) $\frac{1}{3}$(d) none of these

Answer:(c) $\frac{1}{3}$

5. If cosA = 0, then what is the value of $\frac{1}{2}\cos\frac{A}{2}$is:

(a) 0 (b) ½ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2\sqrt{2}}$

Answer:(a) 0

6. The value of $2(\sin^2 45° + \cot^2 30°) - 6(\cos^2 45° - \tan^2 30°)$ is

(a) 6 (b) 3 (c) 2 (d) 4

Answer: (a) 6

7. The value of (sec A + tan A) (1 – sin A) is:

(a) sec A (b) sin A (c) cosec A (d) cos A

Answer:(d) cos A

ASSERTION REASON QUESTIONS (1 MARK)

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(e) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(f) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

8. **Assertion:** The value of sin60° cos30° + sin30° cos60° is 1

Reason: sin90°=1 and cos90°=0

Answer:(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

9. Assertion: sinA is the product of sin A.

Reason: The value of sinθ increases as θ increases.

Answer:(d) Assertion (A) is false but reason (R) is true.

VERY SHORT ANSWER QUESTIONS (2 MARKS)

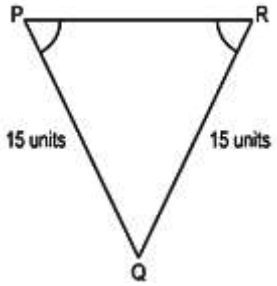
10. Evaluate : $\tan^2 30° - \tan^2 60° + cosec^2 45°$

Answer: $\tan^2 30° - \tan^2 60° + cosec^2 45°$

$= \left(\frac{1}{\sqrt{3}}\right)^2 - \left(\sqrt{3}\right)^2 + \left(\sqrt{2}\right)^2 = \frac{1}{3} - 3 + 2 = -\frac{2}{3}$

11. In the figure below if $5\ sinP = 4$. Find the length of PR. (see figure)

Answer:



Given:

- Triangle PQR is isosceles: PQ = QR = 15 units
- $5 \sin P = 4 \Rightarrow \sin P = \frac{4}{5}$

From the definition of sine in triangle:

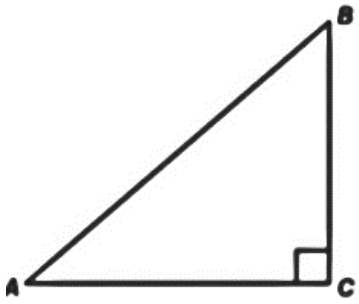
$$\sin P = \frac{\text{opposite side}}{\text{hypotenuse}} = \frac{\text{QR}}{\text{PR}} \Rightarrow \frac{4}{5} = \frac{15}{\text{PR}}$$

Now solve for PR:

$$\text{PR} = \frac{15 \cdot 5}{4} = \frac{75}{4} = 18.75 \text{ units}$$

12. If ∠A and ∠B are acute angles such that cos A = cos B, then show that ∠ A = ∠ B.

Answer: Consider a right-angled triangle ABC as shown below,



∠A and ∠B are acute angles and ∠C is right angle.

cos A $= \frac{AC}{AB}$

cos B $= \frac{BC}{AB}$

Given that cos A = cos B

Therefore, $\frac{AC}{AB} = \frac{BC}{AB}$ => AC = BC

Hence, ∠A = ∠B (angles opposite to equal sides of a triangle are equal.

13. In triangle ABC, right-angled at B, if tan A = $\frac{1}{\sqrt{3}}$ find the value of: sin A cos C + cos A sin C.

Answer: Let ΔABC be a right-angled triangle as show in fig. such that tan A = $\frac{1}{\sqrt{3}}$

tan A = $\frac{BC}{AB} = \frac{1}{\sqrt{3}}$

Let BC = 1k and AB = $\sqrt{3}$ k, where k is a positive integer.

By applying Pythagoras theorem in ΔABC, we have

$AC^2 = AB^2 + BC^2 = (\sqrt{3}\,k)^2 + (k)^2 = 3k^2 + k^2 = 4k^2$

AC = 2k

Therefore, sin A = $\frac{BC}{AC} = \frac{1}{2}$, cos A = $\frac{AB}{AC} = \frac{\sqrt{3}}{2}$, sin C = $\frac{AB}{AC} = \frac{\sqrt{3}}{2}$, cos C = $\frac{BC}{AC} = \frac{1}{2}$

Therefore, sin A cos C + cos A sin C = $\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) + \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{3}}{2}\right) = \frac{1}{4} + \frac{3}{4} = \frac{1+3}{4} = \frac{4}{4} = 1$

14. Evaluate: $\frac{sin30°+tan45°-cosec60°}{sec30°+cos60°+cot45°}$

Answer: $\frac{(sin\ 30° + tan\ 45° - cosec\ 60°)}{(sec\ 30° + cos\ 60° + cot\ 45°)}$:

$= \frac{\left(\frac{1}{2}+1-\frac{2}{\sqrt{3}}\right)}{\left(\frac{2}{\sqrt{3}}+\frac{1}{2}+1\right)} = \frac{\left(\frac{3}{2}-\frac{2}{\sqrt{3}}\right)}{\left(\frac{2}{\sqrt{3}}+\frac{3}{2}\right)} = \frac{\frac{3\sqrt{3}-4}{2\sqrt{3}}}{\frac{4+3\sqrt{3}}{2\sqrt{3}}} = \frac{3\sqrt{3}+4}{3\sqrt{3}+4}$

Rationalise the denominator: Multiplying <u>numerator</u> and <u>denominator</u> by $(3\sqrt{3}-4)$, we get

$= \frac{(3\sqrt{3}-4)(3\sqrt{3}-4)}{(3\sqrt{3}+4)(3\sqrt{3}-4)} = \frac{(27+16-24\sqrt{3})}{(27-16)} = \frac{(43-24\sqrt{3})}{11}$

SHORT ANSWER QUESTIONS (3 MARKS)

15. Prove that : $(\text{cosec q} - \text{sin q})(\text{sec q} - \text{cos q}) = \frac{1}{\text{tan q} + \text{cot q}}$

Answer: To prove: $(\text{cosec q} - \text{sin q})(\text{sec q} - \text{cos q}) = \frac{1}{\text{tan q} + \text{cot q}}$

LHS = $(\text{cosec q} - \text{sin q})(\text{sec q} - \text{cos q})$

$= \left(\frac{1}{sin\ q} - sin\ q\right)\left(\frac{1}{cos\ q} - cos\ q\right)$

$= \left(\frac{1-\sin^2 q}{sin\ q}\right)\left(\frac{1-\cos^2 q}{cos\ q}\right)$

$= \frac{\cos^2 q}{sin\ q} \cdot \frac{\sin^2 q}{cos\ q} =$ **cos q. sin q**

RHS = $\frac{1}{\text{tan q} + \text{cot q}}$

$= \frac{1}{\frac{sin\ q}{cos\ q} + \frac{cos\ q}{sin\ q}}$

$= \frac{1}{\frac{\sin^2 q + \cos^2 q}{sin\ q.cos\ q}}$

$= \frac{1}{\frac{1}{\sin q.\cos q}}$(using identity $\sin^2\theta + \cos^2\theta = 1$)

= **cos q. sin** q =>LHS =RHS

Hence proved.

16. Prove that: $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta.\operatorname{cosec}\theta$

Answer:

$$\text{LHS} = \frac{\tan\theta}{(1-\cot\theta)} + \frac{\cot\theta}{(1-\tan\theta)}$$
$$= \frac{\tan\theta}{(1-\frac{\cos\theta}{\sin\theta})} + \frac{\cot\theta}{(1-\frac{\sin\theta}{\cos\theta})}$$
$$= \frac{\sin\theta\tan\theta}{(\sin\theta-\cos\theta)} + \frac{\cos\theta\cot\theta}{(\cos\theta-\sin\theta)}$$
$$= \frac{\sin\theta\times\frac{\sin\theta}{\cos\theta} - \cos\theta\times\frac{\cos\theta}{\sin\theta}}{(\sin\theta-\cos\theta)}$$
$$= \frac{\frac{\sin^2\theta}{\cos\theta} - \frac{\cos^2\theta}{\sin\theta}}{(\sin\theta-\cos\theta)}$$
$$= \frac{\sin^3\theta-\cos^3\theta}{\cos\theta\sin\theta(\sin\theta-\cos\theta)}$$
$$= \frac{(\sin\theta-\cos\theta)(\sin^2\theta+\sin\theta\cos\theta+\cos^2\theta)}{\cos\theta\sin\theta(\sin\theta-\cos\theta)}$$
$$= \frac{1+\sin\theta\cos\theta}{\cos\theta\sin\theta}$$
$$= \frac{1}{\cos\theta\sin\theta} + \frac{\sin\theta\cos\theta}{\cos\theta\sin\theta}$$
$$= \frac{1}{\cos\theta\sin\theta} + \frac{\sin\theta\cos\theta}{\cos\theta\sin\theta}$$
$$= \sec\theta\operatorname{cosec}\theta + 1$$
$$= 1 + \sec\theta\operatorname{cosec}\theta$$
$$= \text{RHS}$$

{using $a^3 + b^3 = (a+b)(a^2 + ab + b^2)$}

{using identity $\sin^2\theta + \cos^2\theta = 1$

17. Prove that: $\sqrt{\frac{1+sin\theta}{1-sin\theta}} + \sqrt{\frac{1-sin\theta}{1+sin\theta}} = 2sec\theta$

Answer: To prove: $\sqrt{\frac{1+sin\theta}{1-sin\theta}} + \sqrt{\frac{1-sin\theta}{1+sin\theta}} = 2sec\theta$

LHS = $\sqrt{\frac{1+sin\theta}{1-sin\theta}} + \sqrt{\frac{1-sin\theta}{1+sin\theta}}$

$= \sqrt{\frac{(1+sin\theta).\ (1+sin\theta)}{(1-sin\theta).\ (1+sin\theta)}} + \sqrt{\frac{(1-sin\theta).\ (1-sin\theta)}{(1+sin\theta).\ (1-sin\theta)}}$ $.(by\ rationalising\ each\ terms)$

$= \sqrt{\frac{(1+sin\theta)^2}{(1^2-\sin^2\theta).}} + \sqrt{\frac{(1-sin\theta)^2}{(1^2-\sin^2\theta).}}$

$= \sqrt{\frac{(1+sin\theta)^2}{(cos^2\theta).}} + \sqrt{\frac{(1-sin\theta)^2}{(\cos^2\theta).}}$

$= \frac{1+sin\theta}{cos\theta} + \frac{1-sin\theta}{cos\theta} = \frac{1+\ sin\theta+\ 1-sin\theta}{cos\theta}$

$= \frac{2}{cos\theta} = 2sec\theta \quad = RHS$

18. Prove that: $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

Answer: *To prove*: $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

L.H.S. = $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$

= $(\sin^2 A + \operatorname{cosec}^2 A + 2\sin A \operatorname{cosec} A) + (\cos^2 A + \sec^2 A + 2\cos A \sec A)$ {Using $(a+b)^2 = a^2 + b^2 + 2ab$}

= $(\sin^2 A + \cos^2 A) + 2\sin A(\frac{1}{sinA}) + 2\cos A(\frac{1}{cosA}) + 1 + \tan^2 A + 1 + \cot^2 A$

= $1 + 2 + 2 + 2 + \tan^2 A + \cot^2 A$

= $7 + \tan^2 A + \cot^2 A$ = R.H.S. Hence proved

19. A unit circle is shown below with centre O. A tangent AB is drawn to the circle at point M such that ∠MOB = β. If OA ⊥ OB, write the expressions that represent the lengths of:

i) OB ii) OA iii) AB

Answer:) Given: In figure, ∠MOB = β, OA ⊥ OB, OM=1 unit

To find: lengths of: i) OB ii) OA iii) AB

- In △OMB

$$Cos\ \beta = \frac{OM}{OB} = \frac{1}{OB} \Rightarrow OB = \boldsymbol{\frac{1}{cos\beta}}$$

- Again, In △OMB

$\angle OMB + \angle B + \angle MOB = 180°$ (using angle sum property of triangle)

$\Rightarrow 90° + \angle B + \beta = 180°$

$\Rightarrow \angle B = 180° - 90° - \beta$

$\Rightarrow \angle B = 90° - \beta$

Now In △AOB

$\angle AOB + \angle B + \angle A = 180°$ (using angle sum property of triangle)

$\Rightarrow 90° + (90° - \beta) + \angle A = 180°$

$\Rightarrow 180° - \beta + \angle A = 180°$

$\Rightarrow \angle A = 180° - 180° + \beta$

$\Rightarrow \boldsymbol{\angle A = \beta}$

In △OMA

$$sinA = sin\beta = \frac{OM}{OA} = \frac{1}{OA} \Rightarrow OA = \boldsymbol{\frac{1}{sin\beta}}$$

- Now In △AOB,

Using Pythagoras Theorem,

$\Rightarrow (AB)^2 = (OA)^2 + (OB)^2$

$$\Rightarrow \left(\frac{1}{sin\beta}\right)^2 + \left(\frac{1}{cos\beta}\right)^2 = \frac{1}{sin^2\beta} + \frac{1}{cos^2\beta} = \frac{cos^2\beta + sin^2\beta}{sin^2\beta.\ cos^2\beta} = \frac{1}{sin^2\beta.\ cos^2\beta}$$

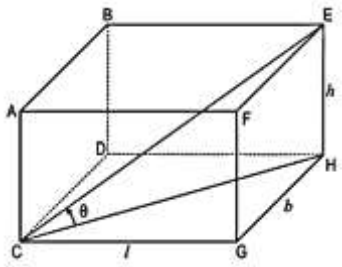
$$\Rightarrow AB = \frac{1}{sin\beta\ .\ cos\beta}$$

CASE BASED QUESTIONS (4 MARKS QUESTIONS)

20. Anju prepared a layout of his bedroom in 3D in cuboidal shaped as shown below:

(i) Express cosθ in terms of l, b and h.

(ii) If the figure was a cube what will be the value of cosθ



Answer:(i) In △CGH, Using Pythagoras Theorem,

$(\text{Hyp})^2 = (\text{perp})^2 + (\text{base})^2$

$\Rightarrow (CH)^2 = (l)^2 + (b)^2$

$\Rightarrow CH = \sqrt{l^2 + b^2}$

Now, In △CHE, Using Pythagoras Theorem,

$\Rightarrow (CE)^2 = (CH)^2 + (HE)^2$

$\Rightarrow (CE)^2 = l^2 + b^2 + h^2 \Rightarrow CE = \sqrt{l^2 + b^2 + h^2}$

In △CHE,

$$Cos\ \theta = \frac{CH}{CE} = \frac{h}{\sqrt{l^2 + b^2 + h^2}}$$

(ii) If the figure is a cube then $l = b = h = a\ (let)$

$$cos\ \theta = \frac{a}{\sqrt{a^2+a^2+a^2}} = \frac{a}{\sqrt{3a^2}} = \frac{a}{a\sqrt{3}} = \frac{1}{\sqrt{3}}$$

21. The teacher asked the students to correctly complete the following sentence about the rhombus. *"A rhombus has a side length of* l *units and one of its angles is equal to* θ*. The ratio of the lengths of the two diagonals is dependent on ____."*

Ashima: only l

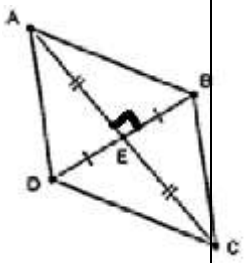
Bilal: only θ

Chris: both l and θ

Duleep: neither l nor θ

(i) Who answered the question correctly?
(ii) Justify your result.

Answer:(i) **Correct answer: Bilal** (Only θ)



(ii) Justification: Given: A rhombus has All sides are equal:

- Let side length = l
- Let One of its angles say $\angle A = \theta$
- We are to find on what the ratio of its diagonals depends.

Draws a rhombus, say ABCD, and connects diagonals**AC**and **BD** bisecting at apoint, say**E.**

In **△AED**, we have: ∠AED = 90° **,**AE = $\frac{AC}{2}$, DE = $\frac{BD}{2}$

Consider ΔAED and ΔAEB

AE = AE (common)

DE = BE (Diagonals bisect each other)

$\angle AED = \angle AEB$ (Diagonals are perpendicular to each other)

$\Rightarrow \Delta AED \cong \Delta AEB$ (SAS congruence)

$\angle DAE = \angle BAE = \frac{\theta}{2}$

Now, In **△AED**

$$\tan(\angle DAE) = \boldsymbol{tan}\left(\frac{\boldsymbol{\theta}}{\boldsymbol{2}}\right) = \frac{DE}{AE} = \frac{\frac{BD}{2}}{\frac{AC}{2}} = \boldsymbol{\frac{BD}{AC}}$$

$\Rightarrow = \boldsymbol{tan}\left(\frac{\boldsymbol{\theta}}{\boldsymbol{2}}\right) = \boldsymbol{\frac{BD}{AC}}$ $\Rightarrow$ ratio of diagonals = $= tan\left(\frac{\theta}{2}\right)$

Thus, the ratio of the diagonals= $\boldsymbol{\frac{BD}{AC}}$ depends only on angle θ.

LONG ANSWER QUESTIONS (5 MARKS)

22. If cosecθ + cotθ = p, then prove that cosθ = $\frac{(p^2-1)}{(p^2+1)}$.

Answer: Given, p = cosecθ + cotθ = $\frac{1}{sin\theta} + \frac{\cos\theta}{sin\theta} = \frac{1+\cos\theta}{sin\theta}$

To prove: cosθ = $\frac{p^2-1}{p^2+1}$

LHS = $\frac{p^2-1}{p^2+1} = \frac{\left(\frac{1+\cos\theta}{sin\theta}\right)^2-1}{\left(\frac{1+\cos\theta}{sin\theta}\right)^2+1} = \frac{\frac{(1+\cos\theta)^2-sin^2\theta}{sin^2\theta}}{\frac{(1+\cos\theta)^2+sin^2\theta}{sin^2\theta}}$

$= \frac{(1+\cos\theta)^2-sin^2\theta}{(1+\cos\theta)^2+sin^2\theta} = \frac{1+\cos^2\theta+2\cos\theta-sin^2\theta}{1+\cos^2\theta+2\cos\theta+sin^2\theta}$

$= \frac{(1-sin^2\theta)+\cos^2\theta+2\cos\theta}{1+(sin^2\theta+\cos^2\theta)+2\cos\theta} = \frac{\cos^2\theta+\cos^2\theta+2\cos\theta}{1+(1)+2\cos\theta}$ {using $sin^2\theta + \cos^2\theta = 1$}

$= \frac{2\cos^2\theta+2\cos\theta}{2\cos\theta+2} = \frac{2\cos\theta(\cos\theta+1)}{2(\cos\theta+1)} = \cos\theta$ = RHS

23. Prove that $(\sin\theta + \sec\theta)^2 + (\cos\theta + \text{cosec}\,\theta)^2 = (1 + \sec\theta cosec\theta)^2$

Answer: To prove: $(\sin\theta + \sec\theta)^2 + (\cos\theta + \text{cosec}\,\theta)^2 = (1 + \sec\theta cosec\theta)^2$

LHS = $(\sin\theta + \sec\theta)^2 + (\cos\theta + \text{cosec}\,\theta)^2$

$= \left(sin\theta + \frac{1}{\cos\theta}\right)^2 + \left(cos\theta + \frac{1}{\sin\theta}\right)^2$

$= \left(\frac{sin\theta.cos\theta+1}{cos\theta}\right)^2 + \left(\frac{sin\theta.cos\theta+1}{sin\theta}\right)^2 = \frac{(sin\theta.cos\theta+1)^2}{\cos^2\theta} + \frac{(sin\theta.cos\theta+1)^2}{\sin^2\theta}$

$= (sin\theta.\cos\theta+1)^2(\frac{1}{\cos^2\theta} + \frac{1}{\sin^2\theta}) = (sin\theta.\cos\theta+1)^2\ (\frac{\sin^2\theta+\cos^2\theta}{\sin^2\theta.\ \cos^2\theta})$

$= (sin\theta.\cos\theta+1)^2\ (\frac{1}{\sin^2\theta.\ \cos^2\theta})$ {using $sin^2\theta + cos^2\theta = 1$}

$= \frac{(sin\theta.\cos\theta+1)^2}{(sin\theta.\cos\theta)^2} = \left(\frac{sin\theta.\cos\theta+1}{sin\theta.\cos\theta}\right)^2$

$= \left(\frac{sin\theta.\cos\theta}{sin\theta.\cos\theta} + \frac{1}{sin\theta.\cos\theta}\right)^2 = (1 + \sec\theta cosec\theta)^2$

= RHS

24. If $x\sin^3\theta + y\cos^3\theta = sin\theta cos\theta\ and\ xsin\theta = ycos\theta$, prove that $x^2+y^2=1$

Answer: Given: $x\sin^3\theta + y\cos^3\theta = sin\theta cos\theta \quad and \quad xsin\theta = ycos\theta$,

To prove that $x^2+y^2=1$

We have $xsin\theta = ycos\theta \Rightarrow \frac{x}{cos\theta} = \frac{y}{sin\theta} = k\ (say)$

$\Rightarrow x = k\ cos\theta,\ y = k\ sin\theta$

We have $x.sin^3\theta + y.cos^3\theta = sin\theta cos\theta$

$\Rightarrow kcos\theta.sin^3\theta + k\ sin\theta.cos^3\theta = sin\theta cos\theta$

$\Rightarrow kcos\theta.sin\theta(sin^2\theta + cos^2\theta) = sin\theta cos\theta$

$\Rightarrow kcos\theta.sin\theta(1) = sin\theta cos\theta$ {using $sin^2\theta + cos^2\theta = 1$}

$\Rightarrow\ k = \frac{sin\theta cos\theta}{sin\theta cos\theta} = 1$

Now LHS = x^2+y^2

$= (k\ cos\theta)^2 + (k\ sin\theta)^2$

$= k^2\cos^2\theta + k^2\sin^2\theta$

$= k^2(\cos^2\theta + \sin^2\theta) = k^2 = $ RHS

WORKSHEET -1 (Trigonometry)

Match the Following

Trigonometric Ratio	Value
Sin 30^0	1
Sin 0^0	$1/\sqrt{2}$
tan 30^0	1/2
Cosec 30^0	$1/\sqrt{3}$
tan 60^0	2
Cos 30^0	0
Cot 90^0	$\sqrt{3}/2$

Question 2.

True and False

a.CosA= $\frac{4}{3}$ for some angle A.

b.tanA=$\frac{Sin\ A}{Cos\ A}$

c.secA=$\frac{1}{CosA}$, for an acute angle

Question 3.

Write the values of sin 0°, sin 30°, sin 45°, sin 60° and sin 90°. What happens to the values of sin as angle increases from 0° to 90°?

Question 4.

If sinA= $\frac{3}{5}$.find cos A and tan A.

Question 5

In a right triangle ABC right angled at B if sinA= $\frac{3}{5}$. find all the six trigonometric ratios of C.

Question 6.

The value of (sin30°+cos30°)−(sin60° + cos60°) is

Question 7

If sinB=$\frac{1}{2}$, show that 3cosB − $4cos^3B$= 0

Question 8.

If tanA + $\frac{1}{tanA}$ = 2, find the value of tan^2A +$\frac{1}{tan2A}$

Question 9

. Evaluate the following:

$2sin^230° - 3cos^245°\circ + tan^260°$

Question 10. Evaluate:

$sin^230^0cos^245^0\circ + 4tan^230^0 + \frac{1}{2}\ sin^290^0 - 2cos^290^0 + \frac{1}{24}\ cos^20\circ$

WORKSHEET -2 (Trigonometry)

Question 1

Fill in the blanks:

a. $5\cos 0^0+\sin 90$ = _____

b. $\tan 0^0$= _____

c. tan90 is _____

d. If sinA=1, then A = _____

e. $2\sin^2 60$ = _____

f. $2\cos^2 45$ = _____

g. $\sin^2 A+\cos^2 A$= _____

h. $(1+\tan 2A)(1+\sin A)(1-\sin A)$=_____

Question 2.

Write the values cos 0°, cos 45°, cos 60° and cos 90°. What happens to the values of cos as angle increases from 0° to 90°?

Question 3.

Prove that: $\cos 1^0.\cos 2^0.\cos 3^0....\cos 180^0= 0$

Question 4

Evaluate: $\cot^2 30^0 - 2\cos^2 60^0 - \frac{3}{4}\sec^2 45^0 - 4\sec^2$

Question 5

Prove the following identity

$(\sin A - \operatorname{cosec} A)^2 + (\cos A - \sec A)^2 = \tan^2 A + \cot^2 A - 1$

Question 6

Prove the following identity

$\cos^6 A + \sin^6 A = 1 - 3\sin^2 A \cos^2 A$

Question 7

Prove the following identity

$\frac{1}{1\cot A+\tan A} = \sin A \cos A$

Question 8

Prove the following

$(\sin A + \cos A)(\cot A + \tan A) = \sec A + \operatorname{cosec} A$

Question 9

Prove the following

$\sin 30\cos 60+\sin 60\cos 30=1$

Question 10.

If $\operatorname{cosec} A = \sqrt{10}$ find other five trigonometric ratios.

WORKSHEET -3 (Trigonometry)

Question 1

True and False statement

a. The value of $\sin\theta+\cos\theta$ is always greater than 1

b. $\tan\theta$ increases faster than $\sin\theta$ as θ increase

c. The value of the expression $(\cos 223^\circ - \sin 267^\circ)$ is positive.

d. The value of the expression $(\sin 80^\circ - \cos 80^\circ)$ is negative.

e. If $\cos A+\cos 2A=1$, then $\sin 2A+\sin 4A=1$.

f. $(\tan\theta+2)(2\tan\theta+1)=5\tan\theta+\sec 2\theta$.

g. If the length of the shadow of a tower is increasing, then the angle of elevation of the sun is also increasing

h. If a man standing on a platform 3 metres above the surface of a lake observes a cloud and its reflection in the lake, then the angle of elevation of the cloud is equal to the angle of depression of its reflection.i. $\sin 60^0 = 2\sin 30^0$

j. SinA + CosA=1

Question 2

If $\sqrt{3}\sin\theta - \cos\theta = 0$ and $0^\circ < \theta < 90^\circ$, find value of θ

Question 3

Prove that $\sec A\,(1 - \sin A)(\sec A + \tan A) = 1$

Question 4

Evaluate $\dfrac{\sin 30°+\tan 45°-\operatorname{cosec} 60}{\sec 30°+\cos 60°+\cot 45}$

Question 5

Evaluate:

$$\frac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$$

Question 6

Prove that:

$$\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta\,\operatorname{cosec}\theta$$

Question 7

Prove that $\dfrac{\theta+1}{\cos\cos\theta+\sin\tau\theta-1} = \operatorname{cosec}\theta + \cot\theta$

Question 8

If $\theta = 45^\circ$, then what is the value of $2\sec^2\theta + 3\operatorname{cosec}^2\theta$

Question 9

If $\sin(A + B) = 1$ and $\sin(A - B) = \frac{1}{2}$, $0 \le A + B \le 90^\circ$ & $A > B$, then find A and B.

Question 10

Given that $\sin\theta = \frac{m}{n}$ then find $\cos\theta$.

WORKSHEET -4 (Trigonometry)

Q1. If 5 tan θ = 4, then find the value of $\frac{5sinsin\,\theta-3cos\theta}{5sin\theta+2coscos\,\theta}$

Q2. If 4 tan θ = 3, then find the value of $\frac{4sinsin\,\theta-cos\theta}{4sin\theta+4coscos\,\theta}$

Q3. If cosec A = $\frac{13}{12}$, then find the value of $\frac{2sinsin\,A-3cosA}{4sinA-9cosA}$

Q4. In ΔABC, right angled at B, AB = 5 cm and sin C = $\frac{1}{2}$. Determine the length of side AC.

Q5. In ΔABC, right-angled at C, if tan A=1, then find the value of 2sin A cos A

Q6. If tan θ = 1, then find the value of sec θ + cosec θ.

Q7. In ABC right angled at B, sin A = $\frac{7}{25}$ then find the value of cos C

Q.8 Evaluate: $3\cos^2 60° \sec^2 30° - 2\sin^2 30° \tan^2 60°$

Q.9.Prove that $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

Q10. If tan θ =$\frac{3}{4}$ evaluate $\frac{\theta\,)(1-sin\theta)}{\theta)(1-cos\theta)}$

WORKSHEET -5 (Trigonometry)

SECTION – A
Questions carry 1 mark each.

Q1. Simplify: $\cos^4 A - \sin^4 A$

Q2. If ΔABC is right angled at C, then find the value of $\cos(A + B)$.

Q3. If $\sin A + \cos A = \sqrt{2}\cos A$, then find the value of $\tan A$.

Q4. Prove the trigonometric identities: $(1 + \tan^2 \theta)(1 + \sin\theta)(1 - \sin\theta) = 1$

Q5. Prove that $(1 + \cot \theta - \operatorname{cosec} \theta)(1 + \tan \theta + \sec \theta) = 2$

Q6. If $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$, show that $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$

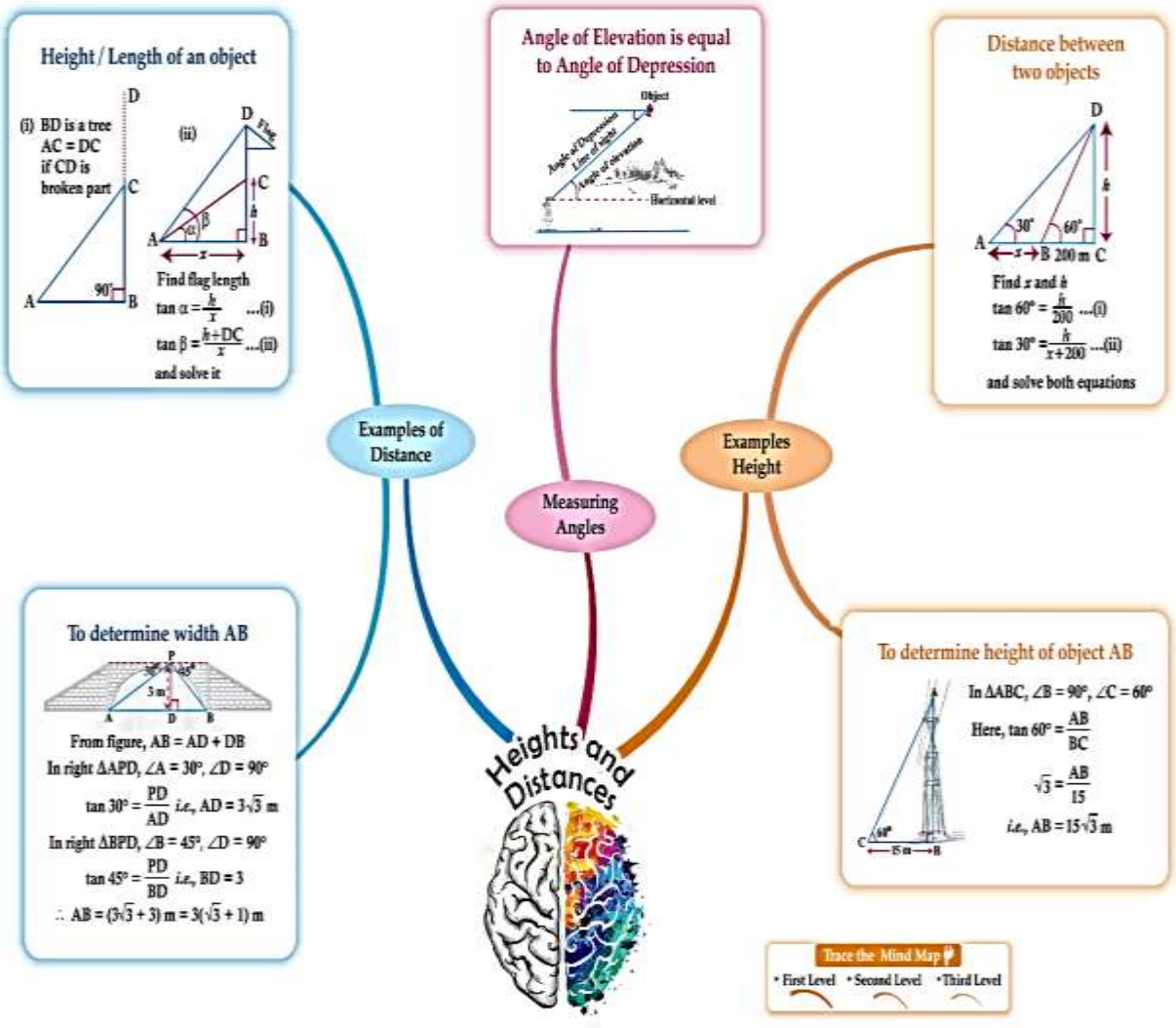
Q7If θ is an acute angle and $\tan \theta + \cot \theta = 2$, then find the value of $\sin^3 \theta + \cos^3 \theta$.

Q8. In ΔABC, right-angled at C, if $\tan A = 1$, then find the value of $2\sin A \cos A$.

Q9. Find the value of $(\sin 45° + \cos 45°)$.

Q10. If $2\sin^2 \beta - \cos^2 \beta = 2$, then find β

CHAPTER-11
SOME APPLICATIONS OF TRIGONOMETRY
MIND MAP



GIST OF THE LESSON

This chapter focuses on the practical use of trigonometry in real-life situations, particularly in finding the heights and distances of various objects without actually measuring them physically.

Using trigonometric ratios (from previous chapters), students learn how to calculate unknown lengths when certain angles and one length (usually a distance or height) are known.

Key concepts introduced:

- Line of sight: The straight line from the observer's eye to the object being viewed.
- Angle of elevation: The angle between the horizontal line and the line of sight when an object is above the horizontal level.
- Angle of depression: The angle between the horizontal line and the line of sight when an object is below the horizontal level.

MULTIPLE CHOICE QUESTION(1MARK)

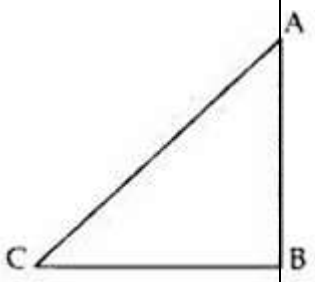
1. A portion of a 60 m long tree is broken by tornado and the top struck up the ground making an angle of 30° with the ground level. The height of the point where the tree is broken is equal to

(a) 30 m (b) 35 m (c) 40 m (d) 20 m

Ans (d) 20 m

2 If a pole 6m high casts a shadow $2\sqrt{3}$ m long on the ground, then the sun's elevation is
(a) 60 ° (b) 45 ° (c) 30° (d) 90°
Ans (a) 60°
3 The angle depression of a car, standing on the ground , from the top of 75 m tower, is 30°.The distance of car from the base of the tower(in meters) is
(a) $25\sqrt{3}$ (b) $50\sqrt{3}$ c)$75\sqrt{3}$ (d)150
Ans (a) $25\sqrt{3}$
4 The angle of elevation of top of the tower at the point on the ground 50 m away from the foot of the tower is 45°. The height of the tower in meter is
(a) $50\sqrt{3}$ (b) 50 (c) $40\sqrt{2}$ (d)$50\sqrt{2}$
Ans (b) 50 m
5. If the altitude of the sun is at 60° , then the height of the vertical tower that will cast a shadow of length 30 m is
(a) $30\sqrt{3}$ m (b) 15m (c) $\sqrt{30}$m (d) $15\sqrt{2}$ m
Ans (a) $30\sqrt{3}$ m
6 If the angle of elevation of the top of the tower from two points distant a and b from the base and in the same straight line with it are complementary, then the height of the tower is
(a) ab (b)$\sqrt{ab}$ (c) a (d) b
Ans (b)$\sqrt{ab}$
7 When the length of shadow of a vertical pole is equal to $\sqrt{3}$ times of its height, the angle of elevation of the Sun's altitude is
(a) 30° (b) 45° (c) 60° (d) 15°
Ans 30°
8 The angles of elevation of the top of a rock from the top and foot of 100 m high tower are respectively 30° and 45°. The height of the rock is
(a) 50 m (b) 150 m (c) 5o$\sqrt{3}$m (d) $50(3 + \sqrt{3})$
Ans d) $50(3 + \sqrt{3})$
In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct
choice as:
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.
9. Assertion (A): If the angle of elevation of Sun, above a perpendicular line (tower) decreases, then the shadow of tower increases.
Reason (R): It is due to decrease in slope of the line of sight.
Ans. **(a)**
10.Assertion (A): When we move towards the object, angle of elevation decreases.
Reason (R): As we move towards the object, it subtends larger.
Ans (d)

VERY SHORT ANSWERS (2 Marks)



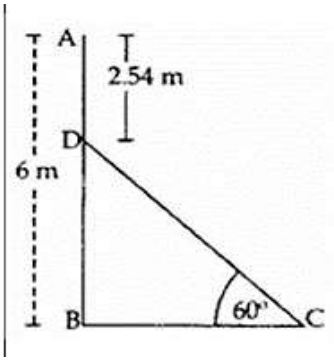
1. A tower AB is 20 m high. Shadow BC = $20\sqrt{3}$ m. Find angle of elevation (∠C).
Ans. $\tan(\theta) = AB / BC = 20 / (20\sqrt{3}) = 1/\sqrt{3} \Rightarrow \theta = 30°$.
2. An Aeroplan at $3000\sqrt{3}$ m has angles of elevation changing from 60° to 30° in 30 sec. Find speed
Ans . Using triangle properties, distance = 6000 m in 30 seconds ⇒ speed = 200 m/s = 720 km/h.
3. From a point 20 m away, angle of elevation to top of tower is 30°. Find height.
Ans $\tan(30°)$ = height / 20 ⇒ height = $20 / \sqrt{3} \approx 11.55$ m.

4. A ladder 50 m long reaches top of a wall making 60° with the wall. Find wall height.
   Ans cos(60°) = height / 50 ⇒ height = 50 × 0.5 = Ans:25 m.
5. A tower of 30 m casts shadow of $10\sqrt{3}$ m. Find angle of elevation.
   Ans tan(θ) = 30 / ($10\sqrt{3}$) = $\sqrt{3}$ ⇒ θ = Ans: 60° (correction from original answer).

SHORT ANSWERS QUESTIONS (3 marks)

1. Two towers of height x and y subtend 30° and 60°. Find x : y.
   Ans x = a/$\sqrt{3}$, y = a$\sqrt{3}$ ⇒ x : y =:1 : 3.
2. Distance between poles is 15 m. Angle of depression from top of 24 m pole is 30°. Find height of first pole.
   Ans tan(30°) = (24 - h) / 15 ⇒ h = 24 - 8.66 =15.34 m.
3. Angles of depression of top and bottom of a 50 m building are 45° and 60°. Find tower height.

Ans From tan formulas: height = x + 50, and h = x$\sqrt{3}$ ⇒ x ≈ 18.25 ⇒ h ≈ 68.25 m.



4. AB = 6 m, ladder CD makes 60°, AD = 2.54 m. Find ladder length.
   Ans sin(60°) = 2.54 / CD ⇒ CD ≈ 2.54 / 0.866 ≈ 4 m.
5. From 60 m building, angles of depression to top and bottom of tower are 45° and 60°. Find tower height.
   Ans x = 60 / $\sqrt{3}$ ≈ 34.68 ⇒ height = 60 - 34.68 ≈:25.4 m.

LONG ANSWER TYPE QUESTIONS (5 marks)

1. From foot of tower (30 m), angle of elevation to building is 30°. From building foot, angle to tower top is 45°. Find height of building.
   Ans tan(45°) = 30 / x ⇒ x = 30. Then tan(30°) = h / 30 ⇒ h = 30 / $\sqrt{3}$ = $10\sqrt{3}$ m.
2. Ship deck 14 m above water. Angle to cliff top is 60°, to base is 30°. Find height of cliff and distance.
   Ans x = $14\sqrt{3}$ ≈ 24.2 ⇒ h = 14 + x$\sqrt{3}$ ≈ 14 + 41.9 = 55.9 ≈ Ans:56 m.
3. Two equal poles on either side of 100 m road. A person sees tops at 60° and 30°. Find height of poles.
   Ans tan(60°) = h / x, tan(30°) = h / (100 - x). Solving: x = 25 ⇒ h = 25$\sqrt{3}$ ≈ Ans: 43.25 m.

CASE STUDY

There is fire incident in the house. The house door is locked so, the fireman is trying to enter the house from the window. He places the ladder against the wall such that its top reaches the window as shown in the figure.

Based on the above information, solve the following questions:

i) If window is 6 m above the ground and angle made by the foot of ladder to the ground is 30°, What is the length of the ladder

ii) If fireman place the ladder 5 m away from the wall and angle of elevation is observed to be 30°, then length of the ladder is:

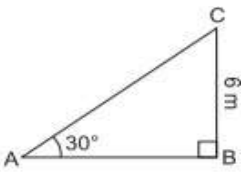
iii) If fireman places the ladder 2.5 m away from the wall and angle of elevation is observed to be 60°, then find the height of the window: (Take $\sqrt{3}$ = 1.73)

Ans

1. Let AC be the length of the ladder
In right-angled ΔABC,

$$\sin 30° = \frac{BC}{AC}$$

$$\Rightarrow \quad \frac{1}{2} = \frac{6}{AC} \quad \Rightarrow \quad AC = 12 \text{ m}$$

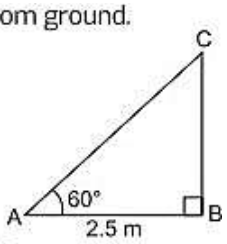


3. Let BC be the height of window from ground.
In right-angled ΔABC,

$$\tan 60° = \frac{BC}{AB}$$

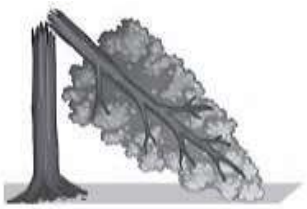
$$\Rightarrow \quad \sqrt{3} = \frac{BC}{2.5}$$

$$\Rightarrow \quad BC = 2.5 \times 1.73 = 4.325 \text{ m}$$



Case Study 2

Suppose a straight vertical tree is broken at some point due to storm and the broken part is inclined at a certain distance from the foot of the tree.
Based on the above information, solve the following questions:



(i) If the top of upper part of broken tree touches ground at a distance of 30 m (from the foot of the tree) and makes an angle of inclination 30°, then find the height of remaining part of the tree.

(ii) Find the height of the straight vertical tree.

(iii) If the height of a tree is 6 m, which is broken by wind in such a way that its top touches the ground and makes an angle 30° with the ground. Find the length of broken part of the tree.

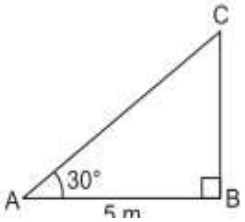
Answer

(i) Let AB be the tree of height h m and let it broken at height of x m, as shown in figure.

2. In right-angled ΔABC, $\cos 30° = \frac{AB}{AC}$

$$\Rightarrow \quad \frac{\sqrt{3}}{2} = \frac{5}{AC}$$

$$\Rightarrow \quad AC = \frac{10}{\sqrt{3}} \text{ m}$$

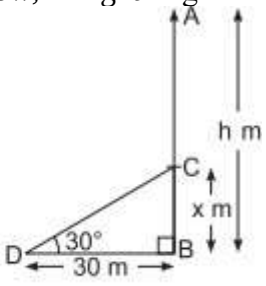


Clearly CD = AC = (h-x) m .Now, in right-angled ΔCBD, we have

$$\tan 30° = \frac{BC}{BD} = \frac{x}{30}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{x}{30}$$

$$\Rightarrow \quad x = \frac{30}{\sqrt{3}}$$



Thus, the height of remaining part of the tree is $10\sqrt{3}$m.

$$= \frac{30}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{30\sqrt{3}}{3} = 10\sqrt{3} \text{ m}$$

1. In right-angled ACBD, from part (1), BC = x = $10\sqrt{3}$m

$$\cos 30^\circ = \frac{DB}{DC} = \frac{30}{DC}$$

$$\Rightarrow \quad \frac{\sqrt{3}}{2} = \frac{30}{DC}$$

$$\Rightarrow \quad DC = \frac{60}{\sqrt{3}} = \frac{60}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{60\sqrt{3}}{3}$$

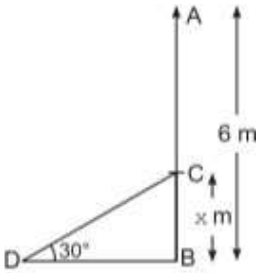
$$\Rightarrow \quad DC = 20\sqrt{3}\,m$$

Thus, the height of the straight vertical tree AB = DC + C
$=20\sqrt{3}+10\sqrt{3} = 30\sqrt{3}$m

2. Here, h=6 m and 0-30°

:- DC = AC = (6x) m

Now, in right-angled BCD, we have



$$\sin 30^\circ = \frac{BC}{CD}$$

$$\Rightarrow \quad \frac{1}{2} = \frac{x}{6-x}$$

$$\Rightarrow \quad 6 - x = 2x \;\Rightarrow\; 3x = 6 \;\Rightarrow\; x = 2$$

So the broken part of the tree AC=6-2=4 m

SOME APPLICATIONS OF TRIGONOMETRY
WORKSHEET 1

Q1. A man is 1.7 m tall. He observes the top of a tower at an angle of elevation of 60°. If he is standing 20 m from the base, the height of the tower is approximately:
A. 35.64 m B. 36.64 m C. 34.64 m D. 38.64 m
Q2. If the height of a tower is 12 m and its shadow is $12\sqrt{3}$ m, the angle of elevation of the sun is:
A. 30° B. 45° C. 60° D. 90°
Q3. A tree 20 m high casts a shadow 20 m long. What is the angle of elevation of the sun?
A. 45° B. 30° C. 60° D. 90

ASSERTION AND REASONING (1 MARK)

Q4.Assertion (A): The angle of elevation of the top of a tower increases when a person walks toward the tower.
Reason (R): As the base distance decreases in a right triangle, the opposite/adjacent ratio increases.
Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

Short Answer Questions – (2 marks each)

Q5. A vertical tower is 40 m high. Find the angle of elevation of its top from a point on the ground at a distance of 40 m from its base.
Q6. The angle of elevation of the top of a tree from a point on the ground is 30°. If the height of the tree is 15 m, find the distance of the point from the base of the tree.
Q7. A pole is leaning against a wall making an angle of 45° with the ground. If the foot of the pole is 5 m away from the wall, find the length of the pole.

Long Answer Questions – (3 marks each)

Q8. A tower is 24 m high. A man observes the top of the tower from a point on the ground at an angle of elevation of 45°. Find the distance of the man from the foot of the tower.
Q9. From the top of a lighthouse 75 m high, the angle of depression of a boat is 60°. Find the distance of the boat from the base of the lighthouse.

Case Based Question – (4 marks)

Q10.*Case Study*: Sneha is standing on the rooftop of her house which is 12 m high. She sees a car on the road at an angle of depression of 45°.
Answer the following:
a) What is the horizontal distance of the car from the base of the house?
b) Which trigonometric ratio will be used here?
c) If the car moves away and the new angle of depression becomes 30°, what is the new distance from the house?
d) Which angle gives a greater horizontal distance — 45° or 30°?

Long Answer Question – (5 marks)

Q11. From the top of a building 50 m high, the angle of depression to the foot of a pole is 30° and to the top is 45°. Find the height of the pole and its distance from the building.

TOPIC: APPLICATION OF TRIGONOMETRY
WORKSHEET NO.2

Q1. A man is 1.7 m tall. He observes the top of a tower at an angle of elevation of 60°. If he is standing 20 m from the base, the height of the tower is approximately:
A. 35.64 m B. 36.64 m C. 34.64 m D. 38.64 m

Q2. If the height of a tower is 12 m and its shadow is $12\sqrt{3}$ m, the angle of elevation of the sun is:
A. 30° B. 45° C. 60° D. 90°

Q3. A tree 20 m high casts a shadow 20 m long. What is the angle of elevation of the sun?
A. 45° B. 30° C. 60° D. 90

Section B: Assertion and Reasoning (1 mark)

Q4.Assertion (A): The angle of elevation of the top of a tower increases when a person walks toward the tower.
Reason (R): As the base distance decreases in a right triangle, the opposite/adjacent ratio increases.

Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false. D. A is false but R is true.

Section C: Short Answer Questions – (2 marks each)

Q5. A vertical tower is 40 m high. Find the angle of elevation of its top from a point on the ground at a distance of 40 m from its base.
Q6. The angle of elevation of the top of a tree from a point on the ground is 30°. If the height of the tree is 15 m, find the distance of the point from the base of the tree.
Q7. A pole is leaning against a wall making an angle of 45° with the ground. If the foot of the pole is 5 m away from the wall, find the length of the pole.

Section D: Long Answer Questions – (3 marks each)

Q8. A tower is 24 m high. A man observes the top of the tower from a point on the ground at an angle of elevation of 45°. Find the distance of the man from the foot of the tower.

Q9. From the top of a lighthouse 75 m high, the angle of depression of a boat is 60°. Find the distance of the boat from the base of the lighthouse.

Section E: Case Based Question – (4 marks)

Q10.*Case Study*: Sneha is standing on the rooftop of her house which is 12 m high. She sees a car on the road at an angle of depression of 45°.
Answer the following:
a) What is the horizontal distance of the car from the base of the house?
b) Which trigonometric ratio will be used here?
c) If the car moves away and the new angle of depression becomes 30°, what is the new distance from the house?
d) Which angle gives a greater horizontal distance — 45° or 30°?

Section F: Long Answer Question – (5 marks)

Q11. From the top of a building 50 m high, the angle of depression to the foot of a pole is 30° and to the top is 45°. Find the height of the pole and its distance from the building.

WORKSHEET NO.3

Topic: Applications of Trigonometry

Section A: Multiple Choice Questions (1 mark each)

Q1. A man standing 30 m away from a building observes the top at an angle of elevation of 45°. The height of the building is:

A. 15 m B. 30 m C. 45 m D. 60 m

Q2. A flagstaff is placed on top of a tower. The height of the tower is 60 m and the angle of elevation of the top of the flagstaff is 60°, while that of the tower is 45°. The height of the flagstaff is:

A. 35 m B. 36.6 m C. 40 m D. 30 m

Q3. If a pole 10 m high casts a shadow $10\sqrt{3}$ m long, the angle of elevation of the sun is:

A. 30° B. 45° C. 60° D. 90°

Section B: Assertion and Reasoning (1 mark)

Q4. Assertion (A): The longer the shadow, the smaller the angle of elevation of the sun.
Reason (R): Angle of elevation increases as the sun rises.
Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

Section C: Short Answer Questions – (2 marks each)

Q5. A boy is flying a kite with the string at an angle of 60° with the ground. If the string is 100 m long, find the height of the kite.

Q6. Find the angle of elevation of the sun when the length of the shadow of a pole is equal to its height.

Q7. A 1.5 m tall boy is standing 28.5 m away from a 30 m high building. Find the angle of elevation of the top of the building from his eyes.

Section D: Long Answer Questions – (3 marks each)

Q8. From a point on the ground, the angles of elevation of the bottom and top of a tower fixed on the top of a 20 m high building are 30° and 60°. Find the height of the tower.

Q9. The angle of elevation of the top of a building from a point on the ground is 30°. If the height of the building is $50\sqrt{3}$ m, find the distance of the point from the base of the building.

Section E: Case Based Question – (4 marks)

Q10. Case Study: A ladder is placed against a wall such that it makes an angle of 60° with the ground. The foot of the ladder is 5 m away from the wall.

a) Find the length of the ladder.
b) Find the height at which the ladder touches the wall.
c) Which trigonometric ratio will be used to find height?
d) If the angle was reduced to 30°, would the height at which it touches the wall increase or decrease?

Section F: Long Answer Question – (5 marks)

Q11. A man standing on the top of a 100 m high tower observes two cars on the opposite sides of the tower. The angles of depression of the cars are 30° and 45° respectively. Find the distance between the two cars.

WORKSHEET NO.4

TOPIC – Applications of Trigonometry

Multiple Choice Questions (1 mark each)

Q1. A pole 10 m high casts a shadow 10 m long. What is the angle of elevation of the sun?
A. 30° B. 45° C. 60° D. 90°

Q2. If the angle of elevation of the sun is 60° and the length of the shadow of a pole is $5\sqrt{3}$ m, find the height of the pole.
A. 15 m B. 10 m C. 20 m D. 5 m

Q3. A person observes the top of a building at an angle of elevation of 30°. If the building is 18 m high, the distance of the person from the building is:
A. 36 m B. 30 m C. $18\sqrt{3}$ m D. 18 m

Assertion and Reasoning (1 mark)

Q4. Assertion (A): In a right triangle, if the angle of elevation increases, the shadow of the object decreases.
Reason (R): As the angle increases, the adjacent side of the triangle (shadow length) decreases.
Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false. D. A is false but R is true.

Short Answer Questions – (2 marks each)

Q5. A vertical pole is 30 m high. Find the angle of elevation of its top from a point on the ground 30 m away from its base.

Q6. The angle of elevation of the top of a tower from a point on the ground is 60°. If the height of the tower is 25 m, find the distance of the point from the base of the tower.

Q7. A ladder is placed against a wall making an angle of 30° with the ground. If the foot of the ladder is 8 m away from the wall, find the length of the ladder.

Long Answer Questions – (3 marks each)

Q8. A building is 40 m high. A boy observes the top of the building at an angle of elevation of 60°. Find the distance of the boy from the building.

Q9. From the top of a lighthouse 60 m high, the angle of depression of a ship is 45°. Find the distance of the ship from the base of the lighthouse.

Case Based Question – (4 marks)

Q10. Case Study: Ravi is flying a kite. The thread of the kite makes an angle of 60° with the horizontal. The length of the thread is 20 m.
Answer the following:
a) What is the height of the kite from the ground?
b) Which trigonometric ratio will be used here?
c) If the angle becomes 45°, what will be the new height of the kite (assuming the same thread length)?
d) Which angle gives a greater height — 60° or 45°?

Long Answer Question – (5 marks)

Q11. From the top of a tower 70 m high, the angles of depression to the top and bottom of a nearby building are 30° and 60° respectively. Find the height of the building and the distance between the tower and the building.

Worksheet No. 5
Topic – Applications of Trigonometry
Section A: Multiple Choice Questions (1 mark each)

Q1. The height of a building is 15 m. From a point on the ground, the angle of elevation of its top is 45°. What is the distance of the point from the building?
A. 10 m B. 15 m C. 20 m D. 25 m

Q2. A tower casts a shadow of $10\sqrt{3}$ m when the angle of elevation of the sun is 30°. The height of the tower is:
A. 10 m B. 15 m C. 20 m D. 30 m

Q3. The angle of elevation of the top of a pole from a point on the ground is 60°. If the height of the pole is $10\sqrt{3}$ m, the distance of the point from the pole is:
A. 10 m B. 20 m C. 15 m D. 5 m

Section B: Assertion and Reasoning (1 mark)

Q4. Assertion (A): As the angle of elevation increases, the shadow of an object becomes shorter.
Reason (R): Shadow length is inversely related to the tangent of the angle of elevation.
Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

Section C: Short Answer Questions (2 marks each)

Q5. A ladder is placed against a wall such that it makes an angle of 60° with the ground. If the foot of the ladder is 5 m away from the wall, find the length of the ladder.

Q6. A man is 1.8 m tall and observes the top of a tower at an angle of elevation of 30°. If he is standing 20 m from the base, find the height of the tower.

Q7. The angle of elevation of a cloud from a point 60 m above a lake is 30° and the angle of depression of its reflection in the lake is 60°. Find the height of the cloud above the lake.

Section D: Long Answer Questions (3 marks each)

Q8. A flagstaff stands on top of a building. From a point on the ground, the angles of elevation of the top and bottom of the flagstaff are 60° and 45°, respectively. If the height of the building is 20 m, find the height of the flagstaff.

Q9. A boy is flying a kite with a string of 100 m, making an angle of 30° with the ground. Find the height of the kite above the ground, assuming the string is tight and the height of the boy is negligible.

Section E: Case Based Question (4 marks)

Q10. Case Study: Ravi is standing on the ground and sees a bird sitting on the top of a tree at an angle of elevation of 60°. The tree is 10 m high.
a) What is the horizontal distance of Ravi from the base of the tree?
b) Which trigonometric ratio is suitable here?
c) If the bird flies and sits on an electric pole at a height of 15 m and the angle of elevation becomes 45°, what is Ravi's new distance from the pole?
d) At which location is Ravi closer — tree or pole?

Section F: Long Answer Question (5 marks)

Q11. Two buildings are on either side of a road, 60 m wide. From the top of the first building, the angles of depression of the top and foot of the second building are 30° and 60°, respectively. Find the heights of the two buildings.

ANSWERS : WORKSHEET 1

Q.1.Answer: B. 8.66 m Q2.Answer: B. 45° Q.3Answer: B. 17.32 m Q4.Answer: A. Both A and R are true and R is the correct explanation of A.

Q5.Angle = 45°, Distance = 15 m Height = 15 m (Because tan 45° = height / 15 ⇒ 1 = h / 15 ⇒ h = 15 m)

Q6.Distance = 20 m, Angle = 30° Height = 20 × tan 30° = 20 × 1/√3 ≈ 11.55 m

Q7.Height = 25 m, Angle = 60°

Q8. The speed of the bird between the two observation points as 1 273 2×60 = 2.27 m/s total distance, AC as (100 + 100√3) = 273 m

Q9.Height = 100 m, Angle of depression = 30°

Distance = 100 / tan 30° = 100 / (1/√3) = 100√3 ≈ 173.2 m

Section E: Case Based (4 marks)

Q10.a) Height = 100 × sin 60° = 100 × √3/2 = 86.6 m

b) Horizontal distance = 100 × cos 60° = 100 × 0.5 = 50 m

c) Use sin θ and cos θ (sin for height, cos for base)

d) At 30°: Height = 100 × sin 30° = 100 × 0.5 = 50 m

→ The height decreases from 86.6 m to 50 m.

Q11. Height of tower = 30 m, Distance from point A = 17.32 m

WORKSHEET 2 – ANSWER KEY

Section A :1. B. 36.64 m 2. C. 60° 3. A. 45°

Section B: 4. A. Both A and R are true and R is the correct explanation of A.

Section C: 5. Angle = 45°, height = 40 m ⇒ tan 45° = 40/x ⇒ x = 40 m 6. tan 30° = 15/x ⇒ x = 15 / (1/√3) = 15√3 ≈ 25.98 m 7. tan 45° = h/5 ⇒ h = 5 m, hypotenuse = √(5² + 5²) = √50 ≈ 7.07 m

Section D: 8. tan 45° = 24/x ⇒ x = 24 m 9. tan 60° = 75/x ⇒ x = 75/√3 ≈ 43.3 m

Section E: 10. a) 12 m b) 12 m c) tan θ d) New distance = 12 / tan 30° = 12√3 ≈ 20.78 m ⇒ 30° gives greater distance

Section F: 11.Let distance of A from building = x

From A: tan 30° = h/ x ⇒ h = x/√3

From B (20 m higher): tan 45° = h − 20 / x ⇒ h − 20 = x

Solve: x/√3 − 20 = x ⇒ (x − x√3) = 20√3 ⇒ x ≈ 69.28 m, h ≈ 40 m

Answers – Worksheet No. 3

Q1: B Q2: B Q3: A Q4: A

Q5: 100 × sin 60° = 86.6 m

Q6: 45°

Q7: tan θ = (30 − 1.5)/28.5 ⇒ θ ≈ 45°

Q8: Use tan 30° = 20/x, tan 60° = (20 + h)/x → h = 20 m

Q9: tan 30° = 50√3 / x ⇒ x = 150 m

Q10: a) 10 m b) Height = 5√3 ≈ 8.66 m c) sin 60° d) Decrease

Q11: x = 100/√3 ≈ 57.74 m, y = 100 m ⇒ Total = 157.74 m

ANSWERS: WORK SHEET 4

Q1. B. 45° Q2. B. 10 m Q3. C. 18√3 m Q4. A. Both A and R are true and R is the correct explanation of A.

Q5. 45° Q6. 25/√3 = 14.43 m (approx.) Q7. 8 / cos(30°) = 9.24 m (approx.)

Q8. 40 / tan(60°) = 23.09 m (approx.) Q9. 60 m (since angle is 45°, base = height)

Q10: a) 20 × sin(60°) = 17.32 m b) sin c) 20 × sin(45°) = 14.14 m

d) 60° gives greater height

Q11. Let the distance between buildings be x.

Then:

tan(30°) = (70 - h) / x ⇒ (√3)/3 = (70 - h)/x

tan(60°) = 70 / x ⇒ √3 = 70 / x ⇒ x = 70/√3
Substitute into first equation: (√3)/3 = (70 - h)/(70/√3)
⇒ (√3)/3 = (70 - h)*√3 / 70
Solve to get h = 35 m

Answers – Worksheet No. 5

Section A – MCQs:

1. B. 15 m 2. C. 20 m 3.A. 10 m

Section B – Assertion & Reasoning:

4. A. Both A and R are true and R is the correct explanation of A.

Section C – Short Answers:

5. 10 m
6. Height of tower = 1.8 + 20 × tan(30°) = 1.8 + 11.55 = **13.35 m**
7. Height of cloud = 60 × tan(30°) + 60 × tan(60°) = 34.64 + 103.92 = **138.56 m**

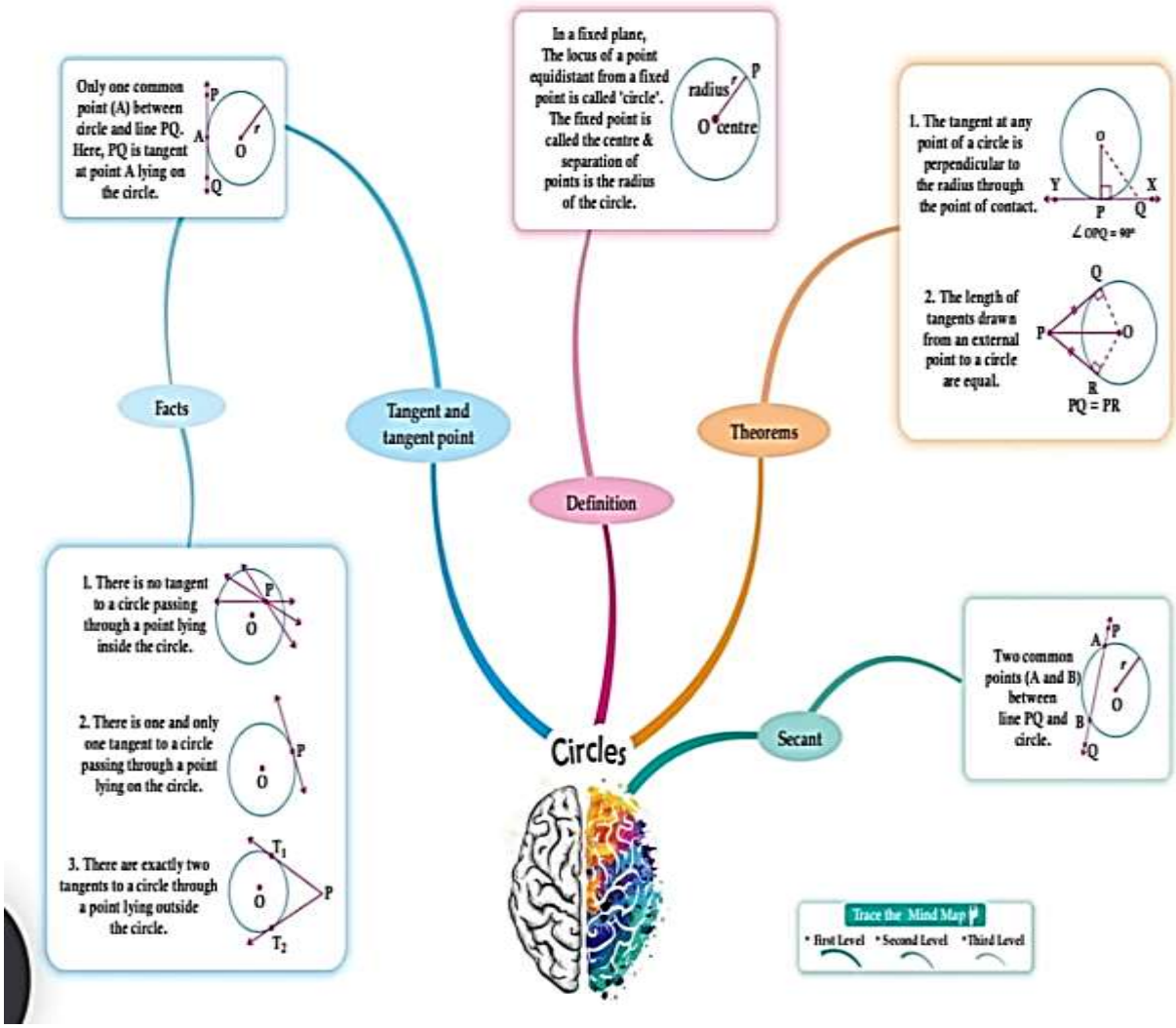
Section D – Long Answers:

8. Let height of flagstaff be h.
From the triangle: tan(60°) = (h + 20)/x, tan(45°) = 20/x
So, x = 20, then h + 20 = 20√3 ⇒ h = 20(√3 – 1) = **14.64 m**
9. Height = 100 × sin(30°) = **50 m**

Section E – Case Based:

a) Distance = 10 / tan(60°) = **5.77 m**
b) **Tangent**
c) Distance = 15 / tan(45°) = **15 m**
d) Ravi is closer to the **tree**

CHAPTER :10
CIRCLES



GIST OF THE CHAPTER :-

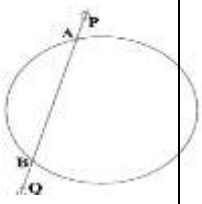
(1) Introduction (https://diksha.gov.in/resources/play/collection/do_31307360978968576011742?contentType=TextBook)
(2) Tangents to a circle (https://diksha.gov.in/resources/play/collection/do_31307360978968576011742?contentType=TextBook)
(3) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
(4) Number of Tangents from a Point on a Circle
(5) The lengths of tangents drawn from an external point to a circle are equal.

DEFINITIONS :-

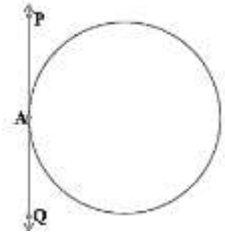
(1) **Circle** :- A circle is a collection of all points in a plane which are at a constant distance (radius) from a fixed point(centre)

(2) **Chord :-** The chord is the line segment having its two end points lying on the circumference of the circle.

(3) **Secant** :- A secant to a circle is a line that intersects the circle at exactly two points.A line PQ is called a secant.



(4) **Tangent to a circle** :- A tangent to a circle is a line that intersects the circle at only one point. A line PQ is called a tangent to a circle.



(5) **Point of Contact** :- The common point of the tangent and the circle is called the point of contact. In the above figure the point A is called the point of contact.

NOTE :- (i) There is only one tangent at a point of the circle. There are infinitely many points on a circle, so a circle can have infinitely many tangents.

(ii) The tangent to a circle is a special case of the secant, when the two end points of its corresponding chord coincides.

(iii) A circle can have two (2) parallel tangents at the most.

MULTIPLE CHOICE QUESTIONS [1 MARK]

1 The number of tangents that can be drawn from a point inside a circle is:
a) 0 b) 1 c) 2 d) Infinite
Ans- (a) 0

2 The maximum number of parallel tangents a circle can have is:
a) 1 b) 2 c) 3 d) 4
Ans: (b) 2

3 The angle subtended by an arc at the centre is double the angle subtended at:
A) any point on the chord B) any point in the alternate segment
C) any point on the major arc D) any point on the remaining part of the circle
Ans- D) any point on the remaining part of the circle

4 The angle between a tangent and the radius at the point of contact is:
a) 45° b) 60° c) 90° d) 180°
Ans-c)90°

5 From an external point, how many tangents can be drawn to a circle?
A) 0 B) 1 C) 2 D) 4
Ans- c)2

6. The tangent at any point of a circle is always:
A) parallel to the radius B) equal to the radius
C) perpendicular to the radius D) smaller than the radius
Ans- C) perpendicular to the radius

7. The length of the tangent drawn from a point 5 cm away from the centre of a circle of radius
A) 2 cm B) 4 cm C) 3 cm D) √16 cm
Ans-b)4 cm

8. A circle can have _____parallel tangents at a single time.
(a)One (b)Two (c)Three (d)Four
Ans-b)two

9. **Assertion (A):** The lengths of the tangents drawn from an external point to a circle are equal.
Reason (R): A line segment joining the center of the circle to the point of contact is perpendicular to the tangent.

Choose the correct option:

A) Both A and R are true and R is the correct explanation of A.
B) Both A and R are true but R is not the correct explanation of A.
C) A is true but R is false.
D) A is false but R is true.

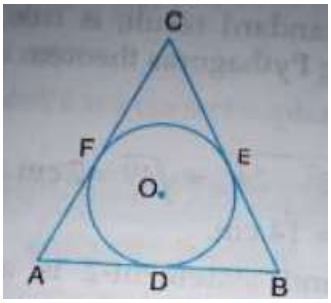
Ans- A) Both A and R are true and R is the correct explanation of A.

10. **Assertion (A):** Tangents drawn from an external point to a circle are equal in length.
Reason (R): A triangle with two equal sides is called an isosceles triangle.
Options:
A) Both A and R are true and R is the correct explanation of A.
B) Both A and R are true but R is not the correct explanation of A.
C) A is true but R is false.
D) A is false but R is true.
Ans- B) Both A and R are true but R is not the correct explanation of A.

VERY SHORT ANSWER[2 MARK]

11. Find the area of the triangle formed by joining the center of a circle and the points of contact of two tangents of length 12 cm each, given the radius is 5 cm
Solution :-Use right triangle formula:
Area = ½ × base × height = ½ × 12 × 5 = **30 cm²**
Ans: 30 cm²

12. The sides AB, BC and CA of a triangle ABC touch a circle at D, E and F respectively. If DA = 6 cm, BD = 5 cm and AC = 14 cm, find the length of BC (in cm).

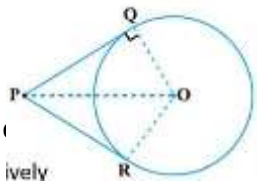


Solution-
Given:

- DA = 6 cm, BD = 5 cm, AC = 14 cm
- AB = DA + BD = 6 + 5 = 11 cm
- Let CF = CE = x
- AF = AD = 6 cm
- BE = BD = 5 cm
- AC = AF + FC ⇒ 14 = 6 + x ⇒ x = 8 cm
- BC = BE + EC = 5 + 8 = 13 cm

Ans: 13 cm

13. Prove that the lengths of tangents drawn from an external point to a circle are equal.
Solution- **Given:** A circle with center **O**. An external point **P**.Two tangents **PA** and **PB** draw to the circle, touching it at points **A** and **B** respectively.



To Prove: PA=PB

- **Proof: The radii** OA and OB to the points of contact A and B.
  Tangents to a circle are **perpendicular** to the radius at the point of
  - So, ∠OAP=∠OBP=90∘

  Consider triangles △OAP:
  In △OAP:
  - OA=OB (radii of the same circle)
  - OP=OP (common side)

  ∠OAP=∠OBP=90∘ By **RHS congruence criterion** (Right angle-Hypotenuse-Side),
  △OAP≅△OBP
  Therefore, **corresponding parts of congruent triangles are equal (CPCT)**:
  PA=PB

14. Find the length of the tangent drawn from a point 13 cm away from the center of a circle of radius 5 cm. [Hint-Pythagoras thorem]

Solution- Given: Distance from the point to the centre(d) =13 cm

Radius of the circle r= 5 cm

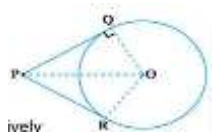
Using pythagoras theorem

Length of tangent = $\sqrt{d^2 - r^2} = \sqrt{13^2 - 5^2} = \sqrt{169 - 25} = \sqrt{144}$

Ans: **12 cm**

15. If two tangents PA and PB are drawn from an external point P to a circle with center O, such that ∠APB = 80°, find ∠AOB. 2

Solution-**Given:**PA and PB are tangents from point P to a circle with center O.



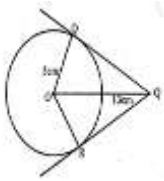
- ∠APB=80∘

  To Find:∠AOB
- **Proof :**Triangles △OAP and △OBP are **congruent** (as shown in the previous proof)., ∠OAP=∠OBP=90 (radius ⊥ tangent).
- Quadrilateral OAPB is formed with two right angles.
- In △APB , given ∠APB=80∘.
- Since OA=OB triangle △AOB is **isosceles**, and angle ∠AOB is at the center.
- In quadrilateral OAPB the angle between tangents ∠APB=80∘ is **external** to triangle and it equals:
- $\angle AOB = 180^0 - \angle APB = 180^0 - 80^0 = 100^0$, $\angle AOB = 100^0$

16 .From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25 cm. Find the radius of the circle.

Solution-Given:Length of the tangent from point Q to the circle = 24 cm 2

- Distance from point Q to the center O of the circle = 25 cm
- Let the radius of the circle be r



To Find: Radius r of the circle

Solution: the diagram: QA is the tangent from point Q to the circle, touching at point A.OA is the radius, and since the radius is perpendicular to the tangent at the point of contact:QA is the tangent from point Q to the circle ,touching at point A OA is the radius and since the radius is perpendicular to the tangent at the point of contactType equation here.

∠OAQ = 90

So , triangle OAQ =90

Therefore

triangle OAQ is right angled triangle

Using the Pythagoras theorem in triangle OAQ

$OQ^2 = OA^2 + AQ^2$

$625 = r^2 + 576$

$r^2 = 625 - 576$

$r^2 = 49$

$r = 7$ cm

SHORT ANSWER [3 MARK]

17. Two tangents TP and TQ are drawn to a circle with center O from an external point T. Prove that ∠PTQ = 2∠OPQ. 3

Solution-TP and TQ are tangents, so OP ⊥ TP and OQ ⊥ TQ.

- In ΔOPT and ΔOQT, OP = OQ (radii), OT is common, and ∠OPT = ∠OQT = 90°.
- Thus, ΔOPT ≅ ΔOQT ⇒ ∠PTO = ∠QTO ⇒ ∠PTQ = 2∠PTO.
- Also, ∠OPQ = ∠OQP (isosceles triangle) ⇒ ∠PTO = ∠OPQ.Therefore, ∠PTQ = 2∠OPQ.

18. From a point 10 cm away from the center of a circle, the length of the tangent to the circle is 8 cm. Find the radius of the circle and prove your result using Pythagoras Theorem. 3

Solution- Using Pythagoras' theorem:

Radius $= \sqrt{10^2 - 8^2} = \sqrt{100 - 64} = \sqrt{36} = 6\ cm$

19. Two concentric circles have radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle. 3

Solution-Let the chord of the larger circle touching the smaller circle be AB.

- The perpendicular distance from the center to AB is equal to the radius of the smaller circle (3 cm).
- Using Pythagoras' theorem in the right triangle formed:

Half-length of AB $= \sqrt{5^{2-}\ \ 3^2} = \sqrt{25 - 9} = \sqrt{16}$ =4, Length of AB=2×4=8 cm

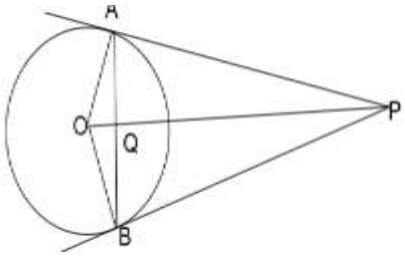
20. In the given figure, a quadrilateral ABCD is drawn to circumscribe a circle. If AB = 6 cm, BC = 7 cm, and CD = 4 cm, find the length of AD. 3

Solution-For a quadrilateral circumscribing a circle, the sum of one pair of opposite sides is equal to the sum of the other pair:

AB+CD=AD+BC =6+4=AD+7

⇒*AD*=3 cm **Ans:** 3 cm

21. In the given figure, PA and PB are tangents to a circle centred at O. Prove that (i) OP bisects $\angle APB$ (ii) OP is the right bisector of AB. 3



Solution-(i) ΔOAP ≅ ΔOBP ⇒ ∠APO = ∠BPO ⇒ OP bisects ∠APB.

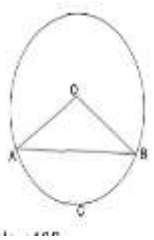
(ii) OP is the perpendicular bisector of AB because ΔOAP ≅ ΔOBP and OA = OB.

LONG ANSWER [5 MARK]

22. The perimeter of sector OACB of the circle centred at O and of radius 24, is 73.12 cm. 5

(i) Find the central angle $\angle AOB$.

(ii) Find the area of the minor segment ACB. (Use π = 3.14 *and* √3 = 1.732



Solution-Given, perimeter of OACB = 73.12 cm

Radius = 24 cm, Perimeter of OACB = Length of arc ACB+ 2 × r

73.12=θ/360×2πr+2×24

$$73.12 = \frac{\theta}{360} \times 2\pi r + 2 \times 24$$

$$73.12 - 48 = \frac{\theta}{360} \times 2 \times 3.14 \times 24$$

$$25.12 = \frac{\theta}{15} \times 2 \times 3.14$$

$$\frac{25.12 \times 15}{2 \times 3.14} = \theta$$

$$\frac{376.8}{6.28} = \theta$$

$$\theta = 60°$$

II. Area of minor segment ACB = Area of sector − Area of Δ

$$= \frac{\theta}{360} \times \pi r^2 - \frac{\sqrt{3}}{4} a^2$$

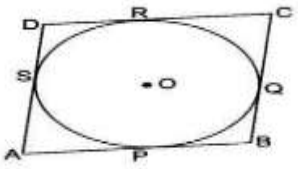
$$= \frac{60}{360} \times 3.14 \times 24 \times 24 - \frac{1.73}{4} \times 24 \times 24$$

$$= 3.14 \times 4 \times 24 - 1.73 \times 6 \times 24$$

301.44 -249.12, Ans : 52.32 cm^2

23. Prove that the parallelogram circumscribing a circle is a rhombus.

Solution-**Given:**A parallelogram that circumscribes a circle (i.e., the circle touches all four sides of the parallelogram).



To Prove: A parallelogram that circumscribes a circle is a rhombus.

Proof:Quadrilateral to circumscribe a circle (i.e., have an incircle), the sum of lengths of opposite sides must be equal**.**

That is: AB+CD=AD+BC

In a parallelogram, opposite sides are already equal:

AB=CD, AD=BC

So the condition becomes:

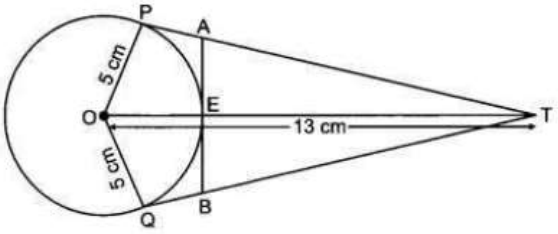
AB+AB=AD+AD⇒2AB=2AD⇒ AB = AD

In the parallelogram, if adjacent sides AB=AD

then all sides are equal (since opposite sides are already equal in a parallelogram).

Hence, the parallelogram is a rhombus.A parallelogram that can circumscribe a circle must have all sides equal, so it is a rhombus.

24. In Fig. O is the centre of a circle of radius 5 cm. T is a point such that OT = 13 cm and OT intersects circle at E. If AB is a tangent to the circle at E, find the length of AB, where TP and TQ are two tangents to the circle. 5



Solution –

OT = 13 CM, RADIUR =5 CM, TE =13-5 =8 CM

AB is a tangent at E OE is perpendicular to AB. Using pythogoras theorem in Triangle OET

ET =$= \sqrt{13^2 - \ 5^2} = \sqrt{169 - 25} = \sqrt{144} = 12\ CM$

PT = $\sqrt{169} - 25 = 12\ CM$

TE = OT - OE =13 - 5 = 8 CM

PA = AE = x cm

PA = AE = x cm, $TA^2 = TE^2 + EA^2$

(12 – x2) = 64 + x2

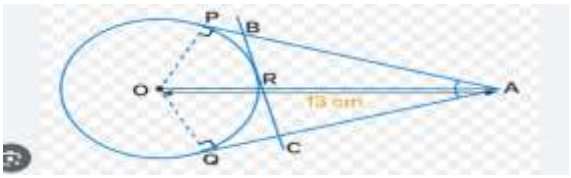
24 x = 80 , x = 3.3 cm

CASE BASED QUESTIONS [4 MARK]

25. A point P is 13 cm away from the center O of a circle of radius 5 cm. PA and PB are tangent circle.a) Find the length of PA. 4

b) Calculate the angle between PA and PB.

c) Find the area of quadrilateral OAPB.



Solution :- Length of PA By using Pythagoras theorem

We can find PA = 169- 25 144 = 12 CM

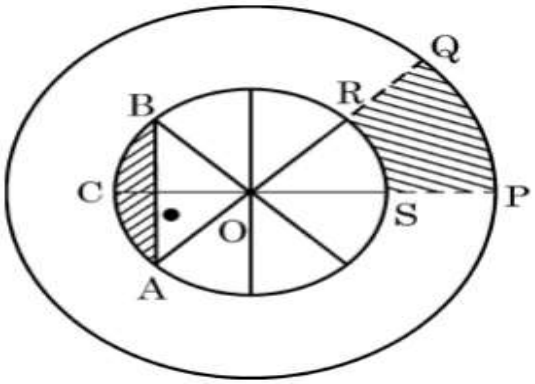
b) Calculating the angle between PA and PB:

1. Properties of tangents: Tangents from a point to a circle are equal in length, so PA = PB.
2. Triangle APB: Triangle APB is isosceles (PA = PB), so angles PAB and PBA are equal.
3. Angles in a quadrilateral: The sum of the interior angles of a quadrilateral is 360 degrees.
   - $\angle AOB = 180°$ (because it is a straight line)
   - $\angle PAB + \angle PBA = 180° - \angle AOB = 180° - 360° = -180°$
   - $\angle PAB = \angle PBA = -90°$ (This is not possible, so there must be an error in the question. The angles should add up to 180°.)

c) Finding the area of quadrilateral OAPB:

1. Divide the quadrilateral: Quadrilateral OAPB can be divided into two right triangles, OAP and OBP.
2. Area of a triangle: The area of a right triangle is $\frac{1}{2} \times \text{base} \times \text{height}$.
3. Area of OAPB:
   - $\text{Area}_{OAPB} = \frac{1}{2} \times OA \times PA + \frac{1}{2} \times OB \times PB$
   - $\text{Area}_{OAPB} = \frac{1}{2} \times 5 \times 12 + \frac{1}{2} \times 5 \times 12$
   - $\text{Area}_{OAPB} = 60\ \text{cm}^2$

26. NSS (National Service Scheme) aims to connect the students to the community and to involve them in problem solving process. NSS symbol is based on the 'Rath' wheel of the Konark Sun Temple situated in Odisha. The wheel signifies the progress cycle of life. The diagramatic representation of the symbol is given below : Observe the figure given above. The diameters of inner circle are equally placed. Given that OP = 21 cm, OS = 10 cm. Based on the above information, answer the following questions: 4



(i) Find ∠ROS.

(ii) Find the perimeter of sector OPQ.

(iii) (a) Find the area of shaded region PQRS. OR (iii) (b) Find the area of shaded region ACB i.e. the segment ACB.

Solution –

Given, OP = 21 cm and OS = 10 cm

(i) The inner circle is divided into 8 equal sectors.

Central angle of circle = 360°

∴ m ∠ROS = 360° = 45°

(ii) We know that the perimeter of sector OPQ

$$= \frac{\theta}{360^\circ} \times 2\pi r + 2r$$

$$= \frac{45}{360} \times 2 \times \frac{22}{7} \times 21 + 2 \times 21 \quad \text{...[∵ Given OP = 21 cm and m ∠RC}$$

$$= 16.5 \text{ cm} + 42 \text{ cm}$$

$$= 58.5 \text{ cm}$$

(iii)

(a) Area of shaded region PQRS

= Area of sector OPQ − Area of sector ORS

$$= \frac{\theta}{360^\circ} \times \pi(OP)^2 - \frac{\theta}{360^\circ} \times \pi(OS)^2$$

$$= \frac{\theta}{360^\circ} \times \pi\left[(OP)^2 - (OS)^2\right]$$

$$= \frac{45}{360} \times \frac{22}{7}\left[(21)^2 - (10)^2\right]$$

$$= \frac{1}{8} \times \frac{22}{7}[441 - 100]$$

$$= \frac{1}{8} \times \frac{22}{7} \times 341$$

$$= 133.96 \text{ cm}^2$$

OR

(b) From figure, we have

∠AOB = 90°

∴ Area of segment ACB

$$= \pi(OA)^2 \frac{90^\circ}{360^\circ} - \text{area of } \Delta(AOB)$$

$$= \pi \times 100 \times \frac{1}{4} - \frac{1}{2} \times 10 \sin 45^\circ \times 2 \times 10 \cos 45^\circ$$

$$= 25\pi - 100 \times \frac{1}{2}$$

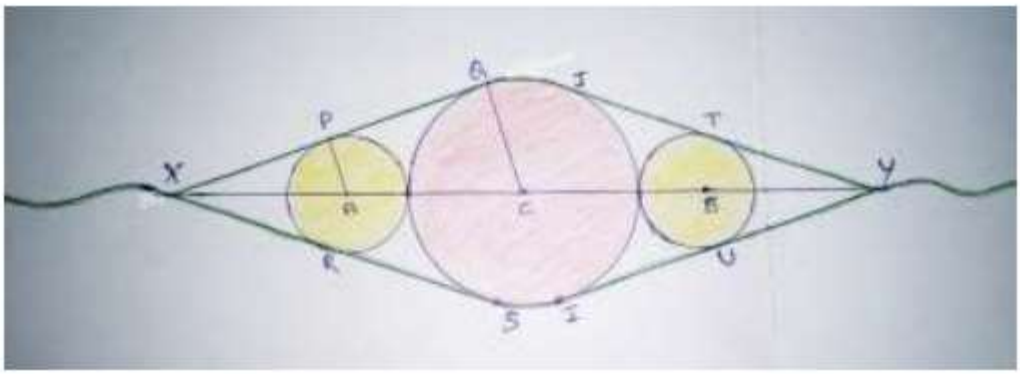
$$= 25\pi - 50$$

$$= 25(\pi - 2)$$

$$= 25\left(\frac{22}{7} - 2\right)$$

$25 \times 8/7 = \frac{200}{7}$ cm^2 Ans : 200/7 cm^2

27. Raksha Bandhan, is a popular annual rite, or ceremony, which is celebrated in South Asia, and in other parts of the world significantly influenced by Hindu culture. On this day, sisters of all ages tie a talisman, or amulet, called the rakhi, around the wrists of their brothers, symbolically protecting them, receiving a gift in return, and traditionally investing the brothers with a share of the responsibility of their potential care. Krishna made up a rakhi for his brother Sumit using three circles of radius 2cm,4cm and 2cm respectively. Figure for the same is given below: 4



Based on this information answer the following questions?
What is the length of AB =?

(ii) If PQ, RS, JT and IU are tangents to the circles as shown in the figure ,then measure of ∠ QPA is equals to measure of which angle?

(iii) Find the value of CX

(iv) Find approximate value of QX

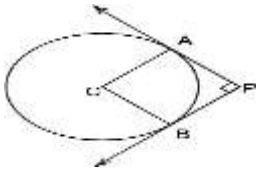
(v) If ∠PXR=40° ,find ∠ PAX=?

Solution –
(i) AB = 4 + 4 + 4 = 12 cm ⇒ (c) 12 cm
(ii) ∠QPA = ∠PQC ⇒ ∠PQC =90°
(iii) CX = 8 cm ⇒ (d) 8 cm
(iv) QX ≈ 9.8 cm ⇒ (b) 9.8 cm
(v) ∠PAX = 70° ⇒ (d) 70°

CIRCLES

WORKSHEET 1

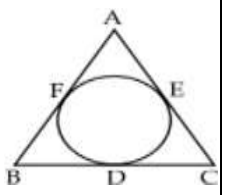
Multiple Choice Questions (1 mark)



1. In the given figure, PA and PB are two tangents drawn from an external point P to a circle with centre C and radius 4cm. If PA ⊥ PB, then the length of each tangent is

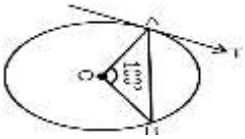
   (a) 3 cm (b) 4 cm (c)5cm (d) 6 cm

2. In the fig. if the semi perimeter of ΔABC = 23cm, then AF + BD + CE is:



(a).46cm (b)11.5cm (C.) 23cm (d) 34.5cm

3.In the given figure, O is the centre of a circle, AB is a chord and AT is the tangent at A. If ∠AOB = 100°, then ∠BAT is equal



4. Assertion (A): The length of the tangent drawn from a point 8 cm away from the centre of circle of r adius 6 cm is $2\sqrt{7}$ cm.

Reason (R): If the angle between two radii of a circle is 130°, then the angle between the tangents at the end points of radii at their point of intersection is 50°.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

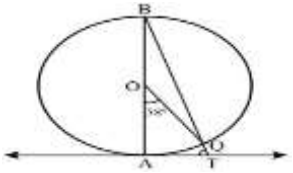
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true

Very Short Answers Ques(2 marks)

5. Find the length of tangent drawn to a circle with radius 7 cm from a point 25 cm away from the centre

6. In the given figure, AB is a diameter of a circle with centre O and AT is a tangent. If ∠AOQ=58°, find ∠ATQ.

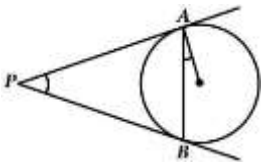


7. Prove that the tangents drawn at the ends of a diameter of a circle are parallel**.**

Short Answer Ques (3 marks)

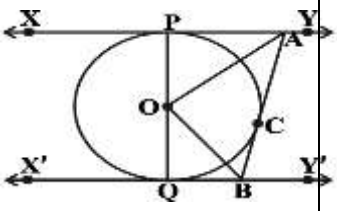
8.A quadrilateral ABCD is drawn to circumscribe a circle as in figure. Prove that AB + CD = AD + BC**.**

9.Two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that $\angle APB = 2\angle OAB$.



Long Answer Ques. (5marks)

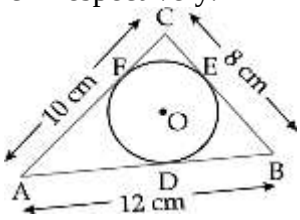
10. In the below figure, XY and X′Y′ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and X′Y′ at B. Prove that ∠AOB = 90



Case Based Ques(4marks)

11 Varun has been selected by his School to design logo for Sports Day T-shirts for students and staff. The logo is designed in different geometry and different colours according to the theme. In given figure, a circle with centre O is inscribed in a ΔABC,

such that it touches the sides AB, BC and CA at points D, E and F respectively. The lengths of sides AB, BC and CA are 12 cm, 8 cm and 10 cm respectively.



(a) Find the length of AD and BE. (2)

OR

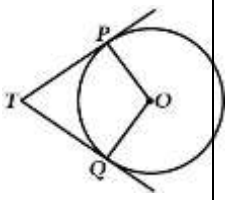
If the radius of the circle is 4 cm, find the area of ΔOAB.

(b) Find the perimeter of ΔABC. (1)

(c) Find the length of CF. (1)

WORKSHEET 2

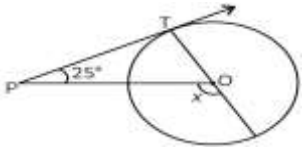
Multiple Choice Questions (1 mark)



1. In figure, TP and TQ are two tangents to a circle with centre O such that $\angle POQ$ = 110°. Then $\angle PTQ$ is equal to

   (A) 55° B) 70 °C) 110° D) 90°

2. In the given figure, PT is a tangent at T to the circle with centre O. If ∠TPO = 25°, then x is equal to:



3. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the Centre O at a point Q so that OQ = 12 cm. Length PQ is:

   (a) 12 cm (b) 13 cm (c) 8.5 cm (d) √119 cm.

4. **Assertion (A):** A circle can have infinitely many tangents.

   Reason (R): The tangent at any point of a circle is perpendicular to the radius through the point of contact.

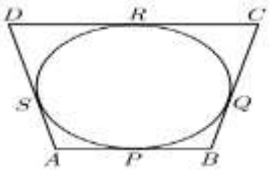
   (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

   (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

   (c) Assertion (A) is true but reason (R) is false.

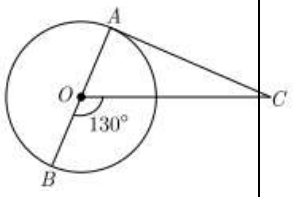
   (d) Assertion (A) is false but reason (R) is true.

Very Short Answers Questions (2 marks)



5.In the given figure, a circle touches all the four sides of quadrilateral ABCD with AB = 6 cm, BC = 7 cm and CD = 4 cm, then length of AD is

6. In the given figure, AOB is a diameter of the circle with centre O and AC is a tangent to the circle at A. If ∠BOC = 130° , the find ∠ACO.

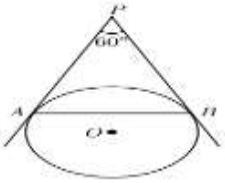


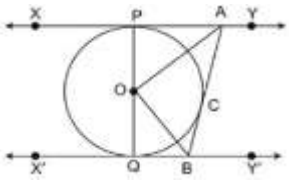
7.Prove that the lengths of tangents drawn from an external point to a circle are equal.

Short Answer Ques (3 marks)

8. In figure, AP and BP are tangents to a circle with centre O , such that AP = 5 cm and ∠APB = 60° . Find the length of chord AB.

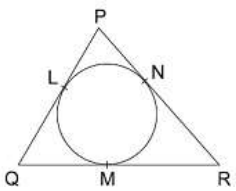
9. In the figure XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C interesting XY at A and X'Y' at B, what is the measure of ∠AOB.





Long Answer Ques. (5marks)

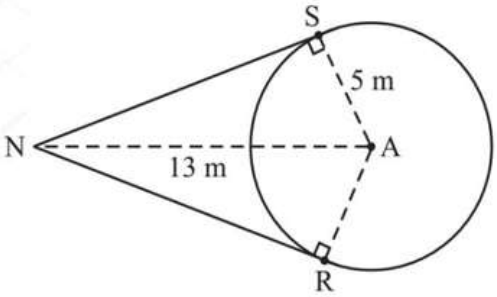
10. In the given figure, a circle is inscribed in a triangle PQR. If PQ = 10 cm, QR = 8 cm and PR = 12 cm, find the lengths of QM, RN and PL



Case Based Ques(4marks)

11. In an international school in Hyderabad organised an Interschool Throwball Tournament for girls just after the pre-board exam. The throw ball team was very excited. The team captain Anjali directed the team to assemble in the ground for practices. Only three girls Priyanshi, Swetha and Aditi showed up. The rest did not come on the pretext of preparing for pre-board exam. Anjali drew a circle of radius 5m on the ground. The centre A was the position of Priyanshi. Anjali marked a point N, 13 m away from centre A as her own position. From the point N, she drew two tangential lines NS and NR and gave positions S and R to Swetha and Aditi. Anjali throws the ball to Priyanshi, Priyanshi throws it to Swetha, Swetha throws it to Anjali, Anjali throws it to Aditi, Aditi throws it to Priyanshi, Priyanshi throws it to Swetha and so on.

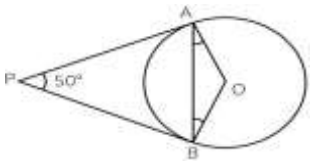
1. Find the measure of ∠NSA.
2. Find the distance between Swetha and Anjali.
3. If ∠SNR is equal to θ, then Find ∠NAS .



WORKSHEET 3

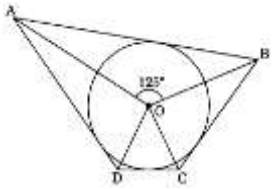
Multiple Choice Questions (1 mark)

1.In the figure, if PA and PB are tangents to the circle with centre O such that ∠APB = 50°, then ∠OAB is:



(a) 25º (b) 30º (c) 40º (d) 50º

2. In Fig., if ∠AOB = 125°, then ∠COD is equal to



(a) 62.5° (c) 35° (b) 45° (d) 55°

3. **A circle can have _____parallel tangents at a single time.**

(a) One (b) Two (c) Three (d) Four

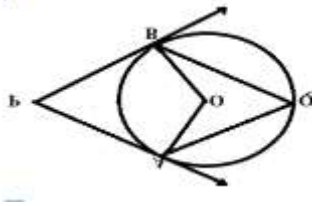
4. **Assertion (A):** If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.
Reason (R): (hypotenuse) 2 = (base) 2 + (height) 2

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). **(b)** Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

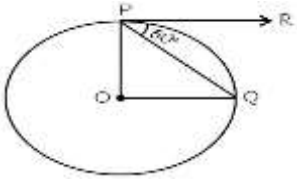
(c) Assertion (A) is true but reason (R) is false. **(d)** Assertion (A) is false but reason (R) is true.

Very Short Answers Ques(2 marks)

5.If all the sides of a parallelogram touch a circle, show that the parallelogram is a rhombus
6. In the given figure, O is the centre of circle. Find ∠AQB, given that PA and PB are tangents to the circle and ∠APB= 75°

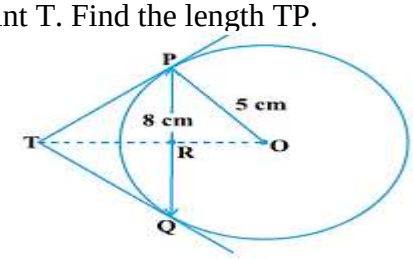


7. In the figure, if O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, find ∠POQ.



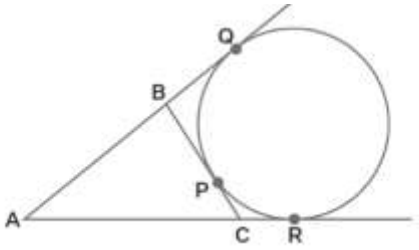
Short Answer Ques (3 marks)

8.In the figure, PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at a point T. Find the length TP.



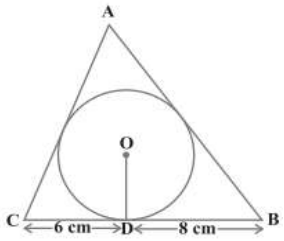
9 If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that

$AQ = \frac{1}{2}(BC + CA + AB)$



Long Answer Ques. (5marks)

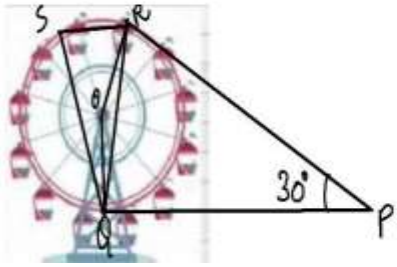
10. A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 8 cm and 6 cm respectively (see Fig.). Find the sides AB and AC.

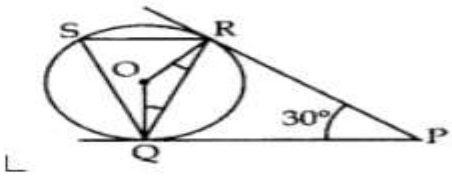


Case Based Ques(4marks)

11.A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms the figure as given below





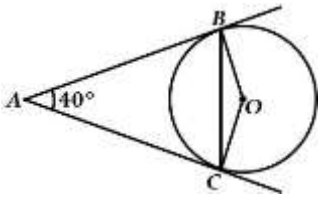
In the given figure

1. find ROQ. 2. Find RQP. 3. Find RSQ 4. Find ORP

WORKSHEET 4

Multiple Choice Questions (1 mark)

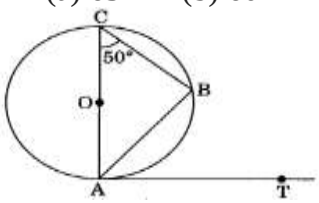
1.In figure, AB and AC are tangents to the circle with centre O such that $\angle BAC = 40°$. Then $\angle BOC$ is equal to



(a)40° (b) 55° (c) 140° (d) 150°

2. If Fig., AB is a chord of the circle and AOC is its diameter such that ∠ACB = 50°. If AT is the tangent to the circle at the point A, the ∠BAT is equal to

(a) 65° (b) 60° (c) 40° (d) 50°



3. If radii of two concentric circles are 4 cm and 5 cm, then the length of each chord of one circle which is tangent to the other circle is

(a) 3cm (b) 1cm (c) 6cm (d) 9cm

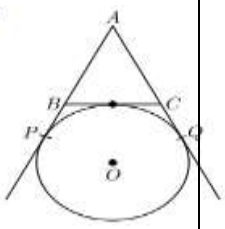
4. **Assertion (A):** The length of the tangent drawn from a point 8cm away from the centre of circle of radius 6cm is $2\sqrt{7}$ cm.

Reason (R): If the angle between two radii of a circle is 130^0, then the angle between the tangents at the end points of radii at their point of intersection is 50^0.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). **(b)** Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

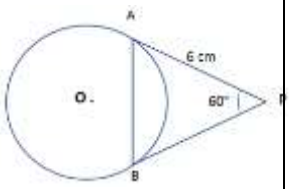
(c) Assertion (A) is true but reason (R) is false. **(d)** Assertion (A) is false but reason (R) is true.

Very Short Answers Question (2 marks)



5. In figure, AP, AQ and BC are tangents of the circle with centre O. If AB = 5 cm, AC = 6 cm and BC = 4 cm, then the length of AP (in cm) is

6. PA and PB are the tangents drawn to a circle with centre O. If PA= 6 cm and ∠ APB=60° , then find the length of the chord AB.

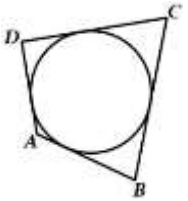


7. Prove that the rectangle circumscribing a circle is a square

Short Answer Ques (3 marks)

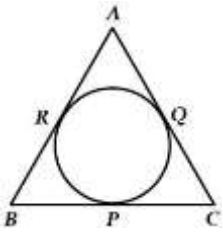
8. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

9. In figure, a circle touches all the four sides of a quadrilateral $ABCD$ whose sides are $AB = 6\ cm, BC = 9\ cm$ and $CD = 8\ cm$. Find the length of side AD.



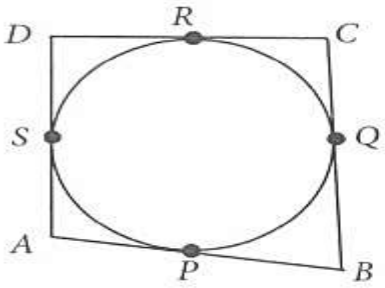
Long Answer Ques. (5marks)

10 Prove that the lengths of tangents drawn from an external point to a circle are equal. Using the about a circle, as shown in Fig. Prove that the base is bisected by the point of contact.



Case Based Ques(4marks)

11 . In a park, four poles are standing at positions A, B, C and D around the fountain such that the cloth joining the poles AB, BC, CD and DA touches the fountain at P, Q, Rand S respectively as shown in the figure.



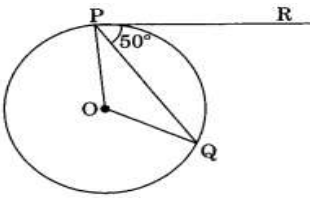
Based on the above information, answer the following questions.
(i) If O is the centre of the circular fountain, then Find ∠OSA.

(ii) If DR = 7 cm and AD = 11 cm, then Find AP.

(iii) If O is the centre of the fountain, with ∠QCR = 60°, then Find ∠QOR

WORKSHEET 5

Multiple Choice Questions (1 mark)

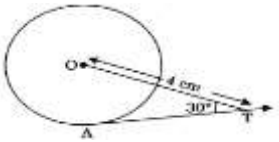


1. In Fig., if O is the centre of a circle PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, then ∠POQ is equal to

(a) 100° (b) 80° (c) 90° (d) 9

2. In Fig., AT is a tangent to the circle with centre O such that OT = 4 cm and ∠OTA = 30°. Then AT is equal to

(a) 4 cm (b) 2 cm (c) $2\sqrt{3}$ cm (d) $4\sqrt{3}$ cm



3. If two tangents inclined at an angle of 60^o are drawn to a circle of radius 3cm, then the length of each tangent is equal to

(a) $3\sqrt{3}/2$ cm (b) 3cm (c) 6cm (d) $3\sqrt{3}$cm

4. **Assertion (A):** PA and PB are two tangents to a circle with centre O. Such that ∠AOB = 110^0, then ∠APB = 90^0.

Reason (R): The length of two tangents drawn from an external point are equal.

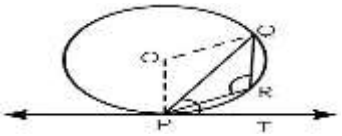
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). **(b)** Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true

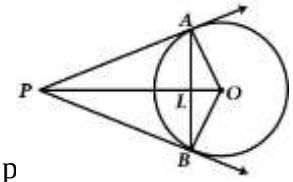
Very Short Answers Ques(2 marks)

5.In figure, PQ is a chord of a circle with centre O and PT is a tangent. If ∠QPT = 60°, find ∠PRQ.



6. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

7. In figure, AB is a chord of a circle, with centre O, such that $AB = 16\ cm$ and radius of circle is 10 cm. Tangents at A and B intersect each other at P. Find the length of PA.



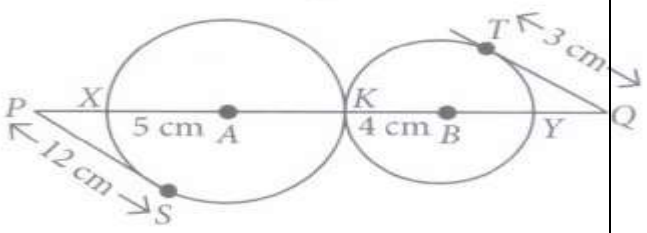
Short Answer Ques (3 marks)

7. Two tangents TP and TQ are drawn to a circle with centre O from an external p that $\angle PTQ = 2 \angle OPQ$
8. Two tangents PQ and PR are drawn from an external point to a circle with centre O. Prove that QORP is a cyclic quadrilateral

Long Answer Ques. (5marks)

9. If a hexagon ABCDEF circumscribe a circle, prove that AB + CD + EF = BC + DE + FA.

10. In a maths class, the teacher draws two circles that touch each other externally at point K with centres A and B and radii 5 em and 4 em respectively as shown in the figure..



Based on the above information, answer the following questions.

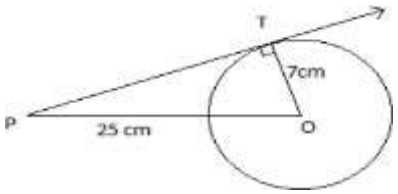
(i) Find the value of PA . (ii) Find the value of BQ. (iii) Find the value of QY.

WORK SHEET -1 ANSWER KEY

1 (b) 4 cm 2 23cm 3(c) 50°

4(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

5. Let C(O, r) be the circle with OT = r = 7 cm and OP = 25 cm.



We know that radius OT is perpendicular to the tangent drawn, $\therefore \angle OTP = 90^0$

In ΔOTP, by Pythagoras Theorem,

$OP^2 = PT^2 + OT^2$, PT = $\sqrt{(625 - 49)}$ = 24 cm

Hence, the length of tangent from point P = 24 cm

6. : ∠ABQ = ½ ∠AOQ

∠ABQ = ½ x 58° , ∠A = 90° (AT is a tangent)

∠BAT + ∠ABT + ∠ATQ = 180° (angle sum property of a triangle)

90 + 29 + ∠ATQ = 180°

∠ATQ = 180° -119°, ∠ATQ = 61°

7. Consider AB as a diameter of the circle.

Let PQ and RS are two tangents drawn at the end points of the diameter AB. As we know that the radius is perpendicular to tangent at the point of contact.

Thus,∠OAR = 90^o and ∠OBQ = 90^o ……(1) Therefore, ∠OAR= ∠OBQ. Since, alternate interior angles are equal, hence lines PQ and RS must be parallel. Hence, proved.

11. (A)AD=7CM ,BE=5CM

(B)Perimeter of ΔABC = AB + BC + CA

= (12 + 8 + 10) cm = 30 cm.

(C) From question (a), CF = (10 – x cm)

= (10 – 7) cm = 3 cm.

WORKSHEET-2 ANSWER KEY

1. 55° 2. (d) 115° 3. (d) $\sqrt{119}$ cm

4 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A). 5. 3 CM 6. **40^0** 8.5CM

9. 90 10. QM=3cm, RN=5cm, PL=7cm **11. :** **1.** 90° **2.** 12m **3.** $= 90° - \frac{\theta}{2}$.

WORK SHEET- 3 ANSWER KEY

1. (a) 25° **2.** (d) 55° **3.** (b) Two

4. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

6. 52.5^0 **7.** ∠POQ = 100° **8.20/3**

11. : 1. 150 ° **2.** 75 ° **3.** 75 ° **4.** 90 °

WORKSHEET -4 ANSWER KEY

1.(C)140 2(D)50 3(d) 9cm

4(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

5 7.5cm 6. 6cm 11. (i) 90° (ii) AP= 4cm (iii) 120°

WORK SHEET 5 ANSWER KEY

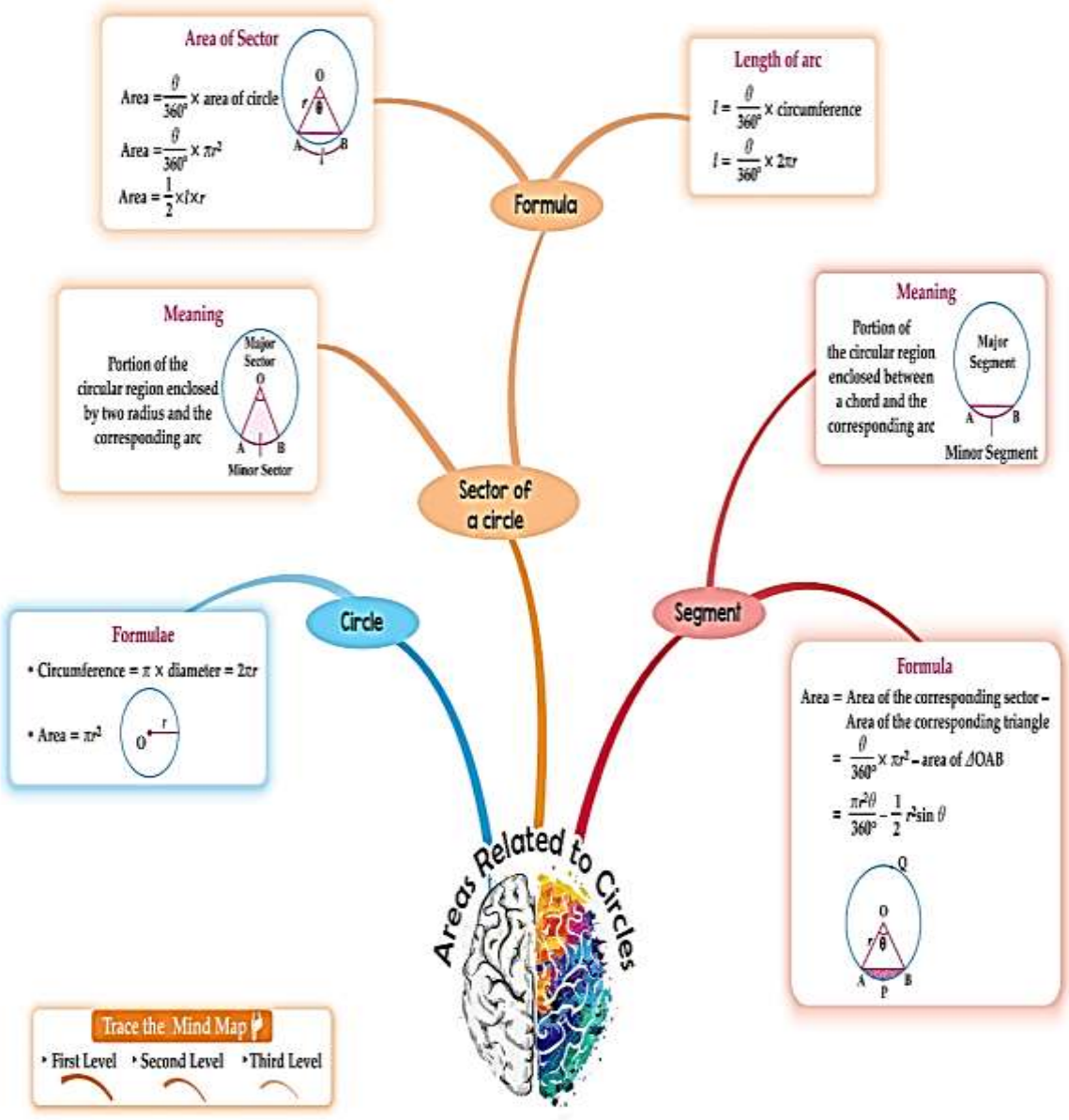
1 POQ = 100° 2(c) $2\sqrt{3}$ cm 3(d) $3\sqrt{3}$cm

4**(d)** Assertion (A) is false but reason (R) is true.

5 120° 11.(i) 13cm (ii) 5cm (iii) 1cm

CHAPTER - 11

AREAS RELATED TO CIRCLES



GIST OF THE LESSON :-

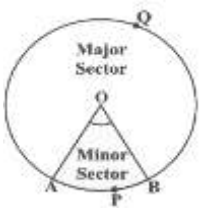
(1) Introduction to a circle and its related terms
https://diksha.gov.in/resources/play/collection/do_31310347523356262411428?contentType=TextBook
(2) Central angle or angle of a sector
(3) Minor Sector (or a Sector) and Major Sector of a circle
(4) Finding the area and perimeter of a Sector
(5) Length of an arc of a sector
(6) Area of minor segment and major segment.

DEFINITIONS :-

(1) Arc :- A continuous piece of a circle is called an arc of a circle
(2) Chord :- A line segment whose end points lie on a circle is called a chord of a circle.

(3) Central Angle :- An angle subtended by an arc at the centre of a circle is called its central angle.

(4) Sector of a circle :- The portion (or part) of the circular region enclosed by two radii and the corresponding arc is called a sector of the circle



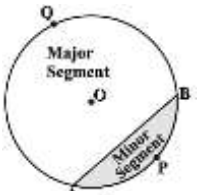
$\angle AOB = \theta$ *is called central angle* (or) *angle of a sector*

$OAPB$ *is called minor sector or sector of a circle.*

$OAQB$ *is called a major sector*

APB *is called an arc of a sector*

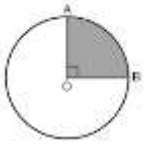
(5) Segment of a circle :- The portion (or part) of the circular region enclosed between a chord and the corresponding arc is called a segment of the circle



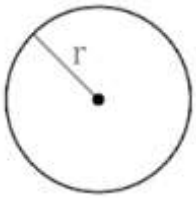
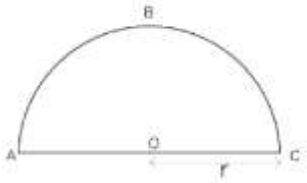
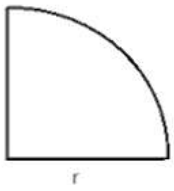
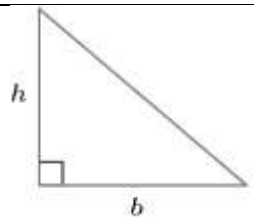
APB *is a minor segment or segment of a circle*

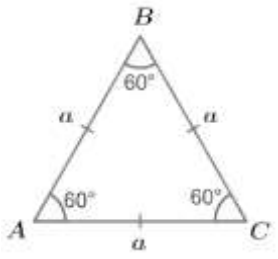
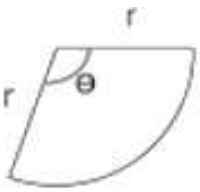
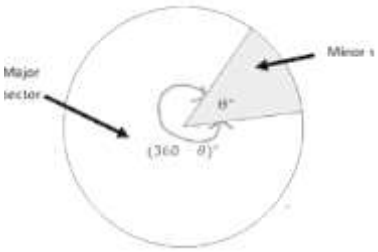
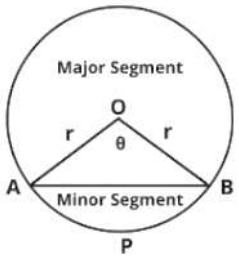
AQB *is called a major segment of a circle.*

(6) Quadrant of a circle :- One – fourth of a circle is called a quadrant of a circle. The shaded portion AOB is called a quadrant of a circle. The central angle of a quadrant is 90^o.



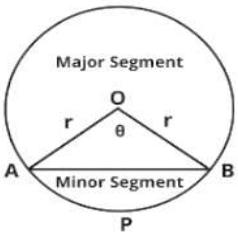
FORMULAE :-

S.No.	Name	Figure	Perimeter	Area
1	Circle		$2\pi r \; or \; \pi d$	πr^2
2	Semi - Circle		$\pi r + 2r$	$\frac{1}{2}\,\pi r^2$
3	Quarter of a circle		$\frac{1}{2}\,\pi r + 2r$	$\frac{1}{4}\,\pi r^2$
4	Right Triangle		Sum of the lengths of 3 sides	$\frac{1}{2}\,bh$

5	Equilateral Triangle		3a	$\frac{\sqrt{3}}{4}\ a^2$
6	Sector of a Circle		Length of an Arc (ℓ) = $\frac{\theta}{360}2\pi r$ Perimeter = ℓ + 2r	$\frac{\theta}{360}\ \pi r^2 OR\ \ \frac{1}{2}$l r
7	Major Sector		$(\frac{360-\theta}{360})2\pi r + 2r$	$\frac{(360-\theta)^0}{360}\ \pi r^2$
8	Segment of a circle		$\frac{\theta}{180}\ \pi r + 2r\ sin\frac{\theta}{2}$	$(\frac{\theta}{360}\ \pi r^2) - (\frac{1}{2}\ r^2 sin\ \theta)$
9	Area of major segment = Area of a circle – Area of minor segment			
10	Number of rotations made by the wheel of a car = $\frac{Distance\ travelled\ by\ the\ car}{Circumference\ of\ the\ wheel}$			
11	1 km/hr = $\frac{1000}{3600}\ =\ \frac{5}{18}\ m/s$			
12	1 km = 1000 m and 1 hr = 3600 sec			
13	Minute hand : 60 minutes = $360^0 \implies 1\ minute = 6^0$ and Hour hand : 12 hours = $360^0 \implies$ 720 minutes = $360^0 \implies$ 1 minute = $(\frac{1}{2})^0$ = half degree			

NOTE :- In the following figure, if $\theta = 60^0$, then the ΔOAB is equilateral and AB = r

If $\theta = 90^0$ then the sector OAPB is a quadrant and ΔOAB is a right triangle.



MULTIPLE CHOICE QUESTIONS (1 Mark Each)

Q1. What is the area of a semi-circle of diameter 'd'?

(a) $\frac{1}{16}\pi d^2$ (b) $\frac{1}{4}\pi d^2$ (c) $\frac{1}{8}\pi d^2$ (d) $\frac{1}{2}\pi d^2$

Ans: (c) $\frac{1}{8}\pi d^2$

Q2. The area swept by 7 cm long minute hand of a clock in 10 minutes is

(a) $77cm^2$ (b) $12\frac{5}{6}\ cm^2$ (c) $7\frac{1}{12}\ cm^2$ (d) $25\frac{2}{3}\ cm^2$.

Ans: (d) $25\frac{2}{3}\ cm^2$.

Q3. The area of the circle that can be inscribed in a square of 6 cm is

(a) 36л cm² (b) 18л cm² (c) 12π cm² (d) 9 π cm²

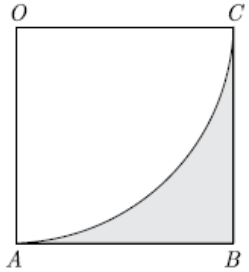
Ans: (d) 9 π cm²

Q4. The number of revolutions made by a circular wheel of radius 0.25m in rolling a distance of 11km is –

(a) 2800 (b) 4000 (c) 5500 (d) 7000 .

Ans: (d) 7000 .

Q5. In the adjoining figure, *OABC* is a square of side 7 cm. *OAC* is a quadrant of a circle with *O* as centre. The area of the shaded region is.



(a) 10.5 cm^2 (b) 38.5cm^2 (c) 49 cm^2 (d) 11.5 cm^2

Ans: (a) 10.5 cm^2

Q6. . If the perimeter of a semi-circular protractor is 36 cm. then its diameter is

(a) 10 cm (b) 14 cm (c) 12 cm (d) 16 cm

Ans: (b) 14 cm

Q7. The radius of a circle whose circumference is equal to the sum of the circumferences of the two circles of diameters 36cm and 20 cm is

(A) 56 cm (B) 42 cm (C) 28 cm (D) 16 cm

Ans: (C) 28 cm

Q8. If the perimeter of a circle is equal to that of a square, then the ratio of their areas is

(a) 22:7 (b) 14:11 (c) 7:22 (d) 11:14.

Ans: (b) 14:11

Q9. In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option:

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)
b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A)
c. Assertion (A) is true but Reason (R) is false
d. Assertion (A) is false but Reason (R) is true.

Assertion (A): The length of the minute hand of a clock is 7 cm. Then the area swept by the minute hand in 5 min is $12\frac{5}{6}$ cm^2.

Reason (R): The length of an arc of a sector of angle θ and radius r is given by $l = \frac{\theta}{360^\circ} \times 2\pi r$.

Ans: (b) Assertion (A): Area swept by minute hand in 5 min.
So, Assertion (A) is true.
Reason (R): It is also a true statement. Hence, both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q10. Assertion (A): A sector is cut from a circle of radius 42 cm. The central angle of the sector is 150°. The perimeter of the sector is 194 cm.
Reason (R): Perimeter of sector = 2 (radius) + Length of corresponding arc of sector.
Answer : (a) Assertion (A): We have, radius of circle, r = 42 cm
Central angle θ = 150°

$$\therefore \text{Perimeter of sector} = 2r + \frac{\theta}{360^\circ} \times 2\pi r$$

$$= 2 \times 42 + \frac{150^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 42$$

$$= 84 + 110 = 194 \text{ cm}$$

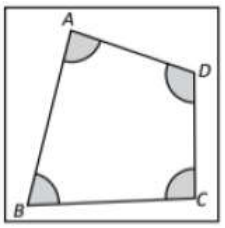
So, Assertion (A) is true.
Reason (R): It is also true statement. Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

VERY SHORT ANSWER TYPE QUESTIONS (2 Marks Each)

Q11. The length of the minute hand of a clock is 6 cm. Find the area swept by it when it moves from 7:05 p.m. to 7:40 p.m.
Ans11.
We know that, in 60 minutes, the tip of minute hand moves 360°. In 1 minute, it will move = 360°/60 = 6°
From 7:05 pm to 7:40 pm i.e. 35 min, it will move through = 35 × 6° = 210°

$$= \frac{210^\circ}{360^\circ} \times \pi \times 6^2 = \frac{7}{12} \times \frac{22}{7} \times 6 \times 6 = 66 \text{ cm}^2$$

Q12. In the given figure, arcs have been drawn of radius 7 cm each with vertices A, B, C and D of quadrilateral ABCD as centres. Find the area of the shaded region.



Ans12:
Here radius (r) = 7cm
Sum of angle of quadrilateral = $360°$
:- Area of sector of circle: $\pi r^2 = \frac{22}{7} \text{x} 7^2 = 154\ cm^2$

Q13. An umbrella has 8 ribs which are equally spaced (see figure). Assuming umbrella to be a flat circle of radius 45 cm, Find the area between the two consecutive ribs of the umbrella.

Ans: Area =792 cm^2

Q14. In fig. arcs are drawn by taking vertices *A*,*B* and *C* of an equilateral triangle of side 10 cm, to intersect the side *BC* , *CA* and *AB* at their respective mid-points *D*,*E* and *F* . Find the area of the shaded region. (Useπ= 3.14)
Ans:14

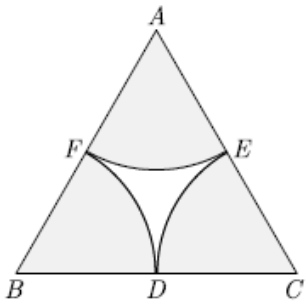
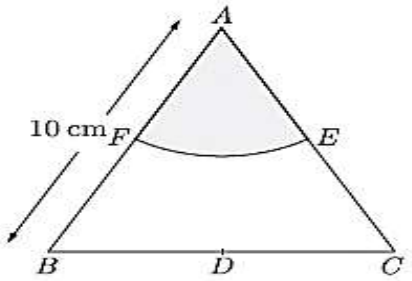


Figure given below shows the single sector.



Since ΔABC is an equilateral triangle

$$\angle A = \angle B = \angle C = 60^\circ$$

Here we have 3 sector and area of all three sector is equal.

Area of sector $AFEA$,

$$\text{Area}_{AFEA} = \frac{\theta}{360^\circ} \times \pi r^2$$

$$= \frac{60^\circ}{360^\circ} \times \pi (5)^2 = \frac{25}{6}\pi \text{ cm}^2$$

Thus total area of shaded region

$$\text{Area} = 3\left(\frac{25}{6}\pi\right) = \frac{25 \times 3.14}{2}$$

$$= 39.25\ cm^2$$

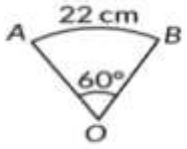
Q15. A piece of wire 22 cm long is bent into the form an arc of a circle subtending an angle of 60° at its centre. Find the radius of the circle. Use $\Pi = \frac{22}{7}$.

Ans: Let AB be the wire of length 22 cm in the form of an arc of a circle subtending an $\angle AOB = 60°$ at centre O.

$\because$ Length of arc $= 2\pi r\left(\frac{\theta}{360^\circ}\right)$

$\Rightarrow \quad 22 = 2 \times \frac{22}{7} \times r\left(\frac{60^\circ}{360^\circ}\right) \Rightarrow r = \frac{7 \times 6}{2} = 21 \text{ cm}$

Hence, radius of the circle is 21 cm.



SHORT ANSWER TYPE QUESTIONS (3Marks Each)

Q16. A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle 120°. Find the total area cleaned at each. Use $\Pi = \frac{22}{7}$.

Ans: Here radius (r) = 21 cm

Sector angle (0) = 120°

:- Area cleaned by each sweep of the blades.

$$= \left[\frac{\theta}{360^\circ} \times \pi r^2\right] \times 2 \ (\because \text{there are 2 blades})$$

$$= \left[\frac{120^\circ}{360^\circ} \times \frac{22}{7} \times 21 \times 21\right] \times 2 = 22 \times 7 \times 3 \times 2 \text{ cm}^2 = 924 \text{ cm}^2$$

Q17. In the given figure, three sectors of a circle of radius 7 cm, making angles of60°, 80° and 40° at the centre are shaded. Find the area of the shaded region.

Ans:

Radius (r) of circle = 7 cm

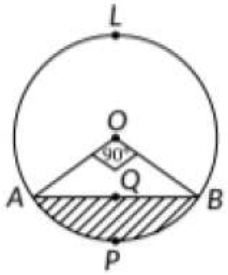
$$\text{Area of shaded region} = \frac{\pi(7)^2 \cdot 40^\circ}{360^\circ} + \frac{\pi(7)^2 \cdot 60^\circ}{360^\circ} + \frac{\pi(7)^2 \cdot 80^\circ}{360^\circ}$$

$$\left[\because \text{Area of sector} = \frac{\theta}{360^\circ}\pi r^2\right]$$

$$= \frac{\pi(7)^2}{9} + \frac{\pi(7)^2}{6} + \frac{\pi(7)^2 \cdot 2}{9} = \pi(7)^2\left[\frac{1}{9} + \frac{1}{6} + \frac{2}{9}\right]$$

$$= \frac{22}{7} \times 7 \times 7 \times \frac{9}{18} = 77\ \text{cm}^2$$

Q18.In the given figure, AB is a chord of a circle, with centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment AQBP. Hence, find the area of major segment ALBQA.



Ans:

We have, radius (r) = 10 cm and $\theta = 90^\circ$

So, area of sector $OAPB = \frac{\theta}{360^\circ}\pi r^2$

$$= \frac{90^\circ}{360^\circ} \times 3.14 \times 10^2 = 78.5\ \text{cm}^2$$

Area of $\Delta OAB = \frac{1}{2} \times 10 \times 10 = 50\ \text{cm}^2$

∴ Area of the minor segment $AQBP$ = Area of sector $OAPB$ − Area of ΔOAB = (78.5 − 50) cm = 28.5 cm^2

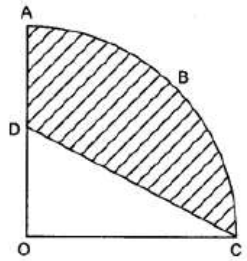
Area of circle = $\pi r^2 = 3.14 \times 10^2 = 314\ \text{cm}^2$

∴ Area of major segment $ALBQA$

= Area of circle − Area of minor segment $AQBP$

= (314 − 28.5) cm^2 = 285.5 cm^2

Q19. In figure, OABC is a quadrant of a circle of radius 7 cm. If OD = 4 cm, find the area of the shaded region.



Ans:

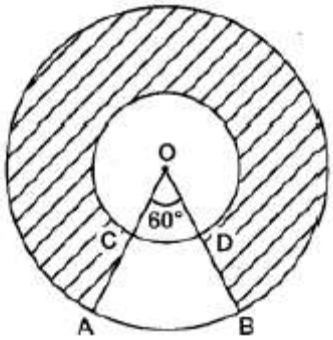
Area of the shaded region

= Area of the quadrant – area of the triangle DOC.

$= \left[\frac{90°}{360°} \times \pi(7)^2 - \frac{1}{2} \times 4 \times 7\right] \text{cm}^2 = \left[\frac{1}{4} \times \frac{22}{7} \times 49 - 14\right] \text{cm}^2$

$= \left(\frac{77}{2} - 14\right) \text{cm}^2 = \frac{49}{2} \text{cm}^2 = 24.5 \text{ cm}^2$

Q20. In figure, two concentric circles with centre O, have radii 21 cm and 42 cm. If $\angle AOB$ = 60°, find the area of the shaded region.



Area of larger circle $= \pi(42)^2$

Area of smaller circle $= \pi(21)^2$

Area of CDBA = Area of sector OAB – Area of sector OCD

$= \frac{60}{360} \times (42)^2 - \frac{60}{360} \times \pi \times (21)^2$

$= \frac{\pi}{6}[(42)^2 - (21)^2]$

Area of the shaded region = Area of larger circle – Area smaller circle – Area of CDBA

$= \pi(42)^2 - \pi(21)^2 - \frac{\pi}{6}[(42)^2 - 21)^2]$

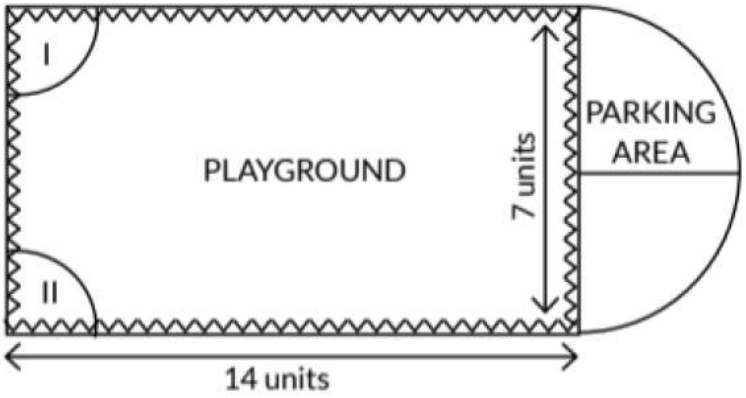
$= \pi[1764 - 441] - \frac{\pi}{6} \times 1323$

$= 1323\left[\pi - \frac{\pi}{6}\right] = 1323 \times \frac{5\pi}{6}$

$= 1323 \times \frac{22}{7} \times \frac{5}{6} = 3465 \text{ cm}^2$

LONG ANSWER TYPE QUESTIONS (5 Marks Each)

Q21. Governing council of a local public development authority of Dehradun decided to build an adventurous playground on the top of a hill, which will have adequate space for parking.



After survey, it was decided to build rectangular playground, with a semicircular area allotted for parking at one end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively. There are two quadrants of radius 2 units on one side for special seats. Based on the above information, answer the following questions:

(i) What is the total perimeter of the parking area?

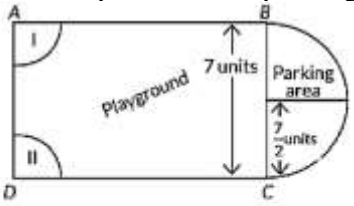
(ii) What is the total area of parking and the two quadrants?

OR

What is the ratio of area of playground to the area of parking area?

(iii) Find the cost of fencing the playground and parking area at the rate of 2 per unit.

Ans: (i) Length of play ground, AB = 14 units, Breadth of play ground, AD = 7 units
Radius of semi-circular part is 7/2 units Total perimeter of parking area = πr+2r



$$=\frac{22}{7}\times\frac{7}{2}+2\times\frac{7}{2}=11+7=18\text{ units}$$

(ii) (a): Area of parking $=\frac{\pi r^2}{2}$

$$=\frac{1}{2}\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}$$

= 19.25 sq. units

Area of two quadrants (I) and (II) $=2\times\frac{1}{4}\times\pi r^2$

$$=\frac{1}{2}\times\frac{22}{7}\times2\times2$$

= 6.29 sq. units.

Total area of parking and two quadrant

= 19.25 + 6.29 = 25.54 sq. units

(a) Area of playground = length x breadth = 14x7 = 98 sq. units.

sq. units

$$\text{Area of parking}=\frac{1}{2}\pi r^2=\frac{1}{2}\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}$$

$$\text{Required ratio}=\frac{98}{\frac{1}{2}\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}}=\frac{98\times4}{77}=\frac{56}{11}=56:11$$

(iii) Perimeter of parking area = 18 units.
So, the cost of fencing the parking area = (18 x 2)=36
Length of remaining three sides of playground

= 14+14+7=35 units
Now, the cost of fencing three sides = √2 × 35 = *70
Total cost = 36+ 70 = 106.

Q22. A chord of a circle of radius 14 cm subtends an angle of 60° at the centre. Find the area of the corresponding minor segment of the circle. Also find the area of the major segment of the circle. (2023)

Here, radius (r) = 14 cm and
Sector angle (θ) = 60°
$\therefore$ Area of the sector

$$= \frac{\theta}{360^\circ} \times \pi r^2 = \left(\frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 14 \times 14\right) \text{cm}^2$$

$$= 102.67 \text{ cm}^2$$

Since $\angle O = 60^\circ$ and $OA = OB = 14$ cm
$\therefore$ AOB is an equilateral triangle.
$\Rightarrow$ $AB = 14$ cm and $\angle A = 60^\circ$
Draw $OM \perp AB$,
In ΔAMO

$$\frac{OM}{OA} = \sin 60^\circ = \frac{\sqrt{3}}{2} \Rightarrow OM = OA \times \frac{\sqrt{3}}{2} = \frac{14\sqrt{3}}{2} \text{cm} = 7\sqrt{3} \text{ cm}$$

Now, $ar(\Delta AOB) = \frac{1}{2} \times AB \times OM$

$$= \frac{1}{2} \times 14 \times 7\sqrt{3} \text{ cm}^2 = 49\sqrt{3} \text{ cm}^2$$

$$= 49 \times 1.732 \text{ cm}^2 = 84.87 \text{ cm}^2$$

Now, area of the minor segment
= (Area of minor sector) – (ar ΔAOB)
= 102.67 – 84.87 cm^2 = 17.8 cm^2
Area of the major segment
= Area of the circle – Area of the minor segment
= (πr^2 – 17·8)

$$= \left[\left(\frac{22}{7} \times 14 \times 14\right) - 17.8\right] \text{cm}^2$$

= (616 – 17.8) cm^2 = 598.2 cm^2

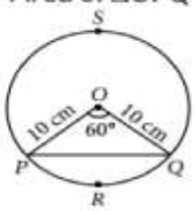
Q23.A chord PQ of a circle of radius 10 cm subtends an angle of 60° at the centre of circle. Find the area of major and minor segments of the circle. (Delhi2017
We have, radius (r) = 10 cm and 0 = 60°
Area of minor segment PQR = Area of sector OPRQ.

$$= \frac{\theta}{360^\circ} \times \pi r^2 - \frac{1}{2} r^2 \sin\theta$$

$$= \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 10 \times 10 - \frac{1}{2} \times 10 \times 10 \times \sin 60^\circ$$

$$= \frac{1100}{21} - 25\sqrt{3} = 52.38 - 43.3 = 9.08 \text{ cm}^2$$

– Area of ΔOPQ

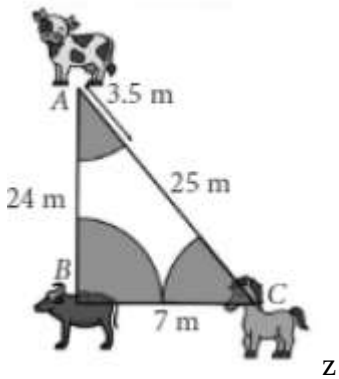


Area of major segment PSQ = Area of circle – Area of minor segment

$$= \pi(10)^2 - 9.08 = 314.28 - 9.08 = 305.2 \text{ cm}^2$$

CASE BASED QUESTIONS

Q24. Gayatri have a triangular shaped grass field .At the three corners of the field ,a cow a buffalo and a horse are tied separetely to the pegs by means of ropes of 3.5 m each to graze in the field ,as shown in the figure .Sides of the triangular field are 25m,24mm and 7 m. Base on the above information ,answer the following questions.



z

Q1.Area of the Triangular field ?

(a) $82m^2$ (b) $84m^2$ (c) $86m^2$ (d) $88m^2$

Ans: (b) $84m^2$

Q2.Total area grazed by the cow, the buffalo and the horse is

(a) $16.25m^2$ (b) 17.3 cm^2 (c) $18.25m^2$ (d) $19.25m^2$.

Ans: $19.25m^2$

Q3.Find the area of the field that can not be grazed?

(b) $60.75m^2$ (b) $64.75m^2$ (c) $68m^2$ (d) $69.75m^2$

Ans: (b) $64.75m^2$

Q25. A car has two wipers which do not overlap. Each wiper has a blade of length 42 cm sweeping through an angle of 120°. Find the total area cleaned at each sweep of the blades..

Ans:25 :

Clearly, each wiper sweeps a sector of a circle of radius 21 cm, making an angle of 120∘ at the centre of the circle.

So, the required the area swept by two wipers

$(2\times\pi r2\theta 360)=(2\times227\times21\times21\times120360)cm2$

$=924cm2$

Q26.A horse is grazing in a field. It is tied to a pole with a rope of length 6 m. The horse moves from point A to point B making an arch with an angle of 70°. Find the area of the sector grazed by the horse.

Ans: A horse is grazing in a field. It is tied to a pole with a rope of a length of 6 m.

The horse moves from point A to point B making an arch with an angle of 70°.

Concept used:

Area of a sector of a circle = $\pi R^2 \times \theta/360$ (R = Radius and θ = Angle obtain by the sector)

Calculation:

The area of the sector grazed by the horse

$\Rightarrow \pi \times 6^2 \times 70/360$

$\Rightarrow 22/7 \times 62 \times 70/360$

$\Rightarrow 22\ m^2$

∴ The area of the sector grazed by the horse is 22 m^2.

AREAS RELATED TO CIRCLE
WORKSHEET -1

Q.1 If the area of a circle is 154 cm^2, then its perimeter is

(A) 11 cm (B) 22 cm **(**C) 44 cm (D) 55 cm

Q.2 If θ is the angle (in degrees) of a sector of a circle of radius r, then area of the sector is

(A) r2360˚ (B) 2πrθ360˚ (C) 2πrθ180˚ (D)r2180˚

Q.3The area of the circle that can be inscribed in a square of side 6 cm is

(A) 36 π cm^2 (B) 18 π cm^2 (C) 12 π cm^2 (D) 9 π cm^2

Q.4 This question is Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Assertion (A): Area of circle is always greater than its sector.

Reason (R): A sector is part of a circle.

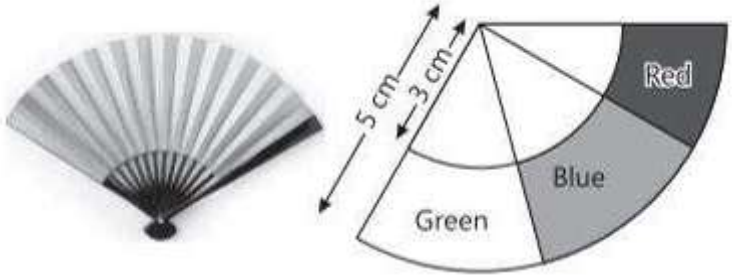
Q.5 A horse is tied to a pole with 28 m long string. Find the area where the horse can graze

Q.6 The circumference of two circles is in the ratio of 2:3. Find the ratio of their areas.

Q.7 An arc of length 20π cm subtends an angle of 144° at the centre of a circle. Find the radius of the circle.

Q.8A sector of a circle of radius 4 cm subtends an angle of 30°. Find the area of the sector.

Q.9 Sara hold a Japanese folding fan in her hand as shown in the figure. It is shaped like a sector of a circle and made of a thin material such as paper or feather. The inner and outer radii are 3 cm and 5 cm respectively. The fan has three colours, i.e., red, blue and green.



Based on the above information, solve the following questions:

(i). If the region containing blue colour makes an angle of 80° at the centre, the area of the region having blue colour is:

a. 9.17 cm^2 b. 10.1 cm^2 c. 11.17 cm^2 d. 13.17 cm^2

(ii). If the region containing green colour makes an angle of 60° at the centre, the area of the region having green colour is:

a. 6.2 cm^2 b. 8.38 cm^2 c. 9.9 cm^2 d. 11.12 cm^2

(iii). If the region containing red colour makes an angle of 20° at the centre, the perimeter of te region containing red colour is:

a. 2.9 cm b. 4.2 cm c. 5.4 cm d. 6.79 cm

Q.10 The area of a circle inscribed in an equilateral triangle is 154 cm^2. Find the perimeter of the triangle.

AREAS RELATED TO CIRCLE
WORKSHEET -2

1. What is the area of a semi-circle of diameter 'd' -

(A) $116\pi d^2$ (B) $14\pi d^2$ (C) $18\pi d^2$ (D) $12\pi d^2$

2. In a right triangle ABC, right-angled at B, BC = 12 cm and AB = 5 cm. The radius of the circle inscribed in the triangle (in cm) is

(A) 3 (B) 4 (C) 2 (D) 1

3. The number of revolutions made by a circular wheel of radius 0.25m in rolling a distance of 11km is –

(A) 2800 (B) 4000 (C) 5500 (D) 7000

Q.4 This question is Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

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(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Assertion (A):If circumference of two circles are in the ratio 4:5 ,then their areas are in the ratio 16:25.

Reason(R): If circumference of two circles are in the ratio C1:C2, then their areas are in the ratio C_1^2: C_2^2.

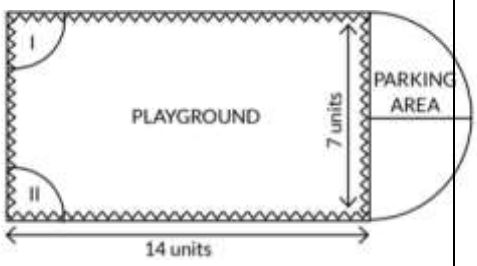
Q.5 A piece of wire 22 cm long is bent into the form of an arc of a circle subtending an angle of 60° at its centre. Find the radius of the circle.

Q.6. The length of the minute hand of a clock is 6 cm. Find the area swept by it when it moves from 7:05 p.m. to 7:40 p.m

Q.7 Find the area of the segment shown in the given figure, if radius of the circle is 21 cm and<AOB = 120°

Q.8 A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle 120°. Find the total area cleaned at each

Q.9 **Case Study:** Governing council of a local public development authority of Dehradun decided to build an adventurous playground on the top of a hill, which will have adequate space for parking.



After survey, it was decided to build rectangular playground, with a semi circular area allotted for parking at one end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively. There are two quadrants of radius 2 units on one side for special seats.

Based on the above information, answer the following questions:

(i) What is the total perimeter of the parking area?

(ii) Find the cost of fencing the playground and parking area at the rate of Rs. 2 per unit

(iii) (a) What is the total area of parking and the two quadrants?

OR

(b) What is the ratio of area of playground to the area of parking area?

Q.10 Achord of a circle of radius 14 cm subtends an angle of 60° at the centre. Find the area of the corresponding minor segment of the circle. Also find the area of the major segment of the circle.

AREAS RELATED TO CIRCLE
WORKSHEET -3

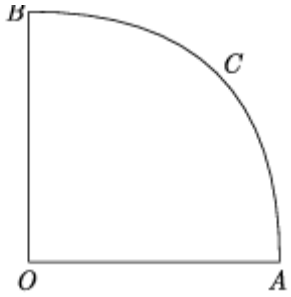
Q.1 The area of a circular ring formed by two concentric circles whose radii are 5.7 cm and 4.3 cm respectively is (Take .π = 3.1416)

(A) 44 sq. cm. (B) 66 sq. cm. (C) 22 sq. cm. (D) 33 sq. cm.

Q.2 If the area of a semi-circular field is 15400 sq m, then perimeter of the field is

(A) 160 2 m (B) 2602 m (C) 3602 m (D) 4602 m

Q.3 In the given figure, OACB is a quadrant of a circle of radius 7 cm. The perimeter of the quadrant is



(A) 11cm (B) 18 cm (C) 25 cm (D) 36 cm

Q.4 This question is Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

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(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

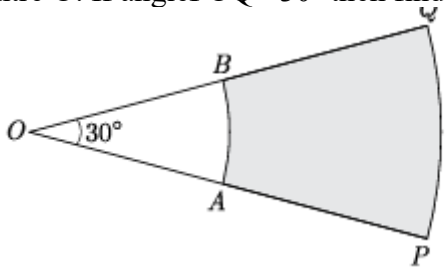
Assertion (A) In a circle of radius 6 cm, the angle of a sector 60°. Then the area of the sector is 187.6 cm ^{2}

Reason (R): Area of the circle with radius r is πr^2.

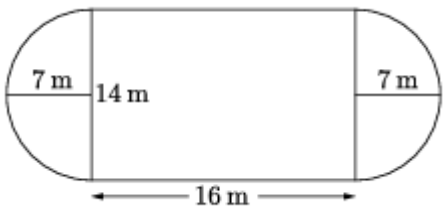
Q.5 Find the area of the sector of a circle of radius 6 cm whose central angle is 30˚. (Take π = 3.14)

Q.6 The diameter of a wheel is 1.26 m. What the distance covered in 500 revolutions

Q.7 In Figure, PQ and AB are two arcs of concentric circles of radii 7 cm and 3.5 cm respectively, with centre O. If anglePOQ =30˚ then find the area of shaded region

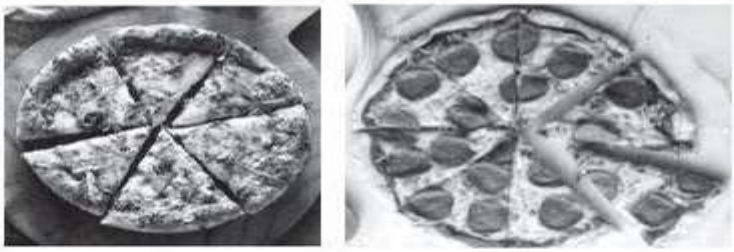


Q.8 Find the area of the adjoining diagram.



Q.9 We all love to eat pizzas, especially kids and a variety of pizzas are available in India which have been modified according to Indian taste and menu. From the Greeks to the

Egyptians, from the Persians to the Indians, there have been incarnations of pizza served throughout history, Flatbreads, naan and plakountos are all early preparations that could be considered cousins to the modern pizza, but there isn't a consensus as to which is first and whether these could even be considered precursors to pizza at all. Consider two pizzas, both of equal diameter, namely, 12 inches. The first pizza marked (I) has been cut into six equal slices, whereas the second pizza, marked (II) has been cut into eight equal slices.



(I) (II)

Based on the above information, solve the following questions:

(i). The area of one slice in pizza, marked (I) is:

a. 6πsq. inches b. 8π sq. inches c. 10π sq. inches d. None of these

(ii). The perimeter of the pizza slice shown in (1) is:

a. (π +12) inch b. (π+10) inch c. (2π+10) inch d. (2π +12) inch

(iii). The ratio of area of slice to the area of remaining pizza in (1) is:

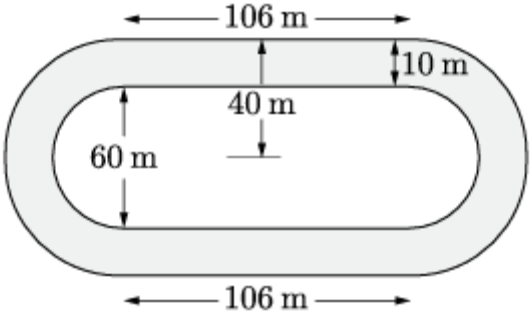
a. 5:1 b. 1:5 c. 2:5 d. 5:3

or

The ratio of areas of each slice of pizza (1) and (II) is:

a. 3:4 b. 5:3 c. 4:3 d. 2:5

Q.10. Fig. depicts a racing track whose left and right ends are semi-circular. The distance between the two inner parallel line segments is 60 m and they are each 106 m long. If the track is 10 m wide everywhere, find the area of the track.



ANSWERS

WORKSHEET-1

Q.1	C) 44 cm	**Q.2**	**A)** r2360˚	**Q.3**	D) 9 π cm^2
Q.4	**B**	**Q.5**	**2264 M^2**	**Q.6**	**4:9**
Q.7	**25 cm**	**Q.8**	**4.19 cm^2**	**Q.9(i)**	c. 11.17 cm^2
Q.9(ii)	**B** 8.38 cm^2	**Q.9(iii)**	d. 6.79 cm	**Q.10**	**126 cm**

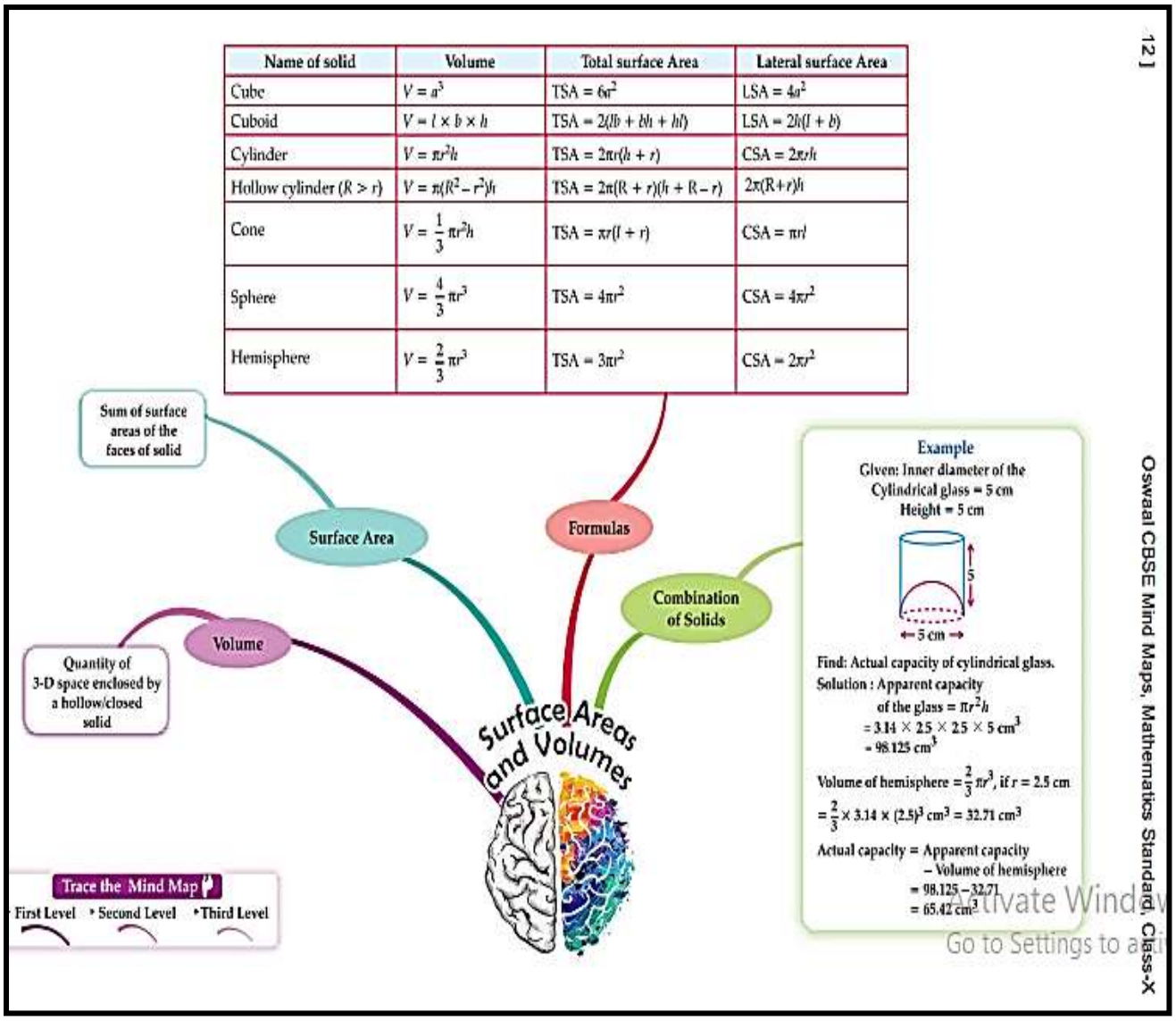
WORKSHEET-2

Q.1	c) $18\pi d^2$	Q.2	(c) 2	Q.3	(d) 7000
Q.4	A	Q.5	6π cm	Q.6	66 m^2
Q.7	462-44143	Q.8	924 cm^2	Q.9(i)	18 units
Q.9(ii)	Rs.106	Q.9(iii)	a)25.54 sq.units b) 56:11	Q.10	17.799 cm^2, 598.201 cm^2

WORKSHEET-3

Q.1	(a) 44 sq. cm	Q.2	(c) 360 2 m	Q.3	(c) 25 cm
Q.4	(B)	Q.5	9.42cm^2	Q.6	1.98 km
Q.7	9.625cm^2	Q.8	378 m^2	Q.9(i)	a. 6πsq. inches
Q.9(ii)	d. (2π +12) inch	Q.9(iii)(a) (b)	b. 1:5 c).4:3	Q.10	3260 m^2

Chapter – 12
SURFACE AREAS AND VOLUMES



Gist of the Chapter

1. To determine the surface area of an object formed by combining any two of the basic solids, namely, cuboid, cone, cylinder, sphere and hemisphere.
2. To find the volume of objects formed by combining any two of a cuboid, cone, cylinder, sphere and hemisphere.
3. When two or more 3-D shapes are combined to form a new solid, then the surface area of the solid formed is the sum of areas of all its visible surfaces.
4. Volume of combination of solids depends on its shape. We add the volumes of the of individual shapes used in the solid or at times we subtract the volume of one solid shape from that of the other.

Formulae:

Name of the solid	CSA	TSA	Volume	Explanation of symbols
Cube	$4l^2$	$6l^2$	l^3	l = length of the side
Cuboid	2h(l+b)	2(lb+bh+hl)	lbh	l = lengh, b = breadth, h = height

Cylinder	$2\pi rh$	$2\pi r(h+r)$	πr^2h	r = radius of the base, h = height
Cone	πrl	$\pi r(l + r)$	$\frac{1}{3}\pi r^2h$	r = radius of the base, h = height, l = slant height = $\sqrt{r^2 + h^2}$
Hemi Sphere	$2\ \pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$	r = radius of hemi sphere
Sphere	$4\pi r^2$		$\frac{4}{3}\pi r^3$	s = radius of the sphere

Multiple Choice Questions (1 Mark Each)

1 A Surahi is the combination of –
(a) a sphere and a cylinder (b) a hemisphere and a cylinder
(c) two hemispheres (d) a cylinder and a cone
Ans. (a) a sphere and a cylinder

2 A cylinder and cone have same base and same height the ratio of their volumes is-
(a) 3:1 (b) 1:3 (c) 2:3 (d) 3:2
Ans. (a) 3:1

3 **If r is the radius of the sphere, then the surface area of the sphere is given by;**
(a) $4\ \pi\ r^2$ (b) $2\ \pi\ r^2$ (c) $\pi\ r^2$ (d) $4/3\ \pi\ r^2$
Ans: (a) $4\ \pi\ r^2$

4 **If we change the shape of an object from a sphere to a cylinder, then the volume of cylinder will**
(a) Increase (b) Decrease (c) Remains unchanged (d) Doubles
Ans: (c) Remains unchanged

5 A solid piece of iron in the form of a cuboid of dimensions 49 cm × 33 cm × 24 cm, is molded to form a solid sphere. The radius of the sphere is
(a) 19 cm (b) 21 cm (c) 23 cm (d) 25 cm
Ans: (b) 21 cm

6 For which of the following solids is the lateral / curved surface area and total surface area the same ?
(a) Cube (b) Cuboid (c) Hemisphere (d) Sphere
Ans. (d) Sphere

7 The volume of cube is 1728 cm^3. The length of its edge is equal to :
(a) 7 cm (b) 12 cm (c)18 cm (d) 19 cm
Ans. (b) 12 cm

8 A sphere has a radius of **3r** cm. What is its volume?
(a) $48\ \pi\ cm^3$ (b) $9\ \pi\ m^3$ (c) $8\ \pi\ cm^3$ (d) $36\ \pi\ cm^3$
Ans. (d) $36\ \pi\ cm^3$

9 **Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:**
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.
ASSERTION (A): If the height of the cone is 5 cm and diameter of the base is 24 cm, then the slant height of the cone is 25 cm.
REASON (R) : If 'r' be the radius and 'h' be the height of the cone, then slant height (l) =$\sqrt{r^2+ h^2}$

Ans: (d)

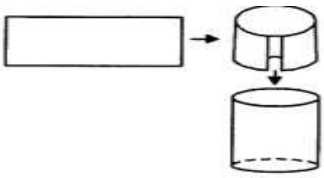
10 **Assertion (A):** Two identical solid cubes of side 5 cm are joined end to end. Then total surface area of the resulting cuboid is 250 cm².
Reason (R): Lateral surface area of a cuboid is 2 (lb + bh +hl)
Ans: (a)

VERY SHORT ANSWER TYPE QUESTIONS (2 Marks Each)

11 A rectangular sheet of paper is 22 cm long and 12 cm wide. A cylinder is formed by rolling the paper along its length. Find the volume of cylinder.
As illustrated in figure length (22 cm) of paper will become circumference of the base of cylinder and breadth of paper will become height of cylinder.

SOLUTION

$2\pi r = 22$ cm $\Rightarrow r = 11/\pi$ cm and $h = 12$ cm



Thus, volume of cylinder = $\pi r^2 h = 22\ 7 \times (11\ \pi)2 \times 12 = 462\ cm^3$

12 A semi-circular sheet of metal of diameter 28cm is bent into an open Find the depth and capacity of cup.

SOLUTION

Given, diameter of a semi-circular sheet = 28 cm
∴ Radius of a semi-circular sheet , r=28/2=14cm
Since, a semi -circular sheet of metal is bent to from an open conical cup.
let the d radius of a conical cup be R.

∴ Circumference of bases of cone = Circumference of semi- circle

$2\pi R = \pi r$

$\Rightarrow \quad 2\pi R = \pi \times 14 \Rightarrow R = 7$cm

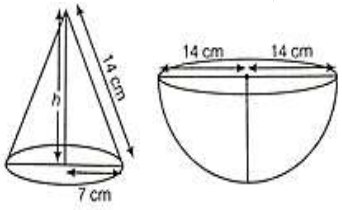
Now, $h = \sqrt{l^2 - R^2} = \sqrt{142 - 72}$

$= \sqrt{} = 196 - 49 = \sqrt{147} = 12.1243$cm

Volume (capacity) of conical cup $= 1/3\ \pi R^2 h$

$= 13 \times 227 \times 7 \times 7 \times 12.1243 = 622.38$cm^3.

Hence, the capacity of an open conical cup is 622.38cm^3.



13 The radius and height of a solid right-circular cone are in the ratio of 5 : 12. If its volume is 314 cm3, find the total surface area. [Take $\pi = 3.14$.]

SOLUTION

The ratio of radius and height of a solid right-circular cone = 5:12.

Let radius(r) = 5x and height (h) = 12x.

Volume = 314 cm^3.

$$\frac{1}{3}\pi r^2 h = 314$$

$$x^3 = \frac{314 \times 3}{3.14 \times 5x5x12}$$

$$x = 1 \text{ cm}$$

So, radius r = 5 cm and height h = 12 cm.

Using Pythagoras Theorem, slant height (l) $= \sqrt{h^2 + r^2}$

$$l = 13 \text{ cm}$$

Total Surface Area of Cone $= \pi r(r + l) = 3.14 \times 5 \times (5 + 13) = 3.14 \times 5 \times 18 = 282.6$ cm^2

14 A solid is in the form of a cylinder with hemi-spherical ends of same radii. The total height of the solid is 20 cm and the diameter of the cylinder is 14 cm. Find the surface area of the solid.

SOLUTION Total height of solid = 20 cm

Diameter = 14 cm → Radius r=7r = 7r=7 cm

Height of two hemispheres = 2×7=142 \times 7 = 142×7=14 cm

Height of cylinder = 20−14=620 - 14 = 620−14=6 cm

Surface Area = CSA of Cylinder + Surface Area of Sphere

CSA of Cylinder = $2\pi rh=2\pi(7)(6)=84\pi$
Surface Area of Sphere = $4\pi r2=4\pi(72)=196\pi$
Total Surface Area = $84\pi+196\pi=280\pi=879.65$ cm^2

15 A juice glass is cylindrical in shape with hemi-spherical raised up portion at the bottom. The inner diameter of glass is 10 cm and its height is 14 cm. Find the capacity of the glass.(use = 3.14)

Radius r=5

SOLUTION

Height of glass = 14 cm
Height of cylindrical part = 14 − 5 = 9 cm
Volume = Volume of Cylinder + Volume of Hemisphere
Volume of cylinder: $\pi r^2h=3.14\times25\times9=706.5$ cm^3
Volume of hemisphere: $2/3\pi r^3=2/3\times3.14\times125=261.67$ cm^3
Total Volume = 706.5 + 261.67 = 968.17 cm^3

SHORT ANSWER TYPE QUESTIONS (3 Marks Each)

16 A solid sphere of radius 9 cm is melted and recast into smaller spheres each of radius 3 cm. Find the number of smaller spheres formed.

SOLUTION **Given:** Radius of large sphere R=9 cm,
Radius of smaller sphere r=3 cm.
Volume of large sphere:
$V=4/3\Pi r^3=4/3\times3.14\times9^3=3052.32$ cm^3
Volume of smaller sphere $v=4/3\pi r^3=4/3\times3.14\times3^3=113.04$ cm^3
Number of smaller spheres = Volume of large sphere/ Volume of smaller sphere
=27

17 A paint roller is a paint application tool used for painting large flat surfaces rapidly and efficiently. One such roller is shown below, which is 26 cm. long with an outer diameter of 7 cm. Find the maximum area of the surface that gets painted when the roller makes 6 complete rotations vertically..

SOLUTION Length h=26 cm,
Diameter d=7 cm ⇒ Radius r=3.5 cm,
Rotations = 6

Curved surface area (CSA) of roller:

$2\pi rh = 2\times 3.14\times 3.5\times 26 = 571.64 \text{ cm}^2$

Total painted area: $6\times 571.64 == 3429.84 \text{ cm}^2$

18 Find the number of solid spheres each of diameter 6 cm that can be made by melting a solid metal cylinder of height 45 cm and diameter 4 cm.

SOLUTION

Cylinder: height H=45 cm, diameter D=4 cm ⇒ radius R=2 cm

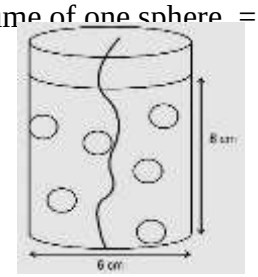
Small sphere: diameter = 6 cm ⇒ radius r=3 cm

Volume of cylinder: $\pi R^2H = 3.14\times 2^2\times 45 = 565.2 \text{ cm}^3$

Volume of one sphere: $4/3\pi r^3 = 4/3\times 3.14\times 3^3 = 113.04 \text{ cm}^3$

Number of spheres: Volume of cylinder/ Volume of one sphere = 5

19 6 spherical glitter balls with diameter 1 cm are present in a cylindrical candle made with transparent wax as shown in the figure below. (Note: The figure is not to scale.) Find the volume of wax used to make the candle.



SOLUTION

Height of candle = 8 cm

Diameter = 6 cm ⇒ Radius R=3R = 3R=3 cm

6 spherical glitter balls, each of diameter = 1 cm ⇒ Radius r=0.5 cm

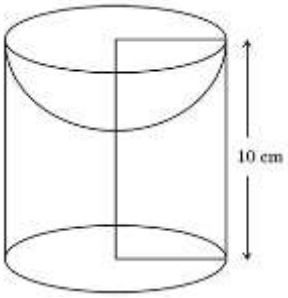
Volume of cylinder: Volume of cylinder:

$\pi R^2H = 3.14\times 3^2\times 8 = 226.08 \text{ cm}^3$

Volume of 6 spheres: $6\times 4/3\pi r^3 = 6\times 4/ 3\times 3.14\times (0.5)^3 = 3.14 \text{ cm}^3$

Volume of wax: $226.08 - 3.14 = 222.94 \text{ cm}^3$

20 A wooden article was made by scooping out a hemisphere (of same diameter) from one end of a solid cylinder as shown in the given figure. If the height of the cylinder is 10 cm and the diameter of the cylinder is 14 cm, find the total surface area of the remaining wooden article.



SOLUTION

Height of cylinder h=10 cm

Diameter = 14 cm ⇒ Radius r=7 cm

One hemisphere is scooped out from one end.

Total Surface Area = CSA of cylinder + base of cylinder + CSA of hemisphere

CSA of cylinder: $2\pi rh = 2\times 3.14\times 7\times 10 = 439.6 \text{ cm}^2$

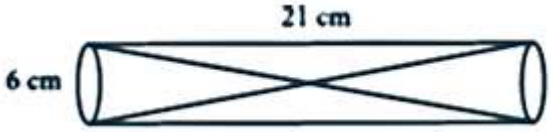
Base of cylinder: $\pi r^2 = 3.14\times 7^2 = 153.86 \text{ cm}^2$

CSA of hemisphere: $2\pi r^2 = 2\times 3.14\times 49 = 307.72 \text{ cm}^2$

Total Surface Area $= 439.6+153.86+307.72 = 901.18 \text{ cm}^2$

LONG ANSWER TYPE QUESTIONS (5 Marks Each)

21 Two solid cones A and B are placed in a cylindrical tube as shown in the Figure. The ratio of their capacities is 2:1. Find the heights and capacities of cones. Also, find the volume of the remaining portion of the cylinder.



Height of cone A = 14 cm

SOLUTION Height of cone B = 21 – 4 = 7 cm
Volume of cone A = 131. 88 cm^3
Volume of cone B = 65. 94 cm^3
Volume of remaining portion = 396.18 cm^3

22 A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top which is open, is 5 cm. It is filled with water upto the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of water flows out. Find the number of lead shots dropped into the vessel.

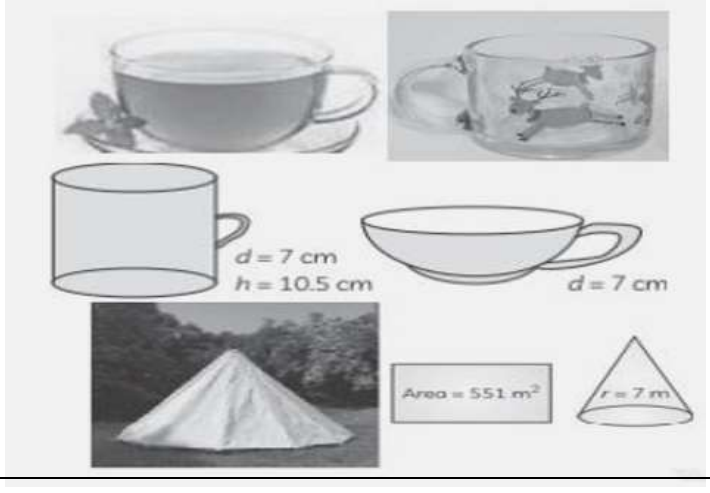
SOLUTION Height of cone h = 8 cm, radius R = 5 cm
Each lead shot is a sphere of radius r = 0.5 cm
One-fourth of water overflow
Volume of cone = $1/3\pi r^2h$
$= 1/ 3\times3.14\times25\times8$
$= 209.33\ cm^3$
Volume of water overflowed = $1/4\times209.33$
$= 52.33\ cm^3$
Volume of one lead shot = $4/3\pi r^3$
$= 43\times3.14\times0.125$
$= 0.5233\ cm^3$
Number of lead shots= 52.33/ 0.5233 = 100

23 A toy is in the form of a cone surmounted on a hemisphere. The cone and hemisphere have the same radii. The height of the conical part of the toy is equal to the diameter of its base. If the radius of the conical part is 5 cm, find the volume of the toy.

SOLUTION Radius r = 5 cm
Height of cone h = 2r = 10 cm
Volume of cone = $1/3\pi r^2h$
$=1/3\times3.14\times5^2\times10$
$=261.67\ cm^3$
Volume of hemisphere = $2/3\pi r^3$
$=2/3\times3.14\times125$
$= 261.67\ cm^3$
Total volume = 261.67 + 261.67 = 523.34 cm^3

CASE BASED QUESTIONS (4 Marks Each)

24 **Read the passage and Answer the following questions**.
Adventure camps are the perfect place for the children to practice decision making for themselves without parents and teachers guiding their every move. Some students of a school reached for adventure at Sakleshpur. At the camp, the waiters served some students with a welcome drink in a cylindrical glass and some students in a hemispherical cup whose dimensions are in the figure.



After that they went for a jungle trek. The jungle trek was enjoyable but tiring. As dusk fell, it was time to take shelter. Each group of four students was given a canvas of area 551 m^2. Each group had to make a conical tent to accommodate all the four students. Assuming that all the wasting incurred while cutting and stitching, would amount to 1 m^2, the students put the tents. The radius of the tent is 7m.

(i) What is the volume of cylindrical cup**?**

(ii) What is the volume of hemispherical cup?

(iii) How much space on the ground is occupied by each student in the conical tent?

SOLUTION

(i) Volume of cylindrical cup = $\pi r^2 h$ = 22 /7 x 7/ 2 x 7/ 2 x 10.5 = 404.25 cm^3

(ii) Volume of cylindrical cup = 2 /3 πr^3 = 2 /3 x 22/ 7 x 7/ 2 x 7/ 2 x 7/ 2

$$= \frac{11 \times 49}{6} = 89.83 \text{ cm}^3$$

(iii) Given that the canvas area = 551 m^2

Wastage of canvas = 1 m^2

Net canvas used for making the tent = original area of canvas – wastage = 551 – 1 = 550 m^2

Since this canvas is used to make the conical tent,

The curved surface area of a conical tent is = πrl = 22/ 7 x 7 x l

550 = 22/ 7 x 7 x l,

l = 25 m,

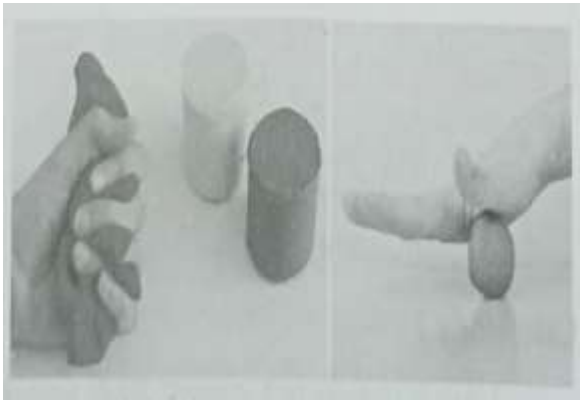
h = $\sqrt{l^2 - r^2}$ = $\sqrt{25^2 - 7^2}$ = $\sqrt{576}$ = 24 m

Ground space by each student in conical tent:

Ground space of the conical tent = area of the base of tent = πr^2 = 22/ 7 x 7 x 7 = 154 m^2

Since the tent can contain 4 students, hence the ground space will be equally shared by the 4 students. Space covered by each student = 154 4 = 38.5 cm^2

25 To make the learning process more interesting, creative and innovative, Anika's class teacher brings clay in the classroom, to teach the topic - Surface Areas and Volumes. With clay, she forms a cylinder of radius 6 cm and height 8 cm. Then she moulds the cylinder into a sphere and asks some questions to students.



(i) What is the radius of the sphere so formed .

(ii) Find the volume of the sphere so formed.

(iii) Find the ratio of the volume of sphere to the volume of cylinder total surface area of cylinder.

SOLUTION

(i) Volume of cylinder = Volume of sphere

$\pi r^2 h = 4/3\pi R^3$

$\pi(6)^2(8) = 4/3\pi R^3$

$288\pi = 43\pi R^3$

$R^3 = 216$

$\Rightarrow R = \sqrt[3]{216}$

= 6cm.

(ii) Volume of the sphere**:** $V = 4/3\pi R^3 = 4/3\pi(6)^3 = 4/3\pi \cdot 216 = 288\pi$

(iii) TSA of cylinder = $2\pi r(h+r) = 2\pi \cdot 6 \cdot (8+6) = 168\pi^2$

Ratio:

$$\frac{\text{Volume of sphere}}{\text{TSA of cylinder}} = \frac{288\pi}{168\pi} = \frac{12}{7}$$

WORKSHEET-1
SURFACE AREAS AND VOLUMES

Multiple Choice Questions (1 mark each)

Q1. The total surface area of a cube of side 4 cm is:
A. 64 cm² B. 96 cm² C. 48 cm² D. 384 cm²

Q2. The volume of a cylinder is 616 cm³ and its height is 14 cm. The radius of the base is:
A. 7 cm B. 5 cm C. 6 cm D. 8 cm

Q3. The surface area of a sphere is 5544 cm². Its radius is:
A. 21 cm B. 14 cm C. 28 cm D. 10 cm

Q4.Assertion (A): The volume of a cone is one-third the volume of a cylinder with same base and height.
Reason (R): The volume of cone is given by $13\pi r^2$h, and for cylinder it is πr^2h,
Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

VERY SHORT ANSWER QUESTIONS – (2 MARKS EACH)

Q5. Find the curved surface area of a cone of radius 3.5 cm and slant height 7 cm.
(Use π=22/7)
Q6. A hemisphere has a radius of 7 cm. Find its total surface area. (Use π=22/7)
Q7. A cube has a volume of 512 cm³. Find the side and total surface area of the cube.

SHORT ANSWER QUESTIONS – (3 MARKS EACH)

Q8. A cylindrical water tank has a radius of 1.4 m and height 3 m. Find its curved surface area and total surface area.
(Use π=22/7)
Q9. A solid metallic sphere of radius 4.2 cm is melted and recast into smaller spheres of radius 0.7 cm. How many such spheres can be made?

CASE BASED QUESTION – (4 MARKS)

Q10. *Case Study*: A cone-shaped tent has a radius of 7 m and height 24 m. A group of students wants to paint its outer surface.
Answer the following:
a) What is the slant height of the tent?
b) Find the curved surface area to be painted.
c) If 1 litre of paint covers 10 m², how many litres will be required?
d) What happens to the surface area if the radius is doubled?

LONG ANSWER QUESTION – (5 MARKS)

Q11. A toy is in the shape of a cone mounted on a hemisphere. The height of the toy is 20 cm, and the radius of both the cone and hemisphere is 7 cm.
a) Find the total surface area of the toy.
b) Find the volume of the toy.
(Use π=22/7)

WORKSHEET-2
SURFACE AREA AND VOLUME

Multiple Choice Questions (1 mark each)

Q1. The curved surface area of a right circular cylinder of height 10 cm and radius 7 cm is:
A. 440 cm^2 B. 420 cm^2 C. 480 cm^2 D. 220 cm^2

Q2. A hemisphere has total surface area 462 cm^2. Its radius is:
A. 5 cm B. 7 cm C. 14 cm D. 10 cm

Q3. If the radius of a sphere is doubled, its surface area becomes:
A. 2 times B. 4 times C. 6 times D. 8 times

Q4. Assertion: If the height of a cone is 24 cm and diameter of the base is 14 cm, then the slant height of the cone is 15 cm.
Reason: If r be the radius and h the slant height of the cone, then slant height = $\sqrt{(h^2+r^2)}$
Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

Very Short Answer Questions – (2 marks each)

Q5. Find the total surface area of a cube whose edge is 5 cm.
Q6. A cone has a radius of 3 cm and height 4 cm. Find its curved surface area.
(Use π=22/7)
Q7. A solid metallic cylinder of radius 4 cm and height 10 cm is melted and recast into spheres of radius 2 cm. How many spheres are formed?

Short Answer Questions – (3 marks each)

Q8. A right circular cone has radius 6 cm and height 8 cm. Find its total surface area.
(Use π=3.14)
Q9. A cylinder has a curved surface area of 352 cm^2 and radius 7 cm. Find its height and total surface area.
(Use π=22/7)

Case Based Question – (4 marks)

Q10. *Case Study*: A company is designing a capsule in the shape of a cylinder with hemispherical ends. The radius of the cylinder is 3 cm and its height (excluding hemispheres) is 10 cm.
Answer the following:
a) What is the total length of the capsule?
b) Find the surface area of the capsule.
c) Find the volume of the capsule.
d) What is the effect on volume if the radius is doubled but height remains the same?

Long Answer Question – (5 marks)

Q11. A container is in the shape of a frustum of a cone. The radii of the top and bottom circular ends are 10 cm and 5 cm, respectively, and the height is 6 cm.
a) Find the slant height of the frustum.
b) Find the total surface area of the frustum.
c) Find its volume.
(Use π=22/7)

Worksheet NO 3

Surface Areas and Volumes

Multiple Choice Questions (1 mark each)

9. Q1. The surface area of a sphere with radius 7 cm is:
A. 616 cm^2 B. 308 cm^2 C. 154 cm^2 D. 500 cm^2
10. Q2. The volume of a cube of side 3 cm is:
A. 27 cm^3 B. 18 cm^3 C. 36 cm^3 D. 9 cm^3
11. Q3. Total surface area of a cylinder with radius 3 cm and height 7 cm is:
A. 180 cm^2 B. 188.4 cm^2 C. 200 cm^2 D. 250 cm^2
Q4. Assertion (A): The volume of a cone is one-third the volume of a cylinder with same base and height.
Reason (R): Volume of cone = $(1/3)\pi r^2h$ and volume of cylinder = πr^2h.
Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

Very Short Answer Questions – (2 marks each)

Q5. Find the surface area of a cube whose edge is 6 cm.
Q6. A sphere has radius 14 cm. Find its volume. (Use $\pi = 22/7$)
Q7. A cone has a radius of 3.5 cm and a slant height of 7 cm. Find its curved surface area.

ShortAnswer Questions – (3 marks each)

Q8. A metallic sphere of radius 4.2 cm is melted and recast into smaller spheres of radius 0.7 cm. How many such spheres are formed?
Q9. Find the total surface area and volume of a cylinder with radius 3.5 cm and height 10 cm.

Case-Based Question – (4 marks)

Q10. Case Study: A tent is in the shape of a cylinder surmounted by a cone. The height of the cylindrical part is 3 m and its radius is 7 m. The conical part has a height of 4 m.
Answer the following:
a) What is the total height of the tent?
b) Find the surface area of the tent (excluding base).
c) How much canvas is required for the tent?
d) Which formula is used for the surface area of the cone?

Long Answer Question – (5 marks)

Q11. A toy is in the shape of a cone mounted on a hemisphere. The height of the toy is 15.5 cm and the radius is 3.5 cm. Find the total surface area and volume of the toy. (Use $\pi = 22/7$)

WORKSHEET 4

SURFACE AREA AND VOLUME

Multiple Choice Questions (1 mark each)

1. The shape of an ice-cream cone is a combination of:
(a) Sphere + cylinder (b) Sphere + cone (c) Hemisphere + cylinder (d) Hemisphere + cone

2. If a cone is cut parallel to the base of it by a plane in two parts, then the shape of the top of the cone will be a:
(a) Sphere (b) Cube (c) Cone itself (d) Cylinder

3. If we cut a cone in two parts by a plane parallel to the base, then the bottom part left over is the:
(a) Cone (b) Frustum of cone (c) Sphere (d) Cylinder

4. Assertion: Total surface area of the cylinder having radius of the base 14 cm and height 30 cm is 3872 cm^2.
Reason: If r be the radius and h be the height of the cylinder, then total surface area = $(2\pi rh + 2\pi r^2)$. ANS D
Options:
A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

Very Short Answer Questions – (2 marks each)

5.A tent is of the shape of a right circular cylinder upto a height of 3 metres and then becomes a right circular cone with a maximum height of 13.5 m above the ground. Calculate cost of painting the inner side of the tent at the rate of Rs. 2 per square metre, if radius of base is 14 m.
6. A circus tent is cylindrical upto a height of 3 m and conical above it. If the diameter of the base is 105 m and the slant height of the conical part is 53 m, find the total canvas used in making the tent.
7. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find volume and total surface area of the solid.

Short Answer Questions (3 MARKS EACH)

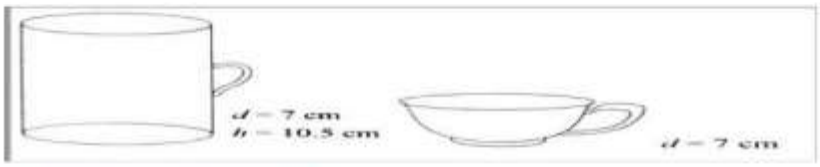
8. A solid toy is in the form of a right circular cylinder with a hemispherical shape at one end and a cone at the other end. Their common diameter is 4.2 cm and the height of the cylindrical and conical portions are 12 cm and 7 cm respectively. Find the volume of the solid toy.

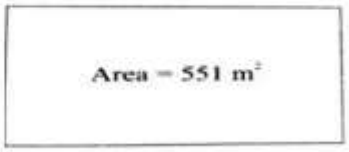
9. A solid is composed of a cylinder with hemispherical ends. It the whole length of the solid is 104 cm and the radius of each of the hemispherical ends is 7 cm, find the cost of polishing its surface at the rate of Rs. 10 per dm2.

LONG ANSWER TYPE (5 MARKS QUESTION)

Q. 10: Selvi's house has an overhead tank in the shape of a cylinder. This is filled by pumping water from a sump (an underground tank) which is in the shape of a cuboid. The sump has dimensions 1.57 m × 1.44 m × 95cm. The overhead tank has a radius of 60 cm and a height of 95 cm. Find the height of the water left in the sump after the overhead tank has been completely filled with water from the sump which had been full. Compare the capacity of the tank with that of the sump. (Use $\pi = 3.14$)

CASE BASED QUESTION (4 MARKS QUESTION)





Q.11.Answer the given questions

1. Find t**he volume of cylindrical cup**

2. Find t**he volume of hemispherical cup**

3. Which container had more juice and by how much?

4. What is t**he height of the conical tent prepared to accommodate four students**

5. How much space on the ground is occupied by each student in the conical tent

WORKSHEET 5

SURFACE AREA AND VOLUME

Multiple Choice Questions (1 mark each)

1. If r is the radius of the sphere, then the surface area of the sphere is given by;

(a) $4 \pi r^2$ (b) $2 \pi r^2$ (c) πr^2 (d) $4/3 \pi r^2$

2. If we change the shape of an object from a sphere to a cylinder, then the volume of cylinder will

(a) Increase (b) Decrease (c) Remains unchanged (d) Doubles

3. Fifteen solid spheres are made by melting a solid metallic cone of base diameter 2cm and height 15cm. The radius of each sphere is:

(a) ½ (b) ¼ (c) $1/\sqrt{2}$ (d) $1/\sqrt{4}$

4 . **Assertion:** Total surface area of the cylinder having radius of the base 14 cm and height 30 cm is 3872 cm^2.

Reason: If r be the radius and h be the height of the cylinder, then total surface area = $(2\pi rh + 2\pi r^2)$. ANS A

Options:

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Very Short Answer Questions – (2 marks each)

5. A cylindrical tub of radius 5 cm and length 9.8 cm is full of water. A solid in the form of a right circular cone mounted on a hemisphere is 3.5 cm and height of the cone outside the hemisphere is 5 cm, find the volume of the water left in the tub.

6. A toy is in the shape of a right circular cylinder with a hemisphere on one end and a cone on the other. The radius and height of the cylindrical part are 5 cm and 13 cm respectively. The radii of the hemispherical and conical parts are the same as that of the cylindrical parts. Find the surface area of the toy if the total height of the toy is 30 cm.

7. A cylindrical container of radius 6 cm and height 15 cm is filled with ice- cream. The whole icecream has to be distributed to 10 children in equal cones with hemispherical tops. If the height of the conical portion is four times the radius of its base, find the radius of the ice-cream cone.

Short Answer Questions – (3 marks each)

8. A building is in the form of a cylinder surmounted by a hemispherical vaulted dome and contains 19 3 41 cm 21 of air. If the internal diameter of the building is equal to the total height above the floor, find the height of the building.

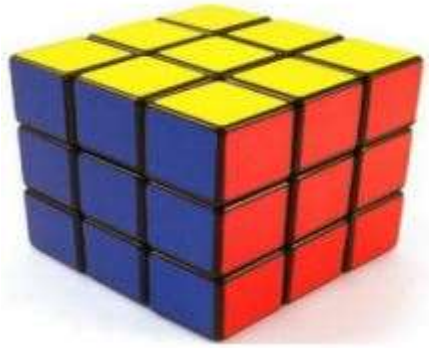
9. An iron pillar has some part in the form of a right circular cylinder and the remaining in the form of a right circular cone. The radius of the base of each of the cone and the cylinder is 8 cm, the cylindrical part is 240 cm high and conical part is 36 cm high. Find the weight of the pillar, if 1 cm3. of iron weighs 10 grams.

Long Answer Questions – (5 marks)

Q. 10: Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively, are melted to form a single solid sphere. Find the radius of the resulting sphere.

Case Based Question(4 MARKS)

Q.11 .On a Sunday, your Parents took you to a fair. You could see lot of toys displayed, and you wanted them to buy a RUBIK's cube and strawberry ice-cream for you. Observe the figures and answer the questions:-



1. Find t**he length of the diagonal if each edge measures 6cm**

2. Find the v**olume of the solid figure if the length of the edge is 7cm**

3. What is the curved surface area of hemisphere (ice cream) if the base radius is 7cm?

4. Find the **Slant height of a cone if the radius is 7cm and the height is 24 cm**

5. Find t**he total surface area of cone with hemispherical ice cream is**

WORKESEET-1 ANSWER KEY : MCQ

1. B. 96 cm^2 2. A. 7 cm 3. A. 21 cm
Assertion-Reason 4. A. Both A and R are true and R is the correct explanation of A.
5. CSA = $\pi rl = (22/7) \times 3.5 \times 7 = 77\ cm^2$
6. TSA = $3\pi r^2 = 3 \times (22/7) \times 7^2 = 462\ cm^2$
7. Side = $\sqrt[3]{512} = 8$ cm; TSA = $6 \times 8^2 = 384\ cm^2$
Section D: Long Answer (3 marks) 8. CSA = $2\pi rh = (22/7) \times 2.8 \times 6 = 52.8\ m^2$,
TSA = $2\pi r(h + r) = 79.2\ m^2$
9. Volume of big sphere = $(4/3)\pi r^3 = (4/3)(22/7)(4.2)^3 = 310.464\ cm^3$
Volume of small sphere = $(4/3)(22/7)(0.7)^3 = 1.436\ cm^3$
Number = $310.464 \div 1.436 \approx 216$
Case Based (4 marks) 10. a) $l = \sqrt{(7^2 + 24^2)} = 25$ m
b) CSA = $\pi rl = (22/7) \times 7 \times 25 = 550\ m^2$
c) Paint needed = $550 \div 10 = 55$ litres
d) If r doubles, CSA becomes 4 times
Long Answer (5 marks) 11. Height of cone = 20 – 7 = 13 cm
a) TSA = $\pi r(l + r) = (22/7) \times 7 \times (\sqrt{(13^2 + 7^2)} + 7)$ = approx. 693.5 cm^2
b) Volume = $(1/3)\pi r^2h + (2/3)\pi r^3$ = approx. 1817.5

WORKSHEET 2 ANSWER KEY MCQ

1. B. 440 cm^2 2. B. 7 cm 3. B. 4 times 4 D.
Short Answer (2 marks) 5. TSA = $6 \times 5^2 = 150\ cm^2$
6. Slant height = $\sqrt{(3^2 + 4^2)} = 5$ cm; CSA = $\pi rl = (22/7) \times 3 \times 5 = 47.14\ cm^2$
7. Volume of cylinder = $\pi r^2h = (22/7)(4^2)(10) = 502.86\ cm^3$
Volume of sphere = $(4/3)\pi r^3 = (4/3)(22/7)(2^3) = 33.52\ cm^3$
Number of spheres = $502.86 \div 33.52 \approx 15$
Long Answer (3 marks) 8. $l = \sqrt{(6^2 + 8^2)} = 10$ cm
CSA = $\pi rl = (22/7)(6)(10) = 188.57\ cm^2$
Base area = $\pi r^2 = (22/7)(36) = 113.14$
TSA = CSA + base = 301.71 cm^2
9. CSA = 352 $cm^2 = 2\pi rh$
→ $h = 352 / (2 \times 22/7 \times 7) = 8$ cm
TSA = $2\pi r(h + r) = 2 \times (22/7) \times 7 \times (8 + 7) = 660\ cm^2$
Case Based (4 marks) 10. a) Total length = 10 + 2×3 = 16 cm
b) SA = CSA of cylinder + 2 × SA of hemisphere
= $2\pi rh + 2 \times 2\pi r^2 = 2\pi r(h + 2r) = (2)(22/7)(3)(10 + 6)$ = approx. 301.7 cm^2
c) Volume = $\pi r^2h + (4/3)\pi r^3$ = approx. 452.6 cm^3
d) If radius doubles, volume becomes 8 times
Long Answer (5 marks) 11. Slant height of cone = $\sqrt{(13^2 + 7^2)} = \sqrt{218}$
TSA = $\pi r(l + r) + 2\pi r^2$ = approx. 693.5 cm^2
Volume = $(1/3)\pi r^2h + (2/3)\pi r^3$ = approx. 1817.5 cm^3

WORKSHEET 3 ANSWER KEY

1. A. 616 cm^2 2. A. 27 cm^3 3. B. 188.4 cm^2 4. A. Both A and R are true and R is the correct explanation of A.
Short Answer (2 marks) 5. TSA = $6 \times 6^2 = 216\ cm^2$
6. Volume = $(4/3)\pi r^3 = (4/3)(22/7)(14^3) = 11494.66\ cm^3$
7. CSA = $\pi rl = (22/7) \times 3.5 \times 7 = 77\ cm^2$
Long Answer (3 marks) 8. Same as before: 4.2 cm to 0.7 cm sphere → 216 spheres
9. TSA = $2\pi r(h + r) = (2)(22/7)(3.5)(10 + 3.5) = 296.38\ cm^2$
Volume = $\pi r^2h = (22/7)(3.5^2)(10) = 384.99\ cm^3$ase-Based (4 marks) 10. a) Total height = 3 + 4 = 7 m

b) SA = CSA of cylinder + CSA of cone
= $2\pi rh + \pi rl = (22/7)(7)(6) + (22/7)(7)(\sqrt{(7^2 + 3^2)})$
= 132 + 154 = approx. 286 m^2
c) Canvas required = 286 m^2
d) Formula: CSA of cone = πrl
Long Answer (5 marks) 11. Height of cone = 15.5 – 3.5 = 12 cm
Slant height = $\sqrt{(12^2 + 3.5^2)}$ = approx. 12.5 cm
TSA = $\pi r(l + r) + 2\pi r^2$ = approx. 301.13 cm^2
Volume = $(1/3)\pi r^2 h + (2/3)\pi r^3$ = approx. 267.6 cm^3

WORKSHEET 4 ANSWER KEY

1. **(d) Hemisphere + cone** 2. **(c) Cone itself** 3. **(b) Frustum of cone**
4.

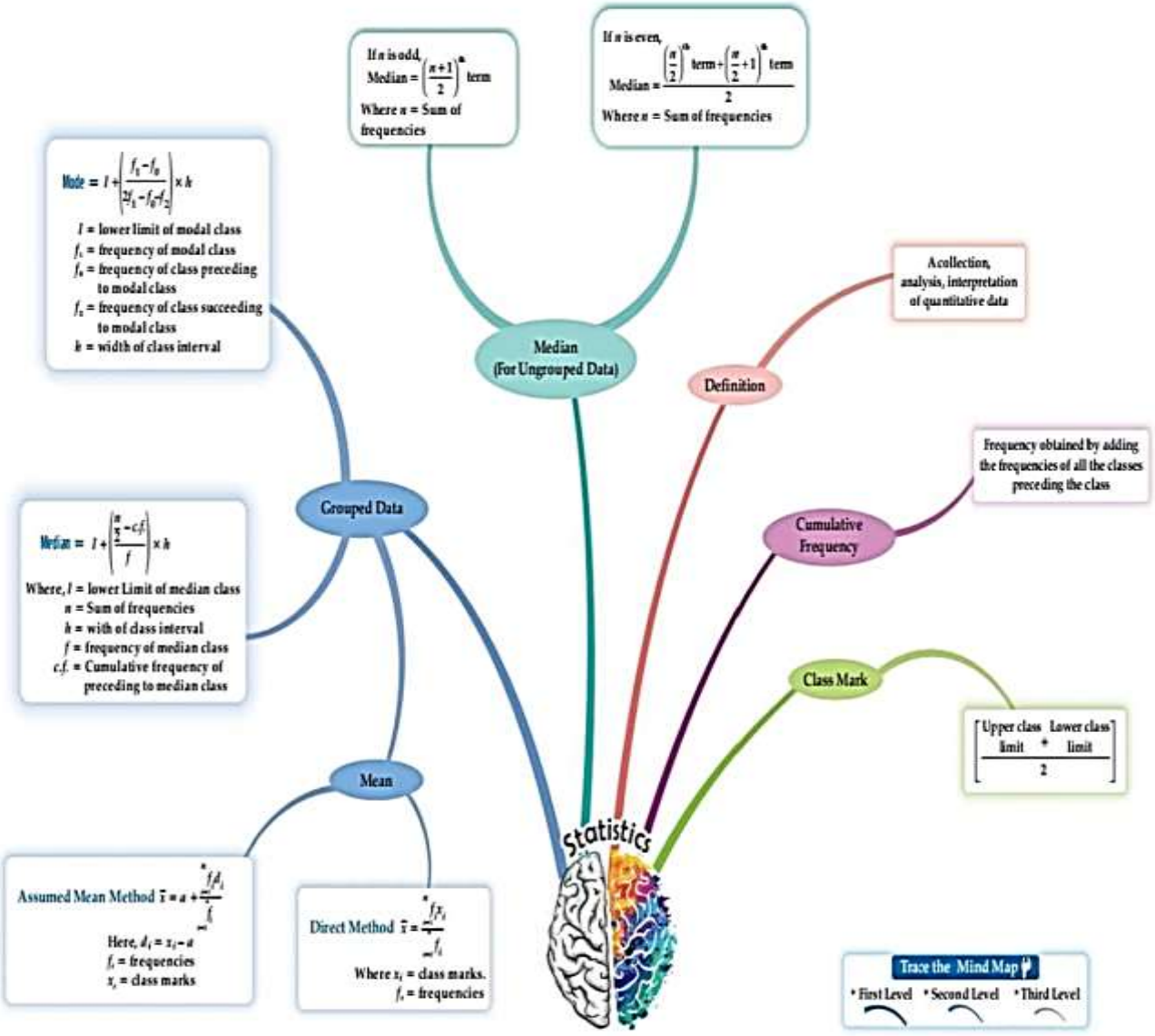
11. (i) 404.25 cm^3 (ii) 89.83 cm^3 (iii) Cylindrical glass, 314.42 cm^3 (iv) 24m (v) 38.5 m^2

WORKSHEET 5 ANSWER KEY

1. (a) $4 \pi r^2$ 2. **(c) Remains unchanged** 3. **(d) 1/√4**

11. (i) $6\sqrt{3}$ (ii) 343 cm3 (iii) 308 cm^2 (iv) 25 cm (v) 858 cm^2

CHAPTER-13
STATISTICS



Key Points

• Statistics – The science of collecting, organizing, presenting, analyzing, and interpreting numerical data.
• Primary Data – Data collected directly by the investigator.
• Secondary Data – Data taken from sources already collected by someone else.
• Ungrouped Data – Raw data that has not been grouped.

• Grouped Data – Data organized into class intervals.
• Class Interval – A group of values between a lower and an upper limit.
• Class Size (h) – The difference between upper and lower limits of a class. Formula: h = Upper limit - Lower limit
• Class Mark – The average of the lower and upper limits of a class.
Formula: x_i = (Lower limit + Upper limit) / 2
• Frequency – Number of observations in a class.

. Mean (for Grouped Data)

✓ Direct Method:
$\bar{x} = \Sigma f_i x_i / \Sigma f_i$

✓ Assumed Mean Method:
$\bar{x} = a + (\Sigma f_i d_i / \Sigma f_i)$, where $d_i = x_i - a$

✓ Step-Deviation Method:
$\bar{x} = a + (\Sigma f_i u_i / \Sigma f_i) \times h$, where $u_i = (x_i - a) / h$

2. Mode (for Grouped Data)

Mode = $l + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$
Where:
l = Lower boundary of modal class
f_1 = Frequency of modal class
f_0 = Frequency of class before modal class
f_2 = Frequency of class after modal class
h = Class width

3. Median (for Grouped Data)

Median = $l + [(N/2 - F) / f] \times h$
Where:
l = Lower boundary of median class
N = Total frequency
F = Cumulative frequency before median class
f = Frequency of median class
h = Class width

MULTIPLE CHOICE QUESTIONS (1X10= 10)

1.Construction of a cumulative frequency table is useful in determining the
(a) mean (b) median (c) mode (d) all the above three measures
Answer: (b) median
2.The empirical relationship between the three measures of central tendency is
(a) 3 Median = Mode + 2 Mean (b) 2 Median = Mode + 2 Mean
(c) 3 Median = Mode + Mean (d) 3 Median = Mode – 2 Mean
Answer: (a) 3 Median = Mode + 2 Mean
3.The _____ of a class is the frequency obtained by adding the frequencies of all the classes preceding the given class.
(a) Class mark (b) Class height (c) Average frequency (d) Cumulative frequency
Answer: (d) Cumulative frequency
4.The method used to find the mean of a given data is(are):
(a) direct method (b) assumed mean method
(c) step deviation method (d) all the above
Answer: (d) all the above
5.The formula to find the median of a set of observations is:
A) $\frac{n+1}{2}$ B) $\frac{n-1}{2}$ C) $\frac{n}{2}$ D) None of the above Answer: A)
6.If mean and median of given set of observations are 10 and 11 respectively, then the value of mode is:
[A]. 10.5 [B]. 8 [C]. 13 [D]. 21
Answer: Option C

7.The cumulative frequency for calculating median is obtained by adding the frequencies of all the

[A]. Classes up to the median class [B]. Classes following the median class

[C]. Classes preceding the median class [D]. All classes

Answer: Option D

8. For a frequency distribution, mean, median and mode are connected by the relation

[A]. Mode = 3 Mean – 2 Median [B]. Mode = 2 Median – 3 Mean

[C]. Mode = 3 Median – 2 Mean [D]. Mode = 3 Median + 2 Mean

Answer: Option C

9.DIRECTIONS:

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(c) If Assertion is correct but Reason is incorrect.

(d) If Assertion is incorrect but Reason is correct.

Assertion: If the value of mode and mean is 60 and 66 respectively, then the value of median is 64.

Reason: Median = (mode + 2 mean)/2 Answer: (c)

10.Assertion: If the number of runs scored by 11 players of a cricket team of India are 5, 19, 42, 11, 50, 30, 21, 0, 52,

36, 27 then median is 30.

Reason: Median = $\frac{n+1}{2}$ if n is odd. Answer: (d)

SHORT ANSWER TYPE QUESTIONS (2X5 MARKS)

11.To find out the concentration of SO_2 in the air (in parts per million, i.e., ppm), the data was collected for 30 localities in a certain city and is presented below:

Concentration of SO_2 (in ppm)	0.00 – 0.04	0.04 – 0.08	0.08 – 0.12	0.12 – 0.16	0.16 – 0.20	0.20 – 0.24
Frequency	4	9	9	2	4	2

Find the mean concentratiof SO_2 in the air.

SOLUTION : The formula to find out the mean is

Mean = $\bar{x}$ = $\frac{\sum fixi}{\sum fi}$

Concentration of SO_2 (in ppm)	Frequency (f_i)	Mid-point (x_i)	f_ix_i
0.00-0.04	4	0.02	0.08
0.04-0.08	9	0.06	0.54
0.08-0.12	9	0.10	0.90
0.12-0.16	2	0.14	0.28
0.16-0.20	4	0.18	0.72
0.20-0.24	2	0.22	0.44
Total	Sum f_i = 30		Sum (f_ix_i) = 2.96

/

Mean = $\bar{x}$ = $\frac{\sum fixi}{\sum fi}$ = 2.96/30 = 0.099 ppm

Therefore, the mean concentration of SO_2 in the air is 0.099 ppm

12. The following data gives the information on the observed lifetimes (in hours) of 225 electrical components:

Determine the modal lifetimes of the components.

Lifetime (in hours)	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	29

Solution:
From the given data the modal class is 60–80.
Lower limit of modal class = l = 60,
The frequencies are:
$f_m = 61$, $f_1 = 52$, $f_2 = 38$ and $h = 20$
Mode = 60 + (45/8) = 60 + 5.625
Therefore, modal lifetime of the components = 65.625 hours.
13 .For the following data, identify the modal class and calculate mode:

Class Interval	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	3	7	12	8

SOLUTION Class Interval Frequency (f_i)
10 – 20 3
20 – 30 7
30 – 40 12 ← Modal Class
40 – 50 8
Formula for Mode (Grouped Data): $\text{Mode} = l + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$
Where:
• l = lower boundary of modal class = 30 • f_1 = frequency of modal class = 12
• f_0 = frequency of class before modal class = 7 • f_2 = frequency of class after modal class = 8
• h = class width = 10
Substitute values:
Mode = 30 + [(12 – 7) / (2×12 – 7 – 8)] × 10
Mode = 30 + (5 / (24 – 7 – 8)) × 10 Mode = 30 + (5 / 9) × 10
Mode = 30 + 5.56 Mode = 35.56
14. Calculate median marks of the following data:

Marks	0 –10	10 – 20	20 – 30	30 – 40	40 – 50
No. of Students	2	12	22	8	6

SOLUTION

Classes	Number of students	c.f.
0 – 10	2	2
10 – 20	12	14
20 – 30	22	36
30 – 40	8	44
40 – 50	6	50

$n = 50, \frac{n}{2} = \frac{50}{2} = 25$, Median Class = 20 – 30

$l = 20, f = 22, c.f. = 14, h = 10$

$$\text{Median} = l + \frac{\left(\frac{n}{2} - c.f.\right)}{f} \times h = 20 + \frac{(25-14)}{22} \times 10 = 20 + \frac{11}{22} \times 10 = 20 + 5 = 25$$

15. Calculate the *median* for the following data:

Class Interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	2	5	8	4	1

SOLUTION:

Classes	Number of students	c.f.
0 – 10	2	2
10 – 20	12	14
20 – 30	22	36
30 – 40	8	44
40 – 50	6	50

$n = 50, \frac{n}{2} = \frac{50}{2} = 25$, Median Class = 20 – 30

$l = 20, f = 22, c.f. = 14, h = 10$

$$\text{Median} = l + \frac{\left(\frac{n}{2} - c.f.\right)}{f} \times h = 20 + \frac{(25-14)}{22} \times 10 = 20 + \frac{11}{22} \times 10 = 20 + 5 = 25$$

SHORT ANSWER TYPE (3X5 MARKS)

16.The median of the following distribution is 35, find the value of a and b.

ClassInterval	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	10	20	*a*	40	*b*	25	15	170

ANS. 25 and 35

17. The mode of the following distribution is 43.75. Find the missing frequency *p*.

ClassInterval	20-30	30-40	40-50	50-60	60-70
Frequency	25	47	62	*p*	10

ANS : 84

18. The table below shows the salaries of 280 persons. Calculate the median

Salary (in thousand Rs.)	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of persons	49	133	63	15	6	7	4	2	1

Answer

Salary (in thousand Rs.)	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of persons	49	133	63	15	6	7	4	2	1
cf	49	182	245	260	266	273	277	279	280

Median salary is Rs.13.42(in thousand)

19.The arithmetic mean of the following frequency distribution is 50.Find the value of p.

Class	0 –20	20 – 40	40 – 60	60 – 80	80 – 100
frequency	17	*p*	32	24	19

Ans:

Class	x_i	Frequency f_i	$f_i x_i$
0 – 20	10	17	170
20 – 40	30	p	$30p$
40 – 60	50	32	1600
60 – 80	70	24	1680
80 – 100	90	19	1710
Total		$\Sigma f_i = 92 + p$	$\Sigma f_i x_i = 5160 + 30p$

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i} \Rightarrow 50 = \frac{5160 + 30p}{92 + p}$$

$$\Rightarrow 50 \times 92 + 50p = 5160 + 30p$$

$$\Rightarrow 50p - 30p = 5160 - 4600$$

$$\Rightarrow 20p = 560 \Rightarrow p = \frac{560}{20} = 28$$

20. The median of the following data is 868.Find the values of x and y, if the total frequency is100

Class	800-820	820-840	840-860	860-880	880-900	900-920	920-940
Frequency	7	14	x	25	y	10	5

Answer:

Step 1: $x + y = 39 \longrightarrow$ *(From total frequency)*

Step 2: Median class is 860 – 880

So, l = 860, h = 20, f = 25, F = 21 + x

Using the formula: Median = l + [(N/2 – F)/f] × h

$868 = 860 + [(50 – (21 + x))/25] \times 20$

$868 = 860 + [(29 – x)/25] \times 20$

$8 = (29 – x)/25 \times 20$

$(29 – x) = 10$

x = 19 , substituting we get y = 20

LONG ANSWER TYPE QUESTIONS (5X3 MARKS)

21.Form a grouped frequency distribution and calculate the median.

Marks	Above 0	Above 10	Above 20	Above 30	Above 40	Above 50	Above 60	Above 70	Above 80	Above 90	Above 100
Number of students	80	76	71	65	57	43	28	15	10	8	0

Answer:

We first convert the given data into grouped frequency distribution and then append a cumulative frequency column as given below.

Marks (x_i)	Number of students (f_i)	Cumulative frequency (c.f.)
0–10	80 – 76 = 4	4
10–20	76 – 71 = 5	9
20–30	71 – 65 = 6	15
30–40	65 – 57 = 8	23
40–50	57 – 43 = 14	37
50–60	43 – 28 = 15	52
60–70	28 – 15 = 13	65
70–80	15 – 10 = 5	70
80–90	10 – 8 = 2	72
90–100	8 – 0 = 8	80
	N = 80	

Here N = 80 ⇒ N/2=80/2 = 40
Cumulative frequency just greater than or equal to 40 is 52 which corresponds to 50 – 60.
Median class = 50-60
The lower limit of the median class (l) – 50
The cumulative frequency of the class preceding the median class (cf) = 37
The frequency of the median class (50 – 60) (f) = 15
The width of the median class (h) = 10
∴ Median = $l + (N/2 - cf)/f \times h$
$= 50 + (\frac{40-37}{15}) \times 10$
$= 50 + 30/15 = 50 + 2 = 52$

22.The following frequency distribution gives the monthly consumption of an electricity of 68 consumers in a locality. Find the median, mean and mode of the data and compare them.

Monthly consumption	65-85	85-105	105-125	125-145	145-165	165-185	185-205
No.of customers	4	5	13	20	14	8	4

Solution:

Class Interval	Frequency	Cumulative frequency
65-85	4	4
85-105	5	9
105-125	13	22
125-145	20	42
145-165	14	56
165-185	8	64
185-205	4	68
	N = 68	

Find the cumulative frequency of the given data as follows:
From the table, it is observed that, N = 68 and hence N/2=34
Hence, the median class is 125-145 with cumulative frequency = 42
Where, l = 125, N = 68, cf = 22, f = 20, h = 20
Median is calculated as follows:
Median=l+N2−cff×h
= 125 + [(34 − 22)/20] × 20 = 125 + 12= 137
Therefore, median = 137
To calculate the mode:

Modal class = 125-145,
f_m or $f_1 = 20$, $f_0 = 13$, $f_2 = 14$ & $h = 20$
Mode formula:
Mode = $l + [(f_1 - f_0)/(2f_1 - f_0 - f_2)] \times h$
Mode = $125 + [(20 - 13)/ (40 - 13 - 14)] \times 20$
$= 125 + (140/13) = 125 + 10.77$
$= 135.77$ Therefore, mode = 135.77

To calculate mean

Class Interval	f_i	x_i	$d_i=x_i-a$	$u_i=d_i/h$	f_iu_i
65-85	4	75	-60	-3	-12
85-105	5	95	-40	-2	-10
105-125	13	115	-20	-1	-13
125-145	20	135 = a	0	0	0
145-165	14	155	20	1	14
165-185	8	175	40	2	16
185-205	4	195	60	3	12
	Sum $f_i = 68$				Sum $f_iu_i = 7$

$\bar{x} = a + h (\sum f_iu_i/\sum f_i) = 135 + 20 (7/68)$
Mean = 137.05
In this case, mean, median and mode are more/less equal in this distribution.
24.If the median of a distribution given below is 28.5, find the value of x & y.

Class Interval	0–10	10–20	20–30	30–40	40–50	50–60	Total
frequency	5	x	20	15	y	5	60

Solution:
Given data, n = 60
Median of the given data = 28.5

CI	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	5	x	20	15	y	5
Cumulative frequency	5	5+x	25+x	40+x	40+x+y	45+x+y

Where, N/2 = 30
Median class is 20 – 30 with a cumulative
frequency = 25 + x
Lower limit of median class, $l = 20$,
$cf = 5 + x$,
$f = 20$ & $h = 10$
Median = $l + (N/2 - cf)/f \times h$
Substitute the values
$28.5 = 20 + [(30 - 5 - x)/20] \times 10$

$8.5 = (25 - x)/2$
$17 = 25 - x$ Therefore, x = 8

25.The lengths of 40 leaves in a plant are measured correctly to the nearest millimeter, and the data obtained is represented as in the following table.Find the median length of the leaves.

Length (in mm)	118-126	127-135	136-144	145-153	154-162	163-171	172-180
Number of leaves	3	5	9	12	5	4	2

(Hint : The data needs to be converted to continuous classes for finding the median, since the formula assumes continuous classes. The classes then change to 117.5 – 126.5, 126.5 – 135.5, . . ., 171.5 – 180.5.)

Solution:
Since the data are not continuous reduce 0.5 in the lower limit and add 0.5 in the upper limit.

Class Interval	Frequency	Cumulative frequency
117.5-126.5	3	3
126.5-135.5	5	8
135.5-144.5	9	17
144.5-153.5	12	29
153.5-162.5	5	34
162.5-171.5	4	38
171.5-180.5	2	40

So, the data obtained are:
N = 40 and N/2 = 20
Median class = 144.5-153.5
then, l = 144.5,
cf = 17, f = 12 & h = 9
Median = $l + (N/2 - cf)/f \times h$
Median = $144.5 + [(20 - 17)/ 12] \times 9$
$= 144.5 + (9/4)$
$= 146.75$ mm
*Therefore, the median l*ength of the leaves = 146.75 mm.

WORKSHEET 1 :
STATISTICS
MULTIPLE CHOICE QUESTIONS:- 1 MARK EACH

1, If the mean of frequency distribution is 6.5 and $\sum fi\ xi = 120 + 2k$, $\sum fi = 20$, then k is equal to:

a. 10 b.15 c.5 d.25

2.If the sum of frequencies is 30, then the value of x in the observation: x, 5,6,1,2, will be;

a. 4 b.16 c.9 d.10

3. Consider the following frequency distribution of the heights of 60 students in a class:

Height (in cm)	150 – 155	155 – 160	160 – 165	165 – 170	170 – 175	175 – 180
Number of students	15	13	10	8	9	5

The sum of the lower limit of the modal class and the upper limit of the median class is:

a. 315 b.310 c.320 d.330

4.Assertion(A):The mode of the following distribution is 52.

Class interval	0-20	20-40	40-60	60-80
Frequency	4	3	2	2

Reason(R):The value of the observation which occurs most often is the mode.
Frequency of the class preceding the median class,f=frequency of the median class, h=classwidth,N=Total frequency.

(a) Both(A)and(R) are true and (R) is the correct explanation of (A)
(b) Both(A)and(R) are true but (R) is not the correct explanation of (A)
(c) (A) is true but (R) is false
(d) (A)is false but(R) is true

VERY SHORT ANSWER TYPE (2 marks)

5.Mrs. Garg recorded the marks obtained by her students in the following table. She calculated the modal marks of the students of the class as 45. While printing the data, a blank was left. Find the missing frequency 'x' in the table given below.

Marks obtained	0 - 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of Students	5	10	(x)	6	3

6.Convert the following distribution into a 'more than type' cumulative frequency distribution.

Marks	0 - 20	20 - 40	40 – 60	60 – 80	80 – 100
No. of Students	5	9	12	8	6

7.The mean of 100 observations is 50. If one of the observations which was 50 is replaced by 150, then find the resulting mean.

SHORT ANSWER TYPE (3marks)

8.If the mean of the following distribution is 54, find the missing frequency 'x'.

Class	0 - 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	16	14	24	26	(x)

9.The following data gives the information on the observed lifetimes (in hours) of 225 electrical components. Determine the modal lifetime of the components.

Lifetime (in hours)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
Frequency	10	35	52	61	38	29

LONG ANSWER TYPE (5 marks)

10.Find the mean,median and mode of the following data.

Class	10 - 20	20 - 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Frequency	4	8	10	12	10	4	2

Case Study (4 marks)

11.In a Vidyalaya there are two sections A and B. 39 students are there in section A and in section B there are 41 students. A periodic test was conducted to assess the performance of students thereafter analyze and plan the teaching learning process accordingly. The marks obtained out of 40 are given below in the table.

Marks obtained by the students	Number of students
Less than 5	3
Less than 10	12
Less than 15	22
Less than 20	35
Less than 25	42
Less than 30	60
Less than 35	71
Less than or equal to 40	80

(i) How many students have obtained more than 34 marks?

(a) 9 (b) 71 (c) 11 (d) 10

(ii) The mean marks obtained is –

(a) 20 (b) 22.19 (c) 21.05 (d) 22.5

(iii) The upper limit of the modal class is –

(a) 25 (b) 35 (c) 30 (d) 40

(iv) The mode of the marks obtained is –

(a) 27.55 (b) 28.06 (c) 28.50 (d) 2

WORKSHEET 2

MULTI CHOICE QUESTIONS (1 mark)

1. The classmarks of a frequency distribution are given as follows: 15, 20, 25, ... The class corresponding to the class mark 20 is :

(a)12.5 -17.5 (b)17.5-22.5 (c).18.5 -21.5 (d).19.5-20.5

2. If the difference of mode and median of a data is 24 than the difference of median and mean is

(a)12 (b)24 (c) 8 (d)36

3. The relationship between mean, median and mode for a moderately skewed distribution is

a)mode=median–2mean (b)mode=3median–2 mean

(c)mode= 2median –3 mean (d)mode=median–mean

4.Assertion (A) : If the mean of the following distribution is 7.5, then the value of missingfrequency f is 8.

x_i	5	6	7	8	9	10	11	12
f_i	20	17	16	10	f	6	7	6

Reason= $Mean = \frac{\Sigma f_i x_i}{\Sigma f_i}$

(a) Both(A)and(R) are true and (R) is the correct explanation of (A)

(b) Both(A)and(R) are true but (R) is not the correct explanation of (A)

(c) (A) is true but (R) is false

(d)(A)is false but(R) is true

VERY SHORT ANSWER (2 marks)

5. Find the unknown values in the given table:

Class Interval	0 - 10	10 - 20	20 – 30	30 – 40	40 – 50
Frequency	*5*	*7*	x_2	*5*	x_4
Cumulative Freq.	*5*	x_1	*18*	x_3	*30*

6. If the arithmetic mean of $x, x + 3, x + 6, x + 9$ and $x + 12$ $is 10, then$ $x =$?

7.Find the mean of the following distribution:

x	4	6	9	10	15
f	5	10	10	7	8

SHORT ANSWER TYPE (3 marks)

8.Determine the missing frequency *x*, if the mode of the following data is 67.

Class	40 - 50	50 – 60	60 – 70	70 – 80	80 – 90
Frequency	5	(x)	15	12	7

9..The table below shows the salaries of 280 persons. Find the median salary of the data.

Salary [in thousands]	5 - 10	10 - 15	15 - 20	20 - 25	25 – 30	30 – 35	35 – 40	40 – 45	45 – 5
No. of Persons	49	133	63	15	6	7	4	2	1

LONG ANSWER TYPE (5 marks)

10.Literacy rates of 40 cities is given in the following table. If the mean literacy rate is 63.5, then find the missing frequencies x and y.

Literacy rate	35 – 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 – 70	70 - 75	75 - 80	80 – 85	85 – 90
No. of City	1	2	3	*(x)*	*(y)*	6	8	4	2	3	2

Case Based Study (4 marks)

11. An electric scooter manufacturing company wants to declare the mileage of their electric scooters. For this,they recorded the mileage(km/charge) of50 scooters of the same model. Details of which are given in the following table.

Mileage(km/charge)	100-120	120-140	140-160	160-180
Number of scooters	7	12	18	13

Based on the above information answer the following

a. What is the average mileage?
b. What is the modal value of the given data ?
c. What is the median value of the given data?

WORK SHEET 3

Multiple Choice Question (1 mark)

1. If the mean of $a, a+2, a+4, a+8$ *and* $a+11$ *is* 10, *then* a *is equal to*;

a. 1 b.2 c.5 d.4

2. What is the difference between maximum and minimum values of a given observation called?

a. Class Interval b. Range c. Class d. Class mark

2. There are50 numbers.Each number is subtracted from 53 and the mean of the Numbers so obtained is found to be–3.5.The mean of the given numbers is :

a. 46.5 b. 49.5 c. 53.5 d. 56.5

4.**Assertion(A):**Consider the following frequency distribution:

Class interval	3-6	6-9	9-12	12-15	15-18	18-21
Frequency	2	5	21	23	10	12

The mode of the above data is 12.4.

Reason(R): The value of the observation which occurs most often is the mode.

(a) Both(A)and(R)are true and(R)is the correct explanation of(A)

Both(A)and(R)are true but(R) is not the correct explanation of(A)

(b) (A)is true but(R) is false

(c) (A) is false but(R)is true

VERY SHORT ANSWER TYPE QUESTIONS (2marks)

5.Find the value of y from the following observations if these are already arranged in ascending order. The Median is 63

20, 24, 42, y , y + 2, 73, 75, 80, 99

6. Convert the following distribution into a 'more than type' cumulative frequency distribution.

Marks	0 - 20	20 - 40	40 – 60	60 – 80	80 – 100
No. of Students	5	9	12	8	6

7.Calculate the mode of the following data.

Class	10 - 15	15 – 20	20 – 25	25 – 30	30 – 35
Frequency	4	7	20	8	1

SHORT ANSWER TYPE QUESTIONS (3 marks)

8.The median of the following distribution is 35. Find the value of 'x'.

CI	0 - 10	10 - 20	20 – 30	30 - 40	40 – 50	50 – 60	60 – 70
Frequency	2	3	(x)	6	5	3	2

9.. Find the mean of the following distribution using the Step – Deviation Method.

Classes	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35
Frequency	4	10	5	6	5

LONG ANSWER TYPE QUESTIONS (5 marks)

10.If the median of the distribution given below is 28.5, find the values of 'x' and 'y'.

CI	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	Total
Frequency	5	(x)	20	15	(y)	5	60

CASE STUDY QUESTIONS (4 marks)

11. Under the physical and health education a medical check up program was conducted in a Vidyalaya to improve the health and fitness conditions of the students. Reading of the heights of 50 students was obtained as given in the table below:

Height (in cm)	135 – 140	140 – 145	145 – 150	150 – 155	155 – 160	160 – 165
Number of students	2	8	10	15	6	5

(i) The lower class limit of the modal class is –
(a) 155 (b) 140 (c) 150 (d) 135
(ii) The median class is –
(a) 150 – 155 (b) 140 – 145 (c) 155 – 160 (d) 135 – 140
(iii) The class mark of the class interval 160 – 165 is –
(a) 160 (b) 162 (c) 163 (d) 162.5
(iv) The average height of the students is –
(a) 152.1 (b) 155 (c) 152.5 (d) 150

WORKSHEET 4

MULTIPLE CHOICE QUESTIONS (1 mark)

1.If the difference of mode and median of a data is 24 than the difference of median and mean is

(a)12 (b)24 (c) 8 (d)36

2. In a frequency distribution ,the mid value of a class is 10 and the width of the class is 6. The lower limit of the class is :

(A)6 (B)7 (C)8 (D)12

3. The times, in seconds ,taken by150 athletes toruna110m hurdle race are tabulated below:

Class	13.8-14	14-14.2	14.2-14.4	14.4-14.6	14.6-14.8	14.8-15
F	2	4	5	71	48	20

The number of athletes who completed the race in less then14.6 seconds is

(a)11 (b)71 (c)82 (d) 130

4 .Assertion(A):If the median and mode of a frequency distribution are 50 and 60 respectively, then its mean is 45.

Reason(R):Mean,median and mode of a frequency distribution are related as:

Mode = 3(Median) – 2(Mean)

(a) Both(A)and(R) are true and (R) is the correct explanation of (A)

(b) Both(A)and(R) are true but (R) is not the correct explanation of (A)

(c) (A) is true but (R) is false

(d) (A)is false but(R) is true

VERY SHORT ANSWER QUESTIONS (2 marks)

5. Obtain the mean of the following distribution and also find the mode

Marks obtained (out of 60)	***5***	***15***	***20***	***35***	***40***	***45***	***50***	***60***
No. of students	***7***	***10***	***6***	***8***	***12***	***3***	***5***	***4***

6.Findthevalueofp,ifthemodeofthefollowingdistributionis48:

Class	0–10	10–20	20–30	30–40	40–50	50–60	60-70	70–80
Frequency	7	14	13	12	*p*	18	15	8

7.The lengths of 50 leaves of a plant are measured and the data obtained is given in the following table. Find the mean length of the leaves.

Length [mm]	109 - 117	118 - 126	127 - 135	136 – 144	145 - 153	155 – 162	163 – 171
No. of Leaves	4	6	14	13	6	4	3

SHORT ANSWER TYPE QUESTIONS (3 marks)

8.The arithmetic mean of the following frequency distribution is 50.Find the value of p.

Class	0–20	20–40	40–60	60–80	80–100
frequency	17	*p*	32	24	19

9. The mean of the following frequency table is 53, but the frequencies of the classes 20 – 40 and 60 – 80 are missing. Find the missing frequencies.

Age (in years)	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	Total
No. of People	15	(x)	21	(y)	17	100

LONG ANSWER TYPE QUESTIONS (5 marks)

10. Literacy rates of 40 cities is given in the following table. If the mean literacy rate is 63.5, then find the missing frequencies x and y.

Literacy rate	35 – 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 – 70	70 – 75	75 - 80	80 – 85	85 – 90
No. of Cities	1	2	3	(x)	(y)	6	8	4	2	3	2

CASE STUDY QUESTION (4 marks)

11. An international cricket tournament was organized. Ten teams participated in the tournament. All the players got opportunity to bat in their first match. The lowest and highest runs scored by an individual players in their first match are 0 and 99 respectively. Runs scored by the players in their first match are given below in the table:-

Runs scored in their first match	Number of players
More than or equal to 0	110
More than or equal to 10	105
More than or equal to 20	95
More than or equal to 30	81
More than or equal to 40	69
More than or equal to 50	51
More than or equal to 60	45
More than or equal to 70	30
More than or equal to 80	20
More than or equal to 90	8

(i) How many players scored more than or equal to 50 runs?

(a) 45 (b) 51 (c) 69 (d) 40

(ii) How many players scored less than 10 runs?

(a) 25 (b) 10 (c) 5 (d) 8

(iii) The range of the runs scored by individual players is –

(a) 98 (b) 110 (c) 50 (d) 99

(iv) Modal class of the given data will be –

(a) 40 - 50 (b) 50 - 60 (c) 30 - 40 (d) 60 - 70

WORKSHEET 5

MULTIPLE CHOICE QUESTION(1 marks)

1. Consider the following frequency distribution of the heights of 60 students of a class:

Height (in cm)	150 – 155	155 – 160	160 – 165	165 – 170	170 – 175	175 – 180
Number of students	15	13	10	8	9	5

The sum of the lower limit of the modal class and upper limit of the median class is
(a) 310 (b) 315 (c) 320 (c) 33

2.The empirical relationship between the three measures of central tendency is
(a) 3 Median = Mode + 2 Mean (b) 2 Median = Mode + 2 Mean
(c) 3 Median = Mode + Mean (d) 3 Median = Mode – 2 Mean

3.Consider the following frequency distribution:

Class	0 – 5	6 – 11	12 – 17	18 – 23	24 – 29
Frequency	13	10	15	8	11

The upper limit of the median class is
(a) 17 (b) 17.5 (c) 18 (d) 18.5

4Assertion(A):The mode of the following distribution is 52.

Class interval	0-20	20-40	40-60	60-80
Frequency	4	3	2	2

Reason(R):The value of the observation which occurs most of ten is the mode.

a) Both(A)and(R) are true and (R) is the correct explanation of (A)
b)Both(A)and(R) are true but (R) is not the correct explanation of (A)
c)(A) is true but (R) is false
d)(A)is false but(R) is true

VERY SHORT ANSWER TYPE QUESTIONS(2 marks)

5. If the mode of the following data is 7, then find the value of k.
2, 4, 6, 7, 5, 6, 10, 6, 7, 2k + 1, 9, 7, 13

6. The mean of 11 numbers is 35. If mean of first 6 numbers is 32 and that of last 6 numbers is 37, find 6th number.

7. Find mode of the following data:

x_i	30	21	27	15	35
f_i	7	5	6	3	8

SHORT ANSWER TYPE QUESTIONS(3marks)

8. The mean of the following distribution is 18. Find the missing frequency ‘x’.

Class	11 - 13	13 - 15	15 – 17	17 – 19	19 - 21	21 – 23	23 – 25
Frequency	3	6	9	13	(x)	5	4

9.A survey regarding the heights(in cm)of 51girls of Class X of a school was conducted and the following data were obtained:

Height(in cm)	Number of girls
Lessthan140	4
Lessthan145	11
Lessthan150	29
Lessthan155	40
Lessthan160	46
Lessthan165	51

Find the median height.

LONG ANSWER TYPE QUESTIONS(5marks)

10.Find the missing frequencies in the following distribution given that y : z = 4 : 3 and mean is 50.

CI	0 - 20	20 - 40	40 - 60	60 – 80	80 - 100	Total
Frequency	17	(x)	(y)	(z)	19	120

CASE BASED QUESTIONS(4marks)

11.Transport department of a city wants to buy some Electric buses for the city. For which they wants to analyse the distance travelled by existing public transport buses in a day.The following data shows the distance travelled by 60 existing public transport buses in a day.

Daily distance travelled(in km)	200-209	210-219	220-229	230-239	240-249
Number of buses	4	14	26	10	6

Based on the above information answer the following questions.

a. What is the median class?
b. What is the The median of the distance travelled ?
c. If the mode of the distance travelled is 223.78km,then what is the mean of the distance travelled by the bus ?

ANSWER KEY

Worksheet 1

1. (c).5 2. (b) 16 3 (a) 315 4.(d) A is false, R is true 5.x=12 7.51
8.x=20 9 65.63 10 Mean=42.2 Median=42.5 Mode=45
11.(i) (a) 9 (ii) (b) 22.19 (iii) (c) 30 (iv) (d)28.06

Worksheet 2

1. b 2. C 3. B 4. A 5. x1=5 ,x2=6, x3=18 ,x4=7
6. x=4 8. x=8 9. Median salary Rs 13.42k 10. x=5 y=4
11. Mean=144.8 Mode=150.91 Median=146.67

Worksheet 3

1.c 2.b 3.d 4.b 5.y=61 7. Mode=22.6 8. x=8
9. Mean=22.17 10. x=8 y=7 11. (i) c (ii)a (iii)d (iv)a

Worksheet 4

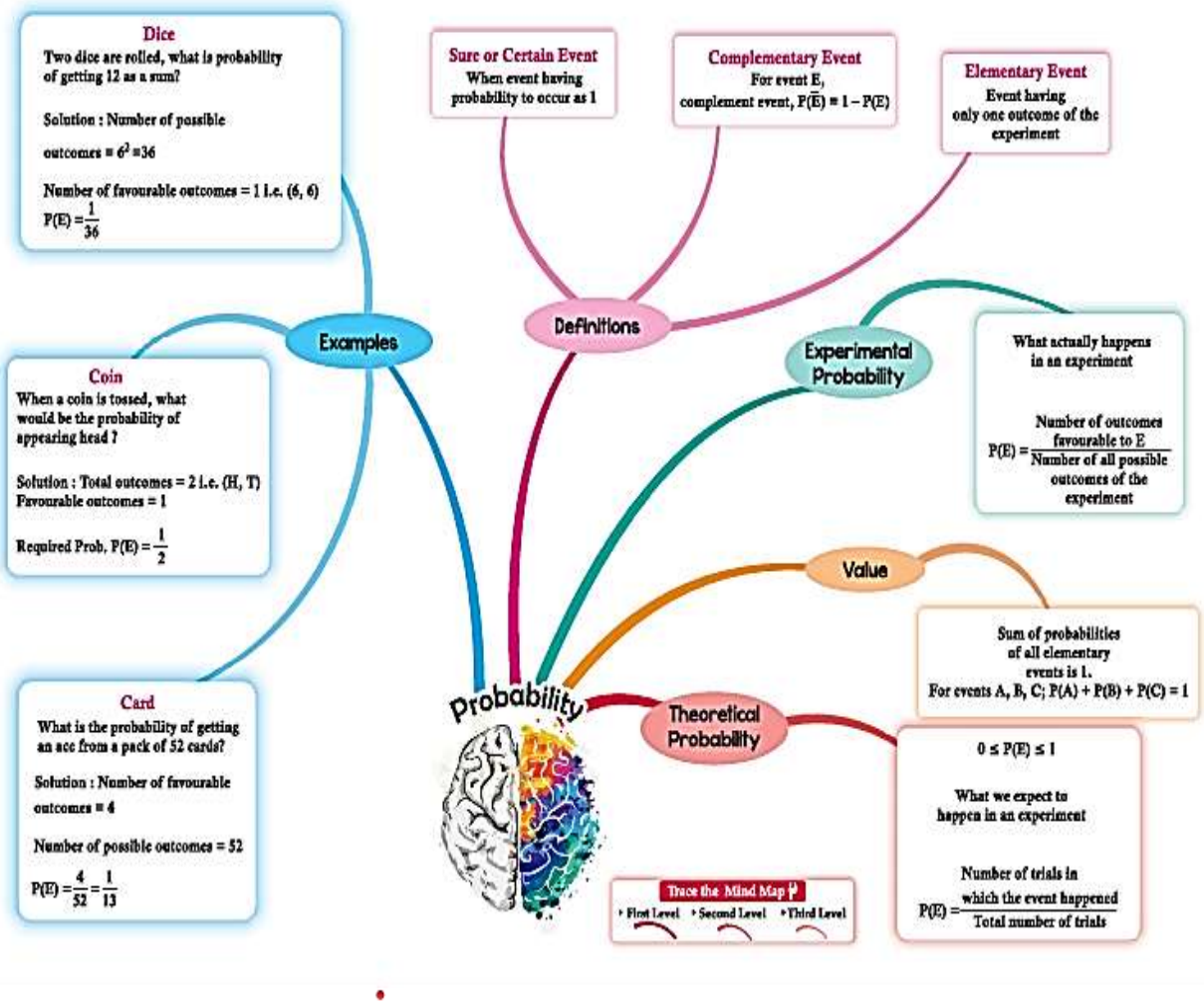
1. a 2. b 3. c 4. a 6. p=20 7. Mean=137.34 mm 8.p=28 9. x=18 y=29
10. x=5 y=4 11. (i) 51 (ii) c (iii)99 (iv) a

Worksheet 5

1. b 2. a 3. a 4. d 5. k=3 6. 6^{th} number =29 8. x=8 9 .Median =149.03
10. x=28 y=32 z=24 11. a) Median class=220-229 b) Median =224.62km c) Mean=225.04km

CHAPTER 14

PROBABILITY



Gist of the lesson: The word 'Probability' is commonly used in our day-to-day conversation and we generally use this word even without going into details of its actual meaning. In general, people have a rough idea about its meaning.

Experiments and its outcomes

An operation which can produce some well-defined outcomes is called an experiment and the results are known as outcomes.

Random experiment

An experiment in which all possible outcomes are known, and the exact outcome cannot be predicted in advance, is called a random experiment.

Equally likely outcomes

If an outcome of an experiment is as likely to occur as the other, then such an outcome is called equally likely. For example: Outcomes head and tail of the experiment "tossing a fair coin" are equally likely.

Event

A collection of one or more outcome (s) out of all possible outcomes of a random experiment is called its event.

An event having a single outcome is known as an elementary event, while an event obtained by combining two or more outcomes is called a compound event.

Sample space

A collection of all possible outcomes of a random experiment is known as the "sample space," which is represented by "S".

Occurrence of an event

An event 'E' associated to a random experiment is said to occur if any one of its outcomes is the result of the experiment.

Favorable outcomes

An outcome of an experiment is said to be favorable to an event 'E', if its occurrence implies the occurrence of events of event 'E'.

Theoretical probability (or) Probability

The probability of an event 'E'

$$P(E) = \frac{Number\ of\ favouable\ outcomes}{Total\ number\ of\ possible\ outcomes}$$

Impossible event: The probability of an impossible event (while has no chance) is zero (0).

Sure event: An event which is sure to occur is called a "sure event". the probability of a sure event is 1.

Complementary event: An event (E) is said to be complementary of event E if $P(E) + P(E) = 1$

MULTIPLE CHOICE QUESTIONS (1MARK)

Q1.A ticket is drawn at random from a bag containing tickets numbered from 1 to 40. The probability that the selected ticket has a number which is a multiple of 5 is

(a) $\frac{3}{5}$ (b) $\frac{1}{5}$ (c) $\frac{1}{3}$ (d)) $\frac{4}{5}$

Ans. (b) $\frac{1}{5}$

Q2. A lot consists of 144 ball pens of which 20 are defective and the others are good. Tanu will buy a pen if it is good but will not buy if it is defective. The shopkeeper draws one pen at random and gives it to her. The probability that she will buy that pen is

(a)$\frac{5}{36}$ (b)$\frac{20}{36}$ (c)$\frac{31}{36}$ (d)$\frac{131}{144}$

Ans.$(c)\ \frac{31}{36}$

Q3. A child has a die whose six faces show the letters as given below:

A B C D E F

The die is thrown once. The probability of getting a 'D' is

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

Ans. $(d)\ \frac{1}{6}$

Q4. A girl calculates that the probability of her winning the first prize in alottery is 8/100. If 6,000 tickets are sold, how many tickets has she bought ?

(a) 400 (b) 750 (c) 480 (d)240

Ans.(c) 480

Q5. The letters of the word SOCIETY are placed at random in a row. The probability of getting a vowel is

(a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c)$\frac{3}{7}$ (d)$\frac{4}{7}$

Ans.$(c)\ \frac{3}{7}$

Q6. Which of the following can be the probability of an event?

(a) -0.4 (b) 1.004 (c)$\frac{18}{23}$ (d) $\frac{10}{7}$

Ans.(c)$\frac{18}{23}$

Q7. The total events to throw three dice simultaneously is

(a) 6 (b) 18 (c) 81 (d)216

Ans216

Q8. If the probability of an event is P, the probability of its complementary event will be:

(a) p -1 (b) p (c) 1-p (d)(p-1)/p

Ans.1-p

ASSERTION REASON QUESTIONS (1 MARK)

Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

(a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

Q9.Assertion: The probability of getting a prime number when a die is thrown once is 2/3.
Reason: Prime numbers on a die are 2, 3, 5.
Ans. D

Q10. **Assertion (A):** The probability of a sure event is 1.
Reason (R): Let E be an event. Then $0 \leq P(E) \leq 1$.
Ans. B

VERY SHORT ANSWER QUESTIONS (2 MARK)

Q11. The probability of selecting a red ball at random from a jar that contains only red , blue and orange balls is ¼ . The probability of selecting a blue ball at random from the same jar is 1/3 . If the jar contains 10 orange balls , find the total number of balls in the jar .

Ans. let the total number of balls in jar be x

then number of blue ball in jar = $\frac{1}{3}\times x = \frac{x}{3}$

and number of red balls = $\frac{1}{4}\times x = \frac{x}{4}$

and number of orange balls = 10

$x = \frac{x}{3} + \frac{x}{4} + 10$

$= 12x = 3x + 4x + 120$

$= 12 - 7x = 120$

$= 5x = 120$

$= x = 24$

Therefore, the total number of balls in the Jar is 24

Q12. Neha and Nisha are playing game with two dice. Each has her own dice. Two different dice are thrown together. Find the probability of the number obtained:

(i) even sum

(ii)even product

Ans. Total possible outcome =36

Favourable outcome =18

$P(A) = \frac{n(A)}{n(S)}$

Where n(S) = 36 (when two dice are thrown simultaneously)

(1) Getting even sum

The terms which gives even sums are, (1,1), (1,3),(1,5),(2,2), (2,4), (2,6),(3,1),(3,3),(3,5),(4,2),(4,4),(4,6),(5,1),(5,3),(5,5),(6,2),(6,3) and(6,6)

The number of terms which gives even number are 18

n(A) = 18

The probability of getting even sum , $P(A) = \frac{18}{36}$

$P(A) = \frac{1}{2}$

(2) Getting even product

The terms which gives even product are (1,2), (1,4),(1,6),(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(3,2),(3,4),(3,6),(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),(5,2),(5, 4),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5) and (6,6)

The number of terms which gives even product are 27

n(B) = 27

The probability of getting even Product is, $P(B) = \frac{27}{36}$

$P(B) = \frac{3}{4}$

Q13. At the kitty party, some ladies decided to play the tambola game. They have a box with 90 cards A box contains cards, number 1 to 90. A card is drawn at random from the box. Find the probability that the selected card be

(i) Two digit number.
(ii) Perfect square number

Ans. The total number of cards are 90.
∴S={1,2,3,…,89,90} ∴n(S)=90
(i) Let A be the event that the card drawn is a two-digit number.
Then A={10,11…,89,90}
∴n(A)=81 [90−9 (one-digit number)=81]
$P(A) = \frac{n(A)}{n(S)}$ ∴P(A)=$\frac{81}{90}=\frac{9}{10}$
(ii) Let B the event that the card drawn is a perfect square number.
Then B={1,4,9,16,25,36,49,64,81} ∴n(B)=9
P(B) = $\frac{9}{90} = \frac{1}{10}$
Q14. Ruhi's father organised a magic show in her birthday party. Various magics by magician are shown using coloured balls, Magician has abag. That bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag.
Ans. No. Of black balls = 45
White balls= 15
Black balls= x
Total balls= x+15
P(black balls)=3*P(white balls)
$\frac{x}{x+15}$= 3*$\frac{15}{x+15}$
x=45
45
Q15. Following are the marks obtained (Out of 50) by the students in a class
One student from the class is selected at random. If the probability that his marks is 20 or more but less than 40, is $\frac{5}{7}$, then the value of x is ?

MARKS	Number of students
10-20	8
20-30	X
30-40	9
40-50	6

Ans. P(E)= $\frac{x+9}{23+x} = \frac{5}{7}$
7x+63=115+5x
2x=52
x=26

SHORT ANSWER QUESTIONS (3 MARKS)

Q16. Two coins are tossed 500 times and outcomes are recorded as below :

Number of tails	0	1	2
Frequency	120	175	205

Based on this information, the probability for at least 1 tail is ?
Ans. P(E)= $\frac{380}{500} = \frac{19}{25}$
Q17. In a medical examination of students of a class, the following blood groups are recorded:

Blood group	A	B	O	AB

Number of students	35	28	19	13

A student is selected at random from the class. The probability that he/she has the blood group other than 'O' is ?

Ans. P(E)= $\frac{19}{95} = \frac{4}{5}$

Q18. One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will

(i) be an ace,

(ii)not be an ace.

Ans. Here, n(S)=52

(i) There are 4 aces in a deck of 52 cards.

So, favorable outcome =4

Probability card drawn is ace, P(E)=$\frac{4}{52}=\frac{1}{13}$

(ii) There are 48 cards that are not aces in a deck of 52 cards.

So, possible outcome =48

Probability card drawn is not ace, P(E)= $\frac{48}{52} = \frac{12}{13}$

Q19. An integer is chosen between 0 and 100. What is the probability that it is

(i) divisible by 7?

(ii)not divisible by 7?

Ans. Number that are multiples of 7 between 0 - 10 = { 7 , 14 , 21 , 28 , 35 , 42 , 49 , 56 , 63 , 70, 77, 84, 91, 98}

Total number divisible by 7 between 0-100 = 14

Total numbers between 0 - 100 = 99

The probability that it is divisible by 7 = 14 / 99

The probability that it is not divisible by 7 = 1 - The probability that it is divisible by 7

The probability that it is not divisible by 7 = 1 - $\frac{14}{99}$

The probability that it is not divisible by 7 = $\frac{(99-14)}{99}$

The probability that it is not divisible by 7 = $\frac{85}{99}$

Hence, the probabilities that it is divisible by 7 and not divisible by 7 are 14/99 and 85 /99 respectively.

Q20. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap?

Ans.0.18= $\frac{x}{900}$

∴ x=900×0.18=162

∴Number of rotten apples in a heap of apples =162

LONG ANSWER QUESTIONS (5 MARKS)

Q21. A bag contains 18 balls out of which x balls are red. If one ball is drawn at random from the bag, what is the probability that it is not red? If 2 more red balls are put in the bag, the probability of drawing a red ball will be 9/8 times the probability of drawing a red ball in the first case. Find the value of x.

Ans (i) Total number of balls = 18.

Number of red balls = x.

Number of balls which are not red = 18 -x.

∴ P(getting a ball which is not red) =$\frac{18-x}{18}$.

(ii) Now, total number of balls = 18+2 = 20.

Number of red balls now = x +2 .

P(getting a red ball now) = $\frac{x+2}{20}$ and P(getting a red ball in first case) = $\frac{x}{18}$

x=$\frac{288}{36}$=8.

Hence, x = 8.

Q22. Cards numbered 1 to 30 are put in a bag. A card is drawn at randomly. Find the probability that the drawn card is

(i) prime number>7

(ii)not a perfect square.

Ans.(i)prime numbers from 1 to 30 are: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29. The prime numbers greater than 7 are: 11, 13, 17, 19, 23, 29. This gives us a total of 6 numbers.

The probability is calculated as:*P*(prime number >7)= $\frac{6}{30}$=$\frac{1}{5}$

(ii) To find the probability that the number on the drawn card is not a perfect square number:

The perfect squares from 1 to 30 are: 1, 4, 9, 16, 25. This gives us a total of 5 perfect squares.

Therefore, the numbers that are not perfect squares are: 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30. This gives us a total of 25 numbers.

The probability is calculated as:*P*(not a perfect square)= $\frac{25}{30}$ = $\frac{5}{6}$

Q23. Two different dice are thrown together. Find the probability that the numbers obtained.

(i) Have a sum less than 7.

(ii) Have a product less than 16.

(iii) Is a doublet of odd numbers.

Ans. Sum less than 7:

Favorable outcomes (sum < 7): (1,1), (1,2), (1,3), (1,4), (1,5), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2), (3,3), (4,1), (4,2), (5,1).

Total favorable outcomes: 15

Probability = $\frac{(Favorable\ outcomes)}{(Total\ outcomes)}$= $\frac{15}{36}$ = $\frac{5}{12}$.

(ii) Product less than 16:

Total outcomes: 36

Favorable outcomes: All pairs except (6,3), (6,4), (6,5), (6,6), (5,6), (4,6), (3,6) and their reverses.

Favorable outcomes: 36 - 7 = 29

Product less than 16: (1,1) to (1,6), (2,1) to (2,6), (3,1) to (3,5), (4,1) to (4,3), (5,1) to (5,3), (6,1), (6,2) excluding (6,3)

Count: 6 + 6 + 5 + 3 + 3 + 2 = 25

Probability = $\frac{25}{36}$

(iii) Doublet of odd numbers:

Doublets: (1,1), (3,3), (5,5)

Favorable outcomes: 3

Probability = $\frac{3}{36}$ = $\frac{1}{12}$

CASE BASED QUESTION (4 MARK)

Q24. Four persons are playing a bridge game forming teams each of two players. A deck of 52 playing cards is distributed around the table clockwise in such a way that each person gets 13 cards

Find the probability of the card drawn by each player with number between 2 and 9.

Ans. Total possible outcomes = 52

Favorable outcomes = 24

$P(E) = \frac{24}{52} = \frac{6}{13}$

Find the probability of the card drawn by each player with number 5 or 6.

Ans. Total possible outcomes = 52

Favorable outcomes = 8

$P(E) = \frac{8}{52} = \frac{2}{13}$

Find the probability of the card drawn by each player with number less than 8.

Ans Total possible outcomes = 52

Favorable outcomes = 24

$P(E) = \frac{24}{52} = \frac{6}{13}$

What is the probability that any one person gets queen of spade?

Ans. Total possible outcomes = 4

Favorable outcomes = 1

$P(E) = \frac{1}{4}$

Q25. Anita, Bina and Charu were fighting to get first chance in a game. 'Anita' says let us toss two coins. If both heads appear, Anita will take first chance. If both Tails appear 'Bina' will get it & if one head & one tail,'Charu' will get the first chance.

What is the probability of 'Anita' getting the first chance?

Ans Total possible outcomes = 4

Favorable outcomes = 1 $P(E) = \frac{1}{4}$

What is the probability that 'Bina' gets the first chance?

Ans. Total possible outcomes = 4

Favorable outcomes = 1 $P(E) = \frac{1}{4}$

What is the probability that ‘charu’ gets the first chance?

Ans. Total possible outcomes = 4

Favorable outcomes = 2

$P(E)=\frac{2}{4} = \frac{1}{2}$

WORKSHEET 1: PROBABILITY

Section A: Multiple Choice Questions (1 mark each)

Q1. A bag contains 4 red, 5 green and 1 white ball. One ball is drawn at random. The probability that it is not green is:

A. ½ B. 1/5 C. 4/5 D. 2/5

Q2. A number is selected at random from the numbers 1 to 20. The probability that it is a prime number is:

A. 4/5 B. 3/5 C. 2/5 D. 1/5

Q3. The probability of getting a number divisible by 3 on a die is:

A. 1/6 B. 1/3 C. ½ D. 2/3

Section B: Assertion & Reasoning (1 mark each).

Q 4 Assertion (A): The probability of getting a multiple of 2 on a single throw of a die is 1/2.

Reason (R): The favourable outcomes are 2, 4, 6.

Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

Section C: Short Answer Type Questions (2 marks each)

Q5. A letter is chosen at random from the word 'MATHEMATICS'. What is the probability of choosing:

(i) a vowel (ii) the letter 'T'?

Q6. A die is thrown once. Find the probability of getting:

(i) a prime number (ii) a number not divisible by 3

Section D: Short Answer Type Questions (3 marks each)

Q7. A card is drawn from a well shuffled deck of 52 cards , what is the probability that the card is (i) A red queen (ii) black non face card

Q8. Two different dice are thrown together. Find the probability of:

(i) getting a sum of 9 (ii) getting a doublet (iii) getting a sum less than 5

Section E: Case Study Based Question (4 marks)

Q9. Context: In a school library, there are 100 books numbered from 1 to 100. A student picks a book randomly.

Questions:

(i) What is the probability that the number on the book is a multiple of 10?

(ii) What is the probability that the number on the book is a perfect square?

(iii) What is the probability of not picking a number divisible by 5 or 10?

Section F: Long Answer Type Question (5 marks)

Q10. A box contains 4 red, 3 green and 2 white balls.

(i) If one ball is drawn randomly then what is the probability that it is red

(ii) Without putting the first ball in the box if another ball is drawn then what is the probability that it is white

(iii) From the remaining balls , again drawn one ball then what is the probability that this ball is not a green ball

(iv) now putting all the balls into the box and one ball is drawn , what is the probability that this ball is white

WORK SHEET 2: PROBABILITY

Section A: Multiple Choice Questions (1 mark each)

Q1. **One card is drawn from a well shuffled deck of 52 cards , what is the probability that the card will be an ace .**

A. 1/12 B. 1/15 C. 1/13 D. 1/26

Q2. A number is selected at random from the numbers 21 to 50. The probability that it is a composite number is:

A. 7/30 B. 21/30 C. 11/30 D. 23/30

Q3. The probability of getting a number divisible by 2 on a die is:

A. 1/6 B. 1/3 C. ½ D. 2/3

Section B: Assertion & Reasoning (1 mark each)

Q4.

Assertion (A): The probability of getting a multiple of 3 on a single throw of a die is 1/3.

Reason (R): The favourable outcomes are 2, 4, 6.

Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

Section C: Short Answer Type Questions (2 marks each)

Q5 The king, queen and ace of clubs and diamonds are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is randomly drawn from the remaining cards. Find the probability of getting

(i) A card of clubs.

(ii) A red coloured card.

Q6. A die is thrown once. Find the probability of getting:

(i) a prime number

(ii) a number not divisible by 3

Q7. A coin is tossed two times . Find the probability of getting at most one head.

Section D: Short Answer Type Questions (3 marks each)

Q7. If 65% of the population has black eyes, 15% have brown eyes and the remaining have blue eyes, what is the probability that a person selected at random has :

(a) Blue eyes ?

(b) Brown or black eyes ?

Q8. Two different dice are thrown together. Find the probability of:

(i) getting a sum of 12

(ii) getting a doublet

(iii) getting a sum less than 7.

Q 9. Three unbiased coins are tossed simultaneously. Find the probability of getting

(i) At least one head.

(ii) Exactly one tail.

(iii) Two heads and one tail.

Section E: Case Study Based Question (4 marks)

Q10. Cards with numbers 2 to 101 are placed in a box. A card is selected at random . Find the probability that the card has

(i) An even number

(ii) A square number

(iii) Both even and square number

(iv) Even or square number Section F: Long Answer Type Question (5 marks)

Q11. Two dice are numbered 1,2,3,4,5,6 and 1,1,2,2,3,3 respectively. They are thrown and the sum of the numbers on them is noted . find the probability of getting each sum from 2 to 9 separately.

WORK SHEET 3: PROBABILITY

Section A: Multiple Choice Questions (1 mark each)

Q1. An event is very unlikely to happen . Its probability is closed to

A. 0 .0001 B. 0 .001 C. 0.01 D. 0.1

Q2. Which of the following cannot be the probability of an event ?

A. 1/3 B. 0.1 C. 3% D. 17/16

Q3. If the probability of an event is p . The probability of its complementary event will be

A. P-1 B. P C. 1-p D. 1-1/p

Section B: Assertion & Reasoning (1 mark each)

Q4.

Assertion (A): If the probability of an event is zero , then the event is impossible.

Reason (R): All events with zero probability never occur in real life experiments.

Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

Section C: Short Answer Type Questions (2 marks each)

Q5 The king, queen and ace of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled . A card is randomly drawn from the remaining cards. Find the probability of getting

(iii) A card of clubs.

(iv) A red coloured card.

Q6. A die is thrown once. Find the probability of getting:

(i) a prime number

(ii) a number not divisible by 3

Q7. A coin is tossed two times . Find the probability of getting at most one head.

Section D: Short Answer Type Questions (3 marks each)

Q7 The number of red balls in a bag is 10 more than the number of blue balls . If the probability of drawing a red ball at random from this bag is 3/5 then find the total number of balls in the bag .

Q8. Two different dice are thrown together. Find the probability of:

(i) getting a sum of 9

(ii) getting a doublet

(iii) getting a sum less than 4

Q 9. Three unbiased coins are tossed simultaneously. Find the probability of getting

(iv) At least one head.

(v) Exactly one tail.

(vi) At least two heads

Section E: Case Study Based Question (4 marks)

Q10. A school has five houses A, B,C, D and E . A class has 23 students, 4 from house A , 6 from house B , 5 from house C, 2 from house D and rest from house E. A single student is selected at random to be the class monitor.

(A) Find the probability that the selected student is not from A, B and C .

(B) Probability if selected student from Either house B or house E.

(C) Probability that Selected student is from house D.

(D) If 2 students are removed from house C then probability that the selected student is not from house D and house E.

Section F: Long Answer Type Question (5 marks)

Q11. Two dice are numbered 1,2,3,4,5,6 and 1,1,2,2,3,3 respectively. They are thrown and the sum of the numbers on them is noted . find the probability of getting each sum from 2 to 9 separately.

WORK SHEET 4: PROBABILITY

Section A: Multiple Choice Questions (1 mark each)

Q1. The probability expressed as a percentage of a particular occurrence can never be

A. less than 100 B. less than 0 C. greater than 1 D. anything but a whole number

Q2. The probability of getting a bad egg in a lot of 400 is 0.035. the number of good eggs in the lot is

A. 386 B. 14 C. 21 D. 356

Q 3 A fish tank has 9 male fish and 11 female fish. The probability of fish taken out is a female fish :

A. ½ B. 11/20 C. 9/20 D. 4/5

Section B: Assertion & Reasoning (1 mark each)

Q 4.Assertion (A): The probability of selecting a number at random from the numbers 1 to 20 is 1

Reason (R): For any event E, if P(E) = 1, then E is called a sure event.

Choose the correct option:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

Section C: Short Answer Type Questions (2 marks each)

Q5 A student says that if you throw a die, it will show up 1 or not 1. Therefore, the probability of getting 1 and the probability of getting "not 1' each is equal to ½ . Is this correct ? Give reason

Q6. A die is thrown once. Find the probability of getting:

(i) a composite number

(ii) a number not divisible by 2

Q7. A coin is tossed three times . Find the probability of getting (i) at most one tail. (ii) at least one tail .

Section D: Short Answer Type Questions (3 marks each)

Q8. Two different dice are thrown together. Find the probability of:

(i) getting a sum of 12 (ii) getting a doublet (iii) getting a sum less than 7.

Q 9. Three unbiased coins are tossed simultaneously. Find the probability of getting

At least one head, Exactly one tail Two heads and one tail.

Section E: Case Study Based Question (4 marks)

Q 10 . A school conducted a survey to find out how students come to school. They collected data from 200 students. The results of the survey are as Follows :

- 100 students use bicycles as their mode of transportation. 60 students walk to school.
- 40 students use buses. The remaining students use other modes of transportation or carpool.

Question: Using the data from the survey, answer the following questions:

1. What is the probability that a randomly selected student uses a bicycle to come to school?
2. Find the probability that a randomly selected student either walks to school or uses a bus as their mode of transportation.
3. If a student is chosen at random, what is the probability that they do not use a bicycle for coming to school?
4. If a student is chosen at random, what is the probability that they do not walk to school?

Section F: Long Answer Type Question (5 marks)

Q11. Standard deck of playing cards contains 52 cards, which are divided into four suits: hearts, diamonds, clubs, and spades. Each suit has 13 cards (Ace through 10, and the face cards: Jack, Queen, and King).

1. What is the probability of drawing a red card (hearts or diamonds) from a well-shuffled deck of cards?
2. If you draw a card at random and it's a red card, what is the probability that it's a diamond?
3. What is the probability of drawing a face card (Jack, Queen, or King) from the deck?
4. If you draw a card and keep it aside and you find that it is an Ace of Diamond, then what is probability that the next card you draw is a red card?
5. What is the probability of drawing black a non face card (Jack ,Queen or King) from the deck?

WORK SHEET 5: PROBABILITY (CLASS 10 - CBSE)

Section A: Multiple Choice Questions (1 mark each)

1. The probability of event equal to zero is called;

(a) Unsure event (b) Sure Event (c) Impossible event (d) Independent event

2 The probability that cannot exist among the following:

(a) 4/5 (b) -1.7 (c) 17% (d) 0.00009

3 If P(E) = 0.00003, then what is the probability of 'not E'?

(a) 0.97 (b) 0.00007 (c) 0.99997 (d) 0.9997

Section B: Assertion & Reasoning (1 mark each)

Q4. Assertion (A): The probability of selecting a number at random from the numbers 1 to 20 is 1

Reason (R): For any event E, if P(E) = 1, then E is called a sure event.

Choose the correct option:
A. Both A and R are true, and R is the correct explanation of A
B. Both A and R are true, but R is not the correct explanation of A
C. A is true, R is false
D. A is false, R is true

Section C: Short Answer Type Questions (2 marks each)

Q5 A bag contains slips numbered from 1 to 100. If Rajima chooses a slip at random from the bag. Find the probability if it is
(i) an odd number (ii) a number divisible by 4 and leave a remainder 1

Q6. A game consists of spinning an arrow which comes to rest pointing at one of the regions (1, 2 or 3)
(i) Are the outcomes 1, 2 and 3 equally likely to occur? Give reasons.
(ii) What is the probability to find out number 3 at rest .

Q7. Two dice are thrown simultaneously. What is the probability that the sum of the numbers appearing on the dice is
(i) 7
(ii) A prime number

Section D: Short Answer Type Questions (3 marks each)

Q8. Two different dice are thrown together. Find the probability of:
(i) getting a sum of 12
(ii) getting a doublet
(iii) getting a sum less than 7.

Q 9. Three unbiased coins are tossed simultaneously. Find the probability of getting
(vii) At least one head.
(viii) Exactly one tail.
(ix) Two heads and one tail.

Section E: Case Study Based Question (4 marks)

Q 10. A bag contains 5 red balls, 4 green balls, and 6 blue balls. Sarah wants to randomly select a ball from the bag.

a. What is the probability that Sarah selects a red ball on her first attempt?

b. If Sarah selects a red ball on her first attempt and does not replace it, what is the probability that she selects a green ball on her second attempt?

c. If Sarah selects a red ball on her first attempt and does not replace it, what is the probability that she selects a blue ball on her second attempt?

d. What is the probability that Sarah selects a green ball on her first attempt ?

Section F: Long Answer Type Question (5 marks)

Q11. Standard deck of playing cards contains 52 cards, which are divided into four suits: hearts, diamonds, clubs, and spades. Each suit has 13 cards (Ace through 4, and 12 face cards: Jack, Queen, and King).

1. What is the probability of drawing a red card (hearts or diamonds) from a well-shuffled deck of cards?

2. If you draw a card at random and it's a red card, what is the probability that it's a diamond?

3. What is the probability of drawing a face card (Jack, Queen, or King) from the deck?

4. If you draw a card and keep it aside and you find that it is an Ace of Diamond, then what is probability that the next card you draw is a red card?

5. What is the probability of drawing black a non face card (Jack ,Queen or King) from the deck?

WORK SHEET 1

ANSWER KEY

Q 1 : A , Q 2 : C , Q 3 : B , Q 4 : A , Q 5 : favourable outcomes ; 4 Total outcomes ;11 Ans 4/11 : Q 6 : (i)1/2 (ii) 2/3 , Q 7(i) 1/26 , (ii) 5/13 Q 8 . (i) 2/36 , (ii) 1/6 (iii) 1/6 , Q 9 . (i) 1/10 (ii) !/10 (iii) 1/5 :Q 10. (i) 4/9 (ii) ¼ (iii) 3/7 (iv) 2/9

WORK SHEET 2

ANSWER KEY

Q1 : C, Q 2 : D, Q3: C, Q4: C, Q5: (i) favorable outcome 11, total outcome = 46 ans = 11/46 (ii) red =23 ,total =46 so p= 23/46 Q 6 : (i) ½ , (ii) 2/3 ,

Q 7 :

(a) Blue eyes 20%
(b) Brown or black eyes 80%

Q 8 (i) 1/36 (ii) 6/36 (iii) 5/36

Q 9 (i) 7/8 (ii) 3/8 (iii) 3/8

Q 10 (i) Total cards =100 even number cards =50 (using ap formula) so p = 50/100 = ½ (ii) Total square number =9 so p= 9/100 (iii) 5/100 = 1/20 (iv) 50+9-5/100 = 54/100 or 27/50

WORK SHEET 3

ANSWER KEY

Answer Key : Q 1 : A , Q 2 : D , Q 3 : C , Q 4 : C, Q 5 : Q 6 (i) 10/49 (ii) 26/49

Q 7 : Let blue balls = b, Red balls = b+10, Total balls = 2b+10 , 3/5 = b+10/2b+10 solving it blue balls = 20 , red balls = 30 , total balls = 50

Q 8 : (i) 1/9 (ii) 1/36 (iii) 1/12 Q 9: (i) 7/8 , (ii) 3/8 (iii) 4/8 or ¼

Q 10 : (A) 8/23 , (B) 12/23, (C) 2/23 (D) 13/21

WORK SHEET 4

ANSWER KEY

Q 1. B : Q 2 . B : Q 3 B : Q 4 A : Q 5 No, the student is not correct because total outcomes are 6 and the probability of getting 1 is 1/6 and probability of getting no0t 1 is 5/6 .
Q 6 . (i) 1/3 (ii) ½ Q 7 . (i) at most one tail means o tail or 1 tail total favorable =4 total outcome= 8 so p= 4/8 =1/2 (ii) at least one tail means 1 or more tail favorable = 7 p= 7/8
Q 8 : (i) 1/36 (ii) 6/36 (iii) 15/36 Q 9 : (i) 7/8 (ii) 3/8 (iii) 3/8
Q 10 : 1. ½, 2. ½ , 3. ½ , 4. 3/5
Q 11 . 1. ½ , 2. ¼ , 3. 12/52 , 4. 25/51 , 5. 20/52

WORK SHEET 5
ANSWER KEY

Q1 (a) ,Q 2 (b), Q 3 (c) , Q 4 (A) Q 5 (i) ½
Q5 (ii) 4k+1 numbers who divisible by 4 and leaves a remainder 1 , 1,5,9,……97 total 25 favorable outcomes p = 25/100 = ¼
Q 6 (i) yes because the arrow has an equal chance of landing on any region . (ii) 1/3

Q 7 . (i) 1/6 (ii) 13/36

Q 8 : (i) 1/36 (ii) 1/6 (iii) 15/36

Q 9 . (i) 7/8 (ii) 3/8 (iii) 3/8

Q 10. a. 5/15= 1/3 , b . 2/7 , c . 3/7 d. 4/15

Q 11. 1. ½ , 2. 13//52 , 3. 12/52 , 4. 5/13

KENDRIYA VIDYALAYA SANGATHAN
SAMPLE PAPER 1

Class- X Time: 3 Hrs Sub- MATHEMATICS BASIC - 241 M.M :80

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever not stated.

SECTION -A

1. If a kite is flying at a height of $40\sqrt{3}$ m from the level ground, attached to a string inclined at 60^0 to the horizontal then the length of string is

(a)80 (b)$60\sqrt{3}$ (c)$80\sqrt{3}$ (d)12

2. The zeroes of the polynomial $4x^2 - 12x + 9$ are

(a) $\frac{3}{2}, \frac{3}{2}$ (b) $-\frac{3}{2}, -\frac{3}{2}$ (c) 3,4 (d))$-3, -4$

3. For a frequency distribution, mean, median and mode are connected by the relation

(a) mode= 3 mean – 2 median (b) mode = 2 median – 3 mean

(c) mode = 3 median – 2 mean (d) mode= 3 median + 2 mean

4. Express 98 as a product of its primes

(a) $2^2 \times 7$ (b) $2^2 \times 7^2$ (c) 2×7^2 (d) $2^3 \times 7$

5. The circumference of the edge of a hemispherical bowl is 132 cm. When π is taken as $\frac{22}{7}$, the radius of the hemisphere is

(a) 21 (b) 42 (c) 2772 (d) none of these

6. The distance of the point P(acosθ , asinθ) from the origin is

(a) $cos\theta$ (b) 1 (c) 2 (d) a

7. If the first three terms of an AP are $3p - 1, 3p + 5$ and $5p + 1$ respectively, then the value of p is

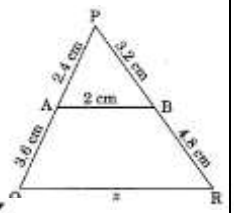
(a) 2 (b) 5 (c) 4 (d) -3

8. ABCD is a rectangle whose three vertices are B (4, 0), C(4, 3) and D(0, 3). The length of one of its diagonals is

(a) 5 (b) 4 (c) 3 (d) 25

9. In the given figure, if AB ∥QR, the value of x =

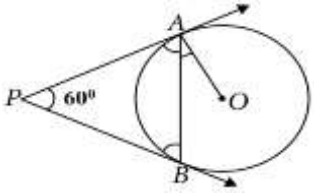
(a) 3 cm (b) 4 cm (c) 5 cm (d) 6 cm



10. In the given figure, PA and PB are tangents to the circle with centre O. If ∠APB = 60°, then ∠OAB is

(a) 30° (b) 60°

(c) 90° (d)45



11. For the following distribution,

12. The sum of lower limits of median class and modal class is:

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

(a) 15 (b) 25 (c) 30 (d) 35

13. HCF of 8, 9, 25 is

(a) 8 (b) 9 (c) 25 (d) 1

14. If in triangle ABC and DEF, AB/DE = BC/EF , then they will be similar when

(a) ∠B = ∠E (b) ∠A = ∠D (c) ∠B = ∠D (d) ∠A = ∠F

15. A card is selected from a deck of 52 cards. The probability of being a red face card is

(a) $\frac{3}{26}$ (b) $\frac{6}{26}$ (c) $\frac{6}{13}$ (d) $\frac{3}{13}$

16. The point which divides the line segment of points P(-1, 7) and (4, -3) in the ratio of 2:3 is:

(a) (-1, 3) (b) (-1, -3) (c) (1, -3) (d) (1, 3)

17. If $\sqrt{3}$ sin θ – cos θ = 0 and 0° < θ < 90°, find the value of θ.

(a) 30° (b) 45° (c) 60° (d) 90°

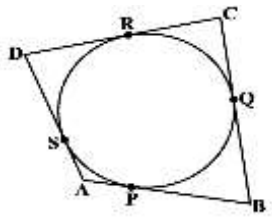
18. If HCF (16, y) = 8 and LCM (16, y) = 48, then the value of y is

(a) 24 (b) 16 (c) 8 (d) 48

19. If one root of the quadratic equation $2x^2 + kx - 6 = 0$ is 2, then, the value of k -1 is

(a) 1 (b) – 1 (c) 2 (d) – 2

Direction- In question numbers 19 and 20 a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option.



(a). Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(b). Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

(c). Assertion is correct but Reason is incorrect.

(d). Assertion is incorrect but Reason is correct

20. **Assertion (A):** Two cubes each of volume 125 cm^3 are joined end to end to form a Cuboid. The surface area of the resulting cuboid is 250 cm^2

Reason (R): If n cubes each of volumea^3. Units are joined end to end to form a Cuboid. Then the surface area of the resulting cuboid is 2(2n+1) a^2square units

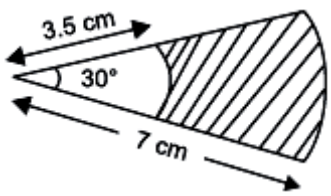
21. **Assertion (A):** If the radius of sector of a circle is reduced to its half and angle is doubled then the perimeter of the sector remains the same

Reason(R): The length of the arc subtending angle θ at the centre of a circle of radius r =$\frac{\Pi r\theta}{180°}$.

SECTION -B

22. A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time; a tower casts a shadow 28 m long. Find the height of the tower.

23. In the given figure, sectors of two concentric circles of radii 7 cm and 3.5 cm are given. Find the area of the shaded region. (Use π = $\frac{22}{7}$)



(OR)

A horse is placed for grazing inside a rectangular field 70 m by 52 m and is tethered toone corner by a rope 21 m long. On how much area can it graze?

24. If tan (A + B) = $\sqrt{3}$and tan (A – B) = $\frac{1}{\sqrt{3}}$, 0 ≤ A + B ≤ 90° and A > B, then find A and B

(OR)

In ΔABC, right angled at B, sin A =$\frac{7}{25}$, then fin the value of sec C + cot C

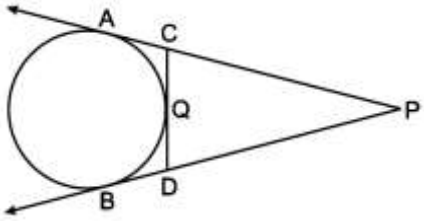
25. A quadrilateral ABCD is drawn to circumscribe a circle.
Prove that AB + CD = AD + BC.

26. Find the zeroes of the quadratic polynomial $x^2 - 7x + 12$ and verify the relationship between the zeroes and the coefficients of the polynomial.

SECTION –C

27. Prove that $\sqrt{7}$ is irrational.

28. In figure PA and PB are tangents to the circle drawn from an external point P. CD are the third tangent touching the circle at Q. If PA = 15 cm, find the perimeter of ΔPCD.



(OR)

Two concentric circles are of radii 8 cm and 5 cm. Find the length of the chord of the larger circle which touches the smaller circle.

29. If the 3rd and the 9th terms of an AP are 4 and – 8 respectively, which term of this AP is zero?

30. Prove that $\frac{tan\theta+sec\theta-1}{tan\theta+1-sec\theta} = sec\theta + tan\theta$

(OR)

Evaluate: $\frac{5tan60°}{(sin^2 60°+cos^2 60°)tan30°}$

31. Two dice are thrown at the simultaneously. Find the probability of getting
(i) a doublet
(ii) sum on two dice is less than 9
(iii) sum two dice is an even number.

32. Solve the following linear equations to find the value of x and y
47x+31y= 63; 31x+47y=15

SECTION –D

33. The median of the following data is 50. Find the values of p and q, if the sum of all frequencies is 90. Also find the mode.

Marks obtained	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Number of students	p	15	25	20	q	8	10

(OR)

Class	85-90	90-95	95-100	100-105	105-110	110-115
frequency	15	22	20	18	20	25

Find the mean and median of the following data: Class frequency 15 22 20 18 20 25

34. Show that a line drawn parallel to one side of a triangle intersecting the other two sides in the distinct points then the other sides are divided in the same ratio.

35. A rocket is in the form a right Circular Cylinder closed at the lower end and surmounted by a cone with same radius as that of cylinder. The diameter and height of the cylinder are 9 m and 15 m, respectively. If the slant height of the conical portion is the 7.5 m, find the total surface area and volume of the rocket.

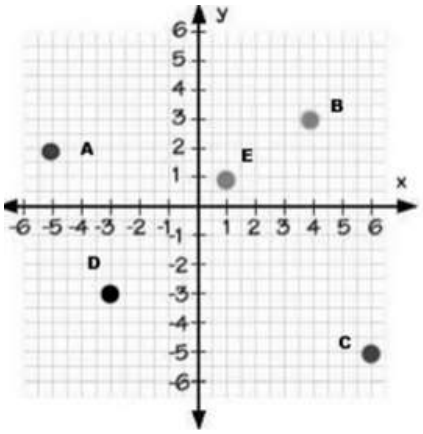
(OR)

A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of hemisphere is 12cm and the total height of vessel is 10 cm. Find the inner surface area and volume of the vessel.

36. A passenger train takes 2 hours less for a journey of 300 km, if its speed is increased by 5km/hr from its usual speed. Find the usual speed of the train.

SECTION E

37. Students of class X, Emma, Anna, Krishnd Sahil gathered in the library. On the Library notice board, the positions of Some books are marked.



Point A – Science Guide, Point B – Maths guide,
Point C – Sanskrit guide, Point D – English guide and Point E – History guide.
Based on the information answer the following questions.
(i) How much distance does Emma has to walk to get the Science guide,
if her starting point is (0,2) ?
(ii) How far apart are the English and Sanskrit guide ?
(iii) Find the distance between the location of Maths guide and Sahil's
starting point (which is at origin).

(OR)

Find the distance from Ato D and A to E. Are the points D and E equidistant from A?

38. Aditya is celebrating his birthday. He invited his friends. He bought a packet of toffees/candies which contains 120 candies. He arranges the candies such that in the first row there are 3 candies, in second there are 5 candies, in third there are 7 candies and so on.

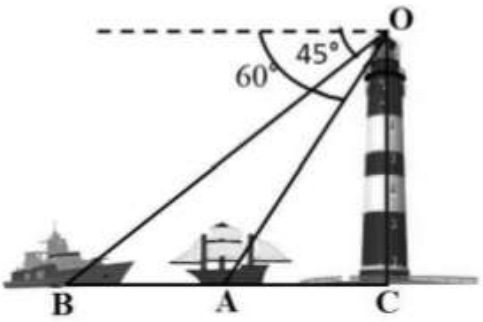
On the basis of the above information, answer any four of the following questions:

1. Find the common difference of the AP.
2. Find the number of candies placed in 7th row?
3. Find the total number of rows of candies

(OR)

Find the difference in number of candies placed in 9th and 4th rows.

39. A person/observer on the sea coast observes two ships in the sea. Both the ships are in same straight path one behind the other. If the observer is on his building of height 20 metres (including observer) and he observes the angle of depression of two ships as 45^0 and 60^0 respectively.



Based on above information answer the following questions.
(i) If a person observes a ship whose angle of depression is 60° then how much distance is the ship away from him?
(ii)If a person observes another ship whose angle of depression is 45° then how much distance that ship is away from him?
(iii)If a person observes the ship whose angle of depression changes from 60° to 30° then how far be ship from the observer if the observer is at 20 m of height (including him)?

(OR)

At a time when a person observes two ships whose angle of depressions are 60° and 45° the distance between the ships is (in meters).

ANSWER KEY
MATHEMATICS (BASIC) - 1 (2025-26)
SECTION A

1. A, 2. A, 3 C, 4 C, 5. A, 6. D, 7.B, 8. A, 9.C, 10. A, 11. C, 12. D, 13.A, 14.A, 15.D, 16. A
17. A, 18. D, 19. A, 20. A.

SECTION B

21. For correct diagram and information
For finding the height of the tower using similarity

$$\frac{height\ of\ pole}{shadow\ of\ pole} = \frac{height\ of\ tower}{shadow\ of\ tower} \Rightarrow \frac{6}{4} = \frac{h}{28}$$

After solving, $h = 42$

22. Area of the shaded region = area of the sector of 30° with radius 7 cm - area of the sector 30° with radius 3.5 cm
$= [\frac{30°}{360°} \times \pi \times 7^2 - \frac{30°}{360°} \times \pi \times 3.5^2]$
$= \frac{77}{8}$ cm^2 = 9.625 cm^2

(OR)

Area of the portion that horse can graze = area of the shaded portion
Shaded portion is a sector of radius 21m = length of the rope
Area of the shaded portion that horse can graze = $\frac{\theta}{360°} \times \pi r^2 = \frac{90°}{360°} \times \frac{22}{7} \times (21)^2 = 346.5m^2$

23. $tan60° = \sqrt{3}$, $tan30° = \frac{1}{\sqrt{3}}$
A + B = 60°, A - B = 30°
on solving we get A = 45° and B = 15°

(OR)

Since the triangle is right angled at B So ∠A + ∠C = 90° ⇒∠C = 90° - ∠A. For angle C:
$secC + cotC = \frac{25}{7} + \frac{7}{24} = \frac{649}{168}$

24. We know that lengths of the tangents drawn from an external point to the circle are equal
DR = DS …(i)
BP = BQ …(ii)
AP = AS …(iii)
CR = CQ …(iv)
Adding (i), (ii), (iii) and (iv), we get DR + BP + AP + CR = DS + BQ + AS + CQ
By rearranging the terms we get
(DR + CR) + (BP + AP) = (CQ + BQ) + (DS + AS)
⇒ CD + AB = BC + AD

25. The zeroes are x=3 and x=4
The sum and product of the zeroes are: Sum of the zeroes = $\frac{-b}{a} = \frac{-(-7)}{1} = 7$
Product of the zeroes = $\frac{c}{a} = \frac{12}{1} = 12$

SECTION C

26. Correct proof
27. Since, PA and PB are tangent from same external point
PA = PB = 15cm. Now, perimeter of ΔPCD = PC + CD + DP = 30 cm

(OR)

The length of the chord of the largest circle AB = $2 \times AP = 2\sqrt{39}\ cm$

28. 3rd term of the AP : a + 2d = 4 9th term of the AP : a + 8d = - 8
on solving we get d = - 2 and a = 8
To find which term is 0, ie. find n such that a + (n - 1)d = 0 so n = 5

29. Correct proof
(OR)
on substituting the values we find 15.

30. (i) Probability of getting a doublet. Favorable outcomes: (1,1), (2,2), (3,3), (4,4), (5,5), (6,6) - 6 outcomes

$P(doublet) = \frac{6}{36} = \frac{1}{6}$

(ii) Probability that sum is less than 9

Total favorable outcomes = 1 + 2 + 3 + 4 + 5 + 6 + 5 = 26, $P(sum < 9) = \frac{26}{36} = \frac{13}{18}$

(iii) Probability that sum is even, Even sums from two dice: 2, 4, 6, 8, 10, 12

Total favorable outcomes =1+3+5+5+3+1=18, $P(even\ sum) = \frac{18}{36} = \frac{1}{2}$

31. On solving the equations, we get x=2, y=-1

SECTION D

32. Now p+q+78 = 90 ⇒ p+q = 12

Here, median is 50, so median class is 50-60, l = 50, cf = p+40, f = 20, h = 10

by applying the formula of median we find p = 5 ⇒ q = 7

Mode :- modal class is 40-50, l = 40, h = 10, f_1 = 25, f_0 = 15, f_2 = 20. Mode= 46.67

(OR)

Use the mean formula: mean = 100.875

Median Class = 100-105, using the formula, the median is 100.83

33. For correct figure, and correct proof.

34. $height\ of\ cone\ h = \sqrt{l^2 - r^2}$, $l = 6m$

$TSA\ of\ rocket = \pi rl + 2\pi rh + \pi r^2 = 594m^2$, $Volume = \frac{1}{3}\pi r^2 h + \pi r^2 h = 1081.93m^3$

(OR)

Diameter of hemisphere= 12 cm, radius=6 cm

Total height of vessel=10 cm. Height of cylinder=10-6=4 cm

$Inner\ CSA\ of\ Vessel = 2\pi rh + 2\pi r^2 = 377.14cm^2$

$Volume\ of\ the\ vessel = \frac{2}{3}\pi r^3 + \pi r^2 h = 905.14cm^3$

35. The initial speed of the train is 25 km/h.

SECTION E

36. (i) From Emma's position (0, 2) to A (-4, 2): $Distance = 4\ units$

(ii) from D(-4,-2) to C(5,-5), $Distance = \sqrt{90} \approx 9.49\ units$

(iii) from (0,0) to B(4,3), $Distance = \sqrt{4^2 + 3^2} = 5\ units$

(or)

distance AD = 4 units, AE= $\sqrt{26}$ units

37. (i) In AP: First term a = 3, Second term = 5, So, d = 5 - 3 = 2

(ii) Using the formula for the nth term of an AP: $a_n = a + (n-1)d$

For n = 7, a_7= 3+ (7-1)2 = 3+12 = 15

(iii) $S_n = \frac{n}{2}[2a + (n-1)d]$ $n^2+2n-120 = 0$, Solve the quadratic equation we get n=10 or -12

Rejecting negative value, $n = 10$ → total number of rows = 10

(or)

a_9 = 3+(9-1).2=3+16=19, a_4= 3+(4-1) . 2=3+6=9. Difference = 19-9 = 10

38. (i) $tan60° = \frac{20}{AC}$, $AC = \frac{20}{\sqrt{3}} = \frac{20\sqrt{3}}{3}m$ (ii) $tan45° = \frac{20}{BC}$, BC = 20m

(iii) $tan30° = \frac{20}{BC}$, BC = $20\sqrt{3}$m

39. $tan60° = \frac{20}{AC}$, $AC = \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3}m$, AB= $\frac{20}{\sqrt{3}}m$

(or) $tan45° = \frac{20}{BC}$, BC = 20m

$tan60° = \frac{20}{AC}$, $AC = \frac{20}{\sqrt{3}} = \frac{20\sqrt{3}}{3}m$, $AB = \frac{20\sqrt{3}-20}{\sqrt{3}}m$

KENDRIYA VIDYALAYA SANGATHAN
SAMPLE PAPER 2

Class- X Time: 3 Hrs Sub- MATHEMATICS BASIC M.M :80

GENERAL INSTRUCTIONS:

This Question Paper has 5 Sections A-E.
Section A has 20 MCQs carrying 1 mark each
Section B has 5 questions carrying 02 marks each.
Section C has 6 questions carrying 03 marks each.
Section D has 4 questions carrying 05 marks each.
Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.

SECTION A

Section A consists of 20 questions of 1 mark each.

1. The greatest possible length of the rope which can be used to measure two sticks of lengths 24m and 18m
   (A) 72 (B) 12 (C) 6 (D) 3
2. Two positive integers 'a' and 'b' can be expressed as $a = x^3 y^2$ and $b = xy^3$, x and y are prime numbers. What is the L.C.M of a and b?
   (A) $x^3 y^2$ (B) xy^3 (C) $x^3 y^3$ (D) xy^2
3. Write the discriminant of quadratic equation $(x+5)^2 = 2(5x - 3)$
   (A)124 (B) -124 (C) -24 (D) 24
4. The value of x for which $2x$, $x + 10$, and $3x + 2$ are the three consecutive terms of an AP
   (A) -6 (B)18 (C)6 (D)-18
5. (sec A + tan A) (1 – sin A) =
   A) sec A (B) sin A (C) cosec A (D) cos A
6. If one zero of the polynomial $f(x)= (k^2+4) x^2+13x+4k$ is the reciprocal of the other, k =
   (A) 2 (B)-2 (C)1 (D) -1
7. The distance of the point P(–6, 8) from the origin is
   (A) 10 units (B) 2√7 units (C) 8 units (D) 6 units
8. The fourth vertex D of a parallelogram ABCD whose three vertices are A(–2, 3), B(6, 7) and C(8, 3) is
   (A) (0, 1) (B) (0, –1) (C) (–1, 0) (D) (1, 0)
9. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q so that OQ = 12 cm. Length PQ is :
   (A) 12 cm (B) 13 cm (C) 8.5 cm (D) √119 cm
10. D and E are the midpoints of side AB and AC of a triangle ABC, respectively and BC = 6cm. If DE || BC, then the length (in cm) of DE is:
    (A) 2.5 (B) 3 (C) 5 (D) 6
11. If triangles ABC and DEF are similar and AB=4 cm, DE=6 cm, EF=9 cm and FD=12 cm, the perimeter of triangle ABC is:
    (A) 22 cm (B) 20 cm (C) 21 cm (D) 18 cm
12. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought?
    (A) 40 (B) 240 (C) 480 (D) 750
13. For a frequency distribution, mean, median and mode are connected by the relation
    (A) mode = 3mean – 2median (B) mode = 2median – 3mean
    (C) mode = 3median – 2mean (D) mode = 3median + 2mean
14. The minute hand of a clock is 7 cm long. Find the area of the face of the clock described by minute hand in 30 minutes.

(A)154 Sq cm (B)38.5 Sq cm (C)105 Sq cm (D)77 Sq cm

15. If the diameter of the sphere is doubled, the surface area of the resultant becomes x times that of the original one. Then the value of x is ……..
(A) 2 (B) 3 (C) 4 (D) 5
16. Two identical solid cubes of side a are joined end to end. Then the total surface area of the resulting cuboid is
(A) $12a^2$ (B) $10a^2$ (C) $8a^2$ (D) $11a^2$
17. The pair of equations y = 0 and y = –7 has:
A) one solution (B) two solutions (C) infinitely many solutions (D) no solution
18. If $\sqrt{3}\sin\theta - \cos\theta = 0$ and $0^0 < \theta < 90^0$, then the value of θ is
A)30^0 (B)60^0 (C)90^0 (D)45^0

DIRECTION: In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason(R) is false.
(d) Assertion (A) is false but reason(R) is true.

19. Statement A (Assertion): $\sin 45^0 = \cos 45^0$
Statement R(Reason) : $\sin\theta = \cos\theta$ for all values of θ.
20. Statement A (Assertion):If the HCF of two numbers is 5 and their product is 150, then their LCM is 30
Statement R(Reason):For any two positive integers p and q,HCF(p, q)×LCM(p,q) = p × q

SECTION B

Section B consists of 5 questions of 2 marks each.

21. If the sum of the zeroes of the quadratic polynomial $f(t) = kt^2 + 2t + 3k$ is equal to their product, find the value of k

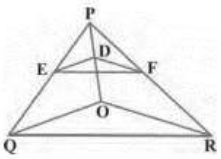
OR

If α and β are the zeros of the quadratic polynomial $2x^2 - 8x + 5$, find the value of $(\alpha + \frac{1}{\beta}) \times (\beta + \frac{1}{\alpha})$

22. Prove that the length of tangents of a circle from an exterior point are equal.
23. D is a point on the side BC of a triangle ABC such that ∠ADC = ∠BAC. Show that $CA^2 = CB.CD$

OR

In the figure, DE||OQ and DF||OR, show that EF||QR.



24. If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$; $0° < A+B \leq 90°$; $A > B$, find A and B.
25. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding minor sector

SECTION C

Section C consists of 6 questions of 3 marks each.

26. Prove that $3 + 2\sqrt{5}$ is irrational.
27. A two-digit number is obtained by either multiplying the sum of digits by 8 and then subtracting or by multiplying the difference of digits by 16 and adding 3. Find the number.

OR

In a competitive examination, one mark is awarded for each correct answer, while $\frac{1}{2}$ mark is deducted for every wrong answer. Rahul answered 120 questions and got 90 marks. How many questions did he answer correctly?

28. A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC
29. Find the zeroes of the quadratic polynomial $x^2 + 7x + 10$, and verify the relationship between the zeroes and the coefficients
30. Prove the following identities, where the angles involved are acute angles for which the

expressions are defined $\sqrt{\frac{1+sin\ A}{1-sin\ A}}$ = sec A + tan A

OR

(cosecA-sinA) (secA-cosA) = $\frac{1}{(tan\ A+cot\ A)}$

31. A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be

    (i) red? (ii) white? (iii) not green?

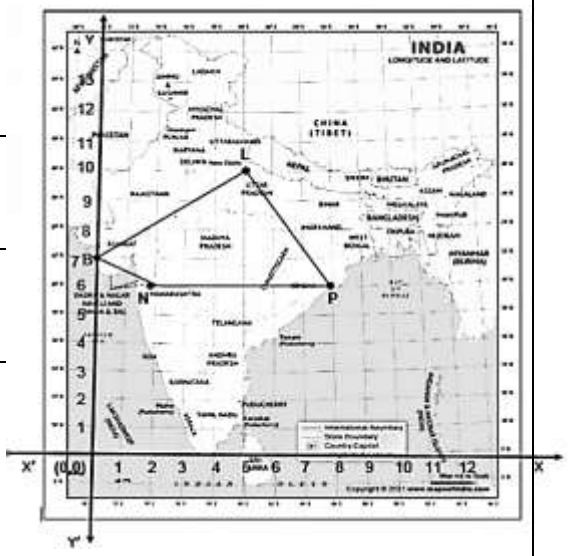
SECTION D

Section D consists of 4 questions of 5 marks each.

32. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13cm, find the other two sides. OR
    A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.
33. A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.
34. The following table shows the ages of the patients admitted in a hospital during a year:

Age (in years)	5-15	15-25	25-35	35-45
Number of patients	6	11	21	23

    Find the mode and the mean of the data given above.



35. Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that ΔABC ~ Δ PQR

    OR

    State and prove Basic Proportionality Theorem

SECTION E

Case study-based questions are compulsory.

36. India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year
    Based on the above information, answer the following questions:
    i.Find the production during first year.
    ii. Find the production during first 3 years.
    iii.In which year, the production is Rs 29,200.

    OR

    Find the difference of the production during 7th year and 4th year.
37. In a GPS, the lines that run east-west are known as lines of latitude, and the lines running north south are known as lines of longitude. The latitude and the longitude of a place are its

coordinates and the distance formula is used to find the distance between two places. The distance between two parallel lines is approximately 150 km. A family from Uttar Pradesh planned a round trip from Lucknow (L) to Puri (P) via Bhuj (B) and Nashik (N) as shown below.

Based on the above information answer the following questions using co- ordinate geometry

(i)Find the distance between Lucknow to Bhuj

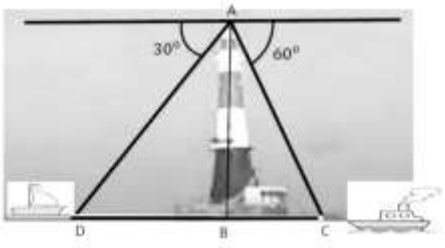
(ii) If Kota internally divides a line segment joining Lucknow to Bhuj in the ratio 3:2 then find the coordinates of Kota .

(iii) Name the type of Triangle formed by the places Lucknow Nashik and Puri

OR

Find a point on the longitude (y-axis) which is equidistant from the points Lucknow (L) and Puri (P).

38. A lighthouse is a tall tower with light near the top. These are often built on islands, coasts or on cliffs. Lighthouses on water surface act as a navigational aid to the mariners and send warning to boats and ships for dangers. Initially wood, coal would be used as illuminators. Gradually it was replaced by candles, lanterns, electric lights. Nowadays they are run by machines and remote monitoring. Prongs Reef lighthouse of Mumbai was constructed in 1874-75. It is approximately 40 meters high and its beam can be seen at a distance of 30 kilometres. A ship and a boat are coming towards the lighthouse from opposite directions. Angles of depression of flash light from the lighthouse to the boat and the ship are 30^0 and 60^0 respectively



(i) Find the distance of boat from the lighthouse?

(ii) Find the distance of ship from the lighthouse?

(iii) Find the time taken by the boat to reach the light house if it is moving at the rate of 2 km per hour.

OR

The ratio of the height of a light house and the length of its shadow on the ground is √3: 1. What is the angle of elevation of the sun?

MARKING SCHEME
SAMPLE PAPER-2 MATHEMATICS BASIC
SECTION A (1 mark each)

1 C) 6 2 c) $x^3 y^3$ 3 B) -124 4 (C)6 5 (D) cos A 6 (A) 2 7 (A) 10 units
8 (B) (0, –1) 9 (D) √119 cm 10 (B) 3 11 (D) 18 cm 12 (C) 480
13(C) mode = 3median – 2mean 14 (D)77 Sq cm 15 (C) 4 16 (B) $10a^2$
17 (D) no solution 18 (a)30^0
19 (c) Assertion (A) is true but reason(R) is false.
20 (a) Both assertion (A) and reason (R) are true and reason (R) is the correct Explanation

SECTION B

21. k= $\frac{-2}{3}$

OR

$(\alpha + \frac{1}{\beta})(\beta + \frac{1}{\alpha}) = \frac{49}{10}$

22. Correct proof
23. Correct proof

OR

Correct proof

25. Area of minor segment APB = Area of sector OAPB - Area of right ΔAOB
= 28.5 cm²

SECTION C

26. Correct proof

27. The two-digit number is 83

OR

The number of correct answers is 100

28. Correct proof

29. The zeroes of the polynomial $x^2 + 7x + 10$ are - 2 and – 5 and verification.

30. Correct proof

OR

Correct proof

31. total number of balls = 5 + 8 + 4 = 17

(i) Probability of drawing red ball = $\frac{5}{17}$

(ii) Probability of drawing white ball = $\frac{8}{17}$

(iii) Probability of drawing a green ball = $\frac{4}{17}$

SECTION D

32 The other two sides are 12 cm and 5 cm

OR

Therefore, speed of the train is 40 km /hr

33. Number of lead shots = 100

34. Mean = 35.37, Mode = 36.8

35. Correct proof

OR

SECTION E

36. (i) Production in first year is Rs.5000.

(ii) The production during first 3 years is 5000+ 7200+9400 = 21600

(iii). The number of years in which the production = Rs 29,200 is 12.

OR

(iii) a_4 = 11600, a_7 = 18200. So the difference = 6600

37. In a GPS, the lines that run east-west are known as lines of latitude, and the line

i) 150 √34

ii) $(3,\frac{41}{5})$

iii) LNP is an isosceles triangle (LN = PL = 5, NP =4)

OR

A point on the longitude $(\frac{0,25}{8})$

38. i) In ΔADB, $\tan 30^o = \frac{AB}{BD} \Rightarrow \frac{1}{\sqrt{3}} = \frac{40}{DB} \Rightarrow DB = 40\sqrt{3}$

ii) In ΔACB, $\tan 60^o = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{40}{BC} \Rightarrow BC = \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3}$

iii) Boat moving at a speed of 2 km/hr = $\frac{2000}{60}$ m/min

Time taken to cover the distance = $\frac{Distance\ DB}{speed} = \frac{60}{2000} \times 40\sqrt{3}$

OR

Let height of light house be AB and its shadow be BC

In ΔABC, $\tan \theta = \frac{AB}{BC}$

$\frac{AB}{BC} = \sqrt{3} \Rightarrow \theta = 60$

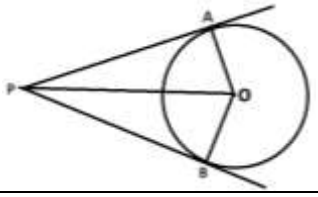
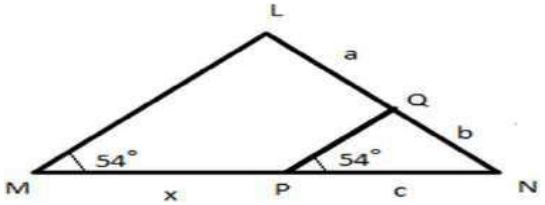
KENDRIYA VIDYALAYA SANGATHAN
SAMPLE PAPER-3 (MATHEMATICS BASIC) (241)

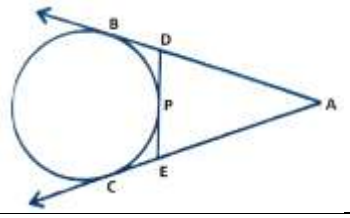
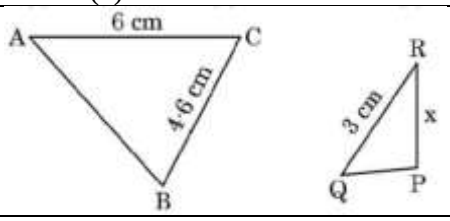
Class: X **Max Marks: 80**
Subject: MATHEMATICS **Time: 3 hrs.**

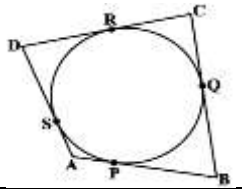
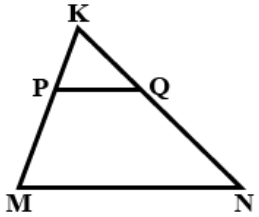
General Instructions:

Read the following instructions carefully and follow them:

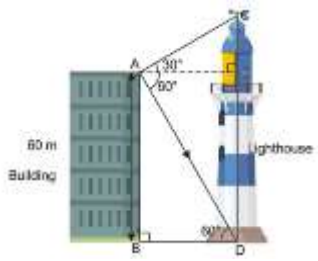
1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion- Reason based questions of 1 mark each.
4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36-38 are case study-based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Questions of section B, 2 Questions of section C and 2 Questions of section D has been provided. And internal choice has been provided in all the 2 marks questions of Section E.

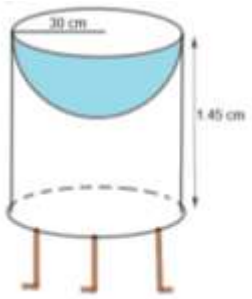
	SECTION A	
1.	If two positive integers p and q are written as $p = x^3y^2 z$ and $q = xy^3$; x, y and z are prime numbers, then LCM (p, q) is (a) xyz (b) xy^2 (c) $x^3y^3 z$ (d) xyz	1
2.	The solution of the following pair of equation is: $x - 3y = 2$, $3x - y = 14$ (a) x = 5, y = 1 (b) x = 2, y = 3 (c) x = 1, y = 2 (d) x = 1, y = 4	1
3.	If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is (a) 10 (b) –10 (c) 5 (d) –5	1
4.	The coordinates of the point A, where AB is the diameter of the circle with center (-2,2) and B is the point with coordinates (3,4) will be: (a) (0,7) (b) (0,-7) (c) (7,0) (d) (-7,0)	1
5.	If tangents PA and PB from a point to a circle with center O are inclined to each other at an angle of 80°, then ∠POA is equal to (a)50° (b) 60° (c) 70° (d) 80° 	1
6.	In the given figure LM || PQ , Then relation in x, a, b and c is  (a) x= c/a (b) ab = cx (c) bx= ac (d) cb= ax	1
7.	The LCM of smallest two-digit composite number and smallest composite number is: (a) 12 (b) 4 (c) 20 (d) 44	1
8.	Which term of an AP, 21, 42, 63, 84, . . . *is* 210? (a) 9^{th} (b) 10^{th} (c) 11^{th} (d) 12^{th}	1
9.	If two tangents inclined at an angle 90° are drawn to a circle of radius 3 cm, then length of each tangent is equal to (a) $\frac{3\sqrt{3}}{2}$ cm (b) 6 cm (c) 3 cm (d) $3\sqrt{3}$ cm	1
10.	The shadow of a pole is equal to its height, what is the angle of elevation of the sun (a) 30° (b)45° (c) 60° (d)90°	1

11.	The number of quadratic polynomials having zeroes –1 and 3 is : (a) 1 (b) 2 (c) 3 (d) more than 3	1
12.	In figure, if AB = 8 cm and PE = 3 cm, then AE = (a)11 cm (b) 7 cm (c) 5 cm (d) 3 cm  	1
13.	The value of $\cos^2 60° + 2 \tan 45° – \sin^2 30°$ is (a) $\sqrt{3}$ (b) 3 (c) 2 (d) 0	1
14.	If 2 is root of the equation $x^2+bx+12=0$ and the equation $x^2+bx+q=0$ has equal roots then q is equal to (a) 8 (b)16 (c) -8 (d) -16	1
15.	In the given figure, if $\Delta ABC \sim \Delta QPR$, then the value of x is : (a)5·3 cm (b) 4·6 cm (c) 2·3 cm (d) 4 cm  	1
16.	ABCD is a trapezium with AD ‖ BC and AD = 4cm. If the diagonals AC and BD intersect each other at O such that AO/OC = DO/OB =1/2, then BC is equal to (a) 6cm (b) 7cm (c) 8cm (d) 9cm	1
17.	A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 7 m long rope. The area of that part of the field in which the horse can graze, is (a) 77 cm² (b) 77/2cm² (c) 154 cm² (d) 77/4cm²	1
18.	Consider the following frequency distribution of the heights of 60 students of a class: Height (in cm) | 150-155 | 155-160 | 160-165 | 165-170 | 170-175 | 175-180 No. of students | 12 | 15 | 8 | 8 | 7 | 10 The sum of the lower limit of the modal class and upper limit of the median class is (a) 310 (b)315 (c) 320 (d) 330	
	DIRECTION: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** Choose the correct option a) Both assertion **(A)** and reason **(R)** are true and reason **(R)** is the correct explanation of assertion **(A)** b) Both assertion **(A)** and reason **(R)** are true and reason **(R)** is not the correct explanation of assertion **(A)** c) Assertion **(A)** is true but reason **(R)** is false. d) Assertion (A) is false but reason **(R)** is true.	
19.	**Assertion (A)**: The HCF of two numbers is 18 and their product is 3072. Then their LCM = 169. **Reason (R)**: If a, b are two positive integers, then HCF x LCM = a x b.	1
20.	**Assertion (A):**The pair of equations $x + 2y – \frac{1}{2} = 0$ and $–3x – 6y + 1 = 0$ have no solution **Reason (R):** Graphical representation of two parallel lines will have no point in common.	1
	SECTION B	
21.	If $\cos (A + B) = \frac{1}{2}$ and $\cos (A – B) = \frac{\sqrt{3}}{2}$; $0° < A + B \leq 90°$; A > B, then find the values of A and B.	2
22.	Find the mode of the following distribution of marks obtained by the students in an examination: **Marks obtained** | **0–20** | **20–40** | **40–60** | **60–80** | **80–100** **Number of students** | **15** | **18** | **21** | **29** | **17**	2

23.	Find the ratio in which the line segment joining the points (– 3, 10) and (6, – 8) is divided by (– 1, 6). **(OR)** Find a relation between x and y such that the point P(x, y) is equidistant from the point A(3, 6) and B(– 3, 4).	2
24.	Find the zeroes of the quadratic polynomial $x^2 – 2x – 8$ and verify the relationship between the zeroes and the coefficients of the polynomial.	2
25.	A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC.  	2
	SECTION C	
26.	Show that $5 + 2\sqrt{3}$ is an irrational number, where $\sqrt{3}$ is given to be an irrational number.	3
27.	Solve the pair of equations 3x – 2y – 6 = 0 and 2x – 3y + 6 = 0 graphically and find the area of triangle formed between the lines and the x-axis.	3
28.	Prove that a parallelogram circumscribing a circle is a rhombus. **(OR)** Prove that the lengths of tangents drawn from an external point to a circle are equal.	3
29.	Find the coordinates of the points of trisection of the line segment joining (4, - 1) and (- 2, - 3)	3
30.	From a pack of 52 playing cards, jacks, queens, kings and aces of red colour are removed. From the remaining a card is drawn at random. Find the probability that the card drawn is (i) a black queen (ii) a red card (iii) a face card.	3
31.	Prove that: $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$ **(OR)** Prove that: $(\sin \alpha + \cos \alpha)(\tan \alpha + \cot \alpha) = \sec \alpha + \operatorname{cosec} \alpha$	3
	SECTION D	
32.	A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train. **(OR)** A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.	5
33.	If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio. In the figure PQ is parallel to MN. If $\frac{KP}{PM} = \frac{4}{13}$ and KN = 20.4 cm. Find KQ  	5
34.	If median height of 50 students of a class in the following frequency distribution is 144 cm, find the missing frequencies x and y	5
35.	A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.	5

Height (in cm)	125-130	130-135	135-140	140-145	145-150	150-155	155-160
No of students	2	4	x	y	8	9	5

	(OR) A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. The length of the entire capsule is 14mm and the diameter of the capsule is 4mm, find its surface area. Also, find its volume.	
	SECTION E	
36.	Lahari has to buy a scooty. She can buy scooty either making cash down payment of Rs. 25,000 and by making 15 monthly instalments as below. Ist month = Rs. 3425, IInd month = Rs. 3225, Illrd month = Rs. 3025, IVth month = Rs. 2825 and so on   (i)Find the amount of 6th instalment. [1] (ii)Find the total amount paid in 15 instalments. [2] **(OR)** (ii)What is the total amount paid by Lahari to buy the scooty? [2] (iii)Lahari paid 10th and 11th instalment together find the amount paid that month. [1]	4
37	Ram is watching the top and bottom of a lighthouse from the top of the building. The angles of elevation and depression of the top and bottom of a lighthouse from the top of a 60 m high building are 30° and 60° respectively.  Find (i) the difference between the heights of the lighthouse and the building. [2] (ii)(a) the distance between the lighthouse and the building. [2] **(OR)** (ii)(b)The ratio of the height of a light house and the length of its shadow on the ground is $\sqrt{3}$: 1 What is the angle of elevation? [2]	4
38.	Mayank a student of class 7th loves watching and playing with birds of different kinds. One day he had an idea in his mind to make a bird-bath on his garden. His brother who is studying in class 10th helped him to choose the material and shape of the birdbath. They made it in the shape of a cylinder with a hemispherical depression at one end as shown in the Figure below. They opted for the height of the hollow cylinder as 1.45 m and its radius is 30 cm. The cost of material used for making bird bath is Rs. 40 per square meter.	1 1 2

	(i)Find the curved surface area of the hemisphere. (Take $\pi = 3.14$) (ii) Find the total surface area of the bird-bath. (Take $\pi = 22/7$) (iii) What is total cost for making the bird bath? **(OR)** (iii) Mayank and his brother thought of increasing the radius of hemisphere to 35 cm with same material so that birds get more space, then what is the new height of cylinder? 	

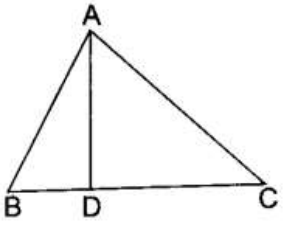
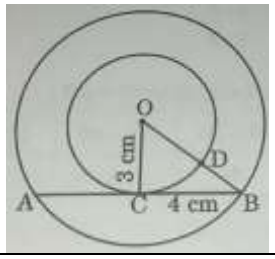
	Marking scheme for Sample paper 3 Basic Math
	Section A
1	c
2	a
3	b
4	d
5	d
6	c
7	c
8	b
9	c
10	b
11	d
12	c
13	a
14	b
15	c
16	c
17	b
18	b
19	d
20	a
	Section B
21	$A=45^0$, $B=15^0$
22	68
23	The point divides the line in the ratio 2:7. (or) Relation**:** 3x+y=5
24	Zeroes: 4 and −2
25	To prove AB + CD = BC + AD
	Section C
26	Proving $5 + 2\sqrt{3}$ as irrational
27	intersection point is (6,6) x=6 and y=6 is the solution triangle vertices: A = (2, 0), B = (-3, 0), C = (6, 6) Area = 15 square units
28	Proving that a parallelogram circumscribing a circle is a rhombus. (OR) Proving the lengths of tangents drawn from an external point to a circle are equal.
29	Points of trisection: $(2,-\frac{5}{3})$ and $(0,-\frac{7}{3})$
30	(i) $\frac{1}{22}$ (ii) $\frac{9}{22}$ (iii) $\frac{3}{22}$
31	Proving $(\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$ (OR) Proving $(\sin \alpha + \cos \alpha)(\tan \alpha + \cot \alpha) = \sec \alpha + \text{cosec } \alpha$
	Section D
32	Speed of train = 40 km/h (OR) Speed of stream = 6 km/h
33	Proving Basic Proportionality theorem KQ = 4.8 cm
34	x = 7, y = 15

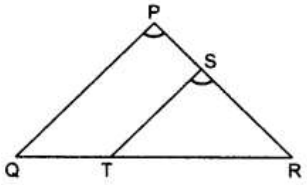
35	Inner surface area ≈ 572.57 cm² (OR) Surface Area ≈ 150.8 mm² Volume ≈ 159.3 mm³
	Section E
36	(i)6th instalment = ₹2425 (ii)Total paid in 15 instalments = ₹30,375 (OR) (ii)₹55,375 (iii)₹3050
37	(i)Difference in height = 80 – 60 = 20 m (ii)Distance ≈ 34.64 m (OR) (ii)Angle of elevation = 60°
38	(i)CSA of hemisphere = 0.5652 m² (ii)Total surface area of bird-bath = 8.772 m² (iii) Total cost = ₹350.88 (OR) (iii)New height of cylinder = 3.637 m

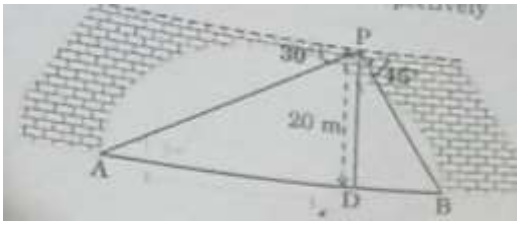
KENDRIYA VIDYALAYA SANGATHAN RO RAIPUR 2025-26

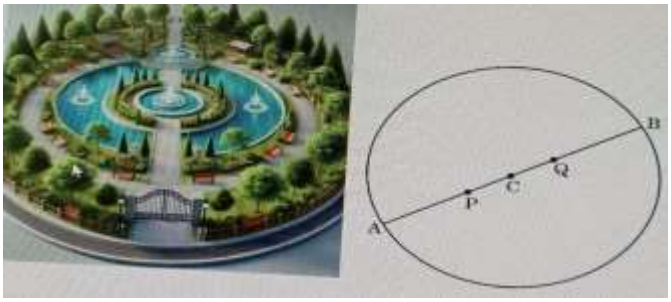
CLASS X

MATHEMATICS BASIC 4

SN	**SECTION A** Question number 1 to 20 are Multiple Choice Questions of one mark each	MARKS
1	If the quadratic equation $x^2 + 2kx + 9 = 0$ has equal roots, then the value of k is: A. 1 B. 3 C. ±3 D. ±2	1
2.	Distance between the points (4, 0) and (0, 3) is: A. 3 B. 4 C. 5 D. 6	1
3	The mode of {3,7,3,2,9,7}: (A) 3 and 7 (B) 7 (C) 3 (D) 2	1
4	Which of the following statement is true A) sin 30° = cos 30° (C) tan 90°= cot 90° B) sin 45° = cos 45° (D) sec 0° = cot 30°	1
5	If ∠BAC = 90° and AD ⊥ BC. Then  (A) $BD.CD = BC^2$ (B) $AB.AC = BC^2$ (C) $BD.CD = AD^2$ (D) $AB.AC = AD^2$	1
6	The pair of linear equation 2x- 5y= -6 and 6x - 15 y =18 represents two lines which are A) Intersecting (C) coincident B) Parallel (D) Either intersecting or parallel	1
7	The perimeter of a sector of a circle whose central angle is 90° (A) 35 cm (B) 11 cm (C) 22 cm (D)19.5 cm	1
8	The curved surface area of a cone having a height of 24 cm and a radius 7 cm is (A) 528 cm^2 (B) 1056 cm^2 (C) 500 cm^2 (D) 550 cm^2	1
9	The ratio of HCF to LCM of the least composite number and the least prime number is (A) 1: 2 (B) 2: 1 (C) 1 : 1 (D) 1 : 3	1
10	In the given figure chord AB of the larger circle touches the smaller circle at C .If both the circles have same centre O then the length of BD is (A) 1 cm (B) 2 cm (C) 3 cm (D) 4cm 	1
11	In triangles ABC~PQR if ∠A=30° and and radius 7cm is ∠Q=90°, then ∠B+∠R= (A) 90° (B) 120° (C) 180° (D) 150°	1
12	I f $(1 + \sqrt{x})^2 = x^2 + 2\sqrt{x}$ is expressed as a quadratic equation in the form of $ax^2 + bx + c = 0$, then the value of a - b + c is (A) - 1 (B) 0 (C) 1 (D) 2	1
	The length of the shadow of a tower when the suns altitude changes from 30° to 60° will	

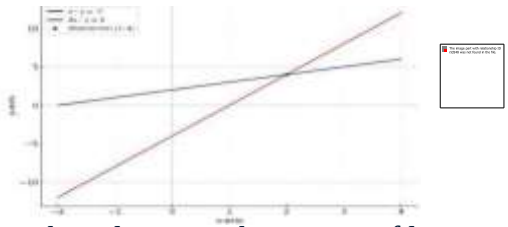
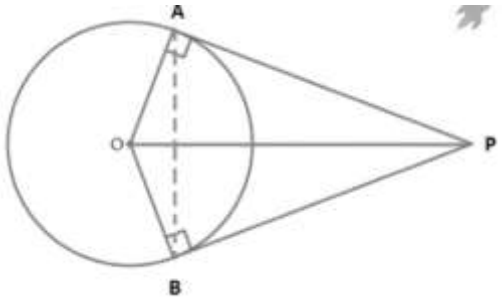
13	A) remain same (C) become longer B) be doubled (D) become shorter	1
14	If in triangles ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar, if (a) ∠B = ∠D (b) ∠A = ∠D (c) ∠B = ∠E (d) ∠A = ∠F	1
15	The equation of the line passing through the points (2, -3) and (4, 1) is: A) y = 2x − 7 B) y = −2x + 1 C) y =12x − 2 D) y = −12x −2	1
16	The 10th term of the AP: 5, 8, 11,… is: (A) 32 (B) 29 (C) 35 (D) 31	1
17	The least significant digit of 7^n when n≥1 is: (A) 7 (B) 1 (C) 3 (D) 9	1
18	Two fair dice are rolled. Probability of a total of 8: (A) 5/36 (B) 5/18 (C) 1/6 (D) 1/3	1
	For question 19 and 20 Direction :(a) both Assertion and Reason are correct and Reason is the correct explanation of Assertion. (b) both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion. (c) Assertion is correct but Reason is incorrect. (d) Assertion is incorrect but Reason is correct.	
19	***Assertion:*** The prime number which divide 36 also divide 6 ***Reason:*** Any number which divide p^2 also divide p.	1
20	***Assertion:*** All congruent triangles are similar ***Reason:*** In congruent triangles , the ratio of corresponding sides is 1 : 1	1
	SECTION B	
21	From a circular sheet of radius 10 cm a quadrant is cut .Find the perimeter of the remaining sheet	2
22	Solve the following system of linear equation graphically x - y = - 2 and 4x - y = 4	2
23	Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre	2
24	"S and T are points on sides PR and QR of triangle PQR such that ∠P = ∠RTS. Show that ΔRPQ ~ ΔRTS."  	2
25	If (secA + tanA) (1 − sinA) = K cos A , then find the value of K ? OR Evaluate : $\tan^2 60° - \text{cosec}^2 30° - 2\tan^2 30°$	2

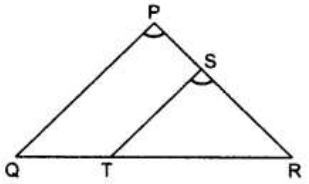
<table>
<tr><td></td><td>SECTION C</td><td></td></tr>
<tr><td>26</td><td>The greater of two supplementary angles exceeds the smaller by 18 °. find measures of these two angles.</td><td>3</td></tr>
<tr><td>27</td><td>Prove that (cot θ - cosecθ)^2 = $\frac{1-\cos\theta}{1+\cos\theta}$</td><td>3</td></tr>
<tr><td>28</td><td>A card is drawn from a pack of 52 cards find the probability of getting
(a) A king
(b) A black card
(c)A red face card</td><td>3</td></tr>
<tr><td>29</td><td>Prove that the parallelogram circumscribing a circle is a rhombus.</td><td>3</td></tr>
<tr><td>30</td><td>Prove that $\sqrt{5}$ is an irrational number
Or
Find which among the following numbers, a, b, and c, is/are composite numbers.
a=7×11×13+13
b=6×5×4+4
c=7×13+6</td><td>3</td></tr>
<tr><td>31</td><td>If α and β are zeroes of the polynomial x^2 + 3x +1 .Find the polynomial whose zeroes are 2α and 2β</td><td>3</td></tr>
<tr><td></td><td>SECTION D</td><td></td></tr>
<tr><td>32</td><td>The difference of squares of two numbers is 180. The square of the smaller number is 8 times the larger number.Find the numbers</td><td>5</td></tr>
<tr><td>33</td><td>The table displays the daily expenditure of 25 households in a locality.
<table>
<tr><td>Daily expenditure (in (in ₹))</td><td>500-750</td><td>750-1000</td><td>1000-1250</td><td>1250-1500</td><td>1500-1750</td></tr>
<tr><td>No of Household</td><td>4</td><td>2x + 1</td><td>12</td><td>x</td><td>2</td></tr>
</table>
Find the value of x
Calculate the mean daily expenditure</td><td>5</td></tr>
<tr><td>34</td><td>A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel</td><td>5</td></tr>
<tr><td>35</td><td>Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that ΔABC ~ ΔPQR.
OR
State and Prove Basic Proportionality theorem</td><td>5</td></tr>
<tr><td></td><td>SECTION E</td><td></td></tr>
<tr><td>36</td><td>Two motorboats A and B are waiting at the opposite banks of a river in order to reach the opposite side. From a point P on the bridge, 20 m above the river, the angles of depression of the boats are 30∘ and 45∘ respectively, as shown in the figure given below. Both the boats leave at the same time at the speed of 10 m/s and 5 m/s, respectively
 
</td><td></td></tr>
</table>

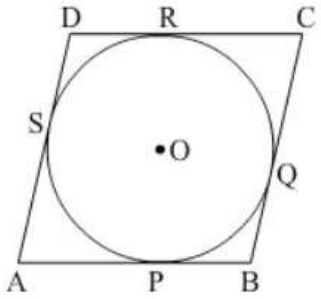
	Based on the above information, answer the following questions : (i) Find the distance travelled by boat A to reach point D in the river, vertically below the point *P*. (Use 3=1.73) 1 1 (ii) What is the width of the river ? (iii) (a) Which boat will reach point D first, and how much earlier, than the other boat? 2 OR (b) What is the distance between the two boats after 3 seconds? 2	1 1 2
37	In a society there is a circular park having two gates.the gates are placed at two points A (10,20) and B(50,50)as shown in figure below .Two fountains are installed at points P and Q on AB all such that AP=PQ=QB  (i) Find the co ordinates of the centre C (ii) Find the radius of the circular park (iii) (a) Find the co-ordinates of the point P Or (c) Find the distance of the fountain at Q from gate A	1 1 2
38	Aahana being a plant lover decides to convert her balcony into beautiful garden full of plants. She bought few plants with pots for her balcony. She placed the pots in such a way that number of pots in the first row is 2 , second row is 5 , third row is 8 and so on.  Based on the above information, answer the following questions : (i) Find the number of pots placed in the 10^{th} row (ii) (ii) Find the difference in the number of pots placed in 5th row and 2nd row. (iii) If Aahana wants to place 100 pots in total, then find the total number of rows formed in the arrangement.	1 1 2

ANSWER KEY

1	C. ±3	
2	**C. 5**	
3	(A) 3 and 7	
4	**B)** sin 45° = cos 45°	
5	C) BD.CD = AD^2	
6	(C) coincident	
7	(D)19.5 cm	

8	D) 550 cm^2	
9	(A) 1: 2	
10	(B) 2 cm	
11	(D) 150	
12	(C) 1	
13	**(D)** become shorter	
14	(a) $\angle B = \angle D$	
15	A) $y = 2x - 7$	
16	(B) 29	
17	(C) 3	
18	(A) 5/36	
19	(c) Assertion is correct but Reason is incorrect.	
20	(a) both Assertion and Reason are correct and Reason is the correct explanation of Assertion.	
21	Solution : Perimeter of remaining sheet consist of (i) two radii ,(ii) The arc of three quarter of circle Length of radii = 2r = 2x 10 = 20 cm Arc length of remaining sheet (3/4 of circle) = $\frac{3}{4}$ of circumference of circle = $\frac{3}{4}$ x 2 $\prod$r = $\frac{3}{4}$ x 2 x $\prod$ x 10 =15 $\prod$ cm Perimeter = 20 + 15 $\prod$ cm	1 1
	SECTION B	
22	Sol: For x - y = - 2 4x - y = 4 x 0 1 / y 2 0 x 0 1 / y - 4 0  Ans. The solution to the system of linear equation is (2,0)	1 1
23	Sol: Let O be the centre and P be a point outside the circle such that tangents PA and PB are drawnwhich touches the circle at point A and B respectively.  The tangent at any point of a circle is always perpendicular to the radius through the point of contact. ∴ $\angle OAP = \angle OBP = 90°$ --- Equation (i) In a quadrilateral, the sum of interior angles is 360°. ∴ In OAPB, $\angle OAP + \angle APB + \angle PBO + \angle BOA = 360°$	

	Using Equation (i), we can write the above equation as 90° + ∠APB + 90° + ∠BOA = 360° ∠APB + ∠BOA = 360° - 180° ∴ ∠APB + ∠BOA = 180° Hence, proved	
24	In ΔRPQ and ΔRTS, ∠RPQ = ∠RTS (given) ∠PRQ = ∠TRS (common angle) Thus, ΔRPQ ~ ΔRTS (AA criterion) 	1 1
25	**L.** H.S. =(secA + tanA) (1−sinA) $=(\frac{1}{\cos A}+\frac{\sin A}{\cos A})(1-\sin A)$ $=\frac{(1+\sin A)}{\cos A}$ x (1−sinA) $=\frac{1-\sin^2 A}{\cos A}=\frac{\cos^2 A}{\cos A}$ = cosA=R.H.S. OR $\tan^2 60° - \operatorname{cosec}^2 30° - 2\tan^2 30°$ $=(\sqrt{3})^2-(2)^2-2(\frac{1}{\sqrt{3}})^2$ $=3-4-2(\frac{1}{3})=\frac{-3-2}{3}=\frac{-5}{3}$ Ans	1 1
	SECTION C	
26	Sol: Let the smaller angle be x and greater angle be (x + 18°) As the angles are supplementary so x+(x + 18°) = 180° = 2x +18° =180° x = 81° smaller angle X + 18° = 99° larger angle	1 1 1
27	L.H.S=(cot θ - cosecθ)^2 $(\frac{\cos\theta}{\sin\theta}-\frac{1}{\sin\theta})^2=(\frac{\cos\theta-1}{\sin\theta})^2=\frac{(\cos\theta-1)^2}{\sin^2\theta}$ $=\frac{\{-(1-\cos\theta)\}^2}{1-\cos^2\theta}$ $=\frac{(1-\cos\theta)^2}{(1+\cos\theta)(1-\cos\theta)}=\frac{(1-\cos\theta)(1-\cos\theta)}{(1+\cos\theta)(1-\cos\theta)}=\frac{(1-\cos\theta)}{(1+\cos\theta)}$ R.H.S	
28	Total number of cards 52 (a) P(getting a king) = 4/52 = 1/13 (b) P(getting a black card) = 26/52 = 1/2 (c) 4 kings, 4 queen and 4 jacks are all face cards. Number of red face cards = 2+2+2 = 6. P(getting a red face card) = 6/52 = 3/26	1 1 1
29	Sol: ABCD is a parallelogram. Therefore, opposite sides are equal. AB = CD , BC = AD	

	 According to Theorem 10.2: The lengths of tangents drawn from an external point to a circle are equal. Therefore, BP = BQ (Tangents from point B)…… (1) CR = CQ (Tangents from point C)…… (2) DR = DS (Tangents from point D)…… (3) AP = AS (Tangents from point A)……. (4) Adding (1) + (2) + (3) + (4) BP + CR + DR + AP = BQ + CQ + DS + AS On re-grouping, BP + AP + CR + DR = BQ + CQ + DS + AS AB + CD = BC + AD Substitute CD = AB and AD = BC since ABCD is a parallelogram, then AB + AB = BC + BC 2AB = 2BC AB = BC ∴ AB = BC = CD = DA This implies that all the four sides are equal. Therefore, the parallelogram circumscribing a circle is a rhombus.	
30	Correct proof OR Sol: a=7×11×13+13 = 13 (7×11+1) = 13 x 78 (a is a composite number) b=6×5×4+4 = 4(6×5+1) = 4 x 31 (b is a composite number) c=7×13+6 = 91 + 6 = 97 (97 is a prime number , so c is not a composite number) Ans. Only a and b are composite number	1 1 1
31	Sol: the given polynomial is $x^2 + 3x + 1$ Sum of zeroes $\alpha + \beta = \frac{-b}{a} = \frac{-3}{1} = -3$, product of zeroes = $\alpha \times \beta = \frac{c}{a} = \frac{1}{1} = 1$Required polynomial Sum of **new zeroes** $2(\alpha + \beta) = 2x(-3) = -6$ product of **new zeroes** $2\alpha \times 2\beta = 4(\alpha \times \beta) = 4x\ 1 = 4$ **Required polynomial x^2 -(**Sum of new zeroes**)x + (**product of new zeroes**)** **Ans $x^2 + 6x + 4$**	

32

Let the Larger numbers be x then

(smaller number)^2 = 8x

ATQ Difference of their squares , $(x)^2$ - (8x) =180. …(i)

$x^2-8x-180=0$

$\Rightarrow x^2-18x+10x-180=0 \quad \Rightarrow x(x-18)+10(x-18)=0$

$\Rightarrow (x-18)(x+10)=0 \quad \Rightarrow x-18=0$ or $x+10=0$

$\Rightarrow x=18$ or $x=-10$.

Now, $x=18 \Rightarrow$ (smaller number)$^2 = (8\times18) = 144$

$\Rightarrow$ smaller number =12 or −12.

Also, $x = -10 \Rightarrow$ (smaller number)$^2 = \{8\times(-10)\} = -80$, which is not possible.

Hence, the numbers are (18 and 12) or (18 and −12).

33

Daily expenditure (in ₹)	No of Household fi	xi	fixi
500-750	4	$\frac{500+750}{2} = 625$	2500
750-1000	2x + 1 = 5	875	4375
1000-1250	12	1125	13500
1250-1500	x (x = 2)	1375	2750
1500-1750	2	1625	3250
	∑fi = 25		∑fixi = 26375

∑fi = 25 ,

4 + 2x + 1 +12 + x + 2 =25

X = 2

Mean daily expenditure = (∑fixi)/ ∑fi = $\frac{26375}{25}$ = 1055

Ans The value of x is 2 and the mean daily expenditure is ₹ 1055

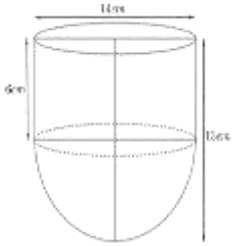
34

Sol:- Given Hemisphere ,Diameter = 14 , r = 7 cm

Height = r =7cm

Hollow cylinder , R = 7cm (same as radius of hemisphere)

Height of cylinder = Total height of the vessel - height of the hemisphere= 13 cm - 7 cm = 6 cm



Inner surface area of the vessel = CSA of the hemisphere + CSA of the cylinder

$= 2\pi r^2 + 2\pi rh$

$= 2\pi r\,(r + h)$

$= 2 \times 22/7 \times 7\text{cm}\,(7\text{ cm} + 6\text{ cm})$

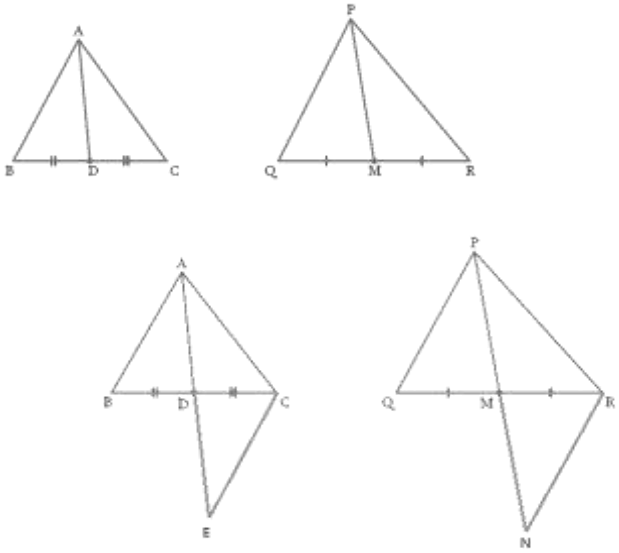
$= 2 \times 22 \times 13\ \text{cm}^2$

$= 572\ \text{cm}^2$

35

Given :In ΔABC and ΔPQR , AB / PQ = AC / PR = AD / PM

To prove : ΔABC ~ ΔPQR.



Construction : Produce AD to E so that AD = DE. Join CE

Similarly, produce PM to N such that PM = MN , and join RN.

In Δ ABD and Δ CDE

AD = DE [By Construction]

BD = DC [AD is the median]

∠ADB = ∠CDE [Vertically opposite angles]

Therefore, Δ ABD ≅ Δ ECD [By SAS criterion of congruence]

⇒ AB = CE [CPCT] ...(i)

Also, in Δ PQM and Δ MNR

PM = MN [By Construction]

QM = MR [PM is the median]

∠PMQ = ∠NMR [Vertically opposite angles]

Therefore, Δ PQM = Δ NRM [By SAS criterion of congruence]

⇒ PQ = RN [CPCT]...(ii)

Now,

AB / PQ = AC / PR = AD / PM [Given]

⇒ CE / RN = AC / PR = AD / PM [from (i) and (ii)]

⇒ CE / RN = AC / PR = 2AD / 2PM

⇒ CE / RN = AC / PR = AE / PN [2AD = AE and 2PM = PN]

Therefore, Δ ACE ~ Δ PRN [By SSS similarity criterion]

Therefore, ∠CAE = ∠RPN

Similarly, ∠BAE = ∠QPN

Hence, ∠CAE + ∠BAE = ∠RPN + ∠QPN

⇒ ∠BAC = ∠QPR

⇒ ∠A = ∠P ....(iii)

Now, In Δ ABC and Δ PQR

AB/PQ = AC/PR

∠A = ∠P [from (iii)]

Therefore, Δ ABC ~ Δ PQR [By SAS similarity criterion]

	or GIVEN TO PROVE PROOF	
	SECTION E	
36	Sol: (i)For boat A, the angle of depression is 30°. The height from point P to the water is 20 m. In APD , tan(30°)=$\frac{PD}{AD}$= $\frac{20}{AD}$ $\frac{1}{\sqrt{3}} = \frac{20}{AD}$, AD = 20 $\sqrt{3}$ m = **34.6 m** approx. (ii) Width of the river is AD + DB = 20 $\sqrt{3}$ + 20 = 20 ($\sqrt{3}$ + 1) = 54.64 (iii) Time taken by boat A = $\frac{Distance}{Speed}$ = $\frac{34.6}{10}$ = 3.46 s Time taken by boat B = $\frac{Distance}{Speed}$ = $\frac{20}{5}$ = 4 s Boat A will each first. So 4 - 3.46 = **0.54 s** OR Distance covered by boat A in 3 seconds , speed x time = 10 x 3 = 30 m Distance covered by boat B in 3 seconds , speed x time = 5 x 3 = 15 m As AD =3.46 m , so boat A is 34.6 -30 = 4.6 m away from D And Db = 20 m , So oat B is 20 - 15 = 5 m away from D Distance between the boats after 3 seconds is 4.6 + 5 = **9.6 m**	1 1 1 1
37	(i) Given : A (10,20)and B(50,50) Let (x_1, x_2) = (10 , 50) and (y_1, y_2) = (20 , 50) Using mid -point formula C = {$\frac{x1 + x2}{2}$, $\frac{y1 + y2}{2}$} = {$\frac{60}{2}$, $\frac{60}{2}$} = (30, 35) **co ordinates of the centre C (30, 35)** (ii) radius of the circular park AC or BC Using distance formula r =$\sqrt{(x2 - x1)2 + (y2 - y1)2}$ = $\sqrt{(10 - 30)^2 + (20 - 35)^2}$ = **25 unit** **(iii)**(a) For co-ordinates of point P , as AP = PQ = QB so AP = m= 1 and PB = n = 2 Using section formula {$\frac{mx2 + n\ x1}{m+n}$, $\frac{my2 + n\ y1}{m+n}$} = {$\frac{70}{3}$, $\frac{90}{2}$} = ($\frac{70}{3}$, 30) Or co-ordinates of point Q = ($\frac{110}{3}$, 40) using distance formula Now AQ = $\frac{100}{3}$ units	1 1 1 1 1
38	Sol: (i) Number of pots in each row forms an A.P 2, 5,8……. Using nth term formula a_n= a + (n−1) d **a_{10} =29** (ii)the difference in the number of pots placed in 5th row and 2nd row $a_5 - a_2$ = 14 - 5 = **9** **(iii)** Formula for sum of n terms S_n = 100 = $\frac{n}{2}${2a + (n−1) d } $3n^2$ + n -200 = 0 , n= 8 or $\frac{-50}{6}$ **total number of rows formed is 8.**	1 1 2

SAMPLE PAPER- I

Class X **MATHEMATICS STANDARD (041)**

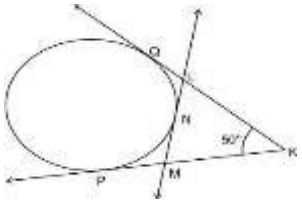
TIME: 3 HOURS **MAX.MARKS: 80**

General Instructions:

1. **This Question Paper has 5 Sections A, B, C, D, and E.**
2. **Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.**
3. **Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.**
4. **Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.**
5. **Section D has 4 Long Answer (LA) type questions carrying 5 marks each.**
6. **Section E has 3 sourced based/Case Based/passage based/integrated units of assessment (4 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.**
7. **All Questions are compulsory. However, an internal choice in 2 Qs of 2 marks, 2 Qs of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.**
8. **Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.**

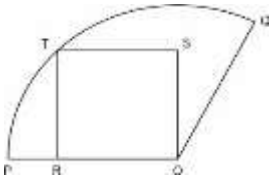
SECTION A

1. If both roots of the quadratic equation $(k+1)x^2 - 2(1+3k)x + 1+8k$ are real and equal then the value of k is
   A) -2 B) 1 C) 2 D) 3
2. 21 mango trees, 42 apple trees and 56 orange trees have to be planted in rows such that each row contains the same number of trees of one variety only. The number of trees in each row will be
   A) 7 B) 8 C) 168 D) 42
3. If graph of a polynomial p(x) does not intersects the x-axis but intersects y-axis in one point, then no. of zeroes of the polynomial is equal to
   A) 0 B) 1 C) 0 or 1 D) none of these
4. If 2x + 3y = 24 and 2x -3y = 12 , then xy equal to:
   A) 10 B) 12 C) 18 D) 16
5. The next term of the AP $\sqrt{18}, \sqrt{50}, \sqrt{98}$,..... is
   A) $\sqrt{146}$ B) $\sqrt{128}$ C) $\sqrt{162}$ D) $\sqrt{200}$
6. Sum of n terms of the A.P. $(3-\frac{1}{n})$, $(3-\frac{2}{n})$, $(3-\frac{3}{n})$,..... is
   A) $\frac{1}{2}(5n+1)$ B) $\frac{1}{2}(5n-1)$ C) $\frac{1}{2}(3n+1)$ D) $\frac{1}{2}(3n-1)$
7. What type of triangle can you form in a garden with three flower beds located at points (−4,0), (4,0), and (0,3).
   A) right triangle B) isosceles triangle C) equilateral triangle D) scalene
8. If $\sin\theta - \cos\theta = 0$, then the value of $\sin^4\theta + \cos^4\theta$ is
   A) 1 B) $\frac{3}{4}$ C) $\frac{1}{2}$ D) $\frac{1}{4}$
9. If $\sin\theta + \cos\theta = \sqrt{2}$, then $\tan\theta + \cot\theta =$
   A) 1 B) 2 C) 3 D) 4
10. If two towers of heights h_1 and h_2 subtend angles of 60° and 30° respectively at the mid-point of the line joining their feet, then $h_1 : h_2 =$
    A) 1 : 2 B) 1 : 3 C) 2 : 1 D) 3 : 1
11. If the area of a circle is equal to sum of the areas of two circles of diameter 10 cm and 24 cm,calculate the diameter of the larger circle
    A) 13 cm B) 14 cm C) 26 cm D) 34 cm
12. Shown below is a circle with 3 tangents KQ, KP and LM. QL = 2 cm and KL = 6 cm. PM = $\frac{1}{2}$ KL. What is the measure of ∠LMK?



    A) 50° B)65° C)80° D)cannot be uniquely determined
13. In the figure below, a unit square ROST is inscribed in a circular sector with centre O

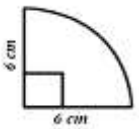
Along with the above information, which of these is SUFFICIENT to find the area of sector POQ?



A)area of the square ROST B)radius of sector POQ

C) arc length PQ D) the given information is sufficient

14. When the figure below is spun around its vertical axis, what is the total surface area of the solid formed?



A) 108 π B) 100 π C) 72 π D) 22

15. If the difference of Mode and Median of a data is 24, then the difference of median and mean is

A) 8 B) 12 C) 24 D) 36

16. The probability of guessing the correct answer to a certain test questions is $\frac{x}{12}$. If the probability of not guessing the correct answer to this question is $\frac{2}{3}$ then x =.....

A) 2 B) 3 C) 4 D) 6

17. A box contains cards numbered 9 to 53. A card is drawn at random from the box The probability that the drawn card is a multiple of 9 is.

A) $\frac{1}{45}$ B) $\frac{2}{15}$ C) $\frac{4}{45}$ D) $\frac{1}{9}$

18. A town has a rectangular park with opposite corners at coordinates (1, 2) and (5, 6). What is the length and breadth of the park?

A) 4 units,4 units B) 6 units,8 units C)5 units, 3 units D) 3 units ,11 units

DIRECTION:

In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option.

A)Both assertion A and reason R are true and reason R is the correct explanation of assertion A.

B)Both assertion A and reason R are true and reason R is not the correct explanation of assertion A.

C) Assertion A is true but reason R is false.

D) Assertion A is false but reason R is true.

19. Assertion (A) : The distance between the points (cos θ, sin θ) and (sin θ, -cos θ) is 2 units.

Reason (R) : The distance between A (x_1,y_1) and B (x_2,y_2) is given by

$$AB = \sqrt{[x_2 - x_1]^2 + [y_2 - y_1]^2}$$

20. Assertion (A): The length of the minute hand of a clock is 7 cm. Then the area swept by the minute hand in 5 minute is $\frac{77}{6}$cm^2

Reason (R): The length of an arc of a sector of angle q and radius r is given by $l = \frac{\theta}{360}2\pi r$

SECTION B

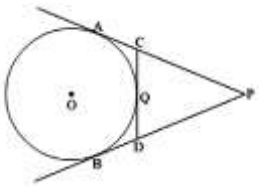
21.Find the largest number that divides 2053 and 967 leaving the remainders 5 and 7 respectively.

22. If tan A = $\frac{3}{4}$, find the value of $\frac{1}{sinA} + \frac{1}{cosA}$

OR

Find A & B if Sin(A + 2B) = $\frac{\sqrt{3}}{2}$ and Cos (A + 4B) = 0, where A & B are Acute angles

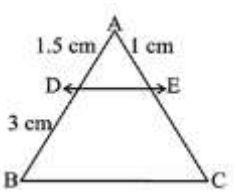
23. In figure, PA and PB are tangents to the circle from an external point P. CD is another tangent touching the circle at Q. If PA=12cm QC=QD =3cm, then find PC + PD



24. If ΔABC and ΔDEF are similar triangles such that ∠A=57°and∠E=83°.Find∠C.

OR

In the below figure, DE||BC, find EC



25. Find the area of the square that can be inscribed in a circle of radius 8 cm.

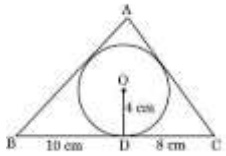
SECTION C

26. Prove that √5 is Irrational.

27. The zeroes of x^2- kx +6 are in the ratio 3:2, find k

28. If 45 is subtracted from twice the greater of two numbers, it results in the other number. If 21 is subtracted from twice the smaller number, it results in greater number. Find the number.

29. A ΔABC is drawn to circumscribe a circle of radius 4 cm such that the tangents BD and DC are of lengths 10 cm and 8 cm. Find the sides AB and AC given area of ΔABC is 90



30. Three coins are tossed simultaneously. Find the probability of getting
    (i) Exactly 2 heads
    (ii) at least 1 head
    (iii) at most 2 tails

31. Prove that (Sin θ + 1 + Cos θ) (Sin θ - 1 + Cos θ) Sec θ Cosec θ = 2

SECTION D

32. . The median of the following data is 868. Find the values of x and y, if the total frequency is 100

Class	Frequency
800 – 820	7
820 – 840	14
840 – 860	x
860 – 880	25
880 – 900	y
900 – 920	10
920 – 940	5

33. Amit bought two pencils and three chocolates for ₹11 and Sumeet bought one pencil and two chocolates for ₹7. Represent this situation in the form of a pair of linear equations. Find the price of one pencil and that of one chocolate graphically.

OR

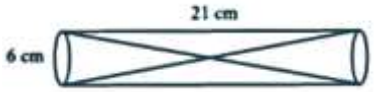
a) In a competitive examination, one mark is awarded for each correct 5 6 answer, while mark is deducted for every wrong answer. Rahul answered 120 questions and got 90 marks. How many questions did he answer correctly?

b) Obtain the value of (x+y) and (x−y) from the following equations

$51x+49y=150$

$49x+51y=50$

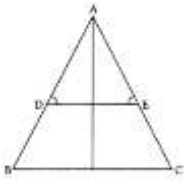
34. Two solid cones A and B are placed in a cylindrical tube as shown in the Figure. The ratio of their capacities are 2:1. Find the heights and capacities of cones. Also, find the volume of the remaining portion of the cylinder.



OR

A cylindrical tank of radius 40cm is filled up to height, 3.15m by another cylindrical pipe with the rate of 2.52 km/hr in half an hour. Calculate the diameter of the cylindrical pipe.

35. i) State and prove Basic Proportionality Theorem.
    ii) In the fig., ∠D = ∠E and AD DB = AE . Prove that ΔBAC is an isosceles triangle.



SECTION E

36. Your elder brother wants to buy a car and plans to take loan from a bank for his car. He repays his total loan of Rs 1,18,000 by paying every month starting with the first instalment of Rs 1000. If he increases the instalment by Rs 100 every month. Based on the above information answer the following questions.

i.Find the amount paid by him in 30th instalment?

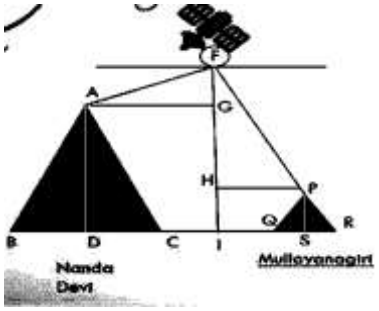
ii.If total instalments are 40 then find the amount paid in the last instalment?

iii.Find the amount paid by him in the 30 instalments?

[OR]

What amount does he still have to pay after 30th instalment?

37. A Satellite flying at a height is watching the top of the two tallest mountains in Uttarakhand and Karnataka, them being Nanda Devi (height 7,816m) and Mullayanagiri (height 1930 m).
The angles of depression from the satellite to the top of Nanda Devi and Mullayanagiri are 30° and 60° respectively. If the horizontal distance between the two mountains is 1938 km, and the satellite is vertically above the midpoint of the distance between the two mountains.

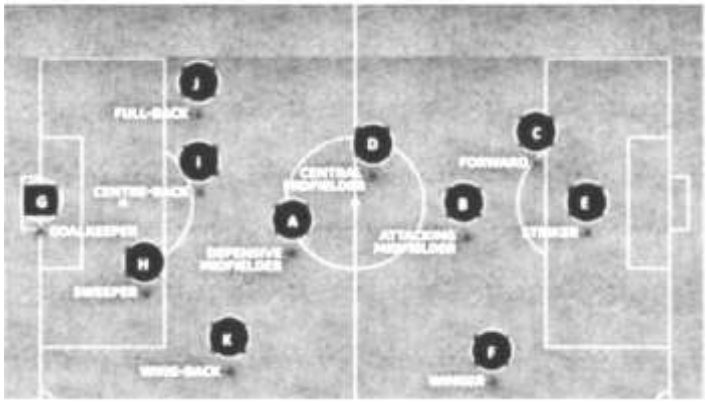


1. What is the distance of the satellite from the top of Mullayanagiri
2. If a mile stone very far away from, makes 450 to the top of Mullanyangiri mountain. So, find the distance of this milestone form the foot of the mountain.
3. What is the distance of the satellite from the ground ?

OR

What is the distance of the satellite from the top of Nanda Devi

38. Tharunya was thrilled to know that the football tournament 20th July to 20th August, 2023 and for the first time in the FIFA Women's World Cup's history ,two nations host in 10 venues. Her father felt that the game can be better understood if the position of two players is represented as points on a coordinate plane



i).At an instance, the midfielders and forward formed a parallelogram. Find the postion of the central midfielder (D) if the position of other players who formed the parallelogram are: A(1, 2), B(4,3) and C(6,6).

ii) Check if the Goalkeeper G(-3,5), Sweeper H(3,1) and Wing-back K(0,3) fall on a same straight line.

iii)Check if the full-back J(5,−3) and centre-back I(−4,6) are equidistant from forward C(0,1) and if C is the mid-point of IJ.

OR

If Defensive midfielder A(1, 4), Attacking midfielder B(2,−3) and Striker E(a,b) lie on the same straight line and B is equidistant from A and E, find the position of E.

MARKING SCHEME
SAMPLE PAPER I STANDARD (041)
SECTION A

1. D) 3 2. A) 7 3. A) 0 4. C) 18 5. B) √128 6. B) $\frac{1}{2}$(5n-1) 7. B) isosceles
8. C) $\frac{1}{2}$ 9. B) 2 10. D) 3 : 1 11. C) 26 cm 12. C)80° 13. C) arc length PQ
14.C) 72 π 15. B) 12 16. C) 4 17. D) $\frac{1}{9}$ 18. A)4 units,4 units 19. D 20. B

SECTION B

21. Required number is HCF of 2053 – 5 = 2048 and 967 – 7 = 960
HCF of 2048 and 960 = 64

22. tan A = $\frac{3}{4}$, Using Pythagoras property, find Hypotenuse as 5
Sin A = $\frac{3}{5}$, Cos A = $\frac{4}{5}$
$\frac{1}{sinA} + \frac{1}{cosA} = \frac{1}{\frac{3}{5}} + \frac{1}{\frac{4}{5}}$
$= \frac{5}{3} + \frac{5}{4} = \frac{35}{12}$

OR

Sin(A + 2B) = $\frac{\sqrt{3}}{2}$, A+ 2B = 60^0
Cos (A + 4B) = 0, A + 4B = 90^0
Solving, A = 30^0 & B = 15^0

23. PA = PC + CA = PC + CQ [∵ CA = CQ. Tangent drawn from an external point are equal] .
12 = PC + 3 ⇒PC=9 CM , PA = PB
⇒PA−AC=PB−BD⇒PC=PD
∴PD=9 CM
Hence PC + PD = 18 cm

24. Since ΔABC and ΔDEF are similar triangles ∠A=∠D,∠B=∠Eand∠C=∠F
∠A=57°and∠E=83°. In △ABC ,∠A+∠B+∠C=180^0
57°+83°+∠C=180
∠C=180°−140° , ∠C=40^0
∴∠F=40^0

OR

In figure,DE||BC, Using Basic proportionality theorem $\frac{AD}{DB} = \frac{AE}{EC}$
$\frac{1.5}{3} = \frac{1}{EC}$, EC = 2 cm.

25. diagonal of square a√2 =16cm
Finding a=8√2cm Area = 128 cm^2

SECTION C

26. correct proof

27. Product of roots = $\frac{c}{a}$ => αβ=6
We get β = ±2 , α=±3
Putting the value we get k = 5 or k = -5

28. 2x – 45 = y ⇒ 2x – y – 45 = 0 …… (i)
2y – 21 = x ⇒ x – 2y + 21 = 0 …… (ii)
On solving we get x=37 and y= 29 ∴ The required numbers are 37, 29

29. ΔABC = Area of ΔOBC+ Area of ΔOCA + Area of △OAB
90 = ½×OD×BC + ½ x OF × AC + ½ × OE × AB
45 = 18+18 + 2x ⇒ x= 4.5, sides are 14.5,12.5

30. The total number of outcomes =8 (HHH, HHT, HTH, THH, TTH, THT, HTT, TTT)
(i):P(E) =$\frac{3}{8}$ (ii): $\frac{7}{8}$ (iii): $\frac{7}{8}$

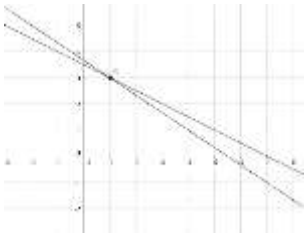
31. correct proof

SECTION D

32. Make a correct table

median = 868, therefore median class is 860 – 880

using the formula of median, we get x=19



33. Let cost of Pencil=x and Chocolate=y

x+3y=11.....(1

X+2y=7.....(2)

For drawing graph One pencil=₹1 and One chocolate =₹3

OR

a) Let the number of right answers and wrong answers be x and y respectively.

According to the given information, x + y = 120

Also, $1x-\frac{1}{2}y= 90$

Solving, we get x =100 and y=20 Therefore, number of right answers = 100

b) adding the given equation and dividing by 100, will get x+y=2,

Subtracting the given equation and dividing by2, will get x−y=50

34. Height of the tube = 21 cm, Base radius of the tube = 3cm

Volume of tube = 594 cm^3

Volume of cone A = 3 π h , Volume of cone B = 3 π (21 – h)

Using the given ratio, we get h = 14

Height of cone A = 14 cm Height of cone B = 21 – 4 = 7 cm

Volume of cone A = 131. 88 cm^3 , Volume of cone B = 65. 94 cm

The volume of remaining portion = Volume of the tube – the volume of cone B

= 594 – 131.88 – 65.94 = 396. 18 cm^3

OR

Volume of cylinder is = πr^2h

The length of the water column in a cylindrical pipe in half an hour = $2.52(\frac{1}{2})$=1.26km.

Volume of water that will flow through the cylindrical pipe

$\Rightarrow V=\pi\times(\frac{d}{2})^2\times126000$ cm^3

volume of the water that falls into the cylindrical tank = volume of length of water

$\Rightarrow\pi\times(\frac{d}{2})^2\times126000=\pi(40)^2325$, So d=4.063 cm the required internal diameter of the pipe.

35. i) Correct statement

Correct diagram and proof

ii) AD/DB=AE/EC [Given] ⇒ DE || BC ⇒ ∠D = ∠B [Corresponding angle]

∠E = ∠C But ∠D = ∠E [Given] Hence ∠B = ∠C …… $\frac{1}{2}$

∴ AB = AC ∴ ΔBAC is an isosceles Δ.

SECTION E

36. (1) amount paid by him in 30th installment = a+29d = 1000+29×100= 3900

(2) amount paid in the last installment = a+39d = 1000+39×100= 4900

(3)amount paid by him in the 30 installments= 73500

OR

amount he still have to pay after 30th instalment=44500.

37. 1) 1938 Km 2) 1930 Km 3) 323√3 Km

OR 646 √3 Km

38. i) Midpoint of AC = Midpoint of BD

Central midfielder is at (3,5) ii) GK + HK = GH, so collinear

iii) equidistant, C is not the mid point B is the midpoint of AE, E = (3,-10)

OR

i)coordinates of I are $(\frac{28}{5}, \frac{16}{5})$ ii) ratio 3:1

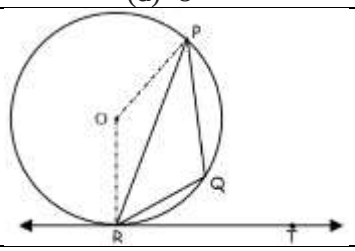
KENDRIYA VIDYALAYA SANGATHAN
SAMPLE PAPER-2 (MATHEMATICS STANDARD)

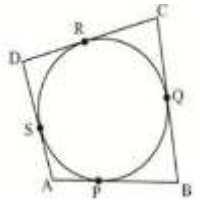
Class: X **Max Marks: 80**
Subject: MATHEMATICS **Time: 3 hrs.**

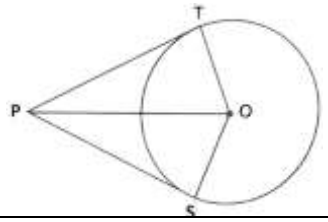
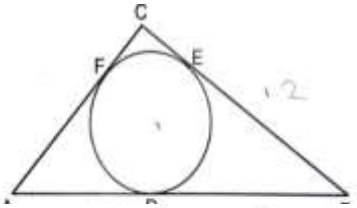
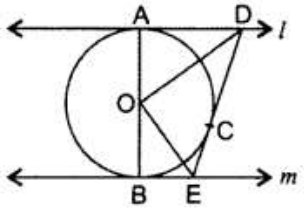
General Instructions:

Read the following instructions carefully and follow them:

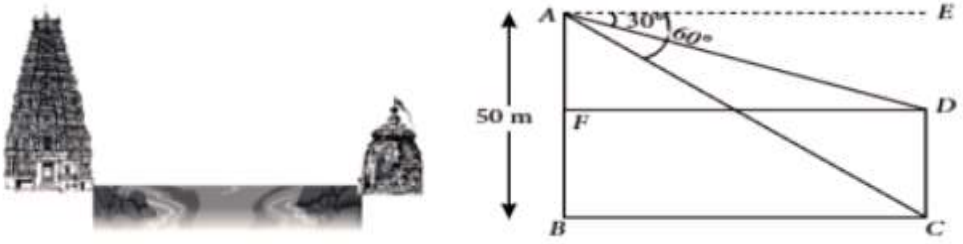
9. This question paper contains 38 questions.
10. This Question Paper is divided into 5 Sections A, B, C, D and E.
11. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion- Reason based questions of 1 mark each.
12. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
13. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
14. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
15. In Section E, Questions no. 36-38 are case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
16. All Questions are compulsory. However, an internal choice in 2 Questions of section B, 2 Questions of section C and 2 Questions of section D has been provided. And internal choice has been provided in all the 2 marks questions of Section E.

	SECTION A	
1.	If the HCF(2520, 6600) = 40 and LCM(2520, 6600) = 252 × k , then the value of k is : (a) 1650 (b) 1600 (c) 165 (d) 1625	1
2.	What would be the value of k for which the pair of Linear equations $2x + ky = 7$ and $3x - 9y - 12$ is consistent and independent ? (a) All real numbers except – 6 (b) All real numbers except 6 (c) 6 (d) – 6	1
3.	If the sum and product of the roots of the equation $3x^2 - 8x + 2k = 0$ are equal, then the value of k is (a) 4 (b) 3 (c) 6 (d) 8	1
4.	If $C(-2, 3)$ is the centre of the circle having the end points $A(4, -2)$ and $B(x, 8)$ of a diameter AB , then the value of x is: (a) 8 (b) 6 (c) -6 (d) -8	1
5.	In given Fig., PR is a chord of a circle and RT is the tangent at R such that ∠PRT = 70°. Then ∠PQR is equal to (a) 140° (b) 120° (c) 150° (d) 110° 	1
6.	In Δ ABC, DE ll BC , AD = 4 cm , DB = 6 cm and AE = 5 cm. The length of EC is (a) 7 cm (b) 6.5 cm (c) 7.5cm (d) 8 cm	1
7.	There are 312, 260 and 156 students in class X, XI and XII respectively. Buses are to be hired to take these students to a picnic. Find the maximum number of students who can sit in a bus if each bus takes equal number of students (a) 52 (b) 56 (c) 48 (d) 63	1
8.	Which term of an AP, 84, 80, 76, … is 0? (a) 9^{th} (b) 10^{th} (c) 11^{th} (d) 22^{nd}	1
9.	If two tangents inclined at an angle 60° are drawn to a circle of radius 3 cm, then length of each tangent is equal to (a) $\frac{3\sqrt{3}}{2}$ cm (b) 6 cm (c) 3 cm (d) $3\sqrt{3}$ cm	1
10.	The height of a tower is 12 m. What is the length of its shadow when Sun's altitude is 45°? (a) 10m (b)11m (c) 12m (d)14m	1

11.	The graph of the polynomial ax^2+bx+c is an upward parabola if (a) a> 0 (b) a < 0 (c) a = 0 (d) a = 1	1
12.	In the adjoining figure , a quadrilateral ABCD is drawn to circumscribe a circle. If BC = 7 cm , CR = 3 cm and AS = 5 cm ,the value of AB is (a) 10 cm (b) 7 cm (c) 8 cm (d) 9 cm 	1
13.	A ladder 20 m long reaches the top of a vertical wall. If the ladder makes an angle of 30° with the wall, then the height of the wall is (a) $20\sqrt{3}$ m (b)$10\sqrt{3}$ m (c) $)\frac{\sqrt{3}}{20}$ m (d) 10 m	1
14.	A quadratic equation is such that its roots are HCF and LCM of the smallest prime number and the smallest composite number, then the quadratic equation is (a) $x^2-2x+4=0$ (b) $x^2-6x+8=0$ (c) $x^2-4x+2=0$ (d) $x^2-8x+6=0$	1
15.	In Δ ABC and Δ DEF, $\frac{AB}{DE}=\frac{BC}{EF}$. Which of the following makes the two triangles similar . (a) ∠ A = ∠ D (b) ∠ B = ∠ D (c) ∠ B = ∠ E (d) ∠ A = ∠F	1
16.	ΔABC is such that AB = 3 cm, BC = 2 cm and CA = 2.5 cm. If ΔDEF ~ ΔABC and FE = 4 cm, then find the perimeter of ΔDEF. (a)7.5cm (b) 10cm (c) 12cm (d) 15cm	1
17.	The length of the minute hand of a clock is 14 cm. The area swept by the minute hand in 5 minutes is (a) 153.9 cm^2 (b) 102.6 cm^2 (c) 51.3 cm^2 (d) 205.2 cm^2	1
18.	Consider the following frequency distribution of the heights of 60 students of a class: Height (in cm) | 150-155 | 155-160 | 160-165 | 165-170 | 170-175 | 175-180 No. of students | 13 | 15 | 10 | 8 | 9 | 5 The sum of the lower limit of the modal class and upper limit of the median class is (a) 310 (b)315 (c) 320 (d) 330	
	DIRECTION: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** Choose the correct option (a) Both assertion **(A)** and reason **(R)** are true and reason **(R)** is the correct explanation of assertion **(A)** (b) Both assertion **(A)** and reason **(R)** are true and reason **(R)** is not the correct explanation of assertion **(A)** (c) Assertion **(A)** is true but reason **(R)** is false. (d) Assertion (A) is false but reason **(R)** is true.	
19.	**Assertion (A):** $\sqrt{11}$ is an irrational number. **Reason (R):** If p is prime number then $\sqrt{p}$ is always an irrational number	1
20.	**Assertion (A):** If the system of equations 2x+3y=7 and 2ax+(a+b)y=28 has infinitely many solutions, then 2a- b=0 Reason (R): The system of equations 3x – 5y =9 and 6x – 10y =8 has infinitely many solutions.	1
	SECTION B	
21.	If $\tan\theta + \cot\theta = 5$, find the value of $\tan^2\theta + \cot^2\theta$.	2
22.	Find the value of p if mean of the given data is 15.45 Class | 0-6 | 6-12 | 12-18 | 18-24 | 24-30 frequency | 6 | 8 | p | 9 | 7	2

23.	Find the length of the median AD of triangle ABC whose vertices are A (-1, 3), B (1, -1), and C (5,1) **(OR)** Write the coordinates of a point on the x-axis which is equidistant from points A(-2, 0) and B(6, 0).	
24.	If α, β are the zeroes of the polynomial $P(x) = 4x^2 + 3x + 7$, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$	2
25.	In the given figure, from a point P, two tangents PT and PS are drawn to a circle with centre O such that $\angle SPT = 120^0$, Prove that OP = 2 PS.  	2
	SECTION C	
26.	Show that $7 - 2\sqrt{3}$ is an irrational number, where $\sqrt{3}$ is given to be an irrational number.	3
27.	If $51x+49y=150$ and $49x+51y=50$ then obtain the value of $x-y : x+y$	3
28.	A circle is inscribed in a ΔABC, with sides AC, AB and BC as 8 cm, 10 cm and 12 cm respectively. Find the length of AD, BE and CF.  **(OR)** In the figure, l and m are two parallel tangents to a circle with centre O, touching the circle at A and B respectively. Another tangent at C intersects the line I at D and m at E. Prove that ∠DOE = 90°  	3
29.	Find the ratio in which P(4, m) divides the line segment joining the points A(2, 3) and B(6, -3). Hence, find m.	3
30.	From a pack of 52 playing cards, jacks, queens, kings and aces of red colour are removed. From the remaining a card is drawn at random. Find the probability that the card drawn is (i) a queen of spades (ii) a red card (iii) a face card.	3
31.	If $x = a\cos\theta - b\sin\theta$ and $y = a\sin\theta + b\cos\theta$, then prove that $a^2 + b^2 = x^2 + y^2$. **(OR)** Find an acute angle θ when $\frac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$	3
	SECTION D	
32.	A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500 km away in time, it had to increase its speed by 100 km/h from the usual speed. Find its usual speed. **(OR)** A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.	5
33.	If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio. Using the above theorem, find the length of EC if D and E are respectively the points on the sides AB and AC of ΔABC such that AD = 3cm, BD = 5cm, AE = 12 cm, DE ‖ BC.	5
34.	The mode of the following frequency distribution is 44. Find the missing frequency.	5

C.I	0-10	10-20	20-30	30-40	40-50	50-60	Total
Frequency	5	13	*x*	22	30	*y*	100

35.	The interior of a building is in the form of cylinder of diameter 4.3m and height 3.8 m, surmounted by a cone whose vertical angle is a right angle. Find the area of the surface and the volume of the building. (Take π= 3.14) **(OR)** A rocket is in the form of a right circular cylinder closed at the lower end and surmounted by a cone with the same radius as that of the cylinder. The diameter and height of the cylinder are 6 cm and 12 cm, respectively. If the slant height of the conical portion is 5 cm, find the total surface area and volume of the rocket [Use π = 3.14]	5
	SECTION E	
36.	**CASE STUDY 1** A pathology lab is a specialized medical facility that analyzes tissue, fluid, and cell samples from patients to help diagnose and monitor diseases. These labs play a crucial role in healthcare by providing vital information that helps doctors make accurate diagnoses, determine treatment plans, and monitor a patient's response to therapy. In a pathology lab, a culture test has been conducted. In the test, the number of bacteria taken into consideration in various samples is all 3-digit numbers that are divisible by 6, taken in order.  Based on the above information, solve the following questions: Q1. How many bacteria are considered in the seventh sample? Q2. How many samples should be taken into consideration? Q3. Find the total number of bacteria in the first 15 samples. **(OR)** Find the number of samples in which sum of bacteria is 840.	1 1 2
37.	There are two temples on each bank of a river . One temple is 50m high. While doing a renovation work, a man standing on the top of the 50m tall temple, observes that the angle of depression of the top and bottom of the other temple are 30^0 and 60^0 respectively. [use$\sqrt{3}$=1.73]Based on the above information , answer the following questions:  (i)Find the measure of ∠ACB. (ii)What is the height of the other temple? **(OR)** Find the width of the river. (iii)Find the difference in the heights of the two temples?	1 2 1
38.	Rohan and his family went for a vacation to Coorge. There they had a stay in tent for a night. Rohan found that the tent in which they stayed is in the form of a cone surmounted on a cylinder. The total height of the tent is 42 m, diameter of the base is 42m and height of the cylinder is 22 m. Based on the information, answer the following questions:	

	 i)How much canvas is needed to make the tent? ii)Find the total volume of the tent. (Use $\pi = 22/7$) iii)If 1 m^2 of cloth costs ₹50, estimate the total cost of cloth required to make the outer covering of the tent (excluding the base). (OR) iii)Find the number of persons that can be accommodated in tent , if each person needs 1892 m^3 of space.	1 1 2

	Marking scheme for Sample paper 2 Standard Math
	Section A
1	a
2	a
3	a
4	d
5	d
6	d
7	a
8	d
9	d
10	c
11	a
12	d
13	d
14	b
15	c
16	d
17	c
18	b
19	a
20	d
	Section B
21	23
22	p =10
23	AD =5 units (OR) Point (2,0)
24	$\frac{1}{\alpha}+\frac{1}{\beta}=-\frac{3}{7}$
25	Proving OP = 2 OS
	Section C
26	Proving 7 - 2√3 is an irrational number.
27	x + y : x – y = 25:1
28	AD=7cm, BE = 5cm, CF = 3cm (OR) Proving ∠DOE = 90°
29	Ratio= 1:1 and m = 0
30	(i)$\frac{1}{44}$ (ii)$\frac{9}{22}$ (iii)$\frac{3}{22}$
31	Proving $a^2 + b^2 = x^2 + y^2$ (OR) $\Theta = 60^0$
	Section D
32	Usual speed of plane = 500km/hr (OR) Speed of stream = 6 km/hr
33	Proving Basic proportionality theorem x = 20cm
34	x = 12 and y = 18
35	Total Surface Area = 71.86 m^2 Total Volume = 65.61 m^3 (OR) Total Surface Area = 301.44 cm^2 **Volume =** 376.8 cm^3
	Section E

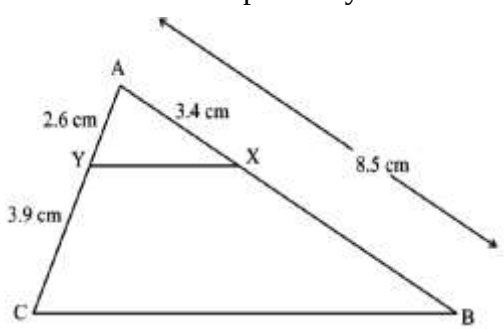
36	(i)Bacteria in 7th sample = 138 (ii) Number of samples considered = 150 (iii)Sum of bacteria in first 15 samples = 2160 (OR) (iii) Number of samples when sum is 840 is 7
37	(i)$\angle ACB=90^\circ$ (ii)Height of the other temple = 33.33 m (OR) (ii)Width of river =28.90m (iii) Difference in heights = 16.67 m
38	(i)Canvas needed = $4818m^2$ (ii)Total volume = $39708m^3$ (iii)Total cost of cloth = ₹ 240900 (OR) (iii)Number of persons accommodated = 21

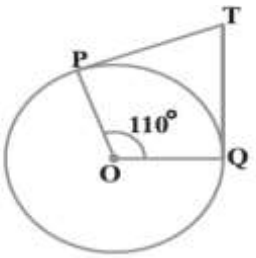
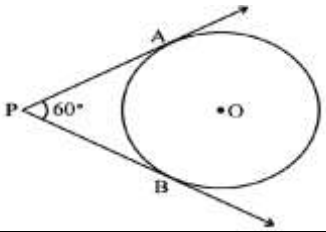
KENDRIYA VIDYALAYA SANGATHAN RAIPUR REGION
SAMPLE PAPER-3 (MATHEMATICS STANDARD)

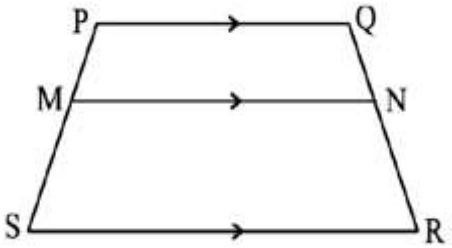
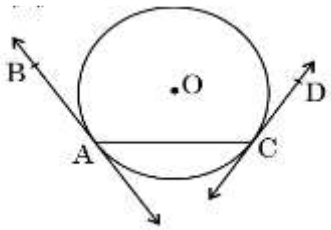
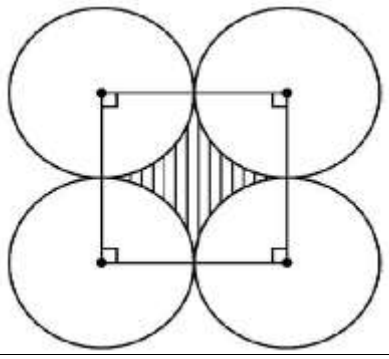
Class: X **Max Marks: 80**
Subject: MATHEMATICS **Time: 3 hrs.**

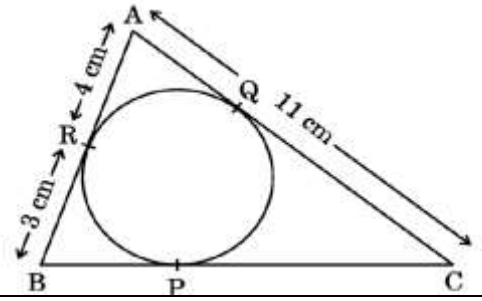
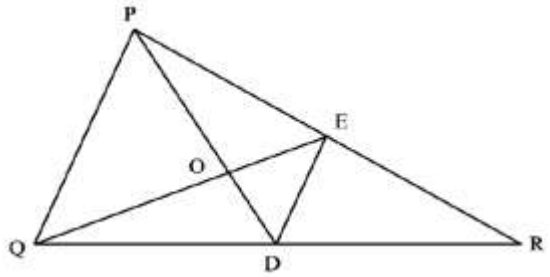
GENERAL INSTRUCTIONS

1.*This question paper contains 38 questions. All questions are compulsory.*
2. This question paper is divided into five sections – A, B, C , D and E.
3. In section A , Question numbers 1 to 18 are multiple choice questions (MCQS) and question numbers 19 and 20 are assertion reason based questions of 1 mark each.
4. In Section B, Question numbers 21 to 25 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Question numbers 26 to 31 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Question numbers 32 to 35 are long answer (LA) type questions, carrying 5 marks each.
7. In Section E, Question numbers 36 to 38 are case – study based questions carrying 4 marks each. Internal choice is provided in 2 marks questions in each case study.
8. There is no overall choice, However, an internal choice has been provided in 2 questions of Section B, 2 questions of section C, 2 questions of section D and 3 questions of 2 marks in section E.

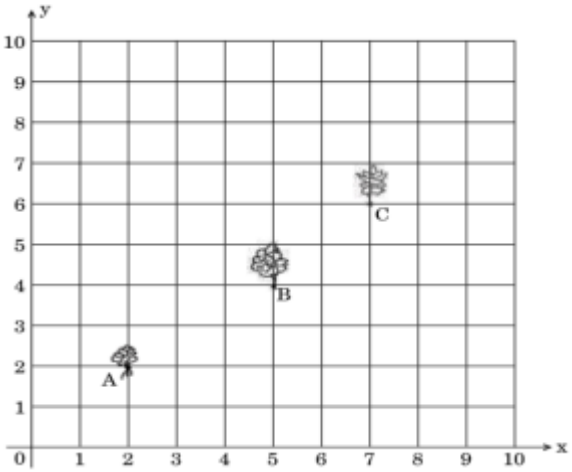
S.NO.	SECTION A	MARKS
1.	Two positive integers m and n are expressed as $m = p^5q^2$ and $n = p^3q^4$ where p, q are prime numbers. The LCM of m and n is (a) P^8q^6 (b) p^3q^2 (c) p^5q^4 (d) $p^5q^2 + p^3q^4$	1
2.	If sum of zeroes of polynomials $p(x) = 2x^2 - k\sqrt{2}x + 1$ is $\sqrt{2}$, then the value of k is (a) $\sqrt{2}$ (b) 2 (c) $2\sqrt{2}$ (d) $\frac{1}{2}$	1
3.	The value of 'k' for which the system of equations $3x - y + 8 = 0$ and $6x - ky + 16 = 0$ has infinitely many solutions, is (a) -2 (b) 2 (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$	1
4.	The quadratic equation $x^2 + x + 1 = 0$ has .....roots. (a) Real and equal (b) irrational (c) real and dictinct (d) not real	1
5.	Three numbers in A.P. have the sum 15. What is its middle term ? (a) 10 (b) 5 (c) 15 (d)20	1
6.	The point on x- axis which is equidistant from the points (5, -3)and (4, 2) is (a) (4.5, 0) (b) (7,0) (c) (0.5,0) (d) (-7,0)	1
7.	If (k,3) is the point of intersection of the lines represented by $x + py = 6$ and $x = 15$ then (k, p) will be (a) (15, 3) (b) (15,-3) (c) (3, 15) (d) (-15, 3)	1
8.	In the figure, X and Y are two points on the sides AB and Ac respectively in Δ ABC, such that AX = 3.4 cm, AB = 8.5 cm, AY = 2.6 cm and YC = 3.9 cm. Which of the following relation is correct ? (a) BC = 2 XY (b) 3 BC = 2 XY (b) BC is not parallel to XY (d) BC is parallel to XY 	1

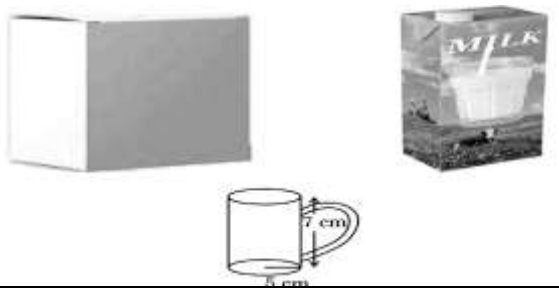
9.	If TP and TQ are two tangents to a circle with centre 'o' so that ∠ POQ = 110^0. Then what will be the measurement of ∠PTQ ? (a) 60^0 (b) 70^0(c) 80^0 (d) 90^0 	1
10.	In the given figure PA and PB are two tangents drawn to the circle with centre 'o' and radius 5 cm. If ∠APB = 60^0, then the length of PA is : (a) $\frac{5}{\sqrt{3}}$ (b) $5\sqrt{3}$ (b) (c) $\frac{10}{\sqrt{3}}$ (d) 10 	1
11.	If $\cos\Theta = \frac{x}{y}$ (x, y ≠ 0) , then tan Θ is equal to : (a) $\frac{y}{\sqrt{y^2-x^2}}$ (b) $\frac{x}{\sqrt{x^2+y}}$ (c) $\frac{\sqrt{y^2-x^2}}{x}$ (d) $\frac{x}{\sqrt{y^2-x^2}}$	1
12.	If $\cos\Theta = \frac{\sqrt{3}}{2}$ and $\sin\emptyset = \frac{1}{2}$, then tan (Θ + ∅) is : (a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c)1 (d) not defined	1
13.	At some time of the day, the length of the shadow of a tower is equal to its height. Then , the sun's altitude at that time is : (a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0	1
14.	The perimeter of the sector of a circle of radius 21 cm which subtends an angle of 60^0 at the centre of circle, is : (a) 22 cm (b) 43 cm (c) 64 cm (d) 462 cm	1
15.	A chord of a circle of radius 10 cm subtends a right angle at its centre. The length of the chord (in mm) is : (a) $5\sqrt{2}$ (b) $10\sqrt{2}$ (c) $\frac{5}{\sqrt{2}}$ (d) 5	1
16.	The volume of the largest right circular cone that can be carved out from a solid cube of edge 2 cm is (a) $\frac{4\pi}{3}$ cm^3 (b) $\frac{5\pi}{3}$ cm^3 (c) $\frac{8\pi}{3}$ cm^3 (d) $\frac{2\pi}{3}$ cm^3	1
17.	If the difference of mode and median of a data is 24, then the difference of its median and mean is (a) 12 (b) 24 (c) 8 (d) 38	1
18.	One ticket is drawn from a bag containing tickets numbered 1 to 40. The probability that the selected ticket has a numbered which is a multiple of 7 is (a) $\frac{1}{7}$ (b) $\frac{1}{8}$ (c) $\frac{1}{5}$ (d) $\frac{7}{40}$	1
	Questions numbers 19 and 20 are assertion reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R) . Select the correct answer to these quesstions from the codes (A), (B), (C) and (D) as given below. (A) Both assertion (A) and Reason (R) are true and Reason (R) is the correct expalanation of the assertion (A). (B) Both assertion (A) and Reason (R) are true and Reason (R) is not the correct expalanation of the assertion (A). (C) Assertion (A) is true, but reason (R) is false. (D) Assertion (A) is false, but reason (R) is true.	

19.	Assertion (A) : In a cricket match, a batsman hits a boundary 9 times out of 45 balls he plays. The probability that in a given ball, he does not hit the boundary is $\frac{4}{5}$. Reason : P (E) + P (not E) = 1	1
20	Assertion : The sum of the first fifteen terms of the A.P. 21,18,15,12 …… is zero. Reason : The sum of the first n terms of an A.P. with first term 'a' and common difference 'd' is given by $S_n = \frac{n}{2}[\,a + (\,n - 1\,)d]$	1
	SECTION B	
21.	Can the number $(15)^n$ ends with the digit zero ? Give reason of your answer.	2
22.	PQRS is a trapezium with PQ || SR, If M and N are two points on the non parallel sides PS and QR respectively, such that MN is parallel to PQ, then show that $\frac{PM}{MS} = \frac{QN}{NR}$ 	2
23.	In the given figure, AB and CD are tangebts to acircle centered at O. Is $\angle BAC = \angle$ DCA ? Justify your answer. 	2
24.	Find the value of x if $3\tan^2 60^0 - x\sin^2 45^0 + \frac{3}{4}\sec^2 30^0 = 2\,\text{cosec}^2 30^0$. **OR** If $\cos(A + B) = \frac{1}{2}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, where $0 \leq A + B \leq 90^0$, then find the value 0f sec (2A- 3 B).	2
25.	Find the area of the shaded region if length of radius of each circle is 7 cm. Each circle touches the other two externally. **OR** A chord is subtending an angle of 90^0 at the centre of a circle of radius 14 cm. Find the area of the corresponding minor segment of the circle. 	2
	SECTION C	
26.	Show that $5 - 7\sqrt{3}$ is an irrational number.	3
27.	If α, β are the zeroes of the polynomial $3x^2 - 13x - 10$, then find the value of (3 α + 1) (3 β + 1).	3
28.	Solve the following system of linear equations graphically. x – y + 1 =0 x+ y = 5. **OR**	3

	The cost of 2 kg of apples and 1 kg of grapes on a day was found to be 160. After a month, the cost of 4 kg of apples and 2 kg of grapes is 300.Represent the situation algebraically and geometrically.	
29.	In the given figure , Δ ABC is circumscribing a circle. Find the BC, if AR = 4 cm, BR = 3 cm and AC= 11 cm. **OR** Prove that parallelogram circumscibing a circle is a rhombus.  	3
30.	Two coins are tossed simultaneously. What is the probability of getting (i) At least one head ? (ii) Exactly two tails ? (iii) At most one tail ?	3
31.	Prove that $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}$ = 1 + secA cosecA	3
	SECTION –D	
32.	If Shalini was 5 years yonger than what she actually is, then the square of her age (in years) would be 11 more than 5 times her actual age. What is her present age ? **OR** A shopkeeper buys a number of books for Rs 1800, if he had bought 15 more books for the same amount, then each book would have cost him Rs 20 less. Find how many books he bought initially ?	5
33.	In the given figure, two medians PD and QEof a Δ PQR meet each other at O. Prove that (i) ΔPOQ ~ Δ DOE (ii)PO= 2 OD (iii)PO = $\frac{2}{3}$ OD  	5
34.	The largest possible hemisphere is drilled out from a wooden cubical block of side 21 cm such that the base of the hemisphere is on the faces of the cube. Find (i) The volume of the wood left in the block, (ii) The total surface area of the remaining solid. **OR** A solid toy is in the form of a hemisphere surmounted by a right circular cone. Ratio of the radius of the cone to its slant height is 3:5 . If the volume of the toy is 240 π cm^3, then find the total height of the toy.	5
35.	A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age , if policies are given only to persons having age 18 years onwards but less than 60 years.	5

Age in years	No. of policy holders
Below 20	2
Below 25	6
Below 30	24
Below 35	45
Below 40	78
Below 45	89

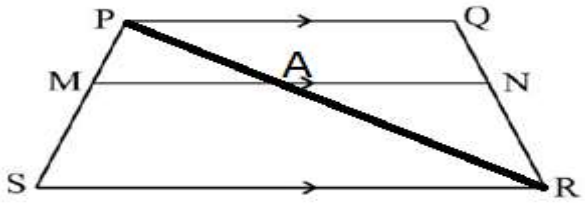
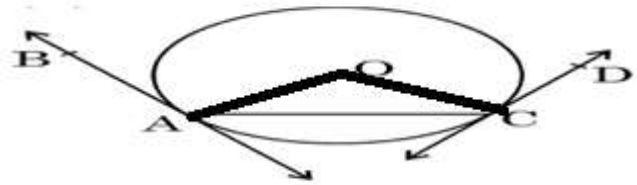
	Below 50	92	
	Below 55	98	
	Below 60	100	
	SECTION –E		
36.	Seema has a 10 m × 10 m kitchen garden attached to her kitchen. She divides it into a 10 ×10 grid and wants to grow some vegetables and herbs used in the kitchen. She puts some soil and manure in that and sow a green chilly plant at A, a coriander plant at B and a tomato plant at C. Her friend Kusum visited the garden and praised the plants grown there. She pointed out that they seem to be in a straight line. See the below diagram carefully and answer the following questions:  (iv) What is the distance between A and B. (v) What is the mid pointof BC. (vi) Find the ratio in which the linesegment AC divided by point B. **OR** What is the mid point of AC.	1 1 2
37.	A school has decided to plant some endangered trees on World Environment Day in the nearest park. They decide to plant those trees in few concentric circular rows such that each succeeding row has 20 more trees than the previous one. The first row has 50 trees.  Based on above given information, answer the following question: (i) How many trees will be planted in the 10 throw ? (ii) How many more trees will be palnted in the 8 th row than in the 5 throw ? (iii) If 3200 trees are to be planted in the park, then how many rows are required ? **OR** If 3200 trees are to be planted in the park, then how many trees are still left to be planted after 11 throw ?	1 1 2

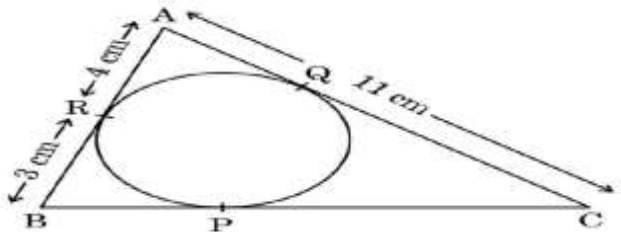
38.	Tamper – proof tetra – packet milk guarantees both freshness and security. This milk ensures uncompromised quality , preserving the nutritional values within and making it a reliable choice for health for health – consious individuals. 500 ml milk is packed in a cuboidal container of dimensions 15 cm × 8 cm ×5 cm. These milk packets are then packed in cuboidal cartons of dimensions 30 cm × 32 cm × 15 cm. Based on the above information, answer the following questions. (i) Find the volume of the cuboidal carton. (ii) How much milk can the cup (as shown in the figure) hold ? (iii) Find the total surface area of a milk packet . Or How many milk packets can be filled in a carton?  	1 1 2

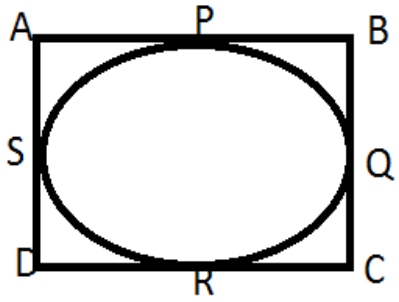
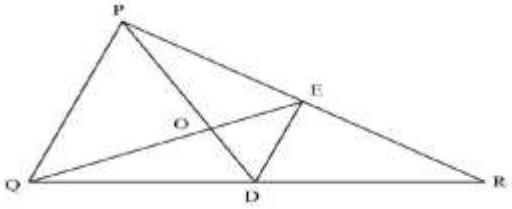
MATHEMATICS (STANDARD) 041

MARKING SCHEME

Q.N.	SOLUTION	MARKS
1	(c) p^5q^4	1
2	(b) 2	1
3	(b) 2	1
4	(d) not real	1
5	(b) 5	1
6	(b) (7,0)	1
7	(b) (15,-3)	1
8	(d)	1
9	(b) 70^0	1
10	(b) $5\sqrt{3}$	1
11	(c) $\frac{\sqrt{y^2-x^2}}{x}$	1
12	(a) $\sqrt{3}$	1
13	(b)45^0	1
14	(a) 22 cm	1
15	(b)$10\sqrt{2}$	1
16	(d) $\frac{2\pi}{3}$ cm^3	1
17	(a) 12	1

18	(b)$\frac{1}{8}$	1
19	(A)	1
20	(A)	1
21	No, $(15)^n$ can not ends with zero because $(15)^n = (3 \times 5)^n$. If any number ends with zero then it is divisible by 10, means in its prime factorization only 2 and 5 must come then only it will be divisible by 10. We can see that the prime factorization of $(15)^n$ does not contains only 2 and 5. So it is not divisible by a0.	
22	 Join PR and take a point A on PR. PQ || SR (given) MN || PQ (given) Type equation here. Therefore MN || SR In ΔPRS MA || SR By BPT theorem $\frac{PM}{MS} = \frac{PA}{AR}$ ……..(1) In ΔPQR AN|| PQ By BPT $\frac{QN}{NR} = \frac{PA}{AR}$ ……(2) From (1) and (2) $\frac{PM}{MS} = \frac{QN}{NR}$	
23	 ∠BAO = 90^0 , ∠DCO = 90^0 In Δ AOC OA=OC ∠ OAC= ∠ OCA (Angles opposite to equal sides of a triangle) ∠ BAO + ∠ OAC =∠DCO + ∠ OCA $\angle BAC = \angle DCA$	½ ½ 1
24	$3 \tan^2 60^0 - x \sin^2 45^0 + \frac{3}{4} \sec^2 30^0 = 2 \operatorname{cosec}^2 30^0$. $3 \times (\sqrt{3})^2 - X (\frac{1}{\sqrt{2}})^2 + \frac{3}{4} (\frac{2}{\sqrt{3}})^2 = 2 (2)^2$ $9 - X/2 + 1 = 8$	1 ½

	-X/2 = 8-1-9 -X/2 = -2 X= 4	½
25	Area of shaded part = 4 ($\frac{\theta}{360} \times \pi r^2$) = 4 {(1/ 4 × 22/7 $(7)^2$} = 4 (38.5) = 154	½ ½ ½ ½
26	Assume that 5 – 7 $\sqrt{3}$ is a rational number. p/q= 5 – 7 $\sqrt{3}$ (p and q are integers and q is not equal to zero. 7 $\sqrt{3}$ = 5 – p/q 7 $\sqrt{3}$ = $\frac{5q-p}{q}$.$\sqrt{3}$ = $\frac{5q-p}{7q}$ We know that $\sqrt{3}$ is an irrational number and $\frac{5q-p}{7q}$ Is a rational number . This contradicts occurs because of our wrong assumption. So that 5 – 7 $\sqrt{3}$ is an irrational number.	½ ½ 1 ½ ½
27	3 x 2 – 13 x - 10 3 x^2 – 15 x + 2x -10 3x(x – 5) + 2 (x – 5) (x -5) (3x + 2) X = 5, x = -2/3 3 α + 1 = 3 × 5 + 1 = 16 3 β + 1 = 3× -2/3 +1 = -1 (3 α + 1) (3 β + 1) = 15	 ½ ½ ½ ½ 1
28	For correct points for equations For correct drawing of graph For correct solution from graph Or 2 x + y = 160 4 x + 2y = 300 For correct graph of equations	1 1 1 ½ ½ 2
29	 Tangents drawn from an external point to the circle are equal in length. AQ = 4 cm QC = 7 cm BP= 3cm PC = 4 cm BC= BP + PC BC= 3 + 4 BC = 7 cm Or	1 ½ ½ ½ ½

	 AP= AS PB= BQ DR= DS CR= CQ AP + PB+ CR + DR = AS + BQ+ CQ + DS AB+ DC = AD + BC AB + AB = AD + AD 2 AB = 2 AD AB= AD SO THAT AB = AD= DC= BC ABCD IS A RHOMBUS.	½ 1 ½ 1
30	(i) $\frac{3}{4}$ (ii) $\frac{1}{4}$ (iii) $\frac{3}{4}$	1 1 1
31	$\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}$ = 1 + secA cosecA $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}$ $\frac{sinA/\cos A}{1-cosA/sinA} + \frac{cosA/sinA}{1-sinA/cosA}$ $\frac{sinA/\cos A}{sinA-cosA/sinA} + \frac{cosA/sinA}{cosA-sinA/cosA}$ sinA./ cosA/(sinA-cosA/sinA) + cosA./sinA/cosA-sinA / cosA $\sin^3A - \cos^3A$/ sinA cosA (sinA – cosA) sinA- cosA (1+ sinA cosA)/(sinA- cosA)sinAcosA 1 + secA cosecA	3
32	Let the Shalini's age be x years Then $(x -5)^2 = 5x + 11$ $X^2 – 10x + 25 = 5 x + 11$ $X^2 – 15 x + 25- 11 = 0$ $X^2 - 15 x + 14 = 0$ $X^2 – 14 x – x +14=0$ X(x-14) -1 (x-14)=0 (x-14) (x- 14) =0 X = 14 years	
33	 (i) QD = DR (given) PE = ER (given)	2

	D and E are the mid points of QR and PR respectively. By mid point theorem DE|| PQ By AA similarity criteria $\Delta POQ \sim \Delta DOE$ (ii) By mid point theorem DE = ½ PQ DE/PQ= ½ OD/ OP=1/2 Because all the correspoing sides are in the same ratio. OP= 2OD (iii) OD/OP=1/2 OD/OP + 1 = ½+ 1 OD+ OP/OP= 1+2/2 PD/OP=3/2 2PD= 3OP OP= 2/3 PD	 2 1
34.	(i) The volume of remaining solid = volume of cube – volume of hemisphere $= 21\times21\times21 - 2/3\ \pi\ (21/2)^3$ =6835.5 (ii) the total surface area of the remaining solid= TSA of cube + CSA of hemisphere- Area of circle $6a^2 + 2\ \pi\ r^2 - \pi\ r^2$ $6a^2 + \pi\ r^2$ 2992.5 Or	2.5 2.5
35	For correct table with class interval For correct median	2 3
36	(i) $\sqrt{13}$ (ii) (6,5) (iii) 3:2 or (4.5.4)	1 1 2
37	(i) 230 (ii) 190 (iii) 16 or 1560	1 1 2
38	(i) 14400 cm^3 (ii) 550 cm^3 (iii) 470 cm^2 or 24	1 1 2

USEFUL LINKS

CBSE CURRICULUM https://cbseacademic.nic.in/curriculum_2026.html

NCERT TEXT BOOK https://ncert.nic.in/textbook.php?jemh1=0-14

CBSE QUESTION PAPER 2024 – 25 https://www.cbse.gov.in/cbsenew/question-paper.html

CBSE MARKING SCHEME 2024 – 25 https://www.cbse.gov.in/cbsenew/marking-scheme.html

CBSE SAMPLE PAPER 2024 -25 https://cbseacademic.nic.in/sqp_classx_2024-25.html

NCERT YOUTUBE LESSONS

https://www.youtube.com/@NCERTOFFICIAL/search?query=CLASS%2010%20MATHEMATICS

INDIAN MATHEMATICIANS
https://www.youtube.com/@NCERTOFFICIAL/search?query=INDINA%20MATHEMATICIANS

FOR Q PAPERS OF 2025, 2024 COMPARTMENT,2024 MAINS

https://www.cbse.gov.in/cbsenew/question-paper.html

SOME TIPS FOR SOLVING THE QUESTIONS IN EXAM

1. **Read the question carefully**
2. **Identify the Topic**
3. **Recall the solution in Mind**
4. **Write - given**
5. **Write - to find/to prove**
6. **Start solving the problem**
7. **Draw the diagram if required**
8. **Write the formula which will be used in solving the question**
9. **Solve the question step by step**
10. **Check the solution once again before proceeding to next question**

MOST IMPORTANT

NEVER- EVER LEAVE ANY QUESTION UN - ATTEMPTED IN THE EXAM

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