MATHEMATICS
CLASS X
VOLUME 2

STUDY CAPSULE   2025-26

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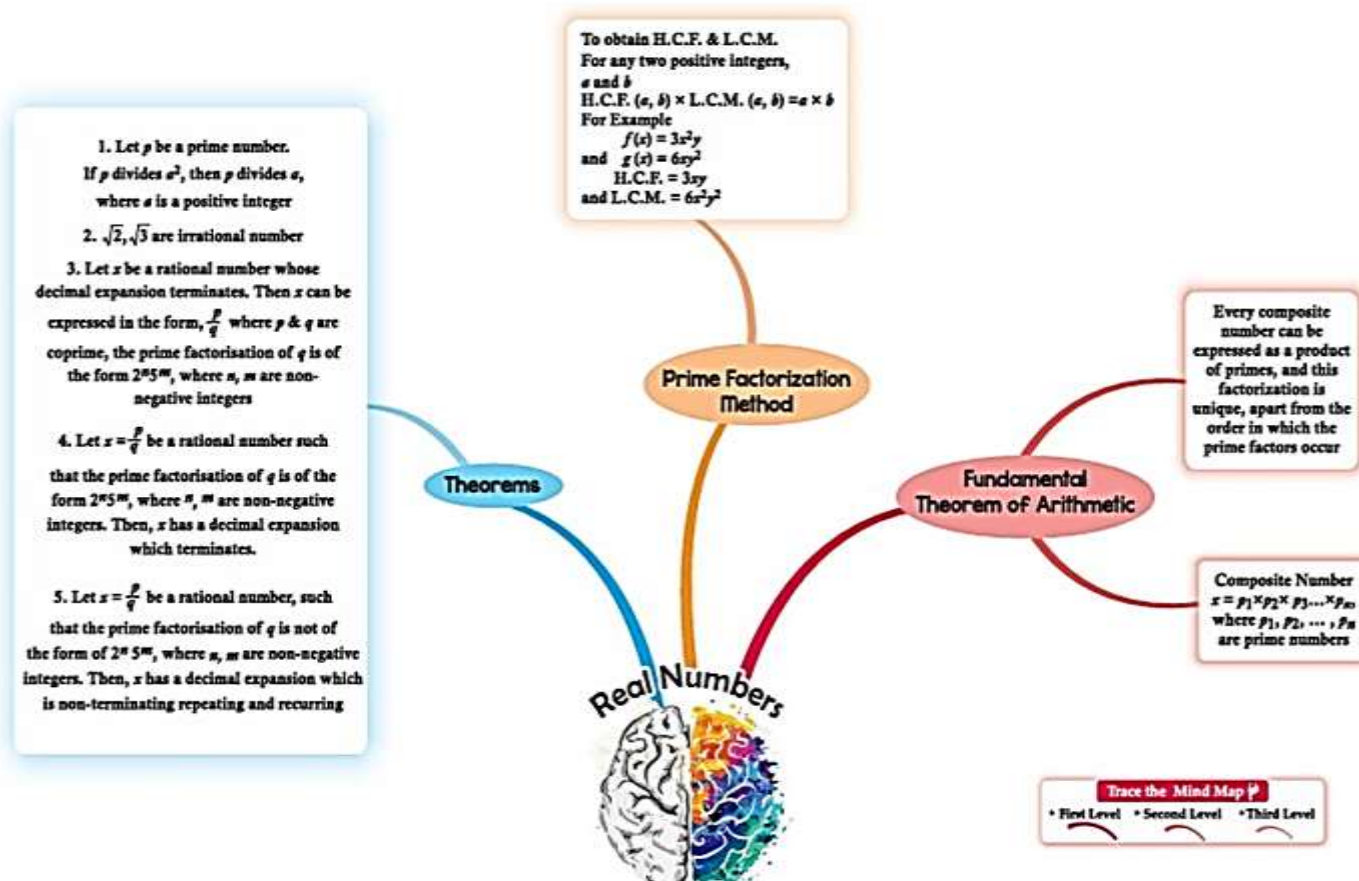तद्वद् वेदांगशास्त्राणां गणितं मूर्ध्नि संस्थितम्॥

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.

INDEX

CHAPTER-1   REAL NUMBERS

To obtain H.C.F. & L.C.M.
For any two positive integers,
a and b
H.C.F. $(a, b) \times$ L.C.M. $(a, b) = a \times b$
For Example
$f(x) = 3x^2y$
and $g(x) = 6xy^2$
H.C.F. $= 3xy$
and L.C.M. $= 6x^2y^2$

Prime Factorization Method

Every composite number can be expressed as a product of primes, and this factorization is unique, apart from the order in which the prime factors occur

1. Let p be a prime number. If p divides a^2, then p divides a, where a is a positive integer

2. $\sqrt{2}, \sqrt{3}$ are irrational number

3. Let x be a rational number whose decimal expansion terminates. Then x can be expressed in the form, $\frac{p}{q}$ where p & q are coprime, the prime factorisation of q is of the form $2^n 5^m$, where n, m are non-negative integers

4. Let $x = \frac{p}{q}$ be a rational number such that the prime factorisation of q is of the form $2^n 5^m$, where n, m are non-negative integers. Then, x has a decimal expansion which terminates.

5. Let $x = \frac{p}{q}$ be a rational number, such that the prime factorisation of q is not of the form of $2^n 5^m$, where n, m are non-negative integers. Then, x has a decimal expansion which is non-terminating repeating and recurring

Theorems

Fundamental Theorem of Arithmetic

Composite Number
$x = p_1 \times p_2 \times p_3 \dots \times p_n$,
where $p_1, p_2, \dots, p_n$
are prime numbers

Real Numbers

Trace the Mind Map
• First Level   • Second Level   • Third Level

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 $\neq$0
4. Irrational numbers: Numbers that cannot be expressed as p/q , like $\pi, \sqrt{2}$
FORMULA
HCF AND LCM FORMULA (For two numbers)
HCF $\times$ LCM = Product of two numbers
HCF (a, b) $\times$ LCM (a, b) = a $\times$ 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 EACH)

1. The LCM of the three numbers 28, 44, 132 is:
(A) 258   (B) 231   (C) 462   (D) 924
Answer: (D) 924

2. The LCM of the smallest prime number and smallest odd composite number is:
(A) 10   (B) 6   (C) 9   (D) 18
Answer: (D) 18

3. The greatest number which divides 281 and 1249, leaving remainder 5 and 7 respectively, is:
(A) 23   (B) 276   (C) 138   (D) 69
Answer: (C) 138

4. If p and q are positive integers such that $p = ab^2$ and $q = a^2b$ where a and b are prime numbers then LCM (p, q) is:
(A) $a b^2$ (B) $a^2 b^2$ (C) $a^2 b$ (D) ab
Answer: (B) $a^2 b^2$

5. If x is the LCM of 4, 6 and 8 and y is the LCM of 3, 5 and 7 and P is the LCM of x and y, then which of the following is true?
(A) $p = 35x$ (B) $p = 4y$ (C) $p = 8x$ (D) $p = 16y$
Answer: (A) $p = 35x$

6. If the product of two co-prime numbers is 553, then their HCF is:
(A) 1   (B) 553   (C) 7   (D) 79
Answer: (A) 1

7. If the prime factorization of 2520 is $2^3 \times 3^a \times b \times 7$, then the value of a+2b is :
(A) 10   (B) 12   (C) 9   (D) 7
Answer: (B) 12

8. The HCF of the smallest prime number and smallest composite number is:
(A) 2   (B) 1   (C) 4   (D) 8
Answer: (A) 2

In the following questions 9 and 10, 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):* The number 5^n cannot end with the digit 0, where 'n' is natural number.
Reason (R): Prime factorization of 5 has only two factors, 1 and 5.

Answer: (C) Assertion (A) is true but reason (R) is false

10. *Assertion (A):* 6^n never ends with the digit 0 for any natural number 'n'
Reason (R): Any number ends with digit zero, if its prime factor is of the form $2^m \times 5^n$, where 'm' and 'n' are natural numbers.
Answer: (A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

VERY SHORT ANSWER QUESTIONS (2MARKS EACH)

11. Find the smallest number which is divisible by both 644 and 462.
Hint: Find the LCM of 644 and 462   **Answer:** 21252
12. Show that 12^n cannot end with digit 0 or 5 for any natural number 'n'
13. HCF and LCM of two numbers is 9 and 459 respectively. If one of the numbers is 27, find the other.
Hint: Use relation HCF $\times$ LCM = Product of Numbers
14. Two numbers are in the ratio 4**:**5 and their HCF is 11. Find the LCM of these numbers.
Hint: Let the two numbers be 4x and 5x where 'x' is common factor.
Given HCF = 11
 x=11. Therefore the numbers are 44 and 55.
Find LCM (44, 55) using relation HCF $\times$ LCM = Product of Numbers.   **Answer:** LCM= 220
15. Find theHCF and LCM of $3^3 \times 5$ and $3^2 \times 5^2$ **Answer:** HCF= 45 and LCM=675

SHORT ANSWER QUESTIONS (3 MARKS EACH)

16. Prove that $\sqrt{5}$ is an irrational number.
17. Prove that $(\sqrt{2} + \sqrt{3})^2$ is an irrational number, given that $\sqrt{6}$ is an irrational number.
Hint: Assume $(\sqrt{2} + \sqrt{3})^2$ is rational and proceed applying identity $(a + b)^2 = a^2 + b^2 + 2ab$
18. Prove that $2 - 3\sqrt{5}$ is an irrational number.
19. Find theHCF and LCM of 570 and 1425 by applying Fundamental Theorem of Arithmetic
Answer: HCF= 285 and LCM= 2850.
20. Find the HCF and LCM of 404 and 96 and verify that HCF $\times$ LCM = Product of the two given numbers.
Answer: HCF= 4 and LCM= 9696

LONG ANSWER QUESTIONS (5 MARKS EACH)

21. The traffic lights at three different road crossings change after every 48 seconds, 72 seconds and 108 seconds respectively. If they change simultaneously at 7 a.m., at what time will they change together next?
Hint: Find theLCM of48, 72 and 108
Answer: LCM (48, 72, 108) is 432. Convert 432 seconds to minutes and seconds and add to the starting time. The traffic lights will change simultaneously 7 minutes 12 seconds after 7:00 am.

22. The length, breadth and height of a room are 825 cm, 675 cm and 450 cm respectively. Find the longest tape which can measure the three dimensions of the room exactly.
Hint: Find theHCF of825, 675 and 450
Answer: HCF of825, 675 and 450 is 75. Thus the length of the longest tape required to measure the three dimensions of the room will be 75 cm.

23. If p, q are prime integers, prove that $\sqrt{p} + \sqrt{q}$ is an irrational number.

Hint: Assume $\sqrt{p} + \sqrt{q}$ is rational and proceed squaring both sides, applying identity
$$(a + b)^2 = a^2 + b^2 + 2ab$$

CASE BASED QUESTIONS   (4 MARKS EACH)

24. Ravish runs a book shop at school of Math, Gurgaon. He received 480 chemistry books, 192 physics books and 672 Mathematics books of class XI. He wishes to average these books in minimum numbers of stacks such that each stack consists of the books on only one subject and the number of books in each stack is the same.

(a) Find the number of books in each stack.   **Answer:** 96
(b) Find the Number of stacks of Mathematics books.   **Answer:** 7
(c) Find the Minimum number of stacks of all the books.   **Answer:** 14
(d) Find the difference in number of stacks of Mathematics books and sum of stacks of Physics and Chemistry books.   **Answer: 0**

25. A Mathematics Exhibition is being conducted in your School and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience.

Observe the following factor tree and answer the following:

(i) What will be the value of x?   **Answer:** 13915
(ii) What will be the value of y?   **Answer:** 11
(iii) What will be the value of z?   **Answer:** 23
(iv)Write the prime factorization of 13915.

Answer: 13915= $5 \times 5 \times 11 \times 23$
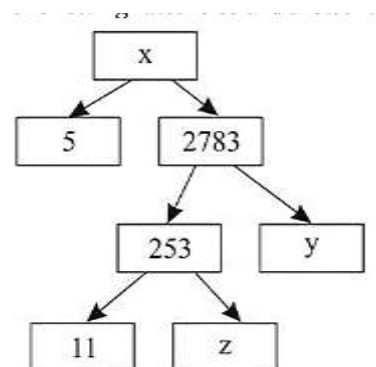
CHAPTER: REAL NUMBERS
Worksheet – 1 [Max. Marks: 25]

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 _____.   [1M]

(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 _____.   [1 M]

(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 _____.   [1 M]

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

Q4. Assertion (A) & Reason (R) type Question: [1 M]

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?   [2 M]

Q6. If xy = 180 and HCF(x, y) = 3, then find the LCM(x, y).   [2 M]

Q7. Explain why (7x11x13) + 13 is a composite number.   [2 M]

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.   [3 M]

Q9. Find the smallest number, which when increased by 14 is exactly divisible by 165 and 770. [3 M]

Q10. Prove that √5 is an irrational number.   [5 M]

Q11. **Case Study Based Question:**   [4 M]

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.(1)

(b) What is the minimum number of rooms required for the seminar?   (1)

(c) (i) Find the product of HCF and LCM of 60, 84 and 108.   (2)

[or]

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

CHAPTER: REAL NUMBERS

Worksheet – 2 [Max. Marks: 25]

Answer the following Questions:

Q1. If HCF of 144 and 180 is expressed in the form of 13m – 3, then the value of m is _____. [1 M]

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

Q2. The sum of exponents of the prime factors in the prime factorisation of 250 is _____.   [1 M]

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

Q3. The smallest irrational no. by which √20 should be multiplied to get a rational number is ___.[1 M]

(a) √20   (b) √2   (c) √5   (d) √4

Q4. Assertion (A) & Reason (R) type Question: [1 M]

A: A number q is prime factorised as $3^2 \times 7^2 \times b$, where b is a prime number other than 3 and 7. So, q is definitely an odd number.

R: $3^2 \times 7^2$ 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 √3 is irrational, prove that $5 + 2\sqrt{3}$ is irrational.   [2 M]

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.   [2 M]

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.   [2 M]

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.   [3 M]

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.   [3 M]

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

Q11.**Case Study Based Question:**   [4 M]

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?   (1)

(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.   (1)

(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?   (2)

[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?

Worksheet – 3 [Max. Marks: 25]

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 _____.   162

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

Q3. A pair of irrational numbers whose product is a rational number is _____. $\sqrt{5}$ 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.[2 M]

Q6. Determine the values of p and q so that the prime factorisation of 2520 is expressible as $2^3 \times 3^P \times q \times 7$.   [2 M]

Q7. Find the largest integer that divides 2053 and 967 leaving remainders 5 and 7 respectively. [2 M]

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 the jar that can transfer the milk of both the containers in exact number of times?   [3 M]

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?   [3 M]

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

Q11.**Case Study Based Question:**   [4 M]

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)   (2)

How many packets of bread are supplied to the school?

(b) How many packets of bread are supplied to the hospital?   (1)

(c) How many packets of jam are supplied to the school?   (1)

CHAPTER: REAL NUMBERS
Worksheet – 4 [Max. Marks: 25]

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 x 3^2 x 103 x 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.   [2M]

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.   [2 M]

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

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?   [3 M]

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.   [3 M]

Q10. Prove that $15 + 17\sqrt{3}$ is an irrational number.   [5 M]

Q11. **Case Study Based Question:**   [4 M]

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)   (2)

        How many students are there in the class?

(b) What is the highest prime number used by the students?   (1)

(c) Which prime number has been used maximum times?   (1)

Worksheet – 5 [Max. Marks: 25]

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 _____.

(b) 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 merchant has 120 litres and 180 litres of two kinds of oil. He wants to sell oil by filling the two kinds of oils in tins of equal volumes. What is the greatest volume of such a tin?

Q6. Find the largest number that divides 615 and 963 leaving 6 as remainder in each case.

Q7. Find the HCF and the LCM of 6, 72 and 120, using the Prime Factorisation Method.

Q8. Prove that ($\sqrt{3}$ - $\sqrt{2}$) is irrational.

Q9. The greatest number that will divide 76, 112, 172 and 184 so as to leave the remainder 4 in each case is k^2 x 3. Find the value of 'k'.

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?
          [5 M]

Q11. **Case Study Based Question:**   [4 M]

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?

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
MIND MAPPING:

Case 1 : Graph cuts X-axis at 2 points
Number of Zeroes = 2

Case 2 : Graph cuts X-axis at exactly one point
Number of Zero = 1

Case 3 : Graph does not cut X-axis
Number of Zero = 0

Parabola
Y Axis of symmetry
x intercepts
Vertex
$y = x^2 - 3x - 4$

Quadratic
If α and β are zeroes of Quadratic Polynomial $ax^2 + bx + c$
Then, Sum of zeroes
$\alpha + \beta = -\frac{b}{a}$
Product of zeroes
$\alpha\beta = \frac{c}{a}$

Graphical Representation of Quadratic Polynomial

Zeroes of Polynomial : Graphically

Cubic
If α, β and γ are zeroes of Cubic Polynomial $ax^3 + bx^2 + cx + d$
Then, Sum of zeroes,
$\alpha + \beta + \gamma = -\frac{b}{a}$
Sum of products of the zeroes taken two at a time
$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$
Product of zeroes
$\alpha\beta\gamma = -\frac{d}{a}$

Relationship Between Zeroes and Coefficients of Quadratic Polynomials
Quadratic
Cubic

Degree of Polynomial
Highest power of x in Polynomial, $p(x)$

Polynomials

Types

Polynomial	Degree	General Form
Linear	1	$f(x) = ax + b$, $a \neq 0$
Quadratic	2	$f(x) = ax^2 + bx + c$, $a \neq 0$
Cubic	3	$f(x) = ax^3 + bx^2 + cx + d$, $a \neq 0$

Trace the Mind Map
• First Level • Second Level • Third Level

GIST / SUMMARY OF THE LESSON

1. An algebraic expression is made up of variables and constants along with mathematical operators. It is a sum of terms which are the building blocks of expressions.

2. Polynomial comes from 'Poly' meaning many, and 'nomial' meaning term – so it means many terms. A polynomial is an algebraic expression where variables have whole number exponents and terms are only added, subtracted, or multiplied.

3. Degree of a Polynomial – For a polynomial in one variable, the highest exponent on the variable is called the degree of the polynomial.

4. Types of Polynomials:
   (a) Based on Number of Terms –
   • Monomial – (one term) e.g., 2x, 6x², 9xy
   • Binomial – (two unlike terms) e.g., 4x² + x, 5x + 4
   • Trinomial – (three unlike terms) e.g., x² + 3x + 4

   (b) Based on Degree –
   • Linear Polynomial (degree 1): e.g., 2x + 1
   • Quadratic Polynomial (degree 2): e.g., 3x² + 8x + 5
   • Cubic Polynomial (degree 3): e.g., 2x³ + 5x² + 9x + 15

5. Zeroes of a Polynomial –
   A zero of a polynomial p(x) is the value of x for which p(x) = 0.
   If p(k) = 0, then k is a zero of p(x).
   Example: p(x) = x² − 3x + 2, then x = 1 is a zero since p(1) = 0.

6. Geometrical Meaning of Zeroes –
   (a) Linear Polynomial – Graph is a straight line; cuts X-axis at one point ⇒ 1 zero.
   (b) Quadratic Polynomial – Graph is a parabola; cuts X-axis at 0, 1, or 2 points ⇒ at most 2 zeroes.
   (c) Cubic Polynomial – Graph is a curve; may cut X-axis at 1, 2, or 3 points ⇒ at most 3 zeroes.

7. Factorisation of Polynomials –
   Quadratic polynomials can be factorised by splitting the middle term method.

8. Relationship between Zeroes and Coefficients (Quadratic Polynomial):
   If α and β are the roots of ax² + bx + c, then:
   • α + β = −b/a
   • αβ = c/a

9. Formation of Polynomial from Given Zeroes –
   If α and β are the zeroes, the polynomial is:
   x² − (α + β)x + αβ

DEFINITIONS AND FORMULAE

1. For ax² + bx + c = 0, if α and β are roots:
   • α + β = −b/a
   • αβ = c/a

2. **Polynomial formed from roots α and β:**
   • **x² − (α + β)x + αβ**

CHAPTER - 2   POLYNOMIALS

MULTIPLE CHOICE QUESTIONS   (1 MARK EACH)

1. If α and β are the zeros of the polynomial p(x) = x^2- ax - b, then the value of $(\alpha + \beta + \alpha\beta)$ is equal to:

(A) a + b   (B) – a - b   (C) a-b   (D) - a + b

Answer: (C) a - b

2. Zeroes of the polynomial $p(x) = x^2 - 3\sqrt{2}\,x + 4$ are:

(A) $2, \sqrt{2}$ (B) $2\sqrt{2}, \sqrt{2}$ (C) $4\sqrt{2}, -\sqrt{2}$ (D)$\sqrt{2}, 2$

Answer: (B) $2\sqrt{2}, \sqrt{2}$

3. Zeroes of the polynomial $p(x) = 7y^2 - \frac{11}{3}y - \frac{2}{3}$ are:

(A) $-\frac{2}{3}, -\frac{1}{7}$ (B) $-\frac{2}{7}, -\frac{1}{3}$ (C) $\frac{2}{3}, \frac{1}{7}$ (D)$\frac{2}{3}, -\frac{1}{7}$

Answer: (D)$\frac{2}{3}, -\frac{1}{7}$

4. If α and β are the zeros of the polynomial p(x) = kx^2- 30x + 45k and $\alpha + \beta = \alpha\beta$, then the value of 'k' is:

(A) $-\frac{2}{3}$ (B) $-\frac{3}{2}$ (C) $\frac{3}{2}$ (D)$\frac{2}{3}$

Answer: (D)$\frac{2}{3}$

5. The number of polynomials having zeroes -1 and 2 is :

(A) exactly 2   (B) only1   (C) at most 2   (D) infinite

Answer: (D) infinite

6. If the square of the difference of the zeroes of the quadratic polynomial p(x) = x^2 + p x +45 is equal to 144, then the value of 'p' is

(A) 18   (B) -18   (C) both (A) & (B)   (D) None of these

Answer: (A) 18

7. 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

Answer: (D) a = 0, b = –6

8. If one of the zeroes of the quadratic polynomial (k – 1)x^2 + kx + 1 is –3, then the value of k is (A) 4/3
(B) -4/3   (C) 2/3   (D) -2/3

Answer: (A) 4/3

ASSERTION AND REASONING

In the following questions 9 and 10, 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)*: $x^2 + 4x + 5$ has two real zeroes.

Reason (R): A quadratic polynomial can have at the most two zeroes.

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

10. *Assertion (A)*: If the sum of the zeroes of the quadratic polynomial $x^2 – 2kx + 8$ is 2 then value of k is 1

Reason (R): Sum of zeroes of a quadratic polynomial $ax^2 + bx + c$ is –b/a

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

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

11. If α and β are the zeros of the polynomial p(x) = $5x^2$- 6x + 1 and find the value of

$\alpha + \beta + \alpha\beta$ **Answer:** 7/5

12. If α and β are the zeros of the polynomial p(y) = y^2- 5y + 3, then find the value of

$\alpha^4\beta^3 + \alpha^3\beta^4$.   **Answer:** 135

13. If the sum of the zeroes of the polynomial p(x) = (p+1) x^2 + (2p+3) x + (3p+4) is -1, then find the value of 'p'.   **Answer:** $p = -2$

14. If α and β are the zeros of the polynomial p(x) = x^2- 2x - 1, then find the value of

$\frac{1}{2\alpha} + \frac{1}{2\beta} + 3\alpha\beta$.   **Answer:** - 4

15. If α and β are the zeros of the polynomial p(x) = x^2- 5x +4, then find the value of

$\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta$.   **Answer:** -27/4

SHORT ANSWER QUESTIONS (3 MARKS EACH)

16. Find the quadratic polynomial sum and product of whose zeroes are -1 and -20 respectively. Also find the zeroes of the polynomial so obtained.

Answer: Required polynomial $x^2 - x - 20$ and Zeroes: 4 and -5

17. Find the zeroes of the polynomial $25a^2 – 10a +1$ and verify the relationship between the zeroes and coefficient of the given polynomial.

Answer: Zeroes: 1/5 and 1/5 and verify Sum of zeroes = -b/a and Product of zeroes= c/a

18. Find the zeroes of the polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and coefficient of the given polynomial.

Answer: Zeroes: 3/2 and -1/3 and verify Sum of zeroes = -b/a and Product of zeroes= c/a

19. If α and β are the zeroes of the polynomial $p(x) = x^2$- 6x +a, then find the value of 'a', if $3\alpha + 2\beta = 20$ **Answer:** $a = -16$

20. If α and β are the zeroes of the polynomial $p(x) = x^2$- 2x +3, then form a quadratic polynomial whose zeroes are $(\alpha + 2)$ and $(\beta + 2)$

Answer: The required polynomial is x^2- 6x + 11

21. If α and β are the zeroes of the polynomial $p(x) = x^2$- 6x +k, then find the value of 'k', such that $(\alpha + \beta)^2 - 2\alpha\beta = 40$ **Answer:** $k = -2$

22. Find the value of 'k' such that the polynomial $x^2 - (k + 6)x + 2(2k - 1)$ has sum of its zeroes equal to half of their product. **Answer:** $k = 7$

LONG ANSWER QUESTIONS (5 MARKS EACH)

23. If one zero of the polynomial $(k + 1)^2 - 5x + 5$ is the multiplicative inverse of the other, then find the zeroes of $kx^2 - 3kx + 9$, where 'k' is constant

Answer: $k = 4$ and Zeroes are 3/2, 3/2 (Both equal roots)

CASE BASED QUESTIONS (4 MARKS EACH)

24. Case Study-1: Lusitania Bridge Quadratic polynomial can be used to model the shape of many architectural structures in the world. The Lusitania Bridge is a bridge in Merida, Spain. The bridge was built over the Guadiana River in 1991 by a Spanish consortium to take the road traffic from the Romano bridge. The architect was Santiago Calatrava. The bridge takes its name from the fact that Emerita Augusta (present day Merida) was the former capital of Lusitania, an ancient Roman province.

Based on the above information, answer the following questions.

(i) If the Arch is represented by $10x^2 – x – 3$, then find its zeroes.

Answer: Zeroes are -1/2 and 3/5

(ii) Find the quadratic polynomial whose sum of zeroes is 0 and product of zeroes is 1.

Answer: Required polynomial $k(x^2+1)$

OR

(ii) Find the sum and product of zeroes of the polynomial $\sqrt{3}\ x2 - 14x + 8\sqrt{3}$

Answer: Sum of zeroes $= \dfrac{14}{\sqrt{3}}$ and Product of zeroes $= 8$

25. The figure given alongside shows the path of a diver, when she takes a jump from the diving board. Clearly it is a parabola. Annie was standing on a diving board, 48 feet above the water level. She took a dive into the pool. Her height (in feet) above the water level at any time 't' in seconds is given by the polynomial h(t) such that h(t) = -16t² + 8t + k.

(i) What is the value of k?
Answer: k = 48
(ii) At what time will she touch the water in the pool?
Answer: t = 2 seconds

OR

(ii) Rita's height (in feet) above the water level is given by another polynomial p(t) with zeroes 1 and 2. Then find P(t)
Answer: The polynomial is -24t²+24t+48

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.3 What is the quadratic polynomial whose sum and the product of zeroes is √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 ?

Four marks questions

Q.9 **Case Study**:

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 $\quad \alpha + \beta = \frac{-2}{\sqrt{3}} + \frac{\sqrt{3}}{4} = \frac{(-8+1)}{4\sqrt{3}} = \frac{(-7)}{4\sqrt{3}}$

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

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

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

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

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.1 Which of the following is not the graph of quadratic polynomial?
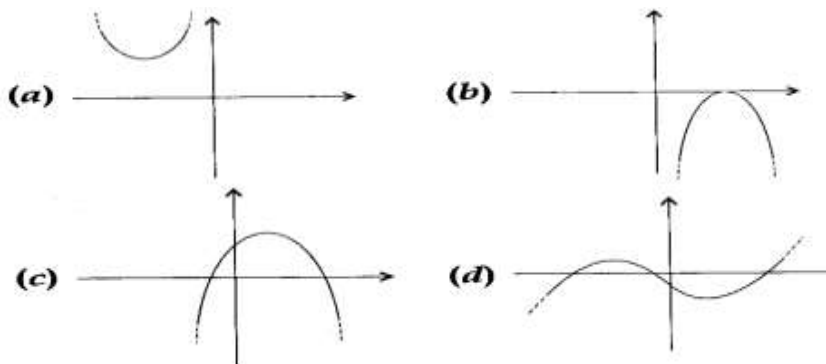
Q.2 **A polynomial of degree n has:**

(a) Only one zero   (b) At least n zeroes   (c) More than n zeroes   (d) At most n zeroes

Q.3 If 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 $2p + q + 5$

Q.9**Case Study**:

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
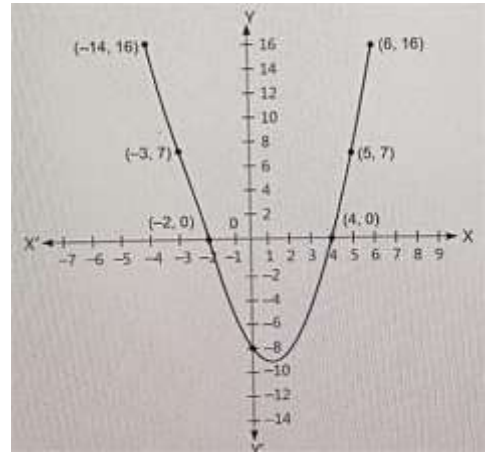
POLYNOMIALS – Worksheet 3

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 –α and –β.

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 $α = –\sqrt{5}$ and $β = \sqrt{5}/2$
$α + β = –\sqrt{5} + \sqrt{5}/2 = (–2\sqrt{5} + \sqrt{5})/2 = –\sqrt{5}/2$
$αβ = –\sqrt{5} \times \sqrt{5}/2 = –5/2$
Required polynomial $= x^2 – (α + β)x + αβ = x^2 + (\sqrt{5}/2)x – 5/2$
Her friend Ayesha pointed out a mistake in the result.
Q1. Is Ayesha correct?
Q2. Find the correct polynomial.
Q3. Find $α^2 + β^2$ 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 α/2 and β/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 $α = –1/\sqrt{2}$ and $β = \sqrt{2}/3$
$α + β = –1/\sqrt{2} + \sqrt{2}/3 = (–3 + 2)/3\sqrt{2} = –1/3\sqrt{2}$
$αβ = –1/\sqrt{2} × \sqrt{2}/3 = –1/3$
Required polynomial: $x^2 – (α + β)x + αβ = x^2 + (1/3\sqrt{2})x – 1/3$
His friend Shalini said his answer was wrong.
Q1. Is Shalini correct?
Q2. Find the correct polynomial.
Q3. Find $α^2 + β^2$ 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.

1. (b) -102 (d) a = 0, b = -63 (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√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, $\frac{c}{a}$ = 10Hence 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 - (2α +2 β) x + 2α .2 β

    x^2 - 2(α + β) x + 4αβ

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

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

1.(d)2 (d) At most n zeroes3(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

Sum of zeroes, $\alpha + \beta = \frac{-b}{a} = \frac{-(-7)}{6} = \frac{7}{6}$

Product of zeroes, $\alpha\beta = \frac{c}{a} = \frac{2}{6} = \frac{1}{3}$

For required polynomial:

Sum of zeroes, $S = \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{\frac{7}{6}}{\frac{2}{6}} = \frac{7}{2}$

Product of zeroes, $P = \frac{1}{\alpha} \times \frac{1}{\beta} = \frac{1}{\alpha\beta} = \frac{1}{\frac{1}{3}} = 3$

Required Quadratic Polynomial, $x^2 – 5x + P$

   $= x^2 - \frac{7}{2}x + 3$

   $= \frac{2x^2 - 7x + 6}{2} = \frac{1}{2}(2x^2 - 7x + 6)$

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

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

          $\alpha + \beta + \gamma = -p$, $\alpha + \beta = -p-2$

$\alpha \beta + \beta \gamma + \alpha\gamma = q = -2p -4 = q +1 = 2p + q + 1$proved

9   (a)Parabola
          (b)(-2, 4)

          (c)(2,0) (4, 0)   Or   y -axis at (0, -8)

1. (a) 9   2. (c) a = 3, b = –2   3. (d) x² – x – 4

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

Two Mark   Q1: x² + √2x + 5   Q2: x² – 8x + 13

Three Mark Q1: x² – 7x + 10   Q2: x² + (–1/2)x – 3

Case Study:
Q1: Yes, Ayesha is correct.
Q2: Multiply through by 2 to remove denominators: 2x² + √5x – 5
Q3: $\alpha^2 + \beta^2 = 5 + 25/4 = 45/4$

ANSWER KEY WORK SHEET 4

1.(d)2 (d) At most n zeroes3(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

- 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. x² − 4x + 16. x² − 4x + 1
- 7. x² + 3x − 4; Verified: Sum = -3, Product = -4
- 8. x² − (α + β)/αβ x + 1/(αβ) = x² − (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

Flowchart content:

If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, then
Graph : Two intersecting Lines
Unique Solution and Consistent

If $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, then
Graph : Two Co-incident Lines
Infinitely Many Solution and Consistent

If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, then
Graph : Two Parallel Lines
No Solution and Inconsistent

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

$a_1x + b_1y + c_1 = 0$
$a_2x + b_2y + c_2 = 0$

GRAPHICAL METHOD

SUBSTITUTION METHOD

ELIMINATION METHOD
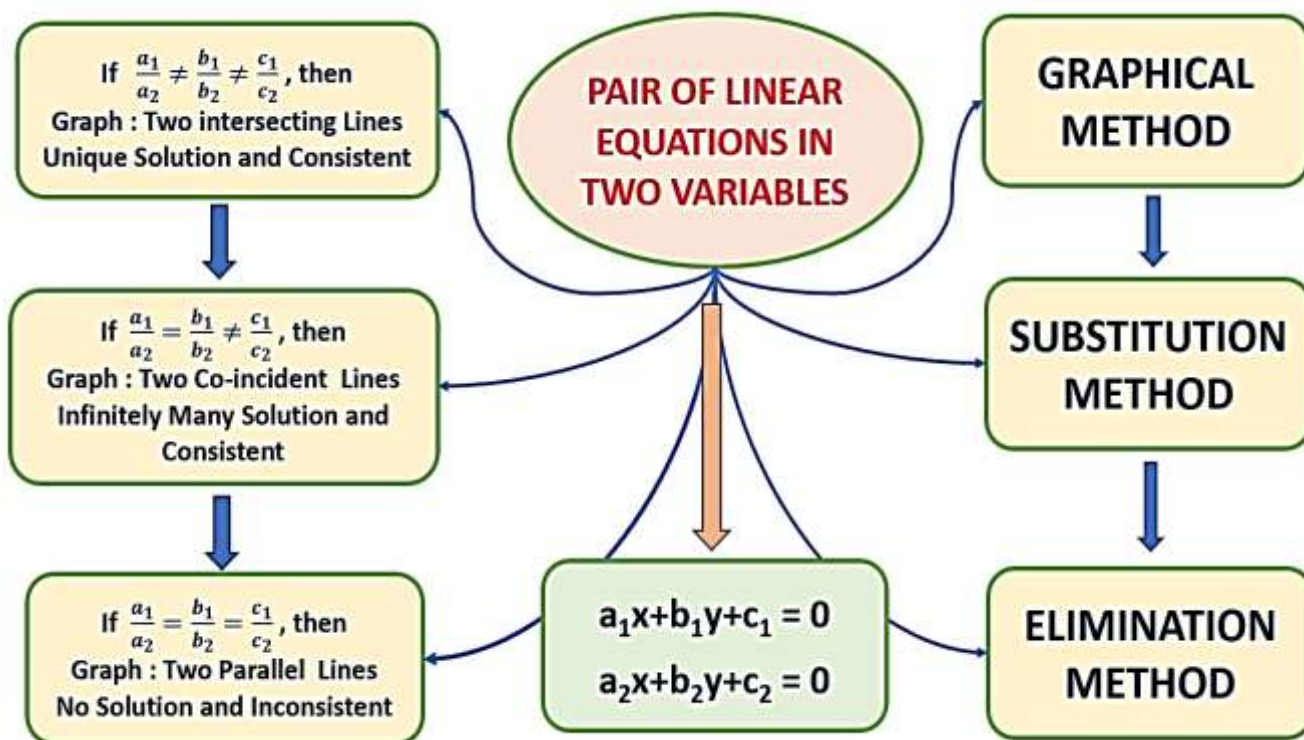
KEY POINTS

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

1) The two-digit number which become $\frac{5}{6}$th 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) None of these

2) For which value(s) of p will lines represented by the following pairs of linear equations be parallel?

(a) All real values except 10   (b) 10   (c) $\frac{5}{2}$ (d) $\frac{1}{2}$

3) (3x4y): (x+2y) =9:4, then (3x+5y): (3x-y) =

(a) 4:1   (b) 1:4   (c) 7:1)   (d) 1:7

4) The pairs of equations y=0 and y= -7 has

(a) one solution   (b) two solutions   (c) Infinitely many solutions   (d) No solution

5) The pair of equations x=a and y=b graphically represents lines which are

(a) Parallel   (b) intersect at (b, a)   (c) Coincident   (d) Intersect at (a, b)

6) If x=a and y=b is the solution of the equations x-y=2 and x+y=4, then the value of a and b are respectively

(a) 3 and 5   (b) 5 and 3   (c) 3 and 1   (d) -1 and -3

7) For what value of k do the equations 3x-y+8=0 and 6x-ky= -16 represent coincident lines

(a) $\frac{1}{2}$ (b) $\frac{-1}{2}$ (c) 2   (d) -2

(8) The father's age is 6 times his son's age. 4 years hence, the age of the father will be 4 times his son's age. The present age (in yrs) of the son and the father are respectively:

(a) 4 and 24   (b) 5 and 30   (c) 6 and 36   (d) 3 and 24

ASSERTION AND REASONING

Directions:

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

9) **Assertion**: Pair of linear equations 9x+3y+12=0 and 8x+6y+24=0 have infinitely many solutions.

Reason: Pair of linear equations a_1x+b_1y+c_1=0 and a_2x+b_2y+c_2=0 have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

10) **Assertion**: x+y-4=0 and 2x+ky-3=0 has no solution if k=2.

Reason: If graph of linear equations a_1x+b_1y+c_1=0 and a_2x+b_2y+c_2=0 are represented Intersecting lines then $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

11) Draw the graphs of the line $x = -2$ and $y = 3$. Write the vertices of the figure formed by these lines, the x-axis and the y-axis. Also find the area of the figure.

12) For what value of k will the following pair of linear equations have infinitely many solutions?

kx+3y-(k-3) =0,   12x+ky-k=0

13) Solve for x and y: 152x-378y = -74, -378x+152y = -604

14) Represent the following pairs of equations graphically and write the co-ordinate of the points where the line intersects Y-axis.

x+3y=6 and 2x-3y=12

15) If (x+1) is a factor of $2x^3 + ax^2 + 2bx + 1$, then find the value of a and b if

SHORT ANSWER QUESTION (3 MARKS)

16) Draw the graph of the following equations: 2x+y=2 and 2x+y=6.

Determine the vertices of trapezium so formed between these lines and find the area of trapezium

17) Determine the values of α and β, so that the following pairs of linear equations have infinite number of solutions:

$(2\alpha - 1)x + 3y = 5$, $3x + (\beta - 1)y - 2 = 0$

18) For what value(s) of m and n the following pair of linear equations represent coincident lines:

$x + 2y = 1$, $(m - n)x + (m + n)y = m + n - 2$

19) A number consist of two digits, when it divided by the sum of its digits, the quotient is 6 with no remainder, when number is diminished by 9, and then digits are reversed. Find the number

20) Solve: $2x + 3y = 11$, $2x - 4y = -24$ Hence find the value of m for which y=mx+3

21) Find 'a' if lines 3x+ay =8 passes through the intersection of lines represented by equation 3x-2y=10, 5x+y=8

LONG ANSWER QUESTIONS (5 MARKS)

22) For which values of p and q, will the following pairs of linear equations have infinitely many solutions?4x+5y-2 = 0, (2p+7q) x+(p+8q) y = 2q-p+1

23) The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in a row, there would be 2 rows more. Find total number of students in the class.

24) Solve for x and y : $2^x + 3^y = 17$, $2^{x+2} - 3^{y+1} = 5$

25) Solve following equations graphically:

   2x+y=6 and 2x-y+2=0

  Find the ratio of the areas of the two triangles formed by these lines with the x-axis and y-axis.

26) A two-digit number is obtained by either multiplying the sum of the digits by 8 and then subtracting 5 or by multiplying the difference of digits by 16 and then adding 3. Find the number.

27) A train covered a certain distance at a uniform speed. If the train would have been 10km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10km/h, it would take 3 hours more than the scheduled time; Find the distance covered by train.

28) A cyclist, after riding a certain distance stopped for half an hour to repair his bicycle, after which he completes the whole journey of 30 km at half speed in 5 hours. If the breakdown had occurred 10 km farther, he would have completed   the whole journey in 4 hours. Find where the breakdown occurred and his original speed.

COMPATENCY BASED (4 MARKS)

29) A company has a locker in which valuable documents are kept. The pass code is a four digit number of the form xyyx. The chief executive officer (CEO) and the Vice President (VP) of the company have each been given one clue. On solving BOTH clues, the passcode that opens the locker can be found.
CEO's clue: When twice the ones digit is subtracted from the tens digit, the result is 1.
VP's clue: Three more than the tens digit is thrice the ones digit.
(i) Frame equations from given clue.
   (ii) Find value of x and y.
   (iii)Find passcode that opens the locker.
   30) Ajay owns a dry-fruit store. He sells cashew nuts at 600/kg and pistachio nuts at Rs. 750/kg.
      A customer asks for a mixture of cashew nuts and pistachio nuts with the following conditions:
   Both the items should together weigh 500gram.
   Both the items should together cost RS.360.
a) If Ajay packs x kg of cashew nuts and y kg of pistachio nuts for the customer, frame the equations that represent the given context.
b) Find the weights of cashew nuts and pistachio nuts that Ajay packed for the customer.
c) Find cost of a packet of 2 kg.

33) The 4-wheeler parking fees at a metro station is charged in two parts- a fixed charge is Rs.x up to 2 hours and Rs. Y for every subsequent hour.

i) Manjeet parked his car for 6 hours and paid Rs. 110. Asha parked her car for 13 hours and paid Rs.250. Frame a pair of linear equations representing the context.

ii) Find the fixed charge and the subsequent charge per hour.

iii) Amlesh parked his car at the station from 8 AM to 3 PM. Find the amount Amlesh must pay as the parking charge.

ANSWER AND SOLUTION HINT

SECTION –A

1. (b)   2. (a)   3. (c)   4. (d)   5. (d)
6. (c)   7. (c)   8. (c)   9. (a)   10. (b)

SECTION –B

11. Rectangle, Area= 6 square units   12. For infinitely many solutions: $\dfrac{k}{12} = \dfrac{3}{k} = \dfrac{k-3}{k}$

After simplify k=6

13. x=2, y=1

14. Draw Graph and find co-ordinates   15. a=5 and b=2

SECTION –C

16 Draw the graph and find the area

17. $\alpha = \dfrac{17}{4}, \beta = \dfrac{11}{5}$

18. m=6, n=2

19. If unit digit x and tens digit y, then original number=10x+y.

According to question: Equations will be 4x-5y=0 and x-y=1

Solve above equations x=5 and y=4 , Number=54

20. x= -2, y=5, m= -1

21. a= - 1

SECTION –D

22. p= -1 and q= 2

23. Let number of rows is x and number of students in each row is y. So total number of students=xy

ATQ: 3x-y=3 and -3x+2y=6

Solve above equations and get x=4 and y=9

Total number of students= 9×4=36

24. x=3 and y=2   25. 8:2 or 4:1

26. If x is tens digit and y is unit digit. Then number =10x+y

ATQ: 2x-7y= -5 and 6x-17y=3

Solve equations get x=8 and y=3

Number will be 83

27. Let speed is x km/h and time taken y hour. Total distance-xy km

ATQ: -2x+10y=20 and 3x-10y=30

Solve above equations and get x= 50 km/h and y= 12 hour

Distance covered=600 km

28. Suppose cyclist travelled x km before stopping and speed is y km/hr.

Acc. To 1st case

Total time taken = 5 hrs.

$$\frac{x}{y} + \frac{30-x}{\frac{y}{2}} = 5$$

Or x+5y=60

Acc. To 2nd case:

Total time taken= 4hrs.

$$\frac{x+10}{y} + \frac{30-(x+10)}{\frac{y}{2}} = 4$$

or x+4y=50

Solve the above equations, we get x=10km and y= 10km/hr.

COMPATENCY BASED QUESTIONS

29. (i) By given clue equations will be -2x+y=1 & 3x-y=3
    (ii) x =2 & y=1   (iii) Passcode 4994

30. (i) According to given conditions:

x+y=0.5 and 600x+750y=360

(ii) Solve above equations x= $\frac{1}{10} kg$ and $\frac{2}{5} kg$

(iii) Rs. 1440

31. (i) According to given condition:

x+4y=110 & x+11y=250

   (ii)   Solve above equations

x=Rs.30 and y=Rs.20

 (iii) Amlesh parking charge: 30+5×20=Rs.130

WORKSHEET-1: PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
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. $10x+14y+4 = 0$ 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 $2x-3y=-8$

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

Q1 For what value of k, do the equations $3x - y + 8 = 0$ and $6x - ky = -16$ 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 and 2X-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?

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.

VERYSHORT 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? 2OR What 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.

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.

Section D: Short Answer Type 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.

Section E: 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.

Section F: Long Answer Type 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

.

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.
.

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: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.

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 .

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

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.

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

Quadratic Equation

Quadratic Equation (degree 2)

General Form
$(ax^2 + bx + c = 0)$

Solutions

METHOD 1

METHOD 2

METHOD 3

Factorisation

Completing Square

Quadratic Formula

Solution of a Quadratic Equation by Factorisation

If we can factorise $ax^2 + bx + c$, $a \neq 0$, into a product of two linear factors, then the roots of the quadratic equation $ax^2 + bx + c = 0$ can be found by equating each factor to zero.

Solution of a Quadratic Equation by completing the Square

A quadratic equation can also be solved by the method of completing the square.

Nature Of Roots

Discriminant (D)

D > 0 Real distinct roots

D = Equal Roots

D < 0 No real roots

KEY POINTS

- **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 MARKS)

Q1. Which of the following equations is a quadratic equation?

(A) $x^2 + 1 = (x - 1)^2$ (B) $(x + x)^2 = 2xx$ (C) $x^3 + 3x^2 = (x + 1)^3$ (D) $(x+1)(x-1) = (x+1)^2$

Q2. If $(x + 1)^2 = x^2 + 2x$ 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

Q3. The roots of the quadratic equation $x^2 + x - 1 = 0$, are

(A) Irrational and distinct   (B) not real   (C) rational and distinct   (D) real and equal

Q4. Find the value of of k, if 12 is a root of the equation $x^2 + kx - 54 = 0$.

(A)2   (B) -2   (C) 0   (D) 12

Q5. Let p be a prime number. The quadratic equation having its roots as factors of p is

(A) $x^2-px+p=0$ (B)$x^2-(p+1)x+p=0$

(C) $x^2+(p+1)x+p=0$ (D) $x^2-px+p+1=0$

Q6. The least positive value of k, for which the quadratic equation $2x2+kx-4=0$ has rational roots, is

(A) ± 22 (B) ± 2 (C) 2   (D) 2

Q7. If the quadratic equation $ax2+bx+c=0$ has two real and equal roots, then 'c' is equal to

(A) $-b^2/a$ (B) b^2/a (C) $-b^2/4a$ (D) $b^2/4a$

Q8. If the quadratic equation $x2-8x+k=0$ has real roots, then

(A) k <16   (B) k ≤16   (C) k >16   (D) k ≥16

REASON ASSERTION 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 Assertion (A) and Reason (R) are true and Reason (R) is correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not correct explanation for 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)**: Equation $2x^2 + 3x + 4 = 0$ has no real roots.
 Reason (R): When discriminant of a quadratic equation is zero, then the equation has real and distinct roots.
Q10. **Assertion (A)**: If the equation $8x^2 + 3kx + 2 = 0$ has equal roots, then the value of k is ± 83.
Reason (R): The equation $ax^2 + bx + c = 0$ has equal roots if $D = b^2 − 4ac = 0$.

VERY SHORT ANSWER QUESTIONS (2 MARKS)

Q11. Solve the quadratic equation for x**:** $x^2-2ax-4b^2-a^2=0$

Q12. If x=-2 is the common solution of quadratic equations $ax^2+x-3a=0$ and $x^2+bx+b=0$, then find the value of a^2b.

Q13. Find the value(s) of k for which the quadratic equation $x^2 + 5kx + 16 = 0$ has real and equal roots.

Q14. If one root of the quadratic equation $x^2 + 12x - k = 0$ is thrice the other root, then find the value of k.

Q15. A natural number when increased by 12 equals 160 times the reciprocal. Find the number.

SHORT ANSWER QUESTIONS (3 MARKS)

Q16. If the quadratic equation $(1+a^2) x^2 + 2abx + (b^2-c^2) = 0$ has equal and real roots, then prove that: $b^2=c^2(1+a^2)$

Q17. Find the value of 'p' for which the quadratic equation $p(x-4) (x-2) +(x-1)^2=0$ has real and equal roots.

Q18. Had Aarush scored 8 more marks in a Mathematics test, out of 35 marks, 7 times these marks would have been 4 less than square of his actual marks. How many marks did he get in the test?

Q19. A dealer sells an article for ₹ 75 and gains as much percent as the cost price of the article. Find the cost price of the article.

Q20. Solve the following equation for x: $1x-2 + 2x-1=6x$, x $\neq$ 0,1,2

LONG ANSWER QUESTIONS (5 MARKS)

Q21. A shopkeeper buys a number of books for ₹ 1,800. If he had bought 15 more books for the same amount, then each book would have cost him ₹ 20 less. Find how many books he bought initially.

Q22. If Nidhi were 7 years younger than what she actually is, then the square of her age (in years) would be 1 more than 5 times her actual age. What is her present age ?

Q23. A person needs to arrange desks in a classroom such that the number of rows is the same as the number of columns of desks. After having made such an arrangement, he found that 34 desks were still left with him. When he doubled the number of rows and columns, he found that he was short of 14 desks. Find the total number of desks available with him.

CASE BASED QUESTIONS (4 MARKS)

Q24. A rectangular floor area can be completely tiled with 200 square tiles. If the side length of each tile is increased by 1 unit, it would take only 128 tiles to cover the floor.

(i) Assuming the original length of each side of a tile be x units, make a quadratic equation from the above information. (Ans:$200x^2=128(x+1)^2$

(ii) Write the corresponding quadratic equation in standard form

(iii) (a) Find the value of x, the length of side of a tile by factorisation.

OR

(b) Solve the quadratic equation for x, using quadratic formula.

Q25. While designing the school year book, a teacher asked the student that the length and width of a particular photo is increased by x units each to double the area of the photo. The original photo is 18 cm long and 12 cm wide.
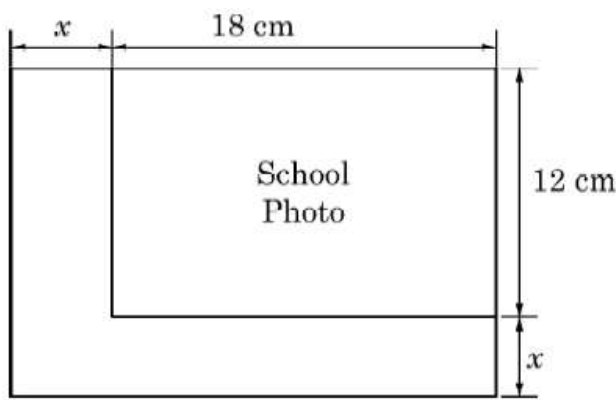
Based on the above information, answer the following questions:

i. Write an algebraic equation depicting the above information.

ii. Write the corresponding quadratic equation in standard form.

ii. (a)What should be the new dimensions of the enlarged photo?

OR

(b)Can any rational value of x make the new area equal to 220 cm^2?

ANSWERS

1.Ans: (A) 2   2.Ans: (D) -14   3.Ans: (A) irrational and distinct

4.Ans: (B) -2   5.Ans: (B)x2-(p+1)x+p=0   6.Ans: (C) 2

7.Ans: (D) b24a   8.Ans: (B) k ≤16   9.Ans:(B)   10.Ans:(A)

11. [Sol:$x^2-2ax-(4b^2-a^2)=0$ or $x^2-2ax-(2b - a)(2b + a)=0$

or $x^2-(2b+a)x+(2b-a)x-(2b-a)(2b+a)=0$ x =a+2b and x=a-2b]

12. [Sol: $(-2)^2+(-2)-3a=0$ or a = 2 $(-2)^2+b(-2) + b=0$ or b = 4   So $a^2b=16$]

13. [Hint:$25k^2-64=0$ or k = 85]

14. [Sol:3β+β=−12 or 4β=−12 or β=−3 α=3β=3×(−3)=−9

    α·β = ac = −k or (−9)·(−3)= −k or 27=−k or k=−27]

15. [Sol:x+12=160 . 1x   or $x^2+12x-160=0$ or x = -20 and 8 Since asked for a natural number, x = 8]

16. [Sol: $(2ab)^2-4(1+a^2)(b^2-c^2)=0$ or $c^2+a^2c^2=b^2$ or $c^2(1+a^2)=b^2$]

17. [Sol: Given equation can be written as $(p+1)x^2+(-6p-2)x+(8p+1)=0$

    So, for real and equal roots, $(-6p-2)^2-4(p+1)(8p+1)=0$ This gives p=0 or p=3]

18. [Sol: $7(x+8)=x^2-4$ or $x^2-7x-60=0$ or x = 12, -5

     Since marks cannot be negative, we discard x=−5.

     Therefore, Aarush's actual marks are x=12.]

19. [Sol:Let the cost price be x . The profit percentage is also x

    So, 75-xx ×100=x or $x^2+100x-7500=0$ or x= -150 or 50 CP is Rs 50]

20. [Sol: On simplifying $3x^2-13x+12=0$ Solving x = 3 or 43]

21. [Sol: Let x be the initial number of books.

Then the initial cost per book is: 1800x   and new cost is 1800x+15

So, 1800x - 1800x+15 = 20 , On solving, x = -45 and 30

Therefore, the initial number of books bought by the shopkeeper is 30]

22. [Sol: Let Nidhi's actual present age be x years

Then $(x-7)^2=5x+1$ or $x^2-19x+48=0$ or x = 3, 16

x = 3 cannot be valid as age cannot be negative. So, x = 16]

23. [Sol: Let number of rows and columns of desks be x. Then $x^2 + 34 = (2x)^2 – 14$

Solving x = 4, – 4, Rejecting – 4, x = 4. So the number of desks = $x^2 + 34 = 50$]

24. [Sol: (i) $200x^2=128(x+1)^2$ (ii) $9x^2$-32x-16=0   (iii) (a) x=4 or x = -49

          OR

      (b) Solving by using quadratic formula x=4 or x = -49]

25. [Sol: (i) (18+x)(12+x)=432   (ii) $x^2+30x-216=0$ (iii) x = 6, -36

 Since x represents an increase in length, it must be a positive value. Therefore, x=6.

  OR

(b) (18+x)(12+x) =220   or $x^2+30x-4=0$

  D=916 which is not a perfect square.

So no rational value of x can make the new area equal to 220 cm^2

WORKSHEET-1
QUADRATIC EQUATION
SECTION – A (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) $a = 2$

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 $x^2 + px + 1$ $p = \overline{0}$ 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) is true.

   Assertion(A): If one root of the quadratic equation $6x^2 - x - k = 0$ is $\frac{2}{3}$, then the value of k is 2.

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

SECTION–B

Questions carry 2 marks each.

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.

SECTION–C (3marks)

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 –5 is 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.

SECTION–D (5 marks)

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?

WORKSHEET -2
QUADRATIC EQUATION
SECTION – A (1 mark)

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.

SECTION–B (2marks)

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.

SECTION–C (3marks)

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?

SECTION–D ((5 marks)

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 thedistancefrom New York City to Montreal in lessthan an hour. Chinahashalf 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)   Findthespeedofslowtrain.
(b)   Findthespeedoffasttrain.
(c)   Howmuchtimetakenbytheslowtrain tocoverthedistance600km?

WORKSHEET- 3
QUADRATIC EQUATION
SECTION – A

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 root
$3x^2-5x+2=0$								
$9x^2+3x+5=0$								
$x^2+2x-143=0$								
$x^2-5x+6=0$								
$x^2+4x+5=0$								

SECTION–B

Questions carry 2 marks each.

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.

SECTION–C

Questions carry 3 marks each.

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.

SECTION–D

Question carry 5 marks

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?

WORKSHEET- 4
QUADRATIC EQUATION
SECTION – A
Questions carry 1 mark each

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. 30yrs
b. 31yrs
c. 36yrs
d. 41yrs

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

1. $x^2 - (2 + \sqrt{3})x + 1 = 0$
2. $x^2 + (2 + \sqrt{3})x + 1 = 0$
3. $x^2 - 4x + 1 = 0$
4. $x^2 + 4x - 1 = 0$

SECTION – B
Questions carry 2 mark each

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.

SECTION – C
Questions carry 3 mark each

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)

SECTION – D
Questions carry 5 mark each

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

WORKSHEET- 5
QUADRATIC EQUATION

SECTION – A
Questions carry 1 mark each

In the following questions 9 and 10, 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.

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 $\frac{2}{3}$, then the value of k is 2.
   Reason (R): The quadratic equation $ax^2+bx+c=0, a\neq0$ has almost two roots.

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 $a\neq0$, 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 $ax^2 +bx+c=0, a\neq0$ has two roots.

SECTION – B
Questions carry 2 mark each

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
SECTION – C
Questions carry 3 mark each

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.

SECTION – D
Questions carry 5 mark each

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 100m² rectangular vegetable garden. Since he has with the only 30m 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 5m, then find the breadth. (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	$\dfrac{3}{4}$
2	$\dfrac{9}{2}$
	Section D
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=3integersare3,3+1,3+2i.e.3,4and5.
2	0
	Section C
1	either23and11or16and18.
2	$x^2-29x+100=0$
	Section D
a	$y=30-2x$
b	5mor10m.
c	20m.

ARITHMETIC PROGRESSION

Sum of first n positive integers
Let $S_n = 1 + 2 + 3 + ... n$
here, $a = 1$, last term, $l = n$
$$S_n = \frac{n(a+l)}{2} = \frac{n(1+n)}{2}$$

Definition
Sequence of numbers in which each term is obtained by adding a fixed number to the preceding term except the first term.

Arithmetic mean
If a, b, c, are in A.P.
Then $b = \frac{a+c}{2}$
here,
$b \rightarrow$ arithmetic mean

General form
$a, a+d, a+2d, a+3d, ...a+(n-1)d$

Common Difference
• Fixed number in arithmetic progression which provides the to and fro terms by adding/subtracting from the present number.
• Can be positive or negative.

Example

Example
How many 2-digit numbers are divisible by 3?
2-digit numbers divisible by 3 are 12, 15, 18, ... 99
here, $a = 12$, $d = 3$, $a_n = 99$
$a_n = a + (n-1)d$
$99 = 12 + (n-1)3$
i.e., $n-1 = \frac{87}{3} = 29$
$\Rightarrow \quad n = 30$

Sum (S)

When first & last terms are given :
$$S_n = \frac{n}{2}(a+a_n) \text{ or } S_n = \frac{n}{2}(a+l)$$
here, $a \rightarrow$ first term
$n \rightarrow$ total terms
$a_n \rightarrow n^{\text{th}}$ term
$l \rightarrow$ last term

When first term and common difference are given :
$$S_n = \frac{n}{2}(2a + (n-1)d)$$
here, $a \rightarrow$ first term
$d \rightarrow$ common difference
$n \rightarrow$ total terms

n^{th} term

From the end
$a_n = l - (n-1)d$
here, $l \rightarrow$ last term
$d \rightarrow$ common difference
$a_n \rightarrow n^{\text{th}}$ term

From the beginning
$a_n = a + (n-1)d$
here, $a \rightarrow$ first term
$d \rightarrow$ common difference
$a_n \rightarrow n^{\text{th}}$ term

Arithmetic Progressions

Trace the Mind Map
• First Level • Second Level • Third Level

GIST OF THE CHAPTER:

❖ 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.

The general form of an AP is $a, a + d, a + 2d, a + 3d, ……..$

❖ A given list of numbers $a_1, a_2, a_3, a_4, a_5, . . .$ is an AP, if the differences $a_2 - a_1, a_3 - a_2, a_4 - a_3, . . .$, give the same value, i.e., $a_{n+1} - a_n$ is the same for different values of n.

❖ In an AP with first term a and common difference d, the nth term (or the general term) is given by $a_n = a + (n - 1) d$.

❖ The sum of the first n terms of an AP is given by : $S_n = \frac{n}{2} [2a + (n - 1)d]$.

❖ If l is the last term of the finite AP, say the nth term, then the sum of all terms of the AP is given by : $S_n = \frac{n}{2}(a + l)$.

❖ If a, b, c are in AP, then $b = \frac{a+c}{2}$ and b is called the arithmetic mean of a and c.

MULTIPLE CHOICE QUESTIONS (1 MARK)

1) The value of x for which 2x, (x + 10) and (3x + 2) are the three consecutive terms of an AP, is
(a) 6   (b) –6   (c) 18   (d) –18

2) The number of terms of an AP   5, 9, 13, …. 185   is

(a) 31   (b) 51   (c) 41   (d) 46

3) The first term of an A.P. is 5 and the last term is 45. If the sum of all the terms is 400, the number of terms is :   (A) 16   (B) 8 (C) 10   (D) 20

4) The nth term of the A.P. *a, 3a, 5a, ……* is
(a) na   *(b) (2n – 1) a*   *(c) (2n + 1) a*   *(d) 2na*

5) The value of p for which (2p + 1), 10 and (5p + 5) are three consecutive terms of an AP is :   (a) –1   (b) –2   (c) 1   (d) 2

6) The 9th term of the A.P. – 15, – 11, – 7, ..., 49 is

(A) 32   (B) 0   (C) 17   (D) 13

7) 20th term of the A.P: 10, 7, 4, …, is :   (a) 67   (b) 47   (c) -47   (d) -77

8) In an AP, if d = -4,   n = 7, $a_n = 4$,   then a is

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

9) Statement A (**Assertion**): 3, 3,3,3,3,3,3 …. is in Arithmetic Progression.

Statement R (**Reason**) : The common difference of an A P can be negative, positive or zero.

(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 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.

10) Statement A (**Assertion**): 0 is the term of A P : 31,28,25,…….

Statement R (**Reason**) : The term of an AP always have a natural number as serial order.

(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 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 ANSWER TYPE QUESTIONS (2 MARKS)

11) Show *that* $(a - b)^2$, $(a^2 + b^2)$ *and* $(a + b)^2$ are in AP.

12) Which term of the Arithmetic Progression –7, –12, –17, –22, ... will be –82 ?

13) What is the common difference of an A.P. in which $a_{21} - a_7 = 84$?

14) Find the 11th term from the last term of the AP   12, 8, 4, …, –84.

15) Find the sum of the first 100 natural numbers.

LONG ANSWER TYPE QUESTIONS (3 MARKS)

16) Find a, b and c if it is given that the numbers a, 7, b, 23, c are in AP.

17) Solve the equation : $1 + 4 + 7 + \ldots\ldots + x = 287$.

18) If 7 times the 7th term of an AP is equal to 11 times its 11th term, then find its 18th term.

19) Find the sum of all the 11 terms of an AP whose middle most term is 30.

20) Find the sum of all integers between 50 and 500, which are divisible by 7.

LONG ANSWER TYPE QUESTIONS (5 MARKS)

21) The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last term to the product of two middle terms is 7 : 15.   Find the numbers.

22) The houses of a row are numbered consecutively from 1 to 49. Show that there is a value of x such that the sum of the numbers of the houses preceding the house numbered x is equal to the sum of the numbers of the houses following it. Find this value of x. [Hint : $S_{x-1} = S_{49} - S_x$]

23) The sum of the third and the seventh terms of an AP is 6 and their product is 8. Find the sum of the first sixteen terms of the AP.

COMPETENCY BASED QUESTIONS (4 MARKS)

24) A fashion designer is designing a fabric pattern. In each row, there are some shaded squares and unshaded triangles.
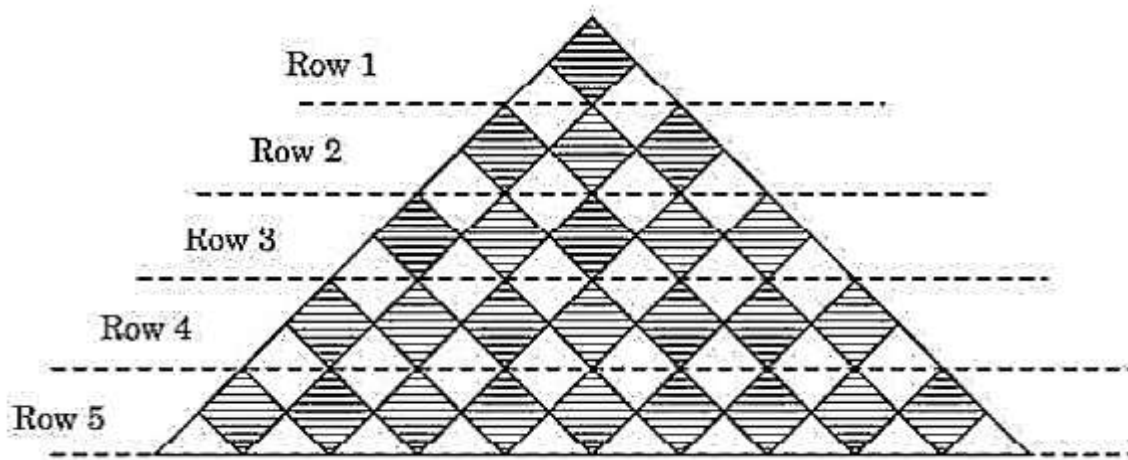
Based on the above, answer the following questions:

(i) Identify A.P. for the number of squares in each row.   1

(ii) Identify A.P. for the number of triangles in each row.   1

(iii) If each shaded square is of side 2 cm, then find the shaded area when 15 rows have been designed.

2

Or

Write the formula for finding total number of triangles in 'n' number of rows. Hence, find S_{10}.

25) Nikhil started saving money for his new project. He started saving Rs 240 in the first month, Rs 300 in the second month Rs 360 in the third month and so on. He continues to save in this manner for quite some time. Based on the above, answer the following questions :

(i) Are the numbers representing his savings in AP ? If so, write the first term (a) and the common difference (d).   1

(ii) In which month will he save Rs 660 ?   1

(iii) What amount will he save in the 15th month ?   2

<div align="center">OR</div>

How much money he will accumulate after 10 months ?

<div align="center">

ANSWERS

</div>

1) (a) **6,**   **2)** (d) 46,   **3)** (A) 16, **4** (b) *(2n – 1) a,*   **5)** d) 2,   **6)** C) 17,   **7)** (c) -47   **8)** (d) 28

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

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

11) Yes, Common Difference is *2ab,*   **12)** 16th term,   **13**) common difference = 6,

14) -44,   **15)** 5050,   **16)** $a = -1$, b = 15, c = 31,

17)   AP : 1, 4, 7, 10, ... x, $S_n = 287$, $3n^2 – n - 574 = 0$,   (n-14)(3n-41) = 0,   n=14

$n_{14} = 1 + (14 – 1) \times 3 = 40$

18)   7(a +6d) =11(a + 10d), a + 17d = 0 , $a_{18} = 0$

19) a + 5d = 30,   S11 = 11[2 a + 10d]/2 ,   S11 = 330

20) AP : 56, 63, 70,……..,497. $a_n = a$ + (n - 1)d = 497,   n = 64 ,

$S_{64} = 32$ (56 + 497) = 17696

21) *a –3d + a – d + a + d + a + 3d = 32,   a = 8,*
(a –3d)(a + 3d)/ (a – d)(a + d) = 7 / 15,   d = 2, - 2,

So numbers are 2, 6, 10, 14.

22)   houses are numbered from 1, 2, 3, 4, 5…….49.

Sum of (1, 2, 3,….x – 1) = sum of [(x + 1), (x + 2) ,….48, 49]

1 + 2 + 3 + …… + (x – 1) = (x + 1) + (x + 2) …… + 49

[(x – 1)/2] [1 + x – 1] = [(49 – x)/2] [x + 1 + 49],   x = 35

23) $a_3 + a_7 = 6$,   *So a + 4d = 3,   a = 3 – 4d,   And* $a_3 \times a_7 = 8$,   *(3-2d)(3 +2d) = 8*

d = 1/2 or -1/2,   a = 1 or 5, S_{16}= 76 or 100

24) (i) AP : 1,3,5,7,9   (ii) AP : 2,6,10,14,18 (iii) Shaded Area =900 cm^2 or $S_n = 2n^2$, S_{10}= 200

25) (i)Yes, AP : 240,300,360,……, a = 240, d = 60, (ii) 8 months, (iii) Rs 1080 or Rs 5100

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 99th term and 100th term is same as that between 999th term and 1000th 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 ?

<div align="center">OR</div>

(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.

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 50th term of the sequence 3, 7,11,…….

Reason (R) : The nth term of A.P .is given by $a_n = a + (n - 1)d$

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 4th and 9th 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 15th 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.

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   **2 M each**

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 $a_{18} - a_{14} = 32$.

SHORT ANSWER   **3 M each**

8 An A.P. consists of 60 terms. If the first and the last terms are 7 and 125, respectively. Find the 32nd term.

9 Show that the sequence defined by $a_n = 5n - 7$ is an A.P., find its common difference.

LONG ANSWER   **5 M each**

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 M each**

In a society, a yoga instructor was hired to train the people of the society to live a healthy lifestyle.

11 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 ?

Q.1 The nth 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 10th 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.5In an A.P. if $S_n = 4n^2 - n$, 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.7How 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.9The 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.10The 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

ARITHMETIC PROGRESSION
WORKSHEET 5

Q.1 The nth 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.
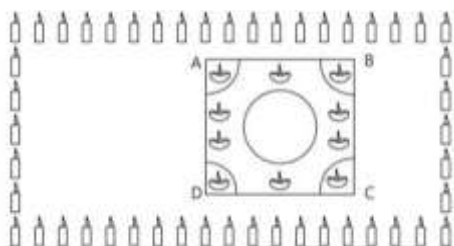
Based on the above information, solve the following questions:

 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,...	19th 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
TRIANGLES

TOPIC 1:
triangles, I
examples,
proportion
theorem.
Two figure
same shap
may or ma
are called
figures.
Pair of all
polygons a
figures.
All circles
figures.
Film 35mr
enlarged ir
and then tl
called sim

Similar tr
two triang
to be simil
(a) Their
corresponc
are equal
(b) Ratio c
corresponc
are
equal/proportional.
We write
$\triangle ABC \sim \triangle DEF$ Where
symbol ~ 'stands for
is similar to'

Summary
In $\triangle ABC$, let DE ∥ BC. Then,
(i) $\dfrac{AD}{DB} = \dfrac{AE}{EC}$
(ii) $\dfrac{AD}{DB} = \dfrac{AC}{EC}$
(iii) $\dfrac{AD}{AB} = \dfrac{AE}{AC}$

Theorems

1. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, (if, DE ∥ BC the other two sides are divided in the same ratio. then $\dfrac{AD}{DB} = \dfrac{AE}{EC}$

2. If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side. If $\dfrac{AD}{DB} = \dfrac{AE}{EC}$ then, DB ∥ BC

3. If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio (or proportion) and hence the two triangles are similar(AAA criterion) If $\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$ then $\dfrac{AB}{DE} = \dfrac{BC}{EF} = \dfrac{AC}{DF}$ $\triangle ABC \sim \triangle DEF$

4. If in two triangles, sides of one triangle are proportional to (i.e, in the same ratio of) the sides of the other triangle, then their corresponding angles are equal and hence the two triangles, are similar(SSS criterion) If $\dfrac{AB}{DE} = \dfrac{BC}{EF} = \dfrac{CA}{FD}$ then, $\angle A = \angle D$, $\angle B = \angle E$ $\angle C = \angle F$ $\triangle ABC \sim \triangle DEF$

5. If one angle of a triangle is equal to one angle of the other triangle and the sides including those angles are proportional, then the two triangles are similar(SAS criterion) If $\dfrac{AB}{DE} = \dfrac{AC}{DF}$ & $\angle A = \angle D$ then, $\triangle ABC \sim \triangle DEF$

Similarity
(i) Corresponding angles are equal
(ii) Corresponding sides are in the same ratio
$\triangle ABC \sim \triangle PQR$

Triangles

Trace the Mind Map
• First Level • Second Level • Third Level

Basic proportionality Theorem/ Thales Theorem: If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.
Converse of BPT : If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.
Two triangles are said to be equiangular, if their corresponding angles are equal.
TOPIC-2
Criterion of similarity (AAA, SSS, SAS) and Results related on it.
Revision notes
In two triangles, if the corresponding angles are equal, then the corresponding sides are in the same ratio, then the triangles are similar (AAA similarity criterion)

If the corresponding sides of any two triangles are proportional, then the corresponding angles are equal and the two triangles are similar (SSS similarity criterion)

If one angle of a triangle is equal to one angle of the other triangle and the corresponding sides including are proportional. Then the triangle are similar (SAS criterion)

MULTIPLE CHOICE QUESTIONS (1 MARKS EACH)

Q1. D and E are the midpoints of side AB and AC of a triangle ABC, respectively and BC = 6 cm. If DE || BC,   then the length (in cm) of DE is:
   (a) 2.5   (b) 3   (c) 5   (d) 6

Q2. The diagonals of a rhombus are 16 cm and 12 cm, in length. The side of the rhombus in length is:
   (a) 20 cm   (b) 8 cm   (c) 10 cm   (d) 9 cm

Q3. 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

Q4. If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then

   (a) ΔPQR ~ ΔCAB   (b) ΔPQR ~ ΔABC
   (c) ΔCBA ~ ΔPQR   (d) ΔBCA ~ ΔPQR

Q5. In triangles ABC and DEF, ∠B = ∠E, ∠F = ∠C and AB = 3 DE. Then, the two triangles are
   (a) congruent but not similar   (b) similar but not congruent
   (c) neither congruent nor similar   (d) congruent as well as similar

Q6. ΔABC is such that AB=3 cm, BC = 2 cm and CA=2.5 cm. If ΔDEF∼ΔABC and FE=4 cm, then the perimeter of ΔDEF is
   (a)7 cm   (b) 10 cm   (c)12 cm   (d) 15 cm

Q7. It is given that ΔABC ~ ΔDFE, ∠A = 30^0, ∠C = 50^0, AB = 5 cm, AC = 8cm and DF = 7.5 cm. Then, the following is true:
   (a) DE = 12 cm, ∠F = 50°   (b) DE = 12 cm, ∠F = 100°
   (c) EF = 12 cm, ∠D = 100°   (d) EF = 12 cm, ∠D = 30°

Q8. If triangle ABC is similar to triangle DEF, then,
   (a) AB/FD = BC/EF = CA/DE   (b) AB/DE = BC/DF = CA/EF
   (c) AB/DE = BC/EF = CA/FD   (d) AB/BC = CA/DE = EF/FD

Q.9 Which of the following is not a similarity criterion for two triangles?
   (a) AAA   (b) SAS   (c) SSS   (d) ASA

Q10. In ΔABC, DE∥BC. If AD = 4 cm, DB = 6 cm and AE = 5 cm. The length of EC is
   (a) 7 cm   (b) 6.5 cm   (c) 7.5 cm   (d) 8 cm

ASSERTION AND REASONING QUESTIONS (1 MARKS EACH)

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

Q1. **Assertion (A):** If two angles of one triangle are equal to two angles of another triangle, then the two triangles are similar.
    Reason (R): Angles are the only criteria to determine similarity of triangles

Q2. **Assertion (A):** The line segment joining the midpoints of any two sides of a triangle is parallel to the third side.

Reason (R): A line drawn through the midpoint of one side of a triangle parallel to another side bisects the third side

Q3. **Assertion (A):** If two triangles are similar, their altitudes drawn to the corresponding sides are equal.

      Reason (R): Corresponding sides of similar triangles are proportional.

Q4. **Assertion (A):** If two triangles have equal corresponding medians, they are similar.

   Reason (R) : Similar triangles have proportional medians

VERY SHORT ANSWER TYPE QUESTIONS (2 MARKS EACH)

Q1. In the given figure, DB⊥BC, DE⊥AB and AC⊥BC.
Prove that $\dfrac{BE}{DE}=\dfrac{AC}{BC}$
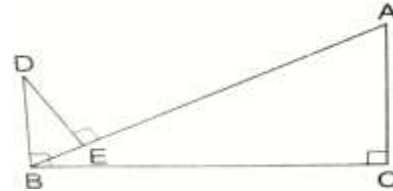
Q2 Find the value of x for which DE || AB in given figure.
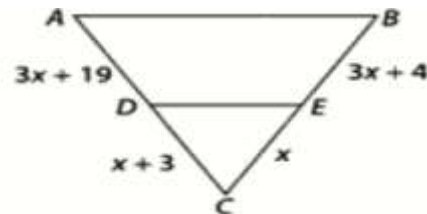
Q3In triangle ABC, if AP perpendicular to BC and $\mathbf{AC^2 = BC^2 - AB^2}$, then prove that
$\mathbf{PA^2 = PB \times CP.}$
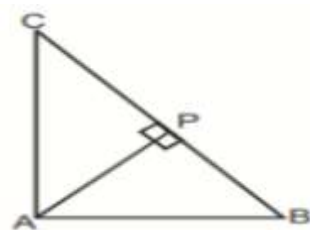
Q4 In ΔABC, altitudes AD and BE are drawn. If AD = 7 cm, BE = 9 cm and EC = 12 cm then, find the length of CD
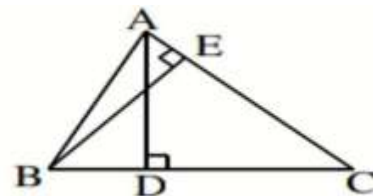
Q 5 In Figure, PQ || BC, PQ = 3 cm, BC = 9cm and AC = 7·5 cm. Find the length of AQ
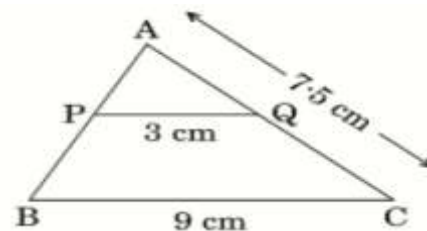
Q6In the given figure, find x

SHORT ANSWER TYPE QUESTIONS

69
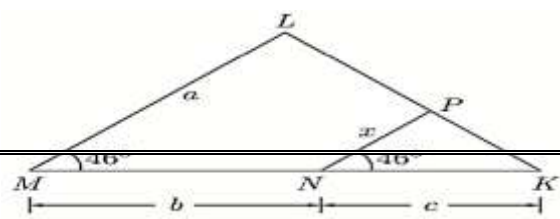
Q1 If AD and PM are the medians of triangles ABC and PQR respectively where ΔABC~ΔPQR. Prove that-

$\frac{AB}{PQ} = \frac{AD}{PM}$ 2023,24

Q2 In the given figure, if Δ ABC ~ Δ DEF and their sides are of lengths (in cm) as marked along them, then find the lengths of the sides of each triangle. 2020
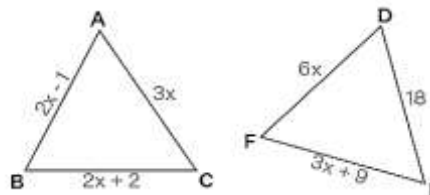
Q3In the given figure below, AD /A E = AC /BD and ∠1 = ∠2,   Show that ΔBAE ~ ΔCAD.
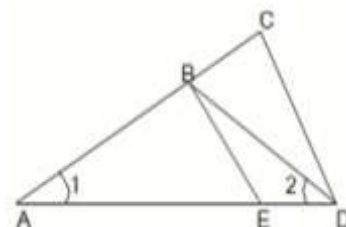
Q4 In a ΔABC P and Q are points on AB and AC respectively and PQ||BC. Prove that the median AD bisects PQ
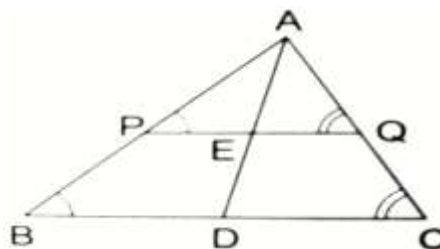
Q5 In figure, ∠1 = ∠2 and ΔNSQ ≅ΔMTR, then prove that ΔPTS ~ ΔPRQ.
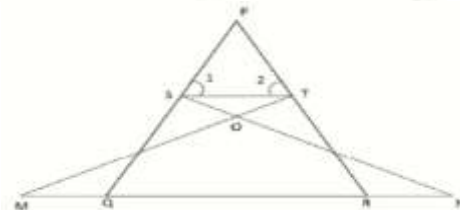
LONG ANSWER TYPE QUESTIONS

Q1. (a) State and prove Basic Proportionality Theorem.

 (b) In the given figure ∠CEF = ∠CFE. F is the midpoint of DC. Prove that AB/BD=AE/FD.
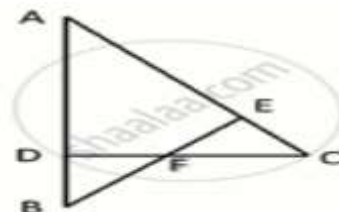
Q2. Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and   median PM of another triangle PQR. Show that ΔABC ~ Δ PQR.

Q3. In the given figure PA, QB and RC are each perpendicular to AC. If AP = x, BQ = y and CR = z, then prove
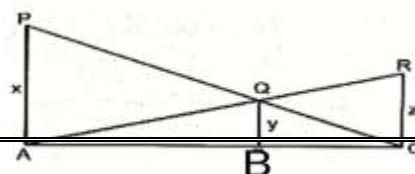
that $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$.

Q4. In a triangle PQR, N is a point on PR such that QN⊥PR.
If PN. NR = QN², prove that ∠PQR = 90°.
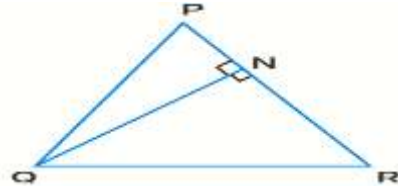
Q5. In the given figure, ∠ADC = ∠BCA; prove that ΔACB ~   ΔADC.
Hence find BD if AC = 8cm and AD = 3 cm
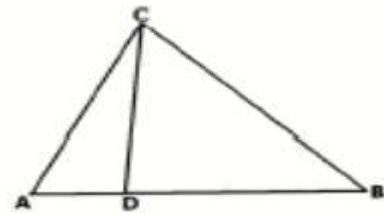
CASE BASED QUESTIONS (4 MARKS EACH)

Q1. A scale drawing of an object is the same shape at the object but a different size. The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio. The ratio of two corresponding sides in similar figures is called the scale factor Scale factor= length in image / corresponding length in object If one shape can become another using revising, then the shapes are similar. Hence, two shapes are similar when one can become the other after a resize, flip, slide or turn. In the photograph below showing the side view of a train engine. Scale factor is 1:200

This means that a length of 1 cm on the photograph above corresponds to a length of 200cm or 2 m, of the actual engine. The scale can also be written as the ratio of two lengths.

(1) If the length of the model is 11cm, then the overall length of the engine in the photograph above,

including the couplings (mechanism used to connect)

(2) What will affect the similarity of any two polygons?

(3) What is the actual width of the door if the width of the door in photograph is 0.35cm?

(4) Find the length of AB in the given figure
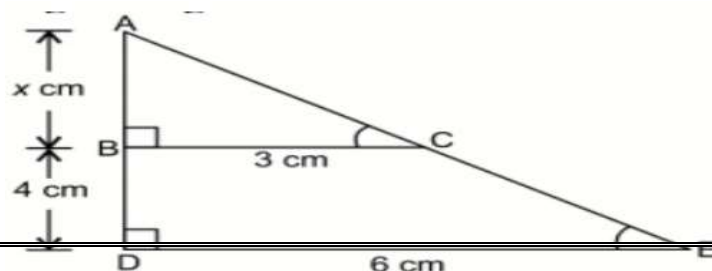
Q2. Rohan wants to measure the distance of a pond during the visit to his native. He marks points A and B on the opposite edges of a pond as shown in the figure below. To find the distance between the points, he makes a right-angled triangle using rope connecting B with another point C are a distance of 12m, connecting C to point D at a distance of 40m from point C and the connecting D to the point A which is are a distance of 30m from D such that $\angle ADC=90^0$
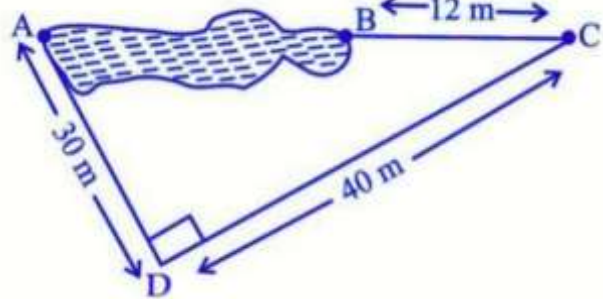
(1) Which property of geometry will be used to find the distance AC?
(2) What is the distance AC?
(3) Find the length AB?
(4) Find the length of the rope used.

Q3.

Triangle is a very popular shape used in interior designing. The picture given above shows a cabinet designed by a famous interior designer.

Here the largest triangle is represented by △ABC and smallest one with shelf is represented by △DEF. PQ is parallel to EF.

(i) Show that △DPQ~△DEF.
(ii) If DP = 50 cm and PE = 70 cm then find PQ/EF.
(iii) If 2AB=5DE and △ABC~△DEF then show that $\frac{perimeter\ of\ \triangle ABC}{perimeter\ of\ \triangle DEF}$ is constant.
(iv) If AM and DN are medians of triangles A BC wad DEP respectively then prove that △ABM~△DEN.
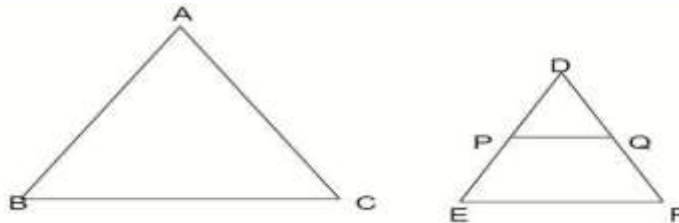
1(c) Though equal angles are necessary conditions for similarity, they are not sufficient. Side ratios also need to
    be proportional for triangles to be similar.
2(b) Both assertion(A) and reason(R) are true but reason(R) is not the correct explanation of assertion (A).
3(d) While corresponding sides of similar triangles are proportional, their altitudes need not be equal.
4(d) While corresponding sides of similar triangles are proportional, their medians need not be equal.

<u>WORKSHEET-1</u>

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

<div align="center">

ASSERTION AND REASONING (1 MARK)

</div>

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.

<div align="center">

VERY SHORT ANSWER QUESTIONS (2 MARKS EACH)

</div>

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 $\triangle ABE \sim \triangle CFB$.

<div align="center">

SHORT ANSWER QUESTIONS (3 MARKS EACH)

</div>

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.

<div align="center">

CASE BASED QUESTION (4 MARKS)

</div>

Case Study: The law of reflection states that when a ray of light reflects off a surface, the angle of incidence is
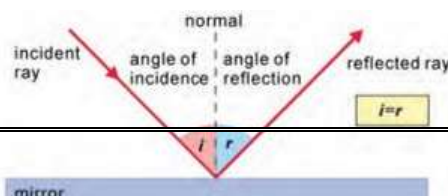
equal to the angle of reflection.

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.

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) $\frac{AD}{AB} = \frac{AC}{AE}$
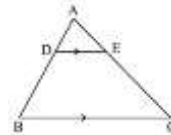
Q3. If two triangles are similar, the ratio of their corresponding altitudes is:
A) Square of the ratio of corresponding sides. B) Same as the ratio of corresponding sides.
C) Cube of the ratio of sides. D) Reciprocal of side ratio.

<div align="center"><strong style="color:red">ASSERTION AND REASONING (1 MARK)</div>

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

<div align="center"><strong style="color:red">VERY SHORT ANSWER QUESTIONS (2 MARKS EA</div>

Q5. In figure, if PQ || RS, prove that Δ POQ ~ Δ SOR.
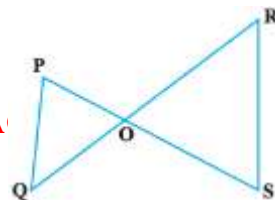
Q6. In ΔDEF and ΔPQR, $\angle D = \angle P$ and $\angle F = \angle R$. Are the triangles similar? Justify your answer.

<div align="center"><strong style="color:red">SHORT ANSWER QUESTIONS (3 MARKS EACH)</div>

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 $\angle AEF = \angle AFE$.

Prove that $\frac{BD}{CD} = \frac{BF}{CE}$.

[Hint: Take point G on AB such that CG DF.]
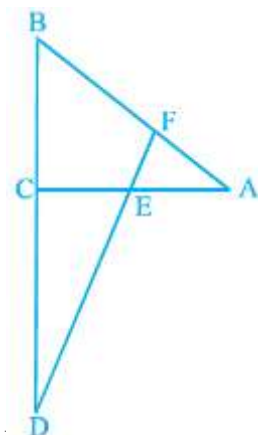
Q8. In the given figure, PQR is a triangle in which PS and QT are altitudes from ̶ ̶a̶n̶d̶ ̶Q̶ ̶r̶e̶s̶p̶e̶c̶t̶i̶v̶e̶l̶y̶, intersecting each other at M. Prove that ΔQSM ~ ΔPTM.
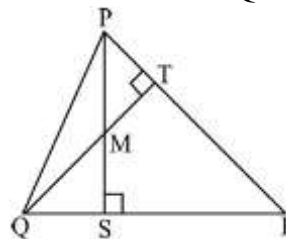
<div><strong style="color:red">CASE BASED QUESTION (4 MARKS)</div>

Case Study:
A surveyor is trying to measure the width of a river. He locates a point A on one bank and places a point B directly across it on the other side. From point C, 60 meters away from A, he 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: SIMILAR TRIANGLES

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 similarityB) SSS similarityC) SAS similarityD) RHS similarity

Q3. Two equilateral triangles are:
A) CongruentB) Not similarC) Always similarD) 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 falseD) 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)

Case Study:
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.
CHAPTER: SIMILAR TRIANGLES

WORKSHEET-4

MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

Q1. Two triangles are similar if their:
A) Corresponding sides are equal B) Corresponding angles are equal
C) Sides are equal in length D) Areas are equal

Q2. Which of the following is correct if ∆ABC ~ ∆PQR?
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
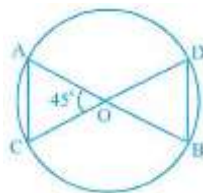
ASSERTION AND REASONING (1 MARK)

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 ∆ABC, 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 ∆XAB ~ ∆XYZ 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)

<h2 style="text-align:center">LONG ANSWER QUESTION (5 MARKS)</h2>

Q10. In Fig. 6.33, CM and RN are respectively the medians of $\triangle ABC$ and $\triangle PQR$.

If $\triangle ABC \sim \triangle PQR$, prove that:

(i) $\triangle AMC \sim \triangle PNR$

(ii) $\dfrac{CM}{RN} = \dfrac{AB}{PQ}$

(iii) $\triangle CMB \sim \triangle RNQ$
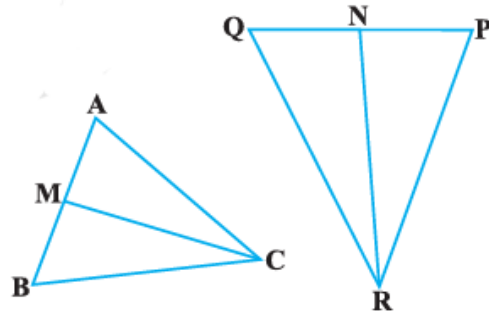
MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

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.
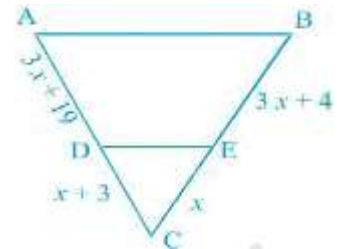
Q6. Find the value of x for which DE ∥ AB in given below figure:
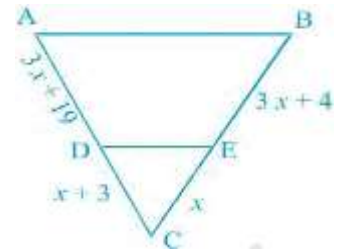
SHORT ANSWER QUESTIONS (3 MARKS EACH)

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)

81
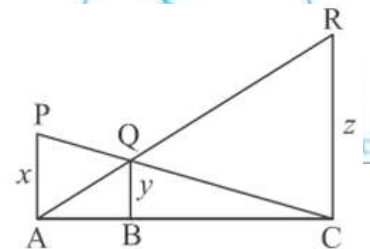
Case Study:
A building and a pole cast shadows at the same time of the day. The pole is 4 m tall and casts a shadow 2.5 m long. The shadow of the building is 10 m long.

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 $\frac{AE}{EC} = \frac{AF}{FD}$
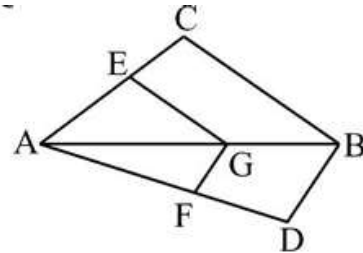
Q5. Given: ∠P = ∠R
By Angle-Angle (AA) criterion, ΔPQR ~ ΔRQP
So, corresponding sides are proportional:
PQ/PR = QR/QP

Q6. In ΔABE and ΔCFB:
∠ABE = ∠CFB (Vertically opposite angles)
∠BAE = ∠BCF (Alternate interior angles, since AB ∥ CD and BE is a transversal)
So, by AA similarity criterion, ΔABE ~ ΔCFB

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
⇒ 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   ∴ EF ∥ QR by converse of BPT.
Yes, EF ∥ QR

Q8 (a) (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
⇒ 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.

(b)Congruency   **Similarity**
Shape and size are the same.   Only shape is the same, size may differ.

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

Q1. A) Two pairs of equal anglesQ2. 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).

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)$\frac{5}{2.5} = \frac{h}{4.5}$

Q9 (c):Height of tree = 9 meters

Q10.(i) Since ΔABC ~ ΔPQR ⇒∠A = ∠P, ∠C = ∠R
Medians divide triangle into smaller 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.**

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 NCERT.

CHAPTER-7
COORDINATE GEOMETRY

MID POINT FORMULA

$$\frac{x_1 + x_2}{2}$$

$$\frac{y_1 + y_2}{2}$$

INTRODUCTION

Geometry + Algebra

Cartesian System

CARTESIAN PLANE

Origin: (0, 0)

Axes: X-axis: Horizontal

Y-axis: Vertical

Coordinates: (x, y)

SECTION FORMULA

Point dividing line in ratio $M_1:M_2$:

$$\frac{M_1 x_2 + M_2 x_1}{M_1 + M_2}$$

$$\frac{M_1 y_2 + M_2 y_1}{M_1 + M_2}$$

COORDINATE GEOMETRY

QUADRANTS:

I: (+, +)

II: (-, +)

III: (-, -)

IV: (+, -)

DISTANCE FORMULA

$\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$

APPLICATIONS

Finding distance between two points

Finding midpoint of a line segment

Verifying collinearity of points

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)

Question 1. The distance of point A (2, 4) from the x-axis is

(a) 2 units   (b) 4 units   (c) -2 units   (d) -4 units

Answer: (b) 4 units

Question 2 .The point which lies on the perpendicular bisector of the line segment joining the points A (–2, –5) and B (2, 5) is

(a) (0, 0)   (b) (0, 2)   (c) (2, 0)   (d) (–2, 0)

Answer: (a) (0, 0)

Question 3.

If O ($\frac{p}{3}$, 4) is the midpoint of the line segment joining the points P (-6, 5) and Q (-2, 3), the value of p is:

(a) 7/2   (b) -12   (c) 4   (d) -4

Answer: (b) -12

Question 4. If the origin is the mid-point of the line segment joined by the points (2, 3) and (x,y), then the value of (x,y) is

(a)(2, 3)   (b)(−2, 3)   (c) (−2, −3)   (d) (2, −3)

Answer. (c) (-2, −3)

Question 5.The coordinate of the point where the line x-y = 5 cuts y-axis are:

(a) (0,-5)   (b) (5,0)   (c) (0,0)   (d) (-5,0)

Answer-   (a) (0,-5)

Question 6. The measure of the angle between the lines x = 2, y = (-3) and the coordinates of the   point of intersection of these lines are respectively   .

(a) 180° , (2, -3)   (b)90°, (2, -3)   (c)90°, (2, -3)   (d) 90°, (2,3)

     Answer- (c) 90°, (2,-3)

   Question 7. If the points (t, 2t), (-2,6), (3,1) are collinear , then t=

     (a) $\frac{3}{4}$(b) $\frac{4}{3}$ (c) 3   (d)4

Answer - (b) $\frac{4}{3}$

Question 8. The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is:

     (a)   5   (b) 11   (c) 12   (d) 4

Answer. (c) 12

<div align="center">**ASSERTION REASON QUESTIONS (1 MARK)**</div>

DIRECTION: In the question number 9 and 10, 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.

Question 9. Statement A (Assertion): If the co-ordinates of the mid-points of the sides AB and AC of ∆ABC are D (3, 5) and E (-3, -3) respectively, then BC = 20 units

 Statement R (Reason): The line joining the mid points of two sides of a triangle is parallel to the third side and equal to half of it.

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

Question 10. Assertion (A): If the centre of a circle is at the origin and its radius = 2 units, then a point on the circle is (0, 2).

Reason (R): The centre of the circle is the mid -point of the line joining the end points of its diameter.

Answer - (b) Both A and R are true and R is not correct explanation for A.

<div align="center">**VERY SHORT ANSWER QUESTIONS (2 MARKS)**</div>

Question 11. Find out the point that is equidistant from the points O (–5, 4) and M (–1, 6)?

Answer. 10: (-3, 5)

Assume the point be P, as per the question, The point P is equidistant from O (–5, 4) and M (–1, 6)

Now, the point P

$= ((x_1+x_2)/2, (y_1+y_2)/2)$

$= ((-5-1)/2, (6+4)/2)$

$= (-3, 5)$

Question 12. Find a point on the x- axis which is equidistant from (2, -5) and (-2, 9).

Answer- Required point (-7, 0)

HINT –let the point on the x-axis be p (x, 0)

Question 13. If the distance between the points (4, k) and (1,0) is 5, then what can be the values of k?

Answer- $\pm$ 4

Question 14. Find the co-ordinates of the point of trisection of the line segment joining the points (3, -2) and (-3, -4).

Answer- (1, -8/3) and (-1, -10/3)

Question 15. Find the centroid of triangles with vertices A ($2\sqrt{3},\sqrt{2}$), B ($\sqrt{27}, \sqrt{8}$), C ($\sqrt{3},-2\sqrt{2}$).

Answer- ($2\sqrt{3}$,$\frac{\sqrt{2}}{3}$)

SHORT ANSWER QUESTIONS (3 MARKS)

Question 16. Determine the ratio in which the line $2x + y – 4 = 0$ divides the segment joining the points A (2, -2) and B (3, 7).

Answer. 2:9

Question 17. Determine, whether each of the given points (-2, 1), (2, -2) and (5, 3) are vertices right angles.

Question 18. In what ratio does the -axis divide the line segment joining the points (-4, -6) and (-1, 7)?

Answer- 6:7

Question 19. If A (1, 2) B (4,y) C (x, 6) and D (3, 5) are the vertices of a parallelogram taken in order find the value of x and y.

Answer – x = 6, y = 3

Question 20. Find the coordinates of a point A. where AB is the diameter of the circle whose centre is (2 , -3) and the point B is (1,4)

Answer. (3, -10)

LONG ANSWER QUESTIONS (5 MARKS)

Question 21. The line segment joining the points P (3, 4) and Q (7, -2) is divided by a point R in the ratio 2:3 internally. Find the coordinates of point R. Also, find the coordinates of the midpoint of PQ.

Answer: Coordinates of R = (4.6, 1.6). Midpoint of PQ = (5, 1).

Question 22. A quadrilateral ABCD has vertices A (0, 0), B (4, 0), C (5, 4), and D (1, 4). Prove that ABCD is a parallelogram. Also, find the length of its diagonals AC and BD.

Answer: ABCD is a parallelogram. Length of diagonal AC = $\sqrt{41}$ units, BD = 5

Question 23. The mid points of the sides AB, BC and CA of a triangle ABC are D (2,1) E (1,0) and F (1, -3) respectively. Find the co-ordinates of the vertices of the triangle.

Answer- A is (-2, 2)

      B is   (0, 4)

      C is   (4,-2)

CASE BASED QUESTIONS (4 MARKS QUESTIONS)

Case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.

Question 24. Alia and Shagun are friends living on the same street in Patel Nagar. Shagun's house is at the intersection of one street with another street on which there is a library. They both study in the same school and that is not far from Shagun's house. Suppose the school is situated at the point O, i.e., the origin, Alia's house is at A. Shagun's house is at B and library is at C. Based on the above information, **Answer** the following questions.
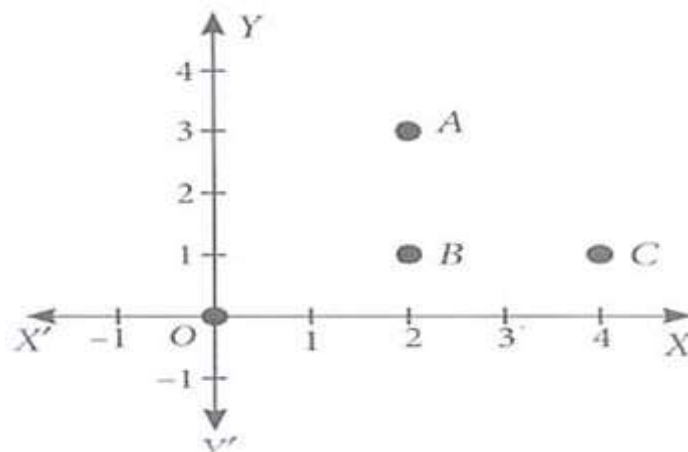
(i)   How far is Alia's house from Shagun's house?
(ii)   How far is the library from Shagun's house?
(iii)   Show that for Shagun, school is farther compared to Alia's house and library.

OR

   Show that Alia's house, Shagun's house and library for an isosceles right triangle

Answer– (i) 2 units. (ii) 2 units.   (iii) Distance between Alia's house and Shagun's house, AB = 2 units.

  Distance between Library and Shagun's house, CB = 2 units, OB is greater than AB and   CB.
For Shagun, school [O] is farther than Alia's house [A] and Library [C]

OR

Distance between Alia's house and Shagun's house, AB = 2 units
Distance between Library and Shagun's house, CB = 2 units
$AB^2 + BC^2 = 4 + 4 = 8 = AC^2$
Therefore A, B and C form an isosceles right triangle.

Question 25. A tiling or tessellation of a flat surface is the covering of a plane using one or more geometric shapes, called tiles, with no overlaps and no gaps. Historically, tessellations were used in ancient Rome and in Islamic art. You may find tessellation patterns on floors, walls, paintings etc. Shown below is a tiled floor in the archaeological Museum of Seville, made using squares, triangles and hexagons.

 A craftsman thought of making a floor pattern after being inspired by the above design. To ensure accuracy in his work, he made the pattern on the Cartesian plane. He used regular octagons, squares and triangles for his floor tessellation pattern
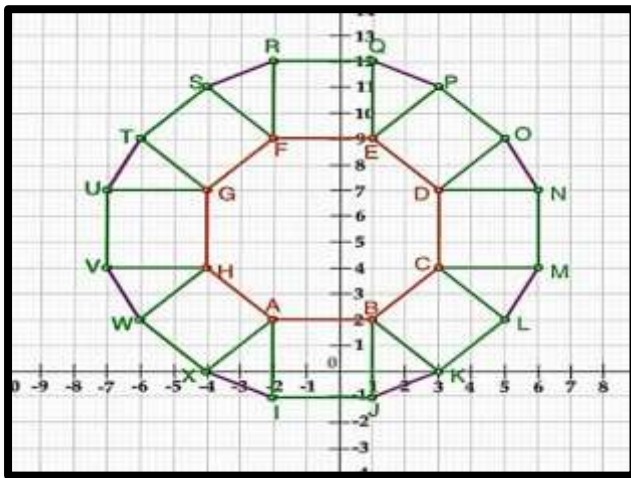
Use the above figure to **answer** the questions that follow:

(i) What is the length of the line segment joining points B and F?

(ii) The centre 'Z' of the figure will be the point of intersection of the diagonals of quadrilateral WXOP. Then what are the coordinates of Z?

(iii) What are the coordinates of the point on y axis equidistant from A and G?

<div align="center">OR</div>

<div align="center">What is the area of Trapezium AFGH?</div>

Answer - (i)$\sqrt{58}$ units

Solution-   (i) B (1, 2), F (-2, 9)

$\quad\quad$ $BF^2 = (-2-1)^2 + (9-2)^2$

$\quad\quad\quad$ $= (-3)^2 + (7)^2$

$\quad\quad\quad$ $= 9 + 49$

$\quad\quad\quad$ $= 58$

$\quad\quad$ So, $BF = \sqrt{58}$ units

(ii)

W (-6, 2), X (-4, 0), O (5, 9), P (3, 11)

Clearly WXOP is a rectangle

Point of intersection of diagonals of a rectangle is the mid -point of The diagonals. So the required point is mid -point of WO or XP

$= \quad (\frac{(-6+5)}{2}, \frac{(2+9)}{2})$

$= \quad (\frac{-1}{2}, \frac{11}{2})$

(iii) A (-2, 2), G (-4, 7)

Let the point on y-axis be Z (0, y)

$AZ^2 = GZ^2$

$\quad (0+2)^2 + (y-2)^2 = (0+4)^2 + (y-7)^2$

$(2)^2 + y^2 + 4 - 4y = (4)^2 + y^2 + 49 - 14y$

$\quad\quad 8 - 4y = 65 - 14y$

$\quad\quad 10y = 57$

$\quad\quad$ So, $y = 5.7$

i.e. the required point is (0, 5.7)

$\quad\quad\quad\quad$ OR
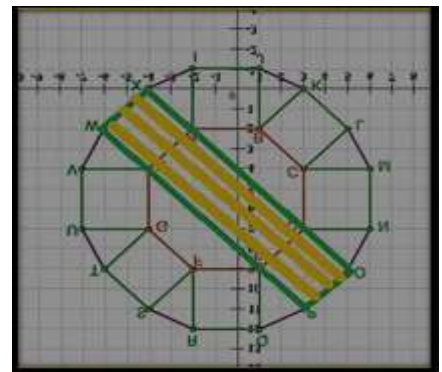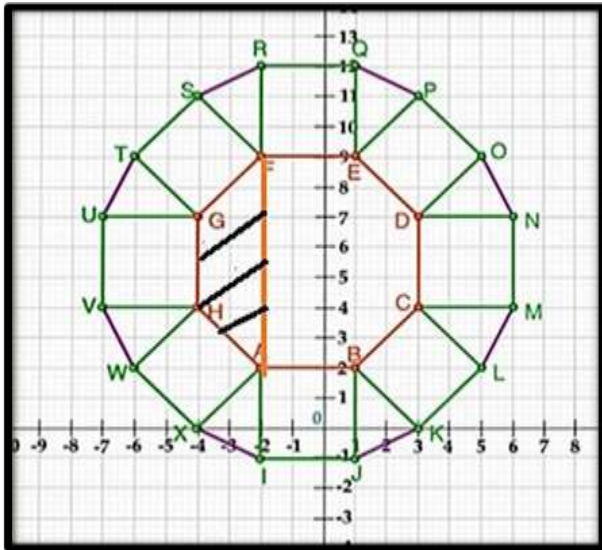
A (-2, 2), F (-2,9), G (-4,7), H (-4,4)

    Clearly GH = 7-4=3units

    AF = 9-2=7 units

    So, height of the trapezium AFGH = 2 units

    So, area of AFGH = $\frac{1}{2}$(AF + GH) ×height = $\frac{1}{2}$(7+3) × 2 = 10 sq. units

SECTION A: 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

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: 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.

SECTION B: 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 √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).

SECTION C: 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.

SECTION D :CASE BASED QUESTIONS (4 MARKS)

Girl did a survey and of his neighborhoods and collected the following information.
1. The hotel, mall and the main gate of the garden lie in a straight line.
2. The distance between the hotel and the mall is half the distance between the mall and the main gate of the garden.
3. The bus stand is exactly midway between the main gate of the garden and the fire station.
4. The mall, bus stand and the water tank lie in a straight line.
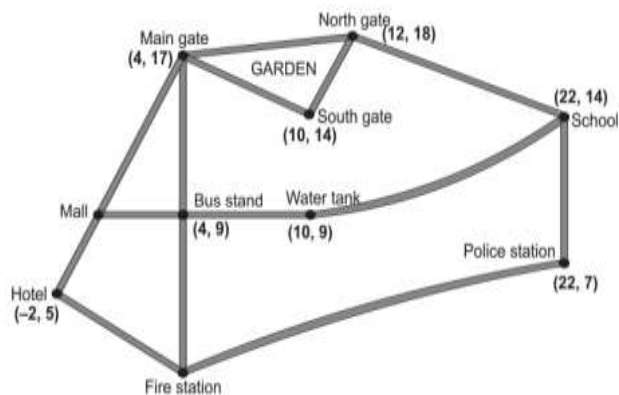
Above is the map of a girl's neighborhoods.

   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 ?

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
    $\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}$.

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: Calculate the length of each side of the playground.
1. What is the perimeter of the playground?
2. 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..

SECTION A: 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 $\dfrac{x1 + x2}{2}, \dfrac{y1 + y2}{2}$.

SECTION B: 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.

SECTION C: 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).

SECTION D :CASE BASED QUESTIONS (4 MARKS)
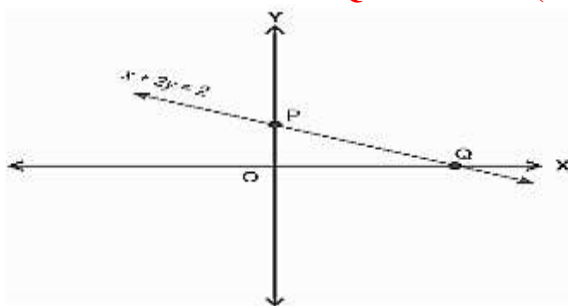
The line x + 2y =2 forms a triangle OPQ , with the coordinate axes.
(i)   What are the co-ordinates of P and Q.
(ii)   What is the area of ΔOPQ ?

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

SECTION A: MULTIPLE CHOICE QUESTIONS (1 mark each)

1. What is the distance between the points $(-1, 2)$ and $(3, -2)$?
    a) 4   b) $\sqrt{20}$ c) $\sqrt{32}$ d) $\sqrt{16}$
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).

SECTION B: 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 $(1, -5)$.

SECTION C: 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.

SECTION D :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
SECTION A: 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

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 : 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.

SECTION B: 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).

SECTION C: 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.

SECTION D :CASE BASED QUESTIONS (4 MARKS)

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.
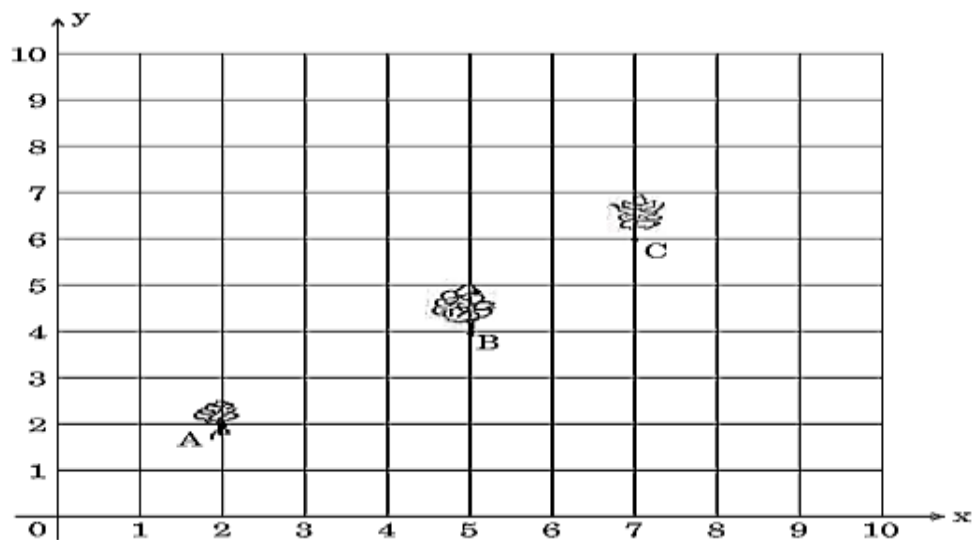
10. If the points A (-2, k) B (3, -4) and C(7, 10) are the vertices of a right angled isosceles triangle

, find the value of k and hence find the area of Δ ABC, given that $\angle A = 9$

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

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)

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

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.

Express tan A and cos A in terms of sin A

Solution : Since, $\cos^2 A + \sin^2 A = 1$

$\cos^2 A = 1 - \sin^2 A$ *i.e.* $\cos A = \sqrt{1 - \sin^2 A}$

$\tan A = \dfrac{\sin A}{\cos A} = \dfrac{\sin A}{\sqrt{1 - \sin^2 A}}$

Relation of tan with sin & cos

Study of relationships between the sides & angles of a triangle

Trigonometry

Trigonometric Ratios

Sine of $\angle A = \dfrac{BC}{AC}$

Cosine of $\angle A = \dfrac{AB}{AC}$

Tangent of $\angle A = \dfrac{BC}{AB}$

Cotangent of $\angle A = \dfrac{AB}{BC}$

Secant of $\angle A = \dfrac{AC}{AB}$

Cosecant of $\angle A = \dfrac{AC}{BC}$

Note: How to learn the relation

"Some people have" $\sin\theta = \dfrac{P}{H}$

"Curly Brown Hair" $\cos\theta = \dfrac{B}{H}$

"through proper Brushing" $\tan\theta = \dfrac{P}{B}$

Trigonometric Identities

$0 \le A \le 90°\ \cos^2 A + \sin^2 A = 1$

$0 \le A < 90°\ 1 + \tan^2 A = \sec^2 A$

$0 < A \le 90°\ \cot^2 A + 1 = \csc^2 A$

Values of trigonometric ratios between 0° to 90°

Trigonometry and Trigonometric Identities

Trace the Mind Map
▸ First Level ▸ Second Level ▸ Third Level

$\angle A$	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 branchofmathematicsthatdealswiththerelationshipbetweenthe 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

Sin $\theta = \dfrac{opposite\ side}{hypotenuse}$ Cos $\theta = \dfrac{adjacent\ side}{hypotenuse}$
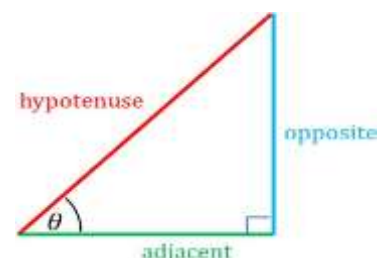
$\text{Tan } \theta = \dfrac{opposite\ side}{adjacent\ side}$ $\text{Cosec } \theta = \dfrac{hypotenuse}{opposite\ side} = \dfrac{1}{\sin \theta}$

$\text{Sec } \theta = \dfrac{hypotenuse}{adjacent\ side} = \dfrac{1}{\cos \theta}$ $\text{Cot } \theta = \dfrac{adjacent\ side}{opposite\ side} = \dfrac{\cos \theta}{\sin \theta}$

TRIGNOMETRIC IDENTITIES

1. $\text{Sin}^2 A + \text{Cos}^2 A = 1$
2. $\text{Sec}^2 A = 1 + \tan^2 A$
3. $\text{Cosec}^2 A = 1 + \text{Cot}^2 A$

<div align="center">**MULTIPLE CHOICE QUESTIONS (1 MARK)**</div>

Que.1 If $cot\theta = \dfrac{1}{\sqrt{3}}$, the value of $sec^2\theta + cosec^2\theta$ is

    (a) 1   (b) $\dfrac{40}{9}$ (c) $\dfrac{38}{9}$ (d) $5\dfrac{1}{3}$

Que.2 Given that $ec\theta = \sqrt{2}$, the value of $\dfrac{1+\tan\theta}{\sin\theta}$

    (a) $2\sqrt{2}$ (b) $\sqrt{2}$ (c) $3\sqrt{2}$ (d) 2

Que.3 If θ is an acute angle and $tan\theta + cot\theta = 2$, then the value of $sin^3\theta + cos^3\theta$ is

    (a) 1   (b) $\dfrac{1}{2}$ (c) $\dfrac{\sqrt{2}}{2}$ (d) $\sqrt{2}$

Que.4 If $tan\theta = \dfrac{a}{b}$ then the value of $\dfrac{a\ sin\theta + b\ cos\theta}{a\ sin\theta - b\ cos\theta}$ is

    (a) $\dfrac{a^2-b^2}{a^2+b^2}$ (b) $\dfrac{a^2+b^2}{a^2-b^2}$ (c) $\dfrac{a}{a^2+b^2}$ (d) $\dfrac{b}{a^2+b^2}$

Que.5 Evaluate $sin^2 60° + 2\tan 45° - cos^2 30°$

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

Que.6 If $\tan\theta = \dfrac{1}{\sqrt{3}}$, then evaluate $\left[\dfrac{cosec^2\theta - sec^2\theta}{sec^2\theta + cosec^2\theta}\right]$

    (a) 1   (b) 2   (c) $\dfrac{1}{2}$ (d) -1

Que.7 If $\sin(A - B) = \dfrac{1}{2}, \cos(A + B) = \dfrac{1}{2}$, Find A and B.

    (a) $30°, 45°$ (b) $45°, 30°$ (c) $45°, 15°$ (d) $60°, 15°$

Que.8 If $cosec\ A - \cot A = \dfrac{4}{5}$, then $cosec\ A =$

    (a) $\dfrac{47}{40}$ (b) $\dfrac{59}{40}$ (c) $\dfrac{51}{40}$ (d) $\dfrac{41}{40}$

Que.9 If $\sin x + cosec\ x = 2$, then $sin^{19}x + cosec^{20}x =$

    (a) 2^{19} (b) 2^{20} (c) 2   (d) 2^{39}

Que.10 If $3x = cosec\ \theta$ and $\dfrac{3}{x} = \cot \theta$, find the value of $3\left(x^2 - \dfrac{1}{x^2}\right)$

    (a) $\dfrac{1}{9}$ (b) 9   (c) $\dfrac{1}{3}$ (d) 3

Que.11 In a right-angled triangle PQR, $\angle$Q = 90°. Which of these is ALWAYS 0?
(a) cos P − sec R   (b) tan P − cot R
(c) sin P − cosec R   (d) (cannot be known without knowing the value of P)

Que.12 **If cos y = 0, then what is the value of $\dfrac{1}{2}cos\ \dfrac{y}{2}$?**

<div align="center">104</div>

(a) 0   (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2\sqrt{2}}$

VERY SHORT ANSWER QUESTIONS (2 MARKS)

Que.13 Find the value of $\left(sin^2\ \theta + \frac{1}{1+tan^2\ \theta}\right)$.

Que.14 Prove that $\frac{sin^3\ \theta + cos^3\ \theta}{sin\ \theta + cos\ \theta} = 1 - sin\ \theta . cos\ \theta$

Que.15 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
     (a) OB   (b) OA   (c) AB

Que.16 If $sec\ \theta + cot\ \theta = x$, find the value of $cosec\ \theta - cot\ \theta$

Que17 Find the value of $(cosec^2\theta - 1).tan^2\theta$

Que.18 Express $cos\ A$ in term of $cot\ A$

Que.19 In the figure , if $5\ sin\ P = 4$

        What is the length of PR? Draw a diagram and show your steps.
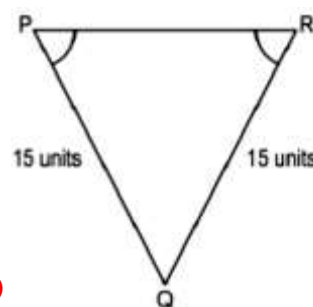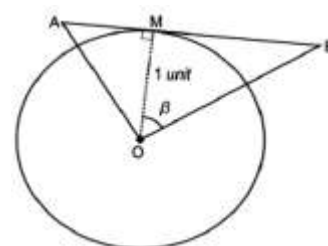
SHORT ANSWER QUESTIONS (3 MARKS)

Que.20 Prove that $\frac{1}{sec\ A - tan\ A} - \frac{1}{cos\ A} = \frac{1}{cos\ A} - \frac{1}{sec\ A + tan\ A}$

Que.21 If $tan\ \theta + sin\ \theta = m$ and $tan\ \theta - sin\ \theta = n$, show that $m^2 - n^2 = 4\sqrt{mn}$

Que.22 Show that $3(sin\ \theta - cos\ \theta)^4 - 6(sin\ \theta + cos\ \theta)^2 + (sin^6\theta + cos^6\theta)$ is independent of θ.

Que.23 Prove that : $sec^2\theta - \left[\frac{sin^2\theta - 2sin^2\theta}{2cos^4\theta - cos^2\theta}\right] = 1$

Que.24 Δ PQR is inscribed in a circle with a centre O and radius r units.

        If PR is the diameter of the circle and $\angle RQO = \beta$

        Express$(QR^4 - PQ^4)$, in terms of r and β, to the simplest form.

        Show your steps and give valid reasons.
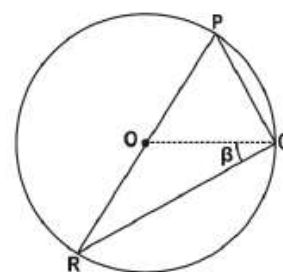
Que.25 If θ is an acute angle and $tan\ \theta + cot\ \theta = 2$, find the value of $tan^9\theta + cot^9\theta$

LONG ANSWER QUESTIONS (5 MARKS)

Que.26 Prove that $\frac{sin\ A - 2sin^3 A}{2cos^3 A - cos\ A} = tan\ A$

Que. 27 If $\frac{1}{sin\ \theta - cos\ \theta} = \frac{cosec\ \theta}{\sqrt{2}}$, prove that $\left(\frac{1}{sin\ \theta + cos\ \theta}\right)^2 = \frac{sec^2\theta}{2}$

Que.28 If $x sin^3\theta + y cos^3\theta = sin\ \theta\ cos\ \theta$ and $x\ sin\ \theta = y\ cos\ \theta$, prove that $x^2 + y^2 = 1$

Que.29 If $cosec\ \theta - sin\ \theta = l$ and $sec\ \theta - cos\ \theta = m$, show that $l^2m^2(l^2 + m^2 + 3) = 1$

Que.30 In ∆ABC, right-angled at B, AB = 6 cm and BC = 8 cm.

   i) Find the value of all six trigonometric ratios of angle C.

   ii) Show that sin² C + cos² C = 1 using the values obtained.

   iii) Prove that: $(1 + \tan^2C) \times \cos^2C = 1$

Que.31 If $\sec A = x + \frac{1}{4x}$, then prove that $\sec A + \tan A = 2x \ or \ \frac{1}{2x}$

CASE BASED QUESTIONS (4 MARKS QUESTIONS)

Que.33. In the giant wheel shown below, Gagan is sitting in one of the cabins which is 12 m high from the platform. Jyoti and Karan are sitting in the lowest and the highest cabins from the platform respectively.
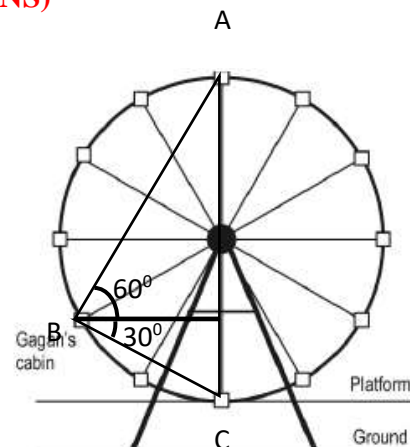
1) What is the distance between Gagan Gagan's cabin and Jyoti's cabin
2) Find the value of cos A.
3) Calculate the value of sin C + Sin A.

                OR

What is the vertical distance between Karan's cabin and Jyoti's cabin.

Que.34 Two fighter jet plane leave an airport, one after the other. After moving on runway, one flies due North and other flies due South. The speed of two aeroplanes is 400 km/hr and 500 km/hr respectively. Considering PQ as runway and A and B are any two points in the path followed by two planes, then answer the following questions.

(i)   Find tan θ; if ∠APQ = θ.
(ii)   Find cot B.
(iii)   Find sec A.
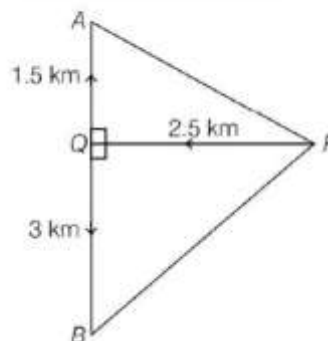
Match the Following

Trigonometric Ratio	Value
Sin 30^0	1
Sin 0^0	1/√2
tan 30^0	1/2
Cosec 30^0	1/√3
tan 60^0	2
Cos 30^0	0
Cot 90^0	√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^{3}B= 0

Question 8.
If tanA +$\frac{1}{tanA}$= 2, find the value of tan^{2}A +$\frac{1}{tan2A}$

Question 9

. Evaluate the following:
2sin^{2}30° −3cos^{2}45°∘ +tan^{2}60°

Question 10. Evaluate:
sin^{2}30^{0}cos^{2}45^0∘+4tan^{2}30^0+$\frac{1}{2}$ sin^{2}90^0−2cos^{2}90^0 +$\frac{1}{24}$ cos^{2}0∘

Question 1

Fill in the blanks:

a. $5\cos0^0+\sin90 =$ _____

b. $\tan0^0=$ _____

c. $\tan90$ is _____

d. If $\sin A=1$, then $A =$ _____

e. $2\sin^2 60 =$ _____

f. $2\cos^2 45 =$ _____

g. $\sin^2 A+\cos^2 A=$ _____

h. $(1+\tan2A)(1+\sin A)(1-\sin A)=$ _____

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: $\cos1^0.\cos2^0.\cos3^0....\cos180^0= 0$

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

$(\sin A - \text{cosec}A)^2 + (\cos A-\sec A)^2 = \tan^2 A + \cot^2 A-1$

Question 6

Prove the following identity

$\cos^6 A + \sin^6 A= 1-3\sin^2 A\text{Cos}^2 A$

Question 7

Prove the following identity

$\frac{1}{1cotA+tanA}= \sin A\cos A$

Question 8

Prove the following

$(\sin A + \cos A)(\cot A + \tan A) = \sec A + \text{cosec}A$

Question 9

Prove the following

$\sin30\cos60+\sin60\cos30=1$

Question 10.

If $\text{cosec}A= \sqrt{10}$find other five trigonometric ratios.

WORKSHEET -3 (Trigonometry)2025-26

Question 1
True and False statement
a. The value of sinθ+cosθ is always greater than 1
b. tanθ increases faster than sinθ as θ increase
c. The value of the expression (cos223∘−sin267∘) is positive.
d. The value of the expression (sin80∘−cos80∘) is negative.
e. If cosA+cos2A=1, then sin2A+sin4A=1.
f. (tanθ+2)(2tanθ+1)=5tanθ+sec2θ.
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. $\sin60^0 = 2\sin30^0$
j. SinA + CosA=1

Question 2
If √3sinθ - cosθ = 0 and 0∘ < θ < 90∘, find value of θ

Question 3
Prove that sec A (1 – sin A)(sec A + tan A) = 1

Question 4
Evaluate $\dfrac{sin\,30°+tan45°-cosec60}{sec\,30°+cos60°+cot45}$

Question 5
Evaluate:

$$\frac{5\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$$

Question 6
Prove that:

$$\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta\,\mathrm{cosec}\,\theta$$

Question 7
Prove that $\dfrac{\theta+1}{coscos\,\theta+sin\tau\theta-1} = \mathrm{cosec}\theta + cot\theta$

Question 8
If θ = 45°, then what is the value of $2\sec^2\theta + 3\,\mathrm{cosec}^2\theta$

Question 9
If sin (A + B) = 1 and sin (A – B) = $\frac{1}{2}$, 0 ≤ A + B ≤ 90° & A > B, then find A and B.

Question 10

Given that sin θ = $\frac{m}{n}$ then find cos θ.

Q1. If 5 tan θ = 4, then find the value of $\frac{5 sin sin\theta - 3cos\theta}{5sin\theta + 2 cos cos\ \theta}$

Q2. If 4 tan θ = 3, then find the value of $\frac{4 sin sin\theta - cos\theta}{4sin\theta + 4 cos cos\ \theta}$

Q3. If cosec A = $\frac{13}{12}$, then find the value of $\frac{2 sin sin A - 3cos A}{4sin A - 9cos A}$

Q4. In ∆ABC, right angled at B, AB = 5 cm and sin C = $\frac{1}{2}$. Determine the length of side AC.

Q5. In ∆ABC, 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 cos² 60° sec² 30° – 2 sin² 30° tan² 60°

Q.9.Prove that (sinA + cosecA)² + (cosA + secA)² = 7 + tan²A + cot²A

Q10. If tan θ = $\frac{3}{4}$ evaluate $\frac{\theta)(1-sin\theta)}{\theta)(1-cos\theta)}$

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 $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$

Q7 If 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 – SOME APPLICATIONS OF TRIGNOMETRY

MIND MAP
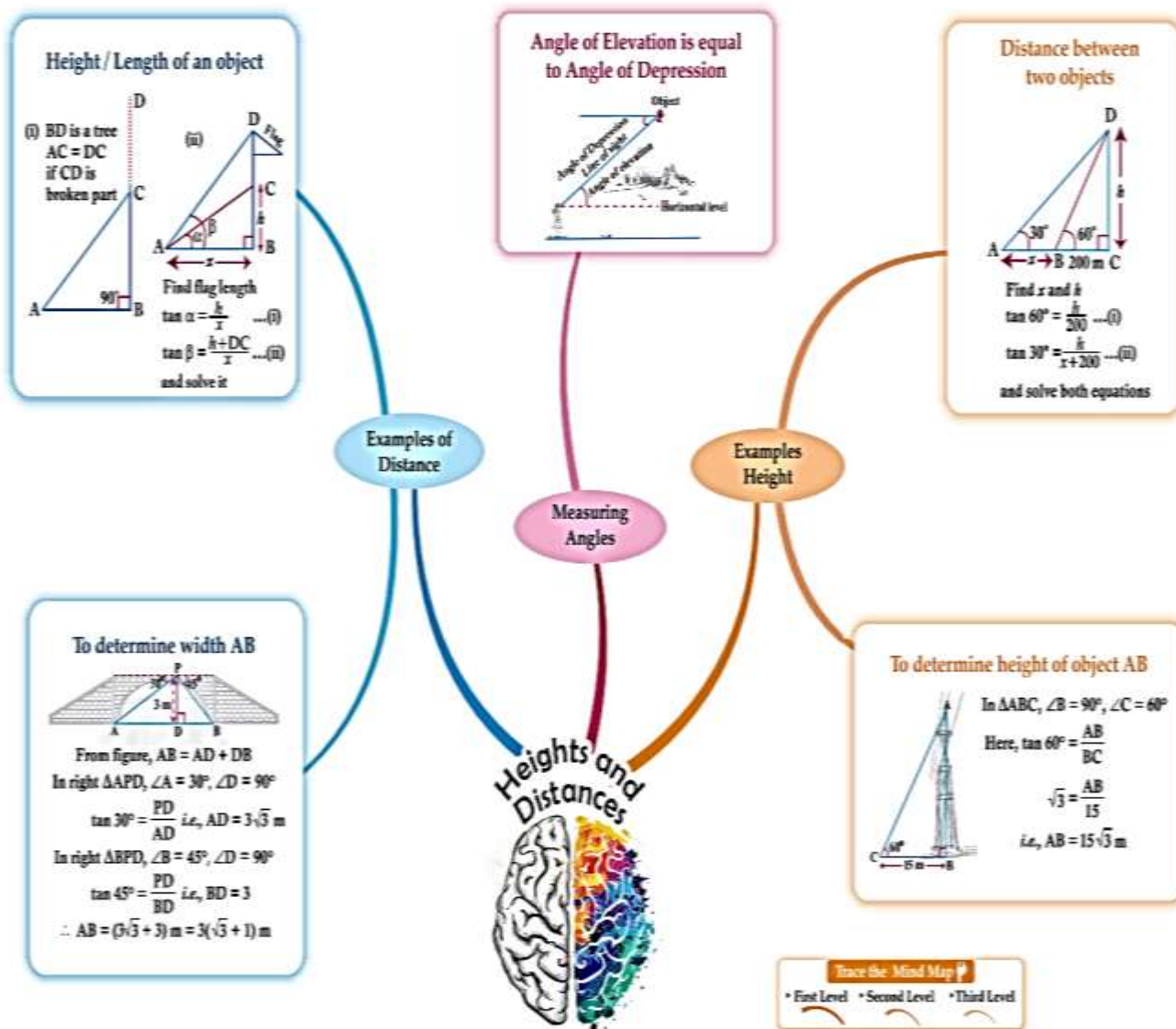
This chapter focuses on the practical use of trigonometry in real-life situations, particularly in finding the heights and distances of various objects without actually measuring them physically. Using trigonometric ratios (from previous chapters), students learn how to calculate unknown lengths when 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.

Q1. At a particular time of the day, Shreya noticed that the length of her shadow was equal to her height. Which of these is the measure of the angle of elevation of the sun from her head?
  a)   30°   (b) 45°   (c) 60°   (d) 90°
Ans : (b) 45°

Q2. From the top of a tower 100 m high, the angles of depression of two cars on opposite sides are 30° and 45°. The distance between the cars is:
(a) 100(√3 + 1) m   (b) 100(√3 - 1) m   (c) 200 m   (d) 100√3 m
Ans : (a) 100(√3 + 1) m

  Q3. A wheelchair ramp needs to be built from the ground to a door that is 2 m above the ground. If the angle of inclination for the ramp is 30 °, what should be the length of the ramp?
(a)   2√3   (b)   2m   (c) 4/√3m   (d) 4m
Ans : (d) 4m

Q4. A kite is flying at a height of 45 m above the ground. The string makes an angle of 60° with the ground. The length of the string is:
(a) 30√3 m   (b) 45√3 m   (c) 30 m   (d) 90 m
Ans : (a) 30√3 m

Q5. A 10 m tall pole casts a shadow of 15 m when the sun is at a certain inclination. At the same time, a nearby building casts a shadow of 25 m. How tall is the building?
(a)16.67 m   (b) 20m   (c) 37.5 m(d)cannot be determined with the given information.
Ans : (a) 16.67 m

Q6. From a point on the ground, angles of elevation of bottom and top of a transmission tower fixed on a 20 m building are 45° and 60°. The height of the tower is:
(a) 20(√3 - 1) m   (b) 20(√3 + 1) m   (c) 20√3 m   (d) 40 m
Ans : (a) 20(√3 - 1) m

Q7. Two poles of equal height subtend angles of 60° and 30° from a point on the road between them. If the road is 100 m wide, the height of each pole is:
(a) 25√3 m   (b) 50 m   (c) 25 m   (d) 50√3 m
Ans : (a) 25√3 m

Q8. An aeroplane flying at height 3000√3 m changes its angle of elevation from 60° to 30° in 30 seconds. The speed of the plane is:
(a) 200 m/s   (b) 240 m/s   (c) 300 m/s   (d) 360 m/s
Ans : (a) 200 m/s

Questions 9-10: Assertion-Reasoning Type
Q9.**Assertion (A)**: The angle of elevation increases as we move closer to the object.
Reason (R): tan θ = height/distance, so as distance decreases, tan θ increases.
Ans : (a) Both A and R are true and R is the correct explanation of A
Q10.**Assertion (A)**: If the height of a tower is doubled, the angle of elevation from a fixed point also doubles.
Reason (R): The angle of elevation is directly proportional to the height.
Ans : (d) A is false but R is true

Q11. An Olympic shooter is aiming a gun at a target from the edge of a cliff such that the gun is 270 m above the ground. The angle of depression of the target from the gun is 30°. What is the shortest distance between the gun and the target?

Ans: 540 metres.

Q12. The ratio of the length of a vertical rod to its shadow is 1:√3. Find the angle of elevation of the sun.

Ans: 30°

Q13. If a tower 30 m high casts a shadow 10√3 m long, find the sun's altitude.

Ans : 60°

Q14. Akash is ascending a vertical ladder, he is first observed from point P at an elevation angle of 45°. Upon climbing further, his elevation from the same point increases to 60°. If point P is 120 m away from the base of the ladder, what is the vertical distance climbed by the man during this change in elevation? Show your steps with a diagram. (Note: Take √3 as 1.73.)

Ans : 87.6 metres

Q15. From the top of a cliff 75 m high, the angles of depression of two boats are 30° and 45°. If the boats are on the same side, find the distance between them.

Ans : 75(√3 - 1) m

SHORT ANSWER QUESTIONS (3 Marks)

Q16. The angles of depression of two ships from the top of a lighthouse are 45° and 30°. If the ships are 200 m apart on the same side, find the height of the lighthouse.

Hint: Use the fact that both ships are on the same side, so their distances from the lighthouse base differ by 200 m.

Ans : 100(√3 + 1) m

Q17. From the top of a 60 m high building, the angles of depression of the top and bottom of a tower are 45° and 60°. Find the height of the tower.

Ans : 20(3 - √3) m

Q18. A man standing on the deck of a ship 10 m above water level observes the angle of elevation of a hill top as 60° and angle of depression of the hill base as 30°. Find the height of the hill and distance from ship.

Hint: Draw a diagram with the ship's deck as reference level. The hill extends both above and below this level.

Ans : Distance = 10√3 m, Height = 40 m

Q19. The angle of elevation of an aeroplane from a point on ground is 60°. After 15 seconds, it becomes 30°. If the plane flies at constant height 1500√3 m, find the speed in km/hr.

Hint: The plane moves horizontally while maintaining constant height. Calculate the horizontal distance traveled.

Ans : 720 km/hr

Q20. Two poles of equal height are on opposite sides of a 100 m wide road. From a point between them, angles of elevation are 60° and 30°. Find the height of poles and distances from the point.

Hint: Let the point be at distance x from one pole. Then it's at distance (100-x) from the other pole.

Solution: Let height = h, distances be x and (100 - x).

Ans : Height = 25√3 m, Distances = 25 m and 75 m

Q21. The angle of elevation of the top of a vertical tower from a point on the ground is 60°. From another point 10 m vertically above the first, the angle of elevation is 30°. Find the height of the tower.
Hint: Both observation points are vertically aligned. Use the same horizontal distance for both triangles.
Ans : 15 m

Q22. From the top of a hill, angles of depression of two consecutive kilometer stones due east are 30° and 45°. Find the height of the hill.
Ans : $(\sqrt{3} + 1)/2$ km

Q23. A peacock sits on a 9 m high pillar. From a point 27 m away, a snake approaches the base. The peacock pounces when seeing the snake. If both have equal speeds, at what distance from the hole is the snake caught?
Ans : 12 m from the hole

CASE STUDY BASED QUESTIONS (4 Marks)

Q24. **Kite Festival**
During a kite festival, two kites are flown from the same point. The angles of elevation are 30° and 60°. If the heights of the kites are 50 m and 60 m respectively, find:
(a) The lengths of the strings (assuming straight lines)
(b) The distance between the two kites
Ans : (a) 100 m and $40\sqrt{3}$ m   (b) Approximately 52.9 m

Q25 **School Playground**

A large playground consists of two connected slides with a flat platform of 3 m between them. Slide 1, AH is inclined at an angle of 60° relative to the flat ground. The distance between the foot of ladder 2 and the base of the Slide 2 is 12 m. Also the height of ladder 2 is 9 m from the ground. The distance between the two ends of the two slides is 24 m as shown below

(Note: The figure is not to scale.)
Find: i) the height of the slide (AC) from the ground. (Round your answer to the nearest integer.)

ii) total distance covered by a person while sliding down from the slide. (Note: Take $\sqrt{3}$ as 1.73 if required.)

iii) What is the horizontal distance between the foot of Slide 1 and the base of Slide 2 in the playground setup?

Ans : i) Height of Slide 1 (AC) = 16 m
ii) Total sliding distance along Slide 1 (AH) = 18 m
iii) 24 metres
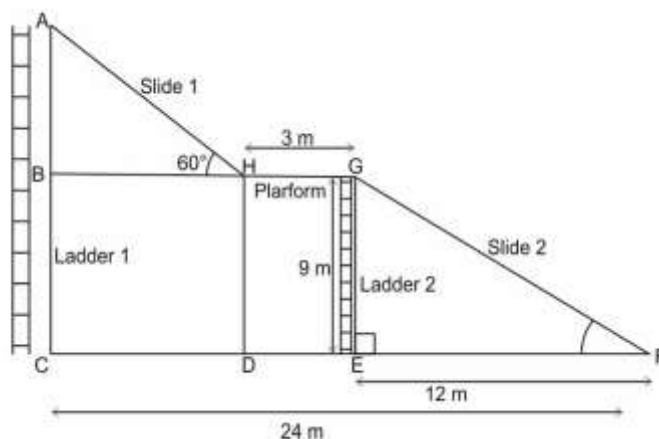
TOPIC: APPLICATION OF TRIGONOMETRY
WORKSHEET NO.1
Section A: Multiple Choice Questions (1 mark each)

Q1. A ladder 10 m long leans against a wall and makes an angle of 60° with the ground. The height it reaches on the wall is:
   A. 5 m   B. 8.66 m   C. 10 m   D. 6 m

Q2. The value of tan θ = 1. Then the angle of elevation is:
   A. 30°   B. 45°   C. 60°   D. 90°

Q3. If the angle of elevation of the sun is 30°, then the length of the shadow of a pole of height 10 m is:
   A. 10 m   B. 17.32 m   C. 5 m   D. 20 m

Section B: Assertion and Reasoning (1 mark)
Q4.
Assertion (A): If the angle of elevation of the top of a tower increases when a person moves closer, then the tower is vertical.
Reason (R): As distance from the tower decreases, angle of elevation increases in right-angled 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.

Section C: Short Answer Questions – (2 marks each)

Q5. The angle of elevation of the top of a tree from a point 15 m away from its base is 45°. Find the height of the tree.

Q6. From a point 20 m away from the base of a tower, the angle of elevation of its top is 30°. Find the height of the tower.

Q7. A kite is flying at a height of 25 m, and the angle between the string and the ground is 60°. Find the length of the string (Assume it is tight and straight).

Section D: Long Answer Questions – (3 marks each)

Q8. A bird was flying parallel to the ground, in an east-west direction with constant speed at a height of 100 m from the ground. Sunita standing in the middle of the park, first observed the bird in the east at an angle of elevation of 30°. After 2 minutes, she observed the bird in the west from the same position making an angle of elevation of 45°. Find the speed of the bird. Draw a rough diagram to represent the given situation. Show your work. (Note: Take √3 as 1.73)

Q9. A man on a cliff observes a boat at an angle of depression of 30°. If the height of the cliff is 100 m, find the distance of the boat from the base of the cliff.

Q10.: Rahul is flying a kite. His friend observes the kite at an angle of elevation of 60°. The string attached to the kite is 100 m and is perfectly straight and tight.

Answer the following questions:
a) What is the height of the kite from the ground?
b) What is the horizontal distance of the kite from Rahul?
c) Which trigonometric ratio will you use here?
d) If the string makes an angle of 30° instead, how does the height change?

Section F: Long Answer (5 marks)

Q11. The angle of elevation of the top of a tower from a point A on the ground is 60°. From another point B, 20 m above A (on a vertical building), the angle of elevation is 30°. Find the height of the tower and the distance of point A from its base.

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√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.

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√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√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.

Multiple Choice Questions

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√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√3 m   D. 18 m

Section B: 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.

Section C: 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.

Section D: 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.

Section E: 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°?

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.

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√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√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?

<p style="text-align:center">**Section F: Long Answer Question (5 marks)**</p>

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.

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
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 - CIRCLES

Only one common point (A) between circle and line PQ. Here, PQ is tangent at point A lying on the circle.

In a fixed plane, The locus of a point equidistant from a fixed point is called 'circle'. The fixed point is called the centre & separation of points is the radius of the circle.

1. The tangent at any point of a circle is perpendicular to the radius through the point of contact.

$\angle OPQ = 90°$

2. The length of tangents drawn from an external point to a circle are equal.

PQ = PR

Facts

Tangent and tangent point

Theorems

Definition

1. There is no tangent to a circle passing through a point lying inside the circle.

2. There is one and only one tangent to a circle passing through a point lying on the circle.

3. There are exactly two tangents to a circle through a point lying outside the circle.

Circles

Secant

Two common points (A and B) between line PQ and circle.

Trace the Mind Map
• First Level   • Second Level   • Third Level

IMPORTANT POINTS:

- • A circle is a closed two-dimensional geometrical figure, such that all points on the surface of a circle are equidistant from the point called the "centre". The distance from the centre to any point on the surface of a circle is called "Radius".
- • For a circle and a line on a plane, there can be **three** possibilities.
- • They can be **non-intersecting.**
- • They can have **a single common point:** in this case, the line touches the circle.

- • They can have **two common points:** in this case, the line cuts the circle.
- • **Tangent:** A **tangent to a circle** is a line that touches the circle at exactly one point. For every point on the circle, there is a unique tangent passing through it.
- • **Secant:** A **secant to a circle** is a line that has two points in common with the circle. It cuts the circle at two points, forming a chord of the circle.
- • The tangent to a circle can be seen as a special case of the secant when the two endpoints of its corresponding chord coincide.
- • For every given **secant** of a circle, there are **exactly two tangents which are parallel** to it and touches
- the circle at two **diametrically opposite points.**
- • Theorems : **1. Tangent Perpendicular to the radius at the point of contact**
- ☐The theorem states that "The **tangent** to the circle at any point is
- the **perpendicular to the radius** of the circle that passes through the
- point of contact".
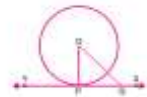
2. The number of tangents drawn from a given point: ▪ If the point is in an **interior region of circle**, any line through that point will be a
- secant. So, **no tangent** can be drawn to a circle which passes through a point that lies
- inside it.
- ▪ When a point of tangency lies on the circle, there is **exactly one tangent** to a circle that passes through it.
- ▪ When the point lies outside of the circle, there are **accurately two**
- **tangents** to a circle through it.
-
3. The tangent at any point of a circle is perpendicular to the radius through the point of contact.
4. The lengths of tangents drawn from an external point to a circle are equal.
-
- • Points to remember:
- • In two concentric circles, the chord of the larger circle, which touches the smaller
- circle, is bisected at the point of contact.
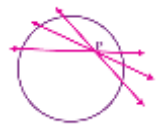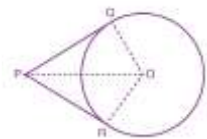
- • The tangents drawn at the ends of a diameter of a circle are parallel.

- • The perpendicular at the point of contact to the tangent to a circle passes through the centre.
- • 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.
- • The parallelogram circumscribing a circle is a rhombus.
• The opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.
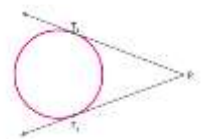
CIRCLES

Q1) In the adjoining figure, AC is the diameter of the larger circle with centre O. AB is tangent to the smaller circle with centre O.
If OD = r, then BC is equal to:

(a) r   (b) 3r/2   (c) 2r   (d)   4r

Ans(c)
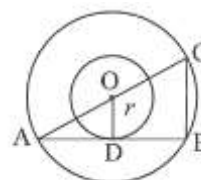
Q2) The following figure O is the centre of the circle and PQ and PQ are tangents to the circle at point Q and S respectively what is the measure of angle QRS

a)40   b)50   c)30   d)25

Ans(b)
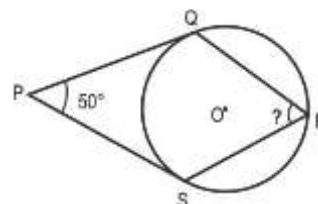
Q3) In the figure below,a circle with centre O inscribed inside triangle LMN, A and B are points of tangency,find angle ANB

a)100   b)50   c)80   d)130

Ans(c)
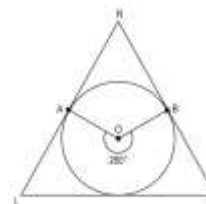
Q4) In figure, O is the centre of a circle, AB is a chord and AT is the tangent at A. If AOB =100°,then BAT is equal to
a)100°   b) 40°   c)50°   d) 90°

Ans(c)
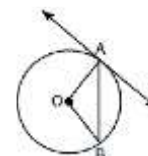
Q5) In figure, AP, AQ and BC are tangents to the circle. If AB = 5 cm, AC = 6 cm and BC = 4 cm, then the length of AP (in cm) is
a)15   b) 7.5   c)20   d) 9
Ans(b)
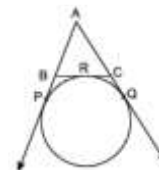
Q6) A piece of wire 20 cm long is bent into the form of an arc of a circle subtending an angle of 60° at its centre. Find the radius of the circle

(a) 30 cm   (b) 12 cm   (c) 16 cm   (d) 19.09cm
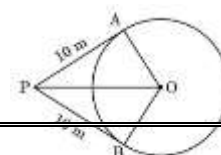
Ans(d)

Q7) If the length of a chord of a circle is equal to its radius, then the angle subtended by chord at the centre is :

(a) 60   (b) 30   (c) 120   (d) 90

Ans(a)

8)The tangents drawn at the extremities of the diameter of a circle are always :

(a) parallel   (b) perpendicular   (c) equal   (d) intersecting

Ans(a)

Assertion questions

(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) Assetion (A)If two circles touch each other externally, the distance between their centers is equal to the sum of their radii.

Reason (R):

If the radii of two circles are equal, then the circles are congruent.

Ans (b),

Q10) Assertion (A): If two tangents are drawn to a circle from an external point, then they subtend equal angles at the center.

Reason (R): A parallelogram circumscribing a circle is a rhombus.

Ans)(b)

VERYSHORT ANSWER TYPE(SECTION B)(2 marks)

Q11)A person is standing at P outside a circular ground at a distance of 26 m from the centre of the ground. He found that his distances from the points A and B on the ground are 10 m (PA and PB are tangents to the

circle). Find the radius of the circular ground.

Hint   Apply the Pythagorean theorem

Find r^2 then find r

Ans) r=24 cm
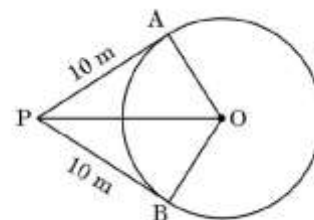
Q12) At point A on the diameter AB of a circle of radius 10 cm, tangent XAY is drawn to the circle. Find the length of the chord CD parallel to XY at a distance of 16 cm from A

Hint

We can use the Pythagorean theorem ($OC^2 = OE^2 + CE^2$) to find CE

Find CE

129
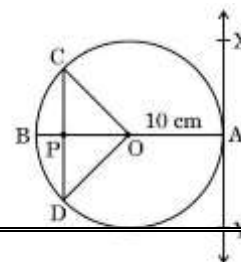
CD = 2 × CE ,CD = 2 × 8 cm

Ans) CD = 16 cm

Q13) In the given figure, PA is a tangent from an external point P
to a circlewith centre O. If ∠POB = 115 , then *what is* ∠APO ?
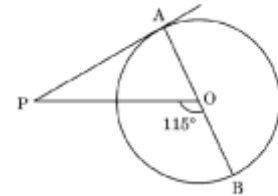
Hint Angle POB and angle BOA are supplementary (they add up to 180 degrees) because they form a
straight line. So, angle BOA = 180 - 115 = 65 degrees.

Angles in a Triangle:
The sum of angles in triangle APO is 180 degrees. Therefore, angle APO = 180 - (angle OAP + angle
AOP) = 180 - (90 + 65) = 25 degrees.

Ans) APO =25º

Q14) Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

Hint

Tangents l and m are drawn at the end points A and B of the diameter AB
of the circle ∠1 = 90°,∠2 = 90°,   ∴∠1 = ∠2
Ans) As these are alternate interior angles. So l is parallel to m
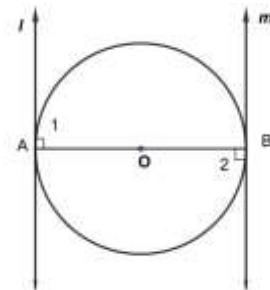
Q15)A circle touches all the four sides of a quadrilateral ABCD with AB = 6 cm,

BC = 7cm and CD = 4 cm. Find AD.

Hint

AB + CD = BC + AD
6 + 4 = 7 + AD
10 = 7 + AD
AD = 10 - 7
Ans) AD = 3 cm.
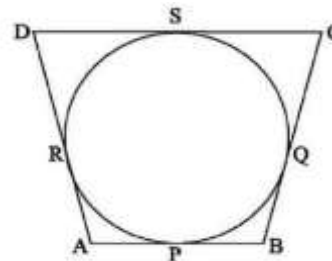
SECTION C

SHORT ANSWER TYPE(SECTION B)(2 marks)

Q16) A person is standing at P outside a circular ground at a distance of 26 m
from the centre of the ground. He found that his distances from the
points A and B on the ground are 10 m (PA and PB are tangents to thecircle). Find the radius of the
circular ground.
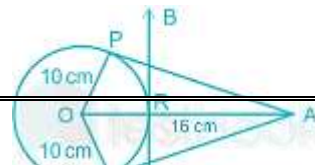
Hint use Pythagoras theorem $OP^2+OA^2 =AP^2$

$26^2+r^2=10^2$ Ans)r=24 cm

Q17) In the given figure, O is the centre of the circle and BCD is tangent to it at C. Prove that BAC + ACD = 90 .

Hint

Since ∠OCD = 90°, we can say that ∠OCA + ∠ACD = 90°.

Because OA = OC, we know that ∠OAC = ∠OCA.

We can substitute ∠OAC for ∠OCA in the equation ∠OCA + ∠ACD = 90°.

We are given that ∠BAC is equal to ∠OAC.

Therefore, substituting ∠BAC for ∠OAC in the previous equation, we get ∠BAC + ∠ACD = 90°.

C +
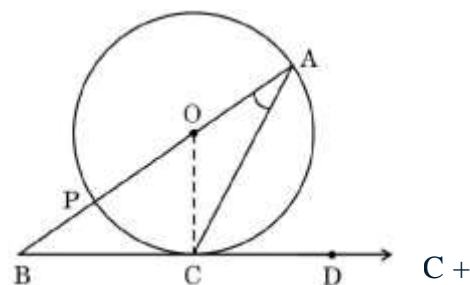
Q18) In the given figure, PC is a tangent to the circle at C. AOB is the diameter which when

extended meets the tangent at P. Find ∠ CBA and ∠ BCO if angle ∠PCA is 110

Hint
First find angle OCA using the fact that angle PCO = 90 °, then find angle BCO using the fact that OC =OB, finally find angle C BA using the fact the sum of the angles in the triangle is 180

Ans) ∠CBA=70º ,∠BCO=20º
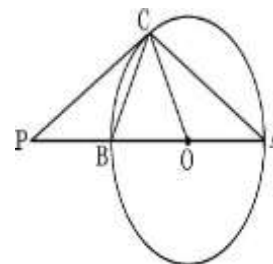
Q19) State true or false and give valid reasons
a)The centre of the circle can be found by using 2 tangents.
b) The centre of the circle can be found by using 2 chords
Hint
a)False
Reason:
If you draw two tangents to a circle, you only get two points (points of tangency).
But these tangents themselves do not directly help locate the exact center.To find the center, you need at least two perpendicular bisectors of chords or more tangents to construct right angles, or the intersection of normals at the points of tangency.

b)True
Reason: If you draw two chords inside the circle, and then draw the perpendicular bisectors of these two chords, these bisectors will intersect at a single point, which is the center of the circle.

Q20) Shown below a triangle inscribed in a semi-circle
A circle is drawn such that QR is atangent at the point R.
How many circles can be drawn.Justify your answer

Hint
Only one circle can be drawn such that QR is tangent at point R
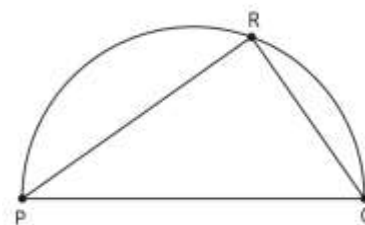
When a triangle is inscribed in a semicircle with one side being the diameter, it's a right-angled triangle with the right angle opposite the diameter. In this case, angle PQR is a right angle .

LONG ANSWER TYPE (SECTION D)

Q21)In the figure given below PQ and RS are tangents to the circle with centre O radius 6 √3 cm prove that

I)triangle PQR is an equilateral triangle

ii) Find the length of RP

Hint

OP ⊥ PQ and OR ⊥ RQ.

In triangle OQP, we have angle OPQ = 90° (right angle) and angle OQP = 60° (given). Therefore, angle QOP = 180° - (90° + 60°) = 30°

Using the properties of triangles, we can find the length of PQ using the tangent-secant theorem:

Ans) PQ = RP= tan(60°) = 6√3 * √3 = 18 cm.

Q22)In the figure below, O is the centre of two concentric circles.   An equilateral triangle PQR such that its vertices and sides touch the bigger and smaller circles respectively. The difference between the area of the bigger circle and the smaller circle is 616 cm².Find the radius of the larger circle and use that to find the side length of the equilateral triangle.

Hint
s-side of triangle, R and r are radius

$R^2-r^2=616/\pi$
s=R√2
Ans)R=16.16 cm,side=28 cm
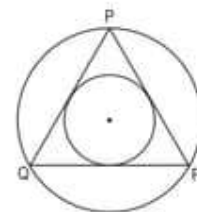
Q23) . In the figure, two circles with centres A and B and radii 5 cm and 3 cm touching each other internally. If the perpendicular bisector of segment AB, meets the bigger circle at P and Q, find the length of PQ.Calculate the distance between the centres
Hint
The distance between the centres of two internally touching circles is the difference of their radii.

Ans) *AB=5−3=2 cm*
Calculate the length of *PM* using the Pythagorean theorem

$AM^2+PM^2=AP^2$

PM=2√6 cm

The length of the line segment
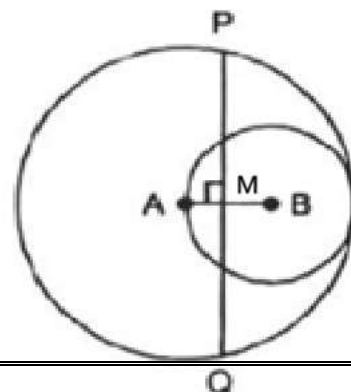
Ans) PQ = 4√6cm

CASE BASED QUESTIONS(4 marks)

Q24) Varun has been selected by his School to design logo for Sports Day T-shirts for students and staff. The logo design is as given in the figure and he is working on the fonts 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

b) Find the length of BE

c) Find the length of CF

d) If radius of the circle is 4 cm, Find the area of ΔOAB

e) Find area of ΔABC.

Ans)
AD=7 CM ,BE=5 cm,CF=3cm
area of OAB= 24 sq cm, area of ABC= 60 sq cm
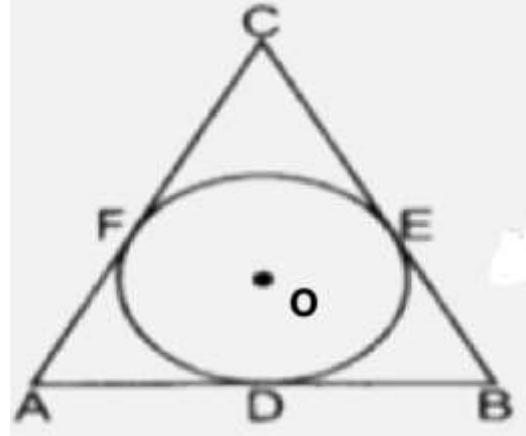
Q25) People of the village want to construct a road nearest to a circular village Rampur. The road cannot pass through the village. But the people want the road to be at the shortest distance from the centre of the village

.i) Which road will be the nearest to the centre of the village.

ii) If the road starts from point O which is outside the circular village and touch the boundary of the circular village at point A such that OA = 20 cm. If the straight distance of the point O from the centre of the village C is 25   cm, then find the shortest distance of the road from the centre of   the village
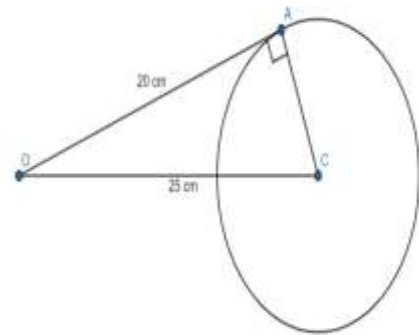
Hint A tangent to a circle is perpendicular to the radius at the point of tangency, meaning the line connecting the center of the circle to the point of tangency is the shortest possible distance from the center to the circle's boundary.

Use pythagorus theorem, $AO^2+AC^2=OC^2$ **Ans) AC=15 cm**

CHAPTER - 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

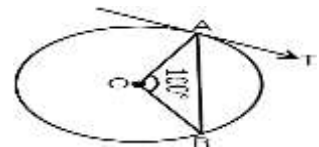   (a) 3 cm   (b) 4 cm   (c)   5   cm
   (d)6cm
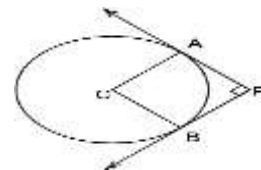
   2. In the fig. if the semiperimeter of ΔABC=23cm, then AF +BD +CE is:

      (a).46cm   (b)11.5cm   (C.) 23cm   (d) 34.5c
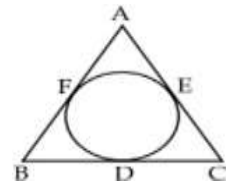
   3.In the given figure, O is the centre of a circle, AB is a chord and AT is the

   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   radius 6 cm is 2√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 radius7 cm from a point25 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)
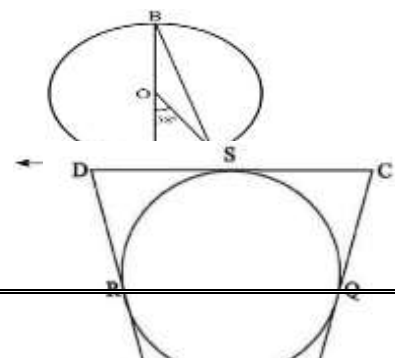
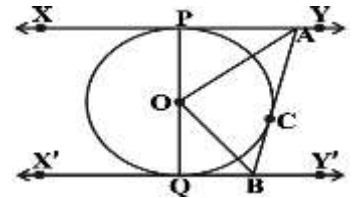8. A quadrilateral ABCD is drawn to circumscribe a circle As in figure.
Prove that $AB + CD = AD + BC$.

9. Two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that $\angle APB = 2\angle OAB$.
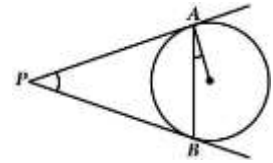
Long Answer Ques. (5marks)

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 $\angle AOB = 90$

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.
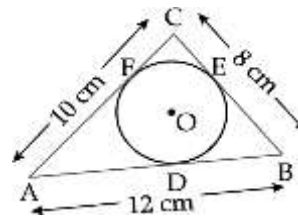
(a) Find the length of AD and BE. (2)

OR

If the radius of the circle is 4cm, 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 $\angle TPO = 25°$, then x is equal to:

   (A) 115°   B)70   °C)110°   D)90°

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) $\sqrt{119}$ cm.
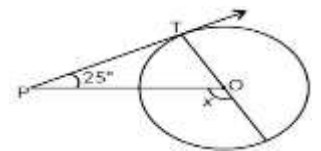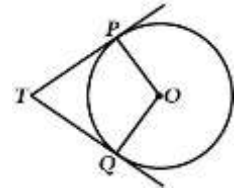
   4. Assertion(A): A circle can have infinitely many tangents.
      Reason (R): The tangent at any point of a circle is perpendicular to the radius through the point of contact.
   (a) Both assertion(A) and reason(R) are true and reason(R) is the correct explanation of assertion(A).
   (b) Both assertion(A) 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 Ques(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
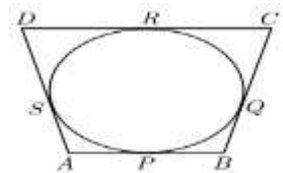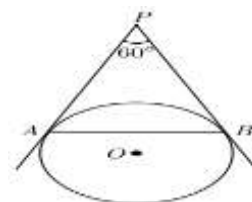
6. In the given figure, AOB is a diameter of the circle with centre O and AC is a tangent to the circle at A. If $\angle BOC = 130°$, the find $\angle ACO$.
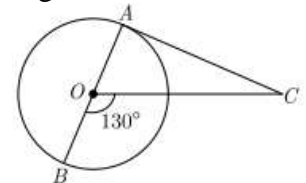
7.Prove that the lengths of tangents drawn from an external point to a circle are equal.

Short Answer Ques (3 marks)

9.   In figure, AP and BP are tangents to a circle with centre O , such that AP = 5 cm and $\angle APB = 60°$. Find the length of chord AB.
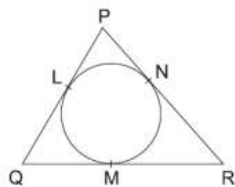
9. In the figure XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C interesting XY at A and X'Y' at B, what is the measure of ∠AOB.
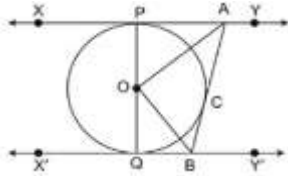
Long Answer Ques. (5marks)

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. InaninternationalschoolinHyderabadorganisedanInterschoolThrowballTournament for girls just after the pre-board exam. The throw ball team was veryexcited. The team captain Anjali directed the team to assemble in the ground forpractices. Only three girls Priyanshi, Swetha and Aditi showed up. The rest did notcome 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 pointN, 13 m away from centre A as her own position. From the point N, she drew twotangential lines NS and NR and gave positions S and R to Swetha and Aditi.Anjalithrows the ball to Priyanshi, Priyanshi throws it to Swetha, Swetha throws it toAnjali, Anjali throws it to Aditi, Aditi throws it to Priyanshi, Priyanshi throws it toSwetha andso on.

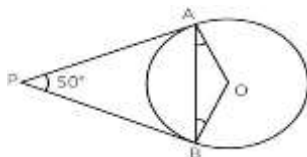1. Findthemeasureof∠NSA.
2. Findthe distancebetween SwethaandAnjali.
3. If ∠SNR is equal to θ, then Find ∠NAS .

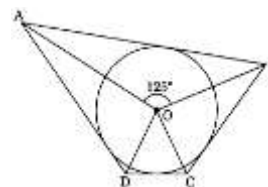

137
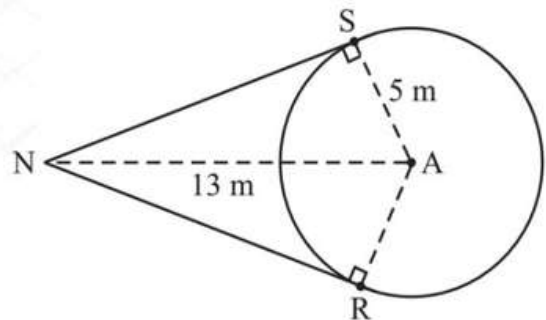
WORKSHEET 3

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.
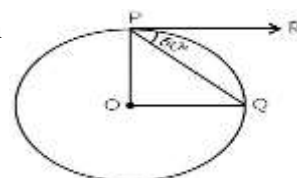
    Very Short Answers Ques(2 marks)

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°
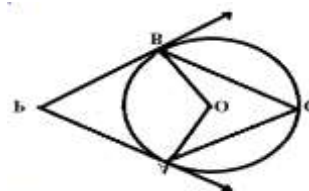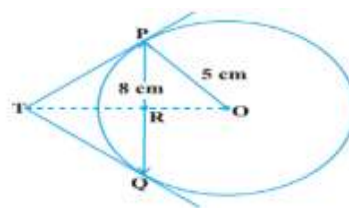

7.In the figure, if O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, find ∠POQ.
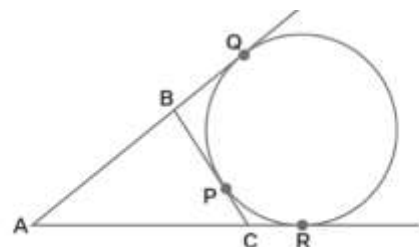
Short Answer Ques (3 marks)

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.
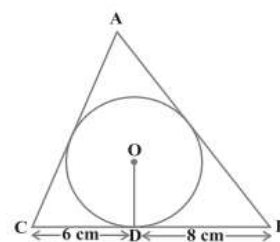
9 If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that

$$AQ = \frac{1}{2}(BC + CA + AB)$$

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 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
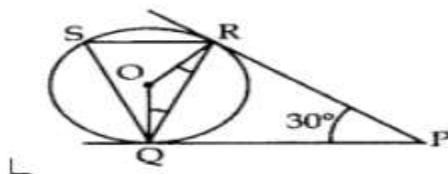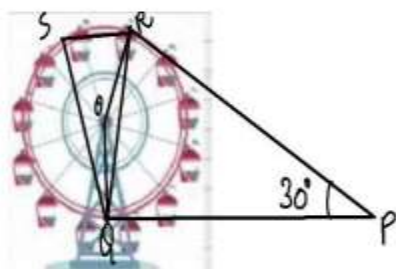
In the given figure
1. find ROQ.   2. Find RQP.   3. Find RSQ   4. Find ORP

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 $\angle ACB = 50°$. If AT is the tangent to the circle at the point A, the $\angle BAT$ is equal to (a) 65°　(b) 60°　(c) 40°　(d) 50°

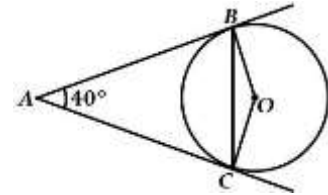3. If radii of two concentric circles are 4 cm and 5 cm, then the length of each chord of one circle which is tangent to the other circle is

(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 Ques(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 $\angle$ APB=60° , then find the length of the chord AB.

7. Prove that the rectangle circumscribing a circle is a square
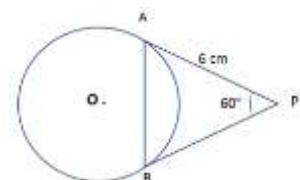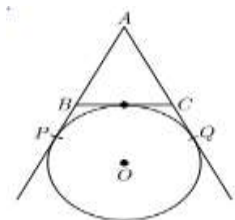
Short Answer Ques (3 marks)

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.
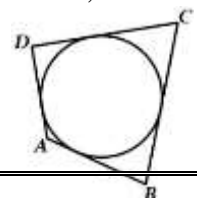
Long Answer Ques. (5marks)

10 Prove that the lengths of tangents drawn from an external point to a circle are equal. Using the above a circle, as shown in Fig. Prove that the base is bisected by the point of contact.
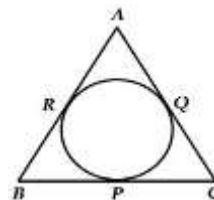
Case Based Ques(4marks)

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, R and S respectively as shown in the figure.
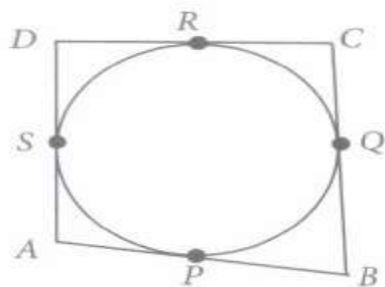
Based on the above information, answer the following questions.
(i) If O is the centre of the circular fountain, then Find ∠OSA.

(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
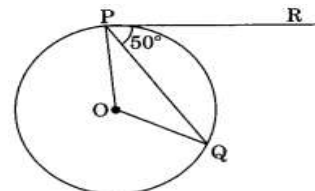
2. In Fig., AT is a tangent to the circle with centre O such that OT = 4 cm and ∠OTA = 30°. Then AT is equal to

    (a) 4 cm   (b) 2 cm   (c) 2√3 cm   (d) 4√3 cm
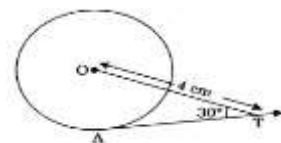
3. If two tangents inclined at an angle of 60º are drawn to a circle of radius 3cm, then the length of each tangent is equal to

(a) 3√3/ 2 cm (b) 3cm (c) 6cm (d) 3√3cm

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.
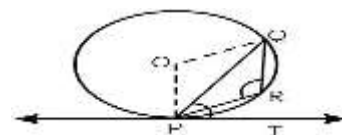
6. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

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.
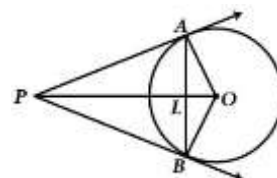
      Short Answer Ques (3 marks)

8. Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠PTQ=2 ∠OPQ

9.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..
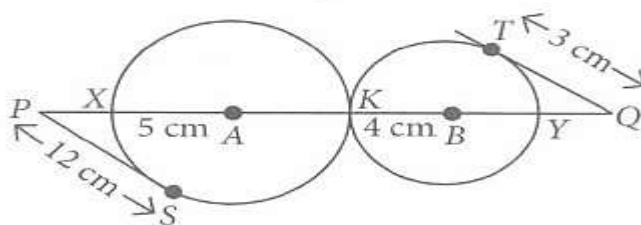
Based on the above information, answer the following questions.
(i) Find the value of PA . (ii) Find the value of BQ.   (iii) Find the value of QY.

1 (b) 4 cm   2 23cm   3(c)50°

4(b)Bothassertion(A)andreason(R) aretruebutreason(R) isnotthecorrectexplanation of assertion (A).

5. LetC(O,r)bethecirclewithOT=r=7cmand OP=25 cm.
WeknowthatradiusOTisperpendiculartothetangent drawn,
∴∠OTP=90^0
In∆OTP,byPythagorasTheorem,
$$OP^2=PT^2+OT^2$$

PT= √(625-49)=24cm
Hence,thelengthoftangentfrompointP=24cm

6. :∠ABQ=½∠AOQ
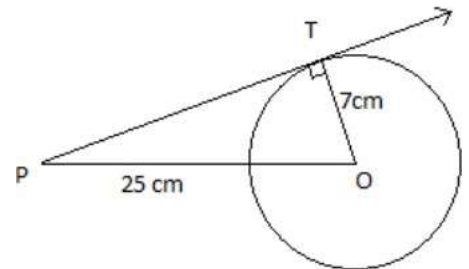
∠ABQ=½ x58°

∠A= 90°(ATis a tangent)

∠BAT+∠ABT+∠ATQ=180°(anglesumpropertyofa triangle)
90+ 29+∠ATQ= 180°
∠ATQ=180°-119°
∠ATQ= 61°

7. ConsiderABas adiameterofthe circle.
Let PQandRS are twotangents drawn at the endpoints ofthe diameterAB. As
we know that the radius is perpendicular to tangent at the point of contact.
Thus,   ∠OAR=90°and∠OBQ=90°………(1)
Therefore, ∠OAR = ∠OBQ
    ………(2)
Since,alternateinterioranglesareequal,hencelinesPQandRSmustbeparallel.
Hence,proved.
11.
(A)AD=7CM ,BE=5CM
(B)Perimeterof∆ABC=AB+BC+ CA
=(12+8+10)cm=30cm.
(C) Fromquestion(a),CF=(10–xcm)
=(10 –7)cm =3 cm.

1. 55°   2. (A)115°   3.(d) √119 cm
4 (b)Bothassertion(A)andreason(R) aretruebutreason(R) isnotthecorrectexplanation 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.**

$$= 90° - \frac{\theta}{2}.$$

1. (a) 25º   **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. $\angle POQ=100°$ **8.20/3**

    11. **:1.** 150 °   **2**. 75 °   **3.** 75 °   **4.** 90 °

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°

1 POQ=100°
2(c) 2√3 cm
3(d) 3√3cm
4**(d)** Assertion (A) is false but reason (R) is true.
5 120°   11.(i) 13cm   (ii) 5cm   (iii) 1cm
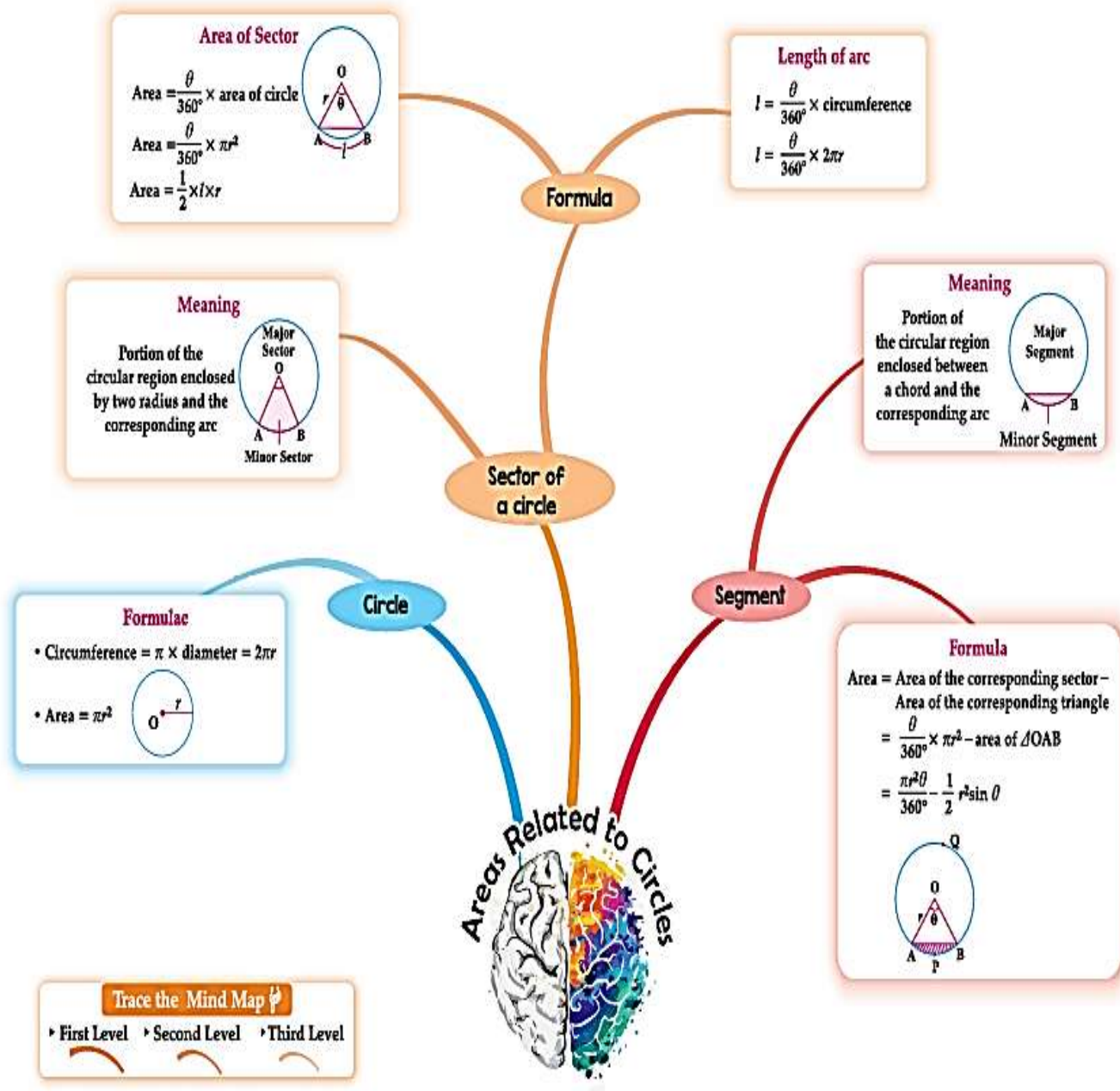
Formulae:

1. Length of arc $= \dfrac{\theta}{360°} \times 2\pi R$

2. Area of sector $= \dfrac{\pi r^2 \theta}{360°}$

3. Area of segment = Area of sector – Area of triangle

[Area of triangle may be calculated by using any suitable formula.]
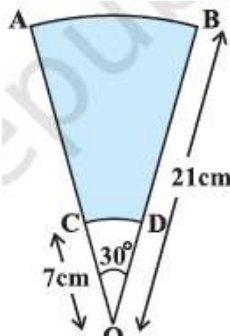
1   If the area of a circle is 154 cm², then its circumference is –
     (A) 11cm   (B) 22cm   (C) 44cm   (D) 55cm
     Ans: (C) 44cm

2   If θ is the angle (in degrees) of a sector of a circle of radius r, then area of the sector is –
     (A) $\frac{\pi r^2 \theta}{360°}$ (B) $\frac{\pi r^2 \theta}{180°}$ (C) $\frac{2\pi r \theta}{360°}$ (D) $\frac{2\pi r \theta}{180°}$
     Ans: (A) $\frac{\pi r^2 \theta}{360°}$

3   The diameter of a circle whose area is equal to the sum of the areas of the two circles of radii 24cm and 7cm is –
     (A) 31cm   (B) 25cm   (C) 62cm   (D) 50cm
     Ans: (D) 50cm

4   The radius of a circle whose circumference is equal to the sum of the circumferences of the two circles of diameters 36cm and 20cm, is –
     (A) 56cm   (B) 42cm   (C) 28cm   (D) 16cm
     Ans: (C) 28cm

5   The area of the largest circle that can be inscribed in a square of side 6cm is –
     (A) 9π cm²   (B) 12π cm²   (C) 18π cm²   (D) 36π cm²
     Ans: (A) 9π cm²

6   If the circumference of a circle is half of the perimeter of a square, then the ratio of the area of the circle to the area of the square is –
     (A) 22 : 7   (B) 11 : 7   (C) 7 : 11   (D) 7 : 22
     Ans: (D) 7 : 22

7   The circumferences of two circles are in the ratio 4 : 5. The ratio of their radii is –
     (A) 2 : √5   (B) 4 : 5   (C) 16 :25   (D) 25 : 16
     Ans: (B) 4 : 5

8   If the radius of a semicircular protractor is 7cm, then its perimeter is –
     (A) 11cm   (B) 14cm   (C) 22cm   (D) 36cm
     Ans: (D) 36cm

     In Qu 9 and Qu 10, a statement of Assertion (A) is followed by a statement of Reason (R). Make 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 but R is true.

9   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, is $\frac{\pi r \theta}{180°}$.
     Ans: (D)

10   Assertion (A): The diameter of a circle whose area is equal to the sum of the areas of the two circles of radii 24cm and 7cm is 50cm.
     Reason (R): If the perimeter and the area of a circle are numerically equal, then the radius of the circle is 2cm.
     Ans: (B)
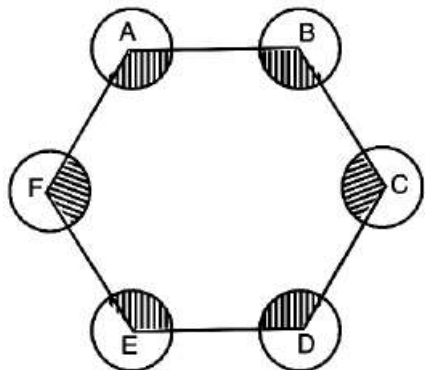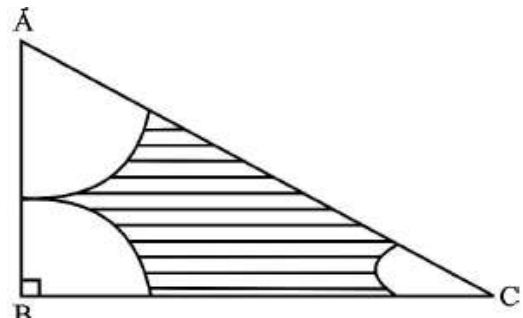
11 The minute hand of a wall clock is 18 cm long. Find the area of the face of the clock described by the minute hand in 35 minutes.

12 Find the perimeter of a quadrant of a circle of radius 14 cm.

13 The given figure is a part of a circle with centre O. Its area is $\frac{1250\pi}{9}$ cm^2 and the 10 sectors are identical. Find the value of β in degrees.
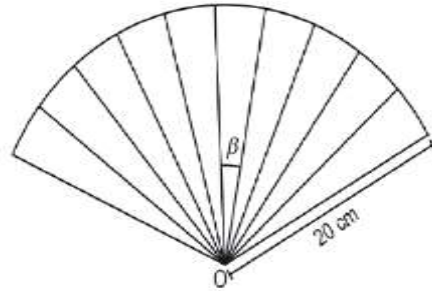
14 AB and CD are respectively arcs of two concentric circles of radii 21cm and 7cm and centre O. If ∠AOB = 30°, find the area of the shaded region.

15 A cow is tied with a rope of length 14m at the corner of a rectangular field of dimension 20m × 16m. Find the area of the field that the cow cannot graze.

SHORT ANSWER TYPE QUESTIONS (3 Marks Each)

16 In the given figure, ABCDEF is a hexagon with vertices A, B, C, D, E and F. Circles of same radii r are drawn at each of the vertices by taking the vertices as centres. Find the area of the shaded portion.

17 In the given fig: ABC is a right triangle, right angled at B, with AB = 14cm and BC = 24cm. With the vertices A, B and C as centres, arcs are drawn each of radius 7cm. Find the area of the shaded region. [Use π = 22/7].

18 Shown below is a semicircular sheet of paper with centre O, which is folded in half. A square of length 5 unit is cut from it. Find the area of the paper left.

5 units
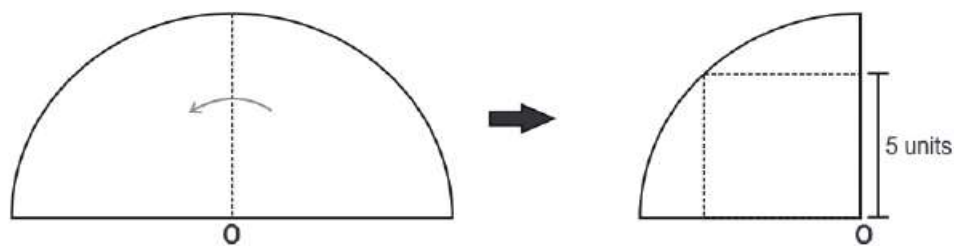
19   A chord of a circle of radius 10cm subtends an angle of 90° at the centre. Find the area of the corresponding major segment of the circle.

20   In the given figure, side of the square is 28cm and radius of each circle is half of the length of the side of the square. Where O and O' are the centres of the circle. Find the area of the whole figure.
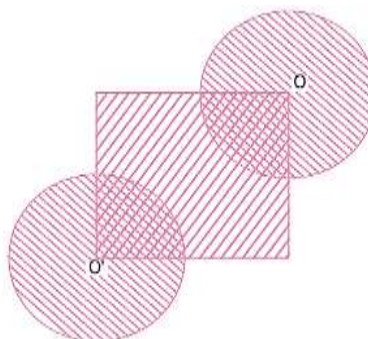
LONG ANSWER TYPE QUESTIONS (5 Marks Each)

21
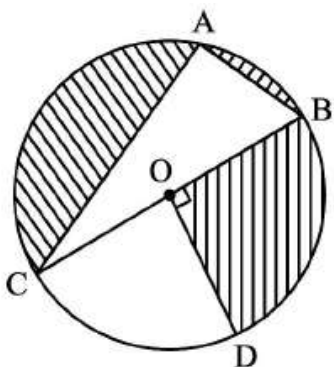
In the given figure, O is the centre of the circle. If AC = 24cm, AB = 7cm and $\angle BOD = 90°$, find the area of the shaded region.

22   The perimeter of a sector of a circle of radius 6.3 cm is 25.8 cm, find the area of the sector.

23
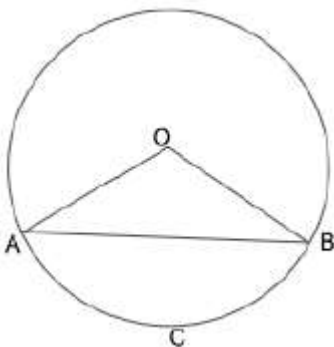
The perimeter of sector OACB of the circle centred at O and of radius 24cm is 73.12cm.
(i) Find the central angle $\angle AOB$.
(ii) Find the area of the minor segment ACB.

24   A cow is tied at one of the corners of a square shed. The length of the rope is 22m. The cow can only eat the grass outside the shed as shown in the figure. What is the area that the cow can graze?
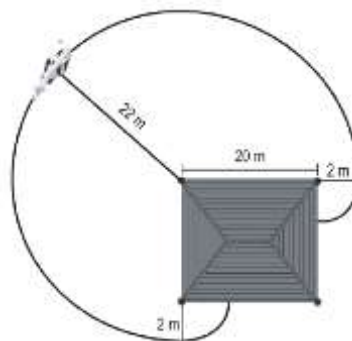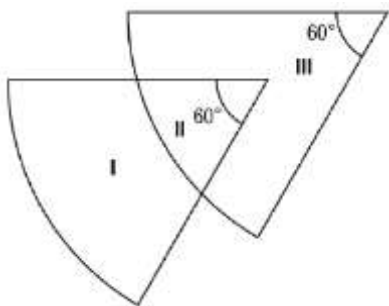
25   In the given figure, there are two overlapping sectors of a circle. The radii of the sectors are 6cm and 8cm. The figure is divided into three regions – I, II and III. Find the difference in the areas of regions I and III.

26   In the given fig: two pendulums of different lengths are attached to a bar.

Pendulum 1   Pendulum 2
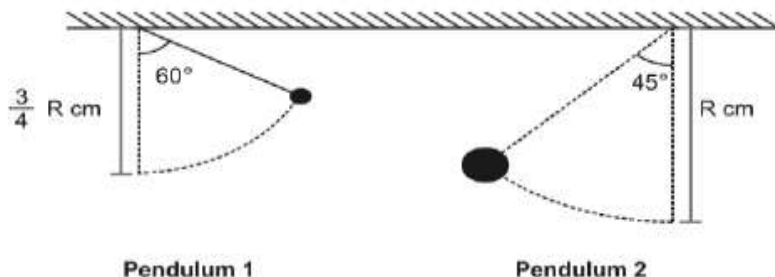
Based on the fig: shown above, determine which pendulum has the greater arc length.

Answers:

1. (C) 44cm   2. (A) $\frac{\pi r^2 \theta}{360°}$ 3. (D) 50cm   4. (C) 28cm

5. (A) 9π cm^2 6. (D) 7 : 22   7. (B) 4 : 5   8. (D) 36cm

9. (D) A is false but R is true.

10. (B) Both A and R are true and R is not the correct explanation of A.

11. 594cm^2 12. 154cm^2 13. 12.5°   14. $\frac{308}{3}$ cm^2

15. 166m^2 16. $2\pi r^2$ 17. 91cm^2 18. $\frac{200}{7}$ cm^2

19. 285.5 cm^2 20. 1708 cm^2 21. 283.97 cm^2 22. 41.58 cm^2

23. (i) 60°, (ii) 52.32 cm^2 24. 365π m^2 25. 14.67 cm^2

26. Both the pendulum have equal arc length (i.e. $\frac{\pi R}{4}$)

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.
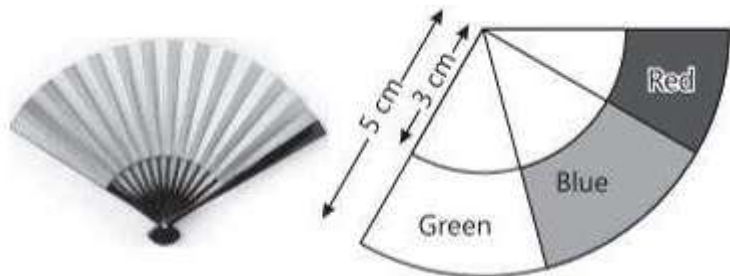
Based on the above information, solve the following questions:
(i). If the region containing blue colour makes an angle of 80° at the centre, the area of the region having blue colour is:
a. 9.17 cm²   b. 10.1 cm²   c. 11.17 cm²   d. 13.17 cm²
(ii). If the region containing green colour makes an angle of 60° at the centre, the area of the region having green colour is:
 a. 6.2 cm²   b. 8.38 cm²   c. 9.9 cm²   d. 11.12 cm²
 (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).

(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 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°
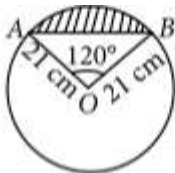
Q.8 A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle 120°. Find the total area cleaned at each

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.
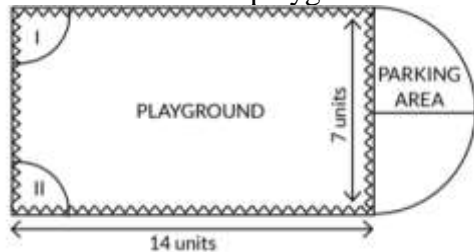
After survey, it was decided to build rectangular playground, with a semi circular area allotted for parking at one end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively. There are two quadrants of radius 2 units on one side for special seats. 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 $\pi = 3.1416$)

(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
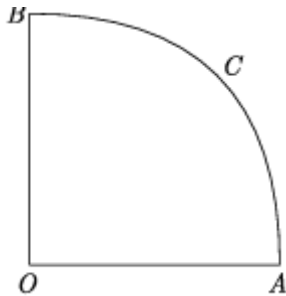
(A) 11cm   (B) 18 cm   (C) 25 cm   (D) 36 cm

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.

 (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 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 $\pi = 3.14$)

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
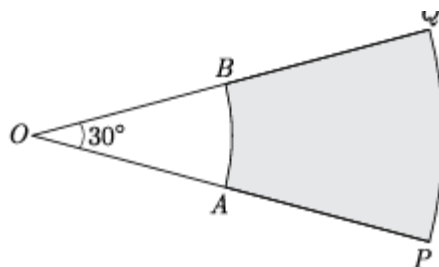
Q.8 Find the area of the adjoining diagram.
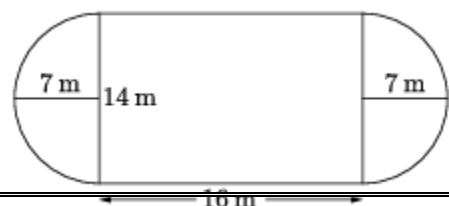
Q.9 We all love to eat pizzas, especially kids and a variety of pizzas are available in India which have been modified according to Indian taste and menu. From the Greeks to the Egyptians, from the Persians to the Indians, there have been incarnations of pizza served throughout history, Flatbreads, naan 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)
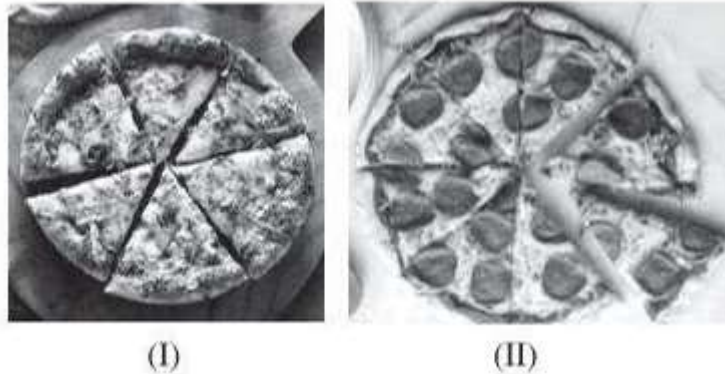
Based on the above information, solve the following questions:
(i). The area of one slice in pizza, marked (I) is:
a. 6π sq. inches   b. 8π sq. inches   c. 10π sq. inches   d. None of these
 (ii). The perimeter of the pizza slice shown in (1) is:
 a. $(\pi +12)$ inch   b. $(\pi+10)$ inch   c. $(2\pi+10)$ inch   d. $(2\pi +12)$ 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.

Q.4	B	Q.5	r2360° 2264 M²	Q.6	4:9
Q.7	25 cm	Q.8	4.19 cm²	Q.9(i)	c. 11.17 cm²
Q.9(ii)	B 8.38 cm²	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 m²
Q.7	462-44143	Q.8	924 cm²	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 cm², 598.201 cm²

WORKSHEET-3

Q.1	(a) 44 sq. cm	Q.2	(c) 360 2 m	Q.3	(c) 25 cm
Q.4	(B)	Q.5	9.42cm²	Q.6	1.98 km
Q.7	9.625cm²	Q.8	378 m²	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 m²

Name of solid	Volume	Total surface Area	Lateral surface Area
Cube	$V = a^3$	$TSA = 6a^2$	$LSA = 4a^2$
Cuboid	$V = l \times b \times h$	$TSA = 2(lb + bh + hl)$	$LSA = 2h(l + b)$
Cylinder	$V = \pi r^2 h$	$TSA = 2\pi r(h + r)$	$CSA = 2\pi rh$
Hollow cylinder $(R > r)$	$V = \pi(R^2 - r^2)h$	$TSA = 2\pi(R + r)(h + R - r)$	$2\pi(R+r)h$
Cone	$V = \dfrac{1}{3}\pi r^2 h$	$TSA = \pi r(l + r)$	$CSA = \pi rl$
Sphere	$V = \dfrac{4}{3}\pi r^3$	$TSA = 4\pi r^2$	$CSA = 4\pi r^2$
Hemisphere	$V = \dfrac{2}{3}\pi r^3$	$TSA = 3\pi r^2$	$CSA = 2\pi r^2$

Sum of surface areas of the faces of solid

Surface Area

Formulas

Combination of Solids

Example

Given: Inner diameter of the Cylindrical glass = 5 cm
Height = 5 cm

5

← 5 cm →
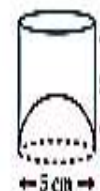
Find: Actual capacity of cylindrical glass.

Solution : Apparent capacity
of the glass = $\pi r^2 h$
= $3.14 \times 2.5 \times 2.5 \times 5$ cm^3
= 98.125 cm^3

Volume of hemisphere = $\dfrac{2}{3}\pi r^3$, if $r = 2.5$ cm
= $\dfrac{2}{3} \times 3.14 \times (2.5)^3$ cm^3 = 32.71 cm^3

Actual capacity = Apparent capacity
– Volume of hemisphere
= 98.125 – 32.71
= 65.42 cm^3

Volume

Quantity of 3-D space enclosed by a hollow/closed solid

Surface Areas and Volumes

Trace the Mind Map

First Level   • Second Level   • Third Level

Activate Windows
Go to Settings to a

SURFACE AREAS AND VOLUMES

1 .A solid metallic sphere of radius 7 cm is melted and recast into smaller spheres each of radius 1 cm. How many such small spheres can be made?

A. 343   B. 364   C. 512   D. 729

Hint: Use volume of sphere: $V = (4/3)\pi r^3$

2. The total surface area of a cone is 616 cm² and its slant height is 14 cm. Find the radius of the base.

A. 5 cm   B. 6 cm   C. 7 cm   D. 8 cm

Hint: TSA = $\pi r(l + r)$, use values to form equation.

3. A cylindrical pipe has inner radius 3.5 cm and water flows through it at 10 m/s. How much water flows through the pipe in 1 minute?

A. 2300 L   B. 2310 L   C. 2314 L   D. 2200 L

Hint: Volume = Area × velocity × time; convert units.

4. A right circular cone has a base radius of 3 cm and height 4 cm. Find its curved surface area.

 A. 35.2 cm² B. 36 cm²   C. 37.68 cm²   D. 38 cm²

Hint: $l = \sqrt{(r^2 + h^2)}$, then CSA = πrl

5. The diameter of a spherical balloon increases from 14 cm to 21 cm as air is being pumped into it. What is the ratio of the surface areas?

A. 2:3   B. 4:9   C. 1:2   D. 9:4

Hint: Surface area of sphere is proportional to square of radius.

6. A conical vessel of radius 6 cm and height 10 cm is completely filled with water. This water is poured into a cylindrical vessel of radius 3 cm. Find the height of water in the cylindrical vessel.

A. 10 cm   B. 20 cm   C. 30 cm   D. 40 cm

Hint: Volume of cone = Volume of cylinder; equate and solve.

7 . A cube of side 5 cm is painted on all its faces and then cut into smaller cubes of side 1 cm. How many of the smaller cubes will have exactly one face painted?

 A. 54   B. 98   C. 100   D. 150

Hint: Only face-center cubes have exactly one face painted.

8. The radii of two right circular cylinders are in the ratio 2:3 and heights are in the ratio 5:4. Find the ratio of their volumes.

   A. 5:6   B. 10:9   C. 4:5   D. 8:2

Hint: Volume = $\pi r^2 h$, apply the given ratios.

9. Assertion (A): When a solid hemisphere is melted and recast into a right circular cone of the same base radius, the height of the cone formed will be two-thirds of the radius of the hemisphere.
Reason (R): Volume of hemisphere = $(2/3)\pi r^3$ and volume of cone = $(1/3)\pi r^2 h$.
Options:

A). Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
B). Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
C) Assertion is true but Reason is false.
D) Assertion is false but Reason is true.

.

10. Assertion (A): If the slant height of a right circular cone remains the same and the radius is increased, the curved surface area increases.
Reason (R): The curved surface area of a cone is given by πrl.
Options:
A). Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
B). Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
C) Assertion is true but Reason is false.
D) Assertion is false but Reason is true

VERY SHORT ANSWER TYPE QUESTIONS (2 Marks Each)

11. The radius and height of a cone are in the ratio 5:12. If the slant height is 13 cm, find the total surface area of the cone.

12. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, surmounted by a cone of height 30 cm. Find the total surface area of the pole.
13. A conical tent is 10 m high and base radius 24 m. Find the cost of canvas at ₹25 per m².

14. A capsule is shaped like a cylinder with hemispherical ends. The total height is 15 cm and diameter is 4 cm. Find the surface area of the capsule.

15. A wooden toy is in the shape of a cone mounted on a hemisphere. The radius of the hemisphere is 3 cm and height of cone is 4 cm. Find the total surface area of the toy.

SHORT ANSWER TYPE QUESTIONS (3 Marks Each)

16. A solid consists of a hemisphere of radius 5 cm surmounted by a right circular cone whose slant height is 13 cm. Find the total surface area of the solid.
17. A hollow cylinder has external radius 10 cm, internal radius 6 cm, and height 20 cm. Find the total surface area.
18. Conical vessel of radius 7 cm, height 24 cm. Emptied into cylinder of radius 14 cm. Find height of water.
19 The radius and height of a right circular cone are in the ratio 5 : 12. If its volume is 3140 cm³, find its slant height.
20. A wooden toy is in the form of a hemisphere of radius 3.5 cm mounted on a cone of same base radius and height 7 cm. Find the total surface area of the toy..

LONG ANSWER TYPE QUESTIONS (5 Marks Each)

21. A cylinder is inscribed in a sphere of radius 10 cm, with height = diameter. Find the total surface area of the cylinder and compare it with the sphere.

22. A cylindrical tunnel has radius 3.5 m and length 300 m. Find the surface area of the walls and total cost of waterproofing at ₹120 per m².
23. A cone and a hemisphere have the same radius and their total surface areas are equal. If radius is 7 cm, find height of the cone.

COMPETENCY BASED QUESTIONS

24. You are part of a team designing eco-friendly water tanks for rural homes. Each tank is a cylinder with a conical top. If the cylindrical part is 1.5 m high with radius 0.8 m and the cone height is 0.6 m, calculate the total surface area (excluding base).
25. Your school plans to cover the open area with hemispherical green domes for environmental awareness. Each dome has a radius of 3.5 m. How much green canvas would be required to cover 5 such domes?

:ANSWERS:

1. Answer: B. 364
2.   Answer: C. 7 cm
3. Answer: B. 2310 L
4. Answer: C. 37.68 cm²
5. Answer: D. 9:4
6. Answer: B. 20 cm
7. Answer: C. 100
8. Answer: D. 8:27
9. **Answer: A.** Both Assertion and Reason are true, and Reason is the correct explanation of Assertion
10. **Answer: A.** Both Assertion and Reason are true, and Reason is the correct explanation of Assertion
11. Ans :r=5 cm, h=12 cm, l=13 cm
    TSA= $\pi r(r+l)$
             $= (22/7)\times5\times(5+13)$
             $= (22/7)\times5\times18$

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 $\frac{1}{3}\pi r^2$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.

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.
Long 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)

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 cm²   B. 420 cm²   C. 480 cm²   D. 220 cm²

Q2. A hemisphere has total surface area 462 cm². 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.

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 $\pi=22/7$)

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?

Long Answer Questions – (3 marks each)

Q8. A right circular cone has radius 6 cm and height 8 cm. Find its total surface area.
(Use $\pi=3.14$)

Q9. A cylinder has a curved surface area of 352 cm² and radius 7 cm. Find its height and total surface area.
(Use $\pi=22/7$)

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 $\pi=22/7$)

WORKSHEET 3

10.   Q1. The surface area of a sphere with radius 7 cm is:

A. 616 cm²   B. 308 cm²   C. 154 cm²   D. 500 cm²

11.   Q2. The volume of a cube of side 3 cm is:

A. 27 cm³   B. 18 cm³   C. 36 cm³   D. 9 cm³

12.   Q3. Total surface area of a cylinder with radius 3 cm and height 7 cm is:

A. 180 cm²   B. 188.4 cm²   C. 200 cm²   D. 250 cm²

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 = $(1/3)\pi r^2 h$ and volume of cylinder = $\pi r^2 h$.

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. 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.

Long Answer 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

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

Explanation: If we cut a cone into two parts parallel to the base, then the shape of the upper part remains the same.

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

Answer: **(b) Frustum of cone**

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.

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.

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.

VERY 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
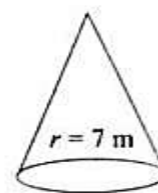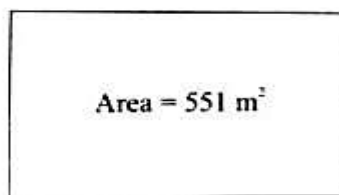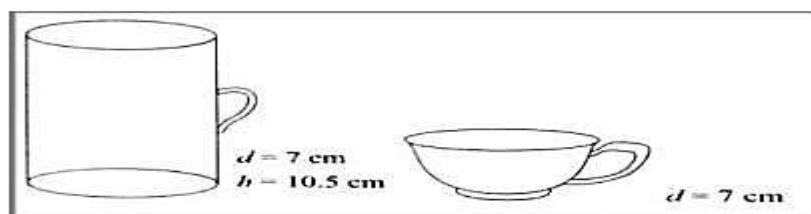
BASED QUESTION(4 MARKS QUESTION)

Q.11.Answer the given questions

1. The volume of cylindrical cup is

a) 295.75 cm^3 b) 7415.5 cm^3 c) 384.88 cm^3 d) 404.25 cm^3

2. The volume of hemispherical cup is

a) 179.67 cm^3 b) 89.83 cm^3 c) 172.25 cm^3 d) 210.60 cm^3

3. Which container had more juice and by how much?

a) Hemispherical cup, 195 cm^3 b) Cylindrical glass, 207 cm^3 c) Hemispherical cup, 280.85 cm^3

d) Cylindrical glass, 314.42 cm^3

4. The height of the conical tent prepared to accommodate four students is

a) 18m   b) 10m   c) 24m   d) 14m

5. How much space on the ground is occupied by each student in the conical tent

a) 54 m^2 b) 38.5 m^2 c) 86 m^{2}d) 24 m^2

Answer: b) 38.5 m^2

WORKSHEET 5

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) $4/3 \pi r^2$

If r is the radius of the sphere, then the surface area of the sphere is given by $4 \pi r^2$.

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) $1/^3\sqrt{2}$ (d) $1/^3\sqrt{4}$

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.

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.

Long 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.

Very 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:-
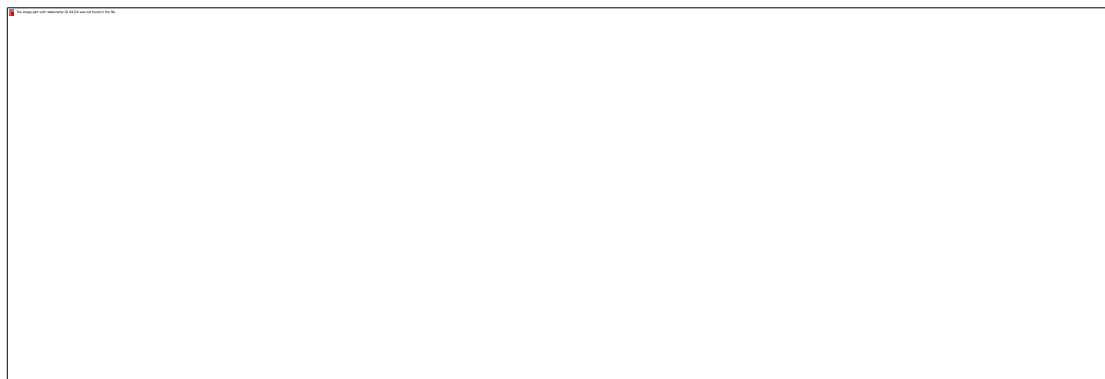
1. The length of the diagonal if each edge measures 6cm is

a) $3\sqrt{3}$　　b) $3\sqrt{6}$　　c) $\sqrt{12}$　　d) $6\sqrt{3}$

2. Volume of the solid figure if the length of the edge is 7cm is

a) 256 cm^3　　b) 196 cm^3　　c) 343 cm^3　　d) 434 cm^3

3. What is the curved surface area of hemisphere (ice cream) if the base radius is 7cm?

a) 309 cm^2　　b) 308 cm^2　　c) 803 cm^2　　d) 903 cm^2

4. Slant height of a cone if the radius is 7cm and the height is 24 cm___

a) 26cm　　b) 25 cm　　c) 52 cm　　d) 62cm

5. The total surface area of cone with hemispherical ice cream is

a) 858 cm^2　　b) 885 cm^2　　c) 588 cm^2　　d) 855 cm^2

WORK SHEET 1
ANSWER KEY : MCQ

1. B. 96 cm²
2. A. 7 cm
3. A. 21 cm
Section B: Assertion-Reason 4. A. Both A and R are true and R is the correct explanation of A.
Section C: Short Answer (2 marks) 5. CSA = πrl = (22/7) × 3.5 × 7 = 77 cm²
6. TSA = $3\pi r^2$ = 3 × (22/7) × 7² = 462 cm²
7. Side = $\sqrt[3]{512}$ = 8 cm; TSA = 6 × 8² = 384 cm²
Section D: Long Answer (3 marks)
8. CSA = $2\pi rh$ = (22/7) × 2.8 × 6 = 52.8 m²,
TSA = $2\pi r(h + r)$ = 79.2 m²
9. Volume of big sphere = $(4/3)\pi r^3$ = (4/3)(22/7)(4.2)³ = 310.464 cm³
Volume of small sphere = (4/3)(22/7)(0.7)³ = 1.436 cm³
Number = 310.464 ÷ 1.436 ≈ 216
Case Based (4 marks)
 10. a) l = $\sqrt{(7^2 + 24^2)}$ = 25 m
b) CSA = πrl = (22/7) × 7 × 25 = 550 m²
c) Paint needed = 550 ÷ 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) × 7 × ($\sqrt{(13^2 + 7^2)}$ + 7) = approx. 693.5 cm²
b) Volume = $(1/3)\pi r^2 h + (2/3)\pi r^3$ = approx. 1817.5
Worksheet 2 Answer Key MCQ
1. B. 440 cm²
2. B. 7 cm
3. B. 4 times

4 D.
Short Answer (2 marks)
5. TSA $= 6 \times 5^2 = 150$ cm²
6. Slant height $= \sqrt{(3^2 + 4^2)} = 5$ cm; CSA $= \pi r l = (22/7) \times 3 \times 5 = 47.14$ cm²

7. Volume of cylinder $= \pi r^2 h = (22/7)(4^2)(10) = 502.86$ cm³
Volume of sphere $= (4/3)\pi r^3 = (4/3)(22/7)(2^3) = 33.52$ cm³
Number of spheres $= 502.86 \div 33.52 \approx 15$
Long Answer (3 marks)
8. $l = \sqrt{(6^2 + 8^2)} = 10$ cm
CSA $= \pi r l = (22/7)(6)(10) = 188.57$ cm²
Base area $= \pi r^2 = (22/7)(36) = 113.14$
TSA $=$ CSA + base $= 301.71$ cm²

9. CSA $= 352$ cm² $= 2\pi r h$
$\rightarrow$ h $= 352 / (2 \times 22/7 \times 7) = 8$ cm
TSA $= 2\pi r(h + r) = 2 \times (22/7) \times 7 \times (8 + 7) = 660$ cm²

Case Based (4 marks)
10. a) Total length $= 10 + 2 \times 3 = 16$ cm
b) SA $=$ CSA of cylinder $+ 2 \times$ SA of hemisphere
$= 2\pi r h + 2 \times 2\pi r^2 = 2\pi r(h + 2r) = (2)(22/7)(3)(10 + 6) =$ approx. 301.7 cm²
c) Volume $= \pi r^2 h + (4/3)\pi r^3 =$ approx. 452.6 cm³
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 cm²
Volume $= (1/3)\pi r^2 h + (2/3)\pi r^3 =$ approx. 1817.5 cm³

Worksheet 3 Answer Key

MCQ

1. A. 616 cm²
2. A. 27 cm³
3. B. 188.4 cm²
4. A. Both A and R are true and R is the correct explanation of A.
Short Answer (2 marks) 5. TSA $= 6 \times 6^2 = 216$ cm²

6. Volume $= (4/3)\pi r^3 = (4/3)(22/7)(14^3) = 11494.66$ cm³
7. CSA $= \pi r l = (22/7) \times 3.5 \times 7 = 77$ cm²

Long Answer (3 marks)

8. Same as before: 4.2 cm to 0.7 cm sphere $\rightarrow$ 216 spheres

9. TSA $= 2\pi r(h + r) = (2)(22/7)(3.5)(10 + 3.5) = 296.38$ cm²
Volume $= \pi r^2 h = (22/7)(3.5^2)(10) = 384.99$ cm³

Case-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 m²
c) Canvas required = 286 m²
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 cm²

Volume = $(1/3)\pi r^2 h + (2/3)\pi r^3$ = approx. 267.6 cm³

CHAPTER - STATISTICS

If n is odd,
Median $= \left(\dfrac{n+1}{2}\right)^{th}$ term

Where n = Sum of frequencies

If n is even,
Median $= \dfrac{\left(\dfrac{n}{2}\right)^{th} \text{term} + \left(\dfrac{n}{2}+1\right)^{th} \text{term}}{2}$

Where n = Sum of frequencies

Median (For Ungrouped Data)

$\text{Mode} = l + \left(\dfrac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

l = lower limit of modal class
f_1 = frequency of modal class
f_0 = frequency of class preceding to modal class
f_2 = frequency of class succeeding to modal class
h = width of class interval

Definition

A collection, analysis, interpretation of quantitative data

Grouped Data

$\text{Median} = l + \left(\dfrac{\dfrac{n}{2} - c.f.}{f}\right) \times h$

Where, l = lower Limit of median class
n = Sum of frequencies
h = with of class interval
f = frequency of median class
$c.f.$ = Cumulative frequency of preceding to median class

Cumulative Frequency

Frequency obtained by adding the frequencies of all the classes preceding the class

Class Mark

$\left[\dfrac{\text{Upper class limit} + \text{Lower class limit}}{2}\right]$

Mean

Assumed Mean Method $\bar{x} = a + \dfrac{\sum f_i d_i}{\sum f_i}$

Here, $d_i = x_i - a$
f_i = frequencies
x_i = class marks

Direct Method $\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i}$

Where x_i = class marks.
f_i = frequencies

Statistics

Trace the Mind Map
• First Level • Second Level • Third Level

1) The mean of 6, 6+2x, 5 and 8+3x is 20. Find value of "x"?

A) 11   B) 6   C) 46   D) 23   Ans:11

2) The mean of 20 observations is 12. If each observation is increased by 5, find the new mean.

A) 17   B) 67   C)89   D) 18   Ans:17

3) If every term of the data consisting of n terms is decreased by 2 then the mean of the data would

A) Decrease by 2   B) Remain unchanged   C) Decrease by 2n   D) Decrease by 1

ANS: Option A

4) If the mean and median of a distribution are 14 and 15 respectively, then find the value of its mode.

A) 13   B) 16   C) 17   D) 20   Ans:17

5) Which of the following is a measure of central tendency?

A) Frequency   B) cumulative frequency   C) mean   D) class limit   Ans: Option C

6) The algebraic sum of deviations of a frequency distribution from its mean is

a) Always positive   b) Always negative   c) Zero   d) A Non Zero number   Ans: Option C

7) The median of the given data is 20. If each item is increased by 2 then the new median will be?

   a) 40   b) 22   c) 10   d) 15   Ans: Option B

8) If the mode of a data is 75 and mean is 45 then find the median.

A) 56   B) 54   C) 55   D) 60   Ans: Median 55

9) If mean of a distribution is 8.1 and $\sum f_i x_i=132 +5k$, $\sum f_i=20$ then find value of k.

A) 5   B) 4   C) 8   D) 6   Ans: k=6

10) If the mean of the following distribution is 2.6 find the value of y.

X	1	2	3	4	5
frequency	4	5	y	1	2

A) 7   B) 6   C) 9   D) 8   Ans: Y=8

VERY SHORT ANSWER TYPE QUESTION

11) If the mean of x and 1/x is M. Then find the mean of x^3 and $1/x^3$.   Ans :$M(4M^2-3)$

12) If the mean of the following distribution is 2.6, then find value of "y".

X	1	2	3	4	5
frequency	4	5	y	1	2

Ans: 8

13) If $di = xi - 25, \sum fidi = 200$ and $\sum fi = 100$, then find mean of x ?

Ans: 27

14) If mode of the given data is 54 then find the value of f.

Class interval	0 - 15	15 - 30	30 - 45	45 - 60	60 - 75	75 - 90
Frequency	3	5	f	16	12	9

Ans: 45 – 60 , f=10

15) If the difference of mode and median of a data is 24 then find the difference median and mean of the data. Ans:12

SHORT ANSWER TYPE QUESTIONS (3 MARKS EACH)

16) Find upper limit of the modal class of the below data.

Height(cm)	Below 140	Below 145	Below 150	Below 155	Below 160	Below 165
No. of girls	4	11	29	40	46	51

Ans:145-150, 150

17) Find mean using appropriate method correct to two decimal places

Marks	0 - 5	5 - 10	10 - 15	15 - 20	20 -25	25 - 30	30 – 35	35 - 40
No. of students	3	7	15	24	16	8	5	2

Ans:M=17.5 + 5(17/80) = 18.56

18) **Competency Based Question :**

Find the unknown entries a, b, c, d, e and f in the following distribution.

Height (in cm)	frequency	Cumulative frequency
150 - 155	12	A
155-160	B	25
160 - 165	10	C
165 - 170	B	43
170 - 175	E	48

175 - 180	2	F
Total	50	

Ans: a=12,b=13,c=35,d=8,e=48,f=50

19) If the mean of first n natural numbers is 5n/9, then find the value of "n"?   Ans:n=9

20) For group data if sum of frequency is 20 and $\sum f_i x_i = 2p+20$ and mean of the distribution is 12. Then find the value of p.   Ans: p=110

LONG ANSWER TYPE(5 MARKS)

21) Find the median of the data

Mid value	115	125	135	145	155	165	175	185	195
frequency	6	25	48	72	116	60	38	22	3

Ans: Median = 153.79

22) Find median of the distribution

Monthly consumption of electricity	No. of consumers
65 – 84	4
85 – 104	5
105 – 124	13
125 – 144	20
145 – 164	14
165 – 184	7
185 – 204	4

Ans:136

23) Find the mean of the data using assumed mean method

Class	2 – 8	8 - 14	14 - 20	20 – 26	26 - 32
Frequency	6	3	12	11	08

Ans:18.8

24) The mean of an observation is M. If the first term is increased by 1, second by 2 and so on then find the new mean.   Ans: $x + \{(n+1)/2\}$

25) Cricket is a team sport where two teams of 11 players compete to score runs and dismiss opponents. It is played using a bat and a ball. An inning in cricket is when one team bats while the other team bowls. The table below shows the number of innings played for various ranges of overs in 50 matches of a tournament. (Note: Round all calculations to two decimal places.)Calculate mean using step deviation method

The table below gives wages of workers in a factory

Number of overs	Number of innings
0-10	5
10-20	10
20-30	8
30-40	15
40-50	12

1.Draw a histogram for the given data. [2]

2. What is the average number of overs played per inning by the team in the tournament? Show your work. [2]

Ans:28.8 overs

3.For which range of overs were the most innings played? Which measure of central tendency will definitely be found within that range?

Ans: 30-40 overs ,mode

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) 25

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 – 50
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 Cities	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) of 50 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?

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)
(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 (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

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

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

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

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:

$$\text{Mode} = 3(\text{Median}) - 2(\text{Mean})$$

(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.Find the value of **p** ,if the mode of the following distribution is 48:

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

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.

6. Find mode of the following data:

x_i	30	21	27	15	35
f_i	7	5	6	3	8

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.

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

Daily distance travelled(in km)	200-209	210-219	220-229	230-239	240-249
Number of buses	4	14	26	10	6

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.

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. 6th 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
MIND MAP

Dice
Two dice are rolled, what is probability of getting 12 as a sum?

Solution : Number of possible outcomes = 6^2 = 36

Number of favourable outcomes = 1 i.e. (6, 6)

$P(E) = \dfrac{1}{36}$

Sure or Certain Event
When event having probability to occur as 1

Complementary Event
For event E, complement event, $P(\bar{E}) = 1 - P(E)$

Elementary Event
Event having only one outcome of the experiment

Examples

Definitions

Experimental Probability

What actually happens in an experiment

$P(E) = \dfrac{\text{Number of outcomes favourable to E}}{\text{Number of all possible outcomes of the experiment}}$

Coin
When a coin is tossed, what would be the probability of appearing head ?

Solution : Total outcomes = 2 i.e. (H, T)
Favourable outcomes = 1

Required Prob. $P(E) = \dfrac{1}{2}$

Value

Probability

Card
What is the probability of getting an ace from a pack of 52 cards?

Solution : Number of favourable outcomes = 4

Number of possible outcomes = 52

$P(E) = \dfrac{4}{52} = \dfrac{1}{13}$

Theoretical Probability

Sum of probabilities of all elementary events is 1.
For events A, B, C; P(A) + P(B) + P(C) = 1

$0 \leq P(E) \leq 1$

What we expect to happen in an experiment

$P(E) = \dfrac{\text{Number of trials in which the event happened}}{\text{Total number of trials}}$

Trace the Mind Map
▸ First Level ▸ Second Level ▸ Third Level

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.Some of the statements like:

❖ Probably it may rain today

❖ He/she may possibly join politics

❖ She is probably right Probability numerically measures the degree of certainty of the occurrence of events.

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'

$P(E)=$ $Number of favouable outcomes/Total number of possible outcomes$

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 $P(E)+P(E')=1$

Q1 – Q8: Choose the correct option.

1. A card is drawn from a well-shuffled deck of 52 cards. What is the probability of getting a king?
   a) 1/13   **b)** 1/26   **c)** 4/13   **d**) 1/52
   Ans: a) 1/13

2. A die is thrown once. What is the probability of getting a number less than 5?
   a) 4/6   **b)** 5/6   **c)** 2/3   **d**) 1/3
   Ans: a) 4/6

3. One card is drawn from a well-shuffled deck. The probability of getting a red queen is:
   a) 2/52   **b)** 1/26   **c)** 1/13   **d**) 1/52
   Ans: b) 1/26

4. The probability of an event that is certain to happen is:
   a) 0   **b)** 1   **c)** 1/2   **d**) 3/4
   Ans: b) 1

5. If a number from 1 to 20 is chosen at random, what is the probability that it is a multiple of 3?
   a) 1/5   **b)** 1/4   **c)** 1/3   **d)** 1/2
   Ans: c) 1/3

6. Two coins are tossed simultaneously. What is the probability of getting at most one head?
   a) 1/4   **b)** 1/2   **c)** 3/4   **d)** 2/3
   Ans: c) 3/4

7. What is the probability of choosing a vowel randomly from the English alphabet?
   a) 5/26   **b)** 4/13   **c)** 1/5   **d)** 2/5
   Ans: a) 5/26

8. A box contains 3 red balls and 7 blue balls. One ball is drawn at random. The probability that it is red is:
   a) 3/7   **b)** 3/10   **c)** 7/10   **d)** 1/2
   Ans: b) 3/10

Q9 – Q10: Assertion and Reasoning*(1 mark each)*
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.

9.Assertion (A): Probability of a sure event is 1.
Reason (R): A sure event has no chance of occurring.
Ans: c) A is true, R is false

10. Assertion (A): Probability of an event lies between 0 and 1 (inclusive).
Reason (R): The number of favourable outcomes can never exceed total outcomes.
Ans: a) Both A and R are true, and R is the correct explanation of A.

11. One card is drawn from a deck of 52 cards. Find the probability that it is neither a king nor a queen.
Ans: 11/13

12. A bag contains 5 white, 4 red and 3 green balls. One ball is drawn at random. Find the probability that the ball drawn is white or green.
Ans: 2/3

13. A coin is tossed twice. What is the probability of getting exactly one head?
Ans: 1/2

14. A number is selected randomly from numbers 1 to 30. Find the probability that it is a multiple of 5 or 7.
Ans: 1/3

15. What is the probability of getting an odd number when a die is thrown once?
Ans: 1/2

Section C: Short Answer Questions *(3 marks each)*

16. A bag contains 4 red balls and 6 black balls. One ball is drawn at random. What is the probability that it is
(i) red   (ii) not red   (iii) black
Ans: (i) 4/10, (ii) 6/10, (iii) 6/10

17. A die is thrown once. Find the probability of getting
(i) a prime number   (ii) a composite number   (iii) neither prime nor composite
Ans: (i) 3/6, (ii) 2/6, (iii) 1/6

18. A letter is chosen at random from the word "STATISTICS". Find the probability of choosing
(i) a vowel   (ii) the letter 'T'   (iii) a consonant
Ans: (i) 3/10, (ii) 3/10, (iii) 7/10

19. A card is drawn from a pack of 52 cards. What is the probability of getting
(i) a face card   (ii) a black card   (iii) a red king
Ans: (i) 12/52, (ii) 26/52, (iii) 1/26

20. A die is rolled twice. What is the probability of getting a doublet (both numbers same)?
Ans: 1/6

Section D: Long Answer Questions *(5 marks each)*

21.   A bag contains 5 red balls, 7 blue balls and 3 green balls. A ball is drawn at random. Find the probability of the following events:
(i) Drawing a red ball
(ii) Drawing a blue ball
(iii) Drawing a green ball
(iv) Drawing a ball which is not red
(v) Drawing a yellow ball
Ans: (i) 5/15, (ii) 7/15, (iii) 3/15, (iv) 10/15, (v) 0

22. Cards marked with numbers 2 to 50 are placed in a box. One card is drawn at random. Find the probability of getting:
(i) An even number   (ii) A number divisible by 5
(iii) A number which is a perfect square
(iv) A number divisible by both 2 and 3
(v) A number divisible by 7
Ans: (i) 24/49, (ii) 9/49, (iii) 6/49, (iv) 8/49, (v) 7/49

23. A bag contains 3 red balls and 5 black balls. Two balls are drawn successively with replacement. Find the probability of:
(i) Both red   (ii) Both black
(iii) One red and one black
(iv) At least one red   (v) At least one black

Ans: (i) 9/64, (ii) 25/64, (iii) 30/64, (iv) 39/64, (v) 55/64

Section E: Competency-Based Questions *(4 marks each)*

24. In a school, 30% of students like Mathematics, 40% like Science, and the rest like both subjects. If a student is selected at random, find the probability that the student:
(i) Likes Mathematics   (ii) Likes Science
(iii) Likes both   (iv) Does not like either
Ans: (i) 0.30, (ii) 0.40, (iii) 0.30, (iv) 0

25. A survey was conducted among 100 students about their favourite sport. 45 liked Cricket, 30 liked Football, 25 liked Hockey. If a student is chosen at random, what is the probability that the student:
(i) Likes Cricket   (ii) Does not like Hockey
(iii) Likes Football or Hockey
(iv) Does not like Cricket or Football
Ans: (i) 0.45, (ii) 0.75, (iii) 0.55, (iv) 0.25

WORKSHEET1: 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

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

(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 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
(x)   At least one head.
(xi)   Exactly one tail.
(xii)   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?

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) favourable 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($a\cos\theta$, $a\sin\theta$) 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:
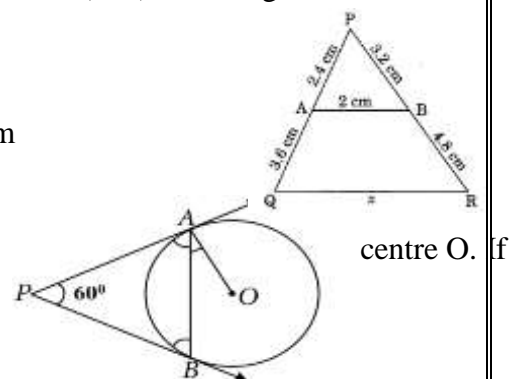
Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

(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 volume a^3. Units are joined end to end to form a Cuboid. Then the surface area of the resulting cuboid is $2(2n+1)a^2$ square 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 $\pi = \frac{22}{7}$)

(OR)

A horse is placed for grazing inside a rectangular field 70 m by 52 m and is tethered to one 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
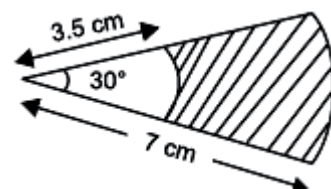
In ∆ABC, right angled at B, sin A $=\frac{7}{25}$, then fin the value of sec C + cot C

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 ∆PCD.
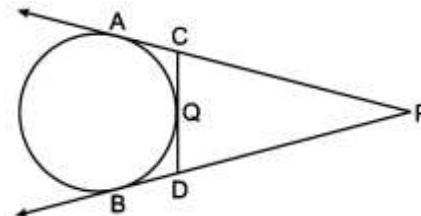
(OR)

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
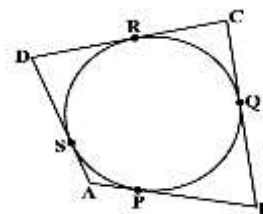
SECTION –D

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.

37.
Students of class X, Emma, Anna, Krish and 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 A to 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.
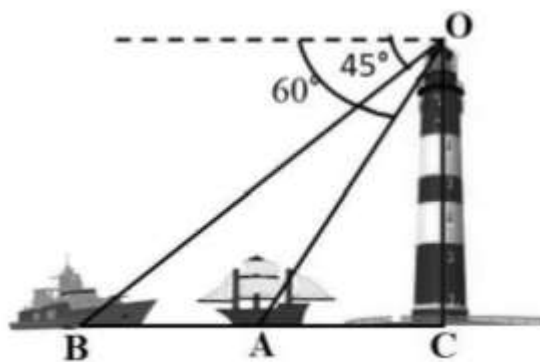
Based on above information answer the following questions.
(i) If a person observes a ship whose angle of depression is 60° then how much distance is the ship away from him?
(ii)If a person observes another ship whose angle of depression is 45° then how much distance that ship is away from him?
(iii)If 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).
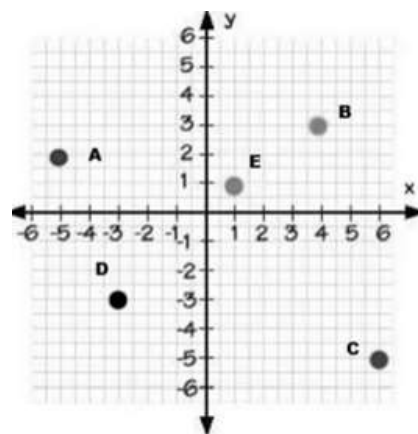
ANSWER KEY
MATHEMATICS (BASIC) - 1 (2025-26)
SECTION A
1. A, 2. A, 3 C, 4 C, 5. A, 6. D, 7.B, 8. A, 9.C, 10. A, 11. C, 12. D, 13.A, 14.A, 15.D, 16. A
17. A, 18. D, 19. A, 20. A.

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 $= \frac{\theta}{360°} \times \pi r^2 = \frac{90°}{360°} \times \frac{22}{7} \times (21)^2 = 346.5 m^2$

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 BSo ∠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

$P(doublet) = \dfrac{6}{36} = \dfrac{1}{6}$

(ii) Probability that sum is less than 9

Total favorable outcomes $= 1 + 2 + 3 + 4 + 5 + 6 + 5 = 26$, $P(sum < 9) = \dfrac{26}{36} = \dfrac{13}{18}$

(iii) Probability that sum is even, Even sums from two dice: 2, 4, 6, 8, 10, 12

Total favorable outcomes $=1+3+5+5+3+1=18$, $P(even\ sum) = \dfrac{18}{36} = \dfrac{1}{2}$

31. On solving the equations, we get x=2, y=-1

SECTION D

32. Now p+q+78 = 90 $\Rightarrow$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 $\Rightarrow$ 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. $height\ of\ cone\ h = \sqrt{l^2 - r^2}$, $l = 6m$

$TSA\ of\ rocket = \pi rl + 2\pi rh + \pi r^2 = 594m^2$, $Volume = \dfrac{1}{3}\pi r^2 h + \pi r^2 h = 1081.93m^3$

(OR)

Diameter of hemisphere= 12 cm, radius=6 cm

Total height of vessel=10 cm.Height of cylinder=10-6=4 cm

$Inner\ CSA\ of\ Vessel = 2\pi rh + 2\pi r^2 = 377.14cm^2$

$Volume\ of\ the\ vessel = \dfrac{2}{3}\pi r^3 + \pi r^2 h = 905.14cm^3$

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) $S_n= \dfrac{n}{2}[2a + (n-1)d]n^2+2n - 120 = 0$, Solve the quadratic equation we get n=10 or -12

Rejecting negative value, $n = 10 \rightarrow$ 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) $tan60° = \dfrac{20}{AC}$, $AC = \dfrac{20}{\sqrt{3}} = \dfrac{20\sqrt{3}}{3}m$

(ii) $tan45° = \dfrac{20}{BC}$, BC = 20m

(iii) $tan30° = \dfrac{20}{BC}$, BC = $20\sqrt{3}$m

39. $tan60° = \dfrac{20}{AC}$, $AC = \dfrac{40}{\sqrt{3}} = \dfrac{40\sqrt{3}}{3}m$, AB= $\dfrac{20}{\sqrt{3}}m$

(or)

$tan45° = \dfrac{20}{BC}$, BC = 20m

$tan60° = \dfrac{20}{AC}$, $AC = \dfrac{20}{\sqrt{3}} = \dfrac{20\sqrt{3}}{3}m$, $AB = \dfrac{20\sqrt{3}-20}{\sqrt{3}}m$

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) $2\sqrt{7}$ 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) $\sqrt{119}$ 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)$\times$LCM(p,q) = p $\times$ 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 $\angle ADC = \angle BAC$. Show that $CA^2 = CB.CD$

OR

In the figure, DE||OQ and DF||OR, show that EF||QR.
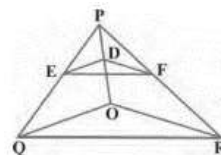
24. If tan (A + B) = $\sqrt{3}$ and tan (A - B) = $\frac{1}{\sqrt{3}}$; 0°<A+B≤90°;A>B, find A and B.

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 $\sqrt{\frac{1+sinA}{1-sinA}}$ = sec A + tan A

OR

(cosecA-sinA)(secA-cosA)=$\frac{1}{(tanA+cotA)}$

214

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

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
Number of patients	6	11	21	23	14	5

following table shows the ages of the patients

admitted in a hospital during a year:

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 $\Delta ABC \sim \Delta PQR$

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
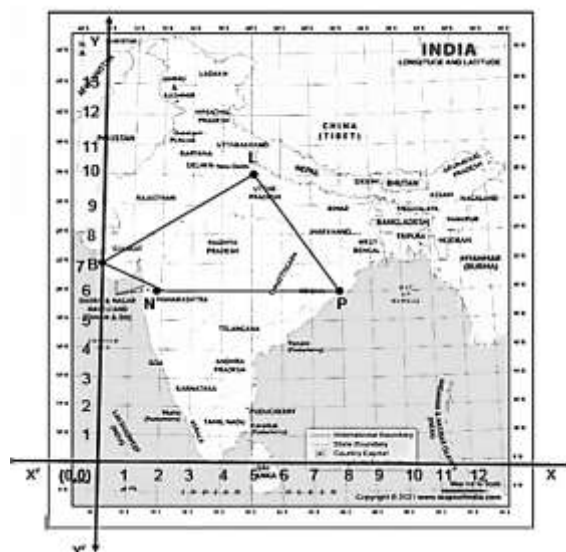
(i)Find the distance between Lucknow to Bhuj

(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
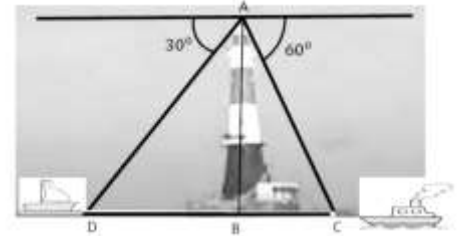
(i)   Find the distance of boat from the lighthouse?
(ii)   Find the distance of ship from the lighthouse?
(iii)   Find the time taken by the boat to reach the light house if it is moving at the rate of 2 km per hour.

OR

The ratio of the height of a light house and the length of its shadow on the ground is $\sqrt{3}: 1$. 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) $\sqrt{119}$ 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 $\triangle$AOB
     = 28.5 cm²

SECTION C

26.   Correct proof
27. The two-digit number is83

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.

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 ∆ADB, tan30º = $\frac{AB}{BD} \Rightarrow \frac{1}{\sqrt{3}} = \frac{40}{DB} \Rightarrow$ DB= $40\sqrt{3}$

ii) In ∆ACB, tan60º = $\frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{40}{BC} \Rightarrow$ 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 ∆ABC, tan θ = $\frac{AB}{BC}$

$\frac{AB}{BC} = \sqrt{3} \Rightarrow θ = 60$
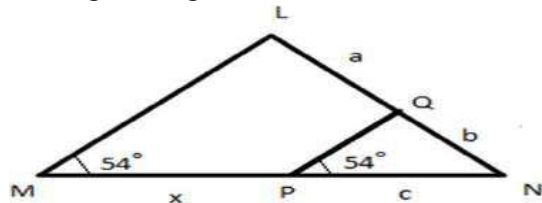
Class: X   **Max Marks: 80**
Subject: MATHEMATICS   **Time: 3 hrs.**
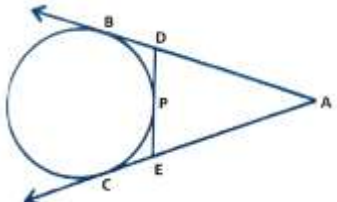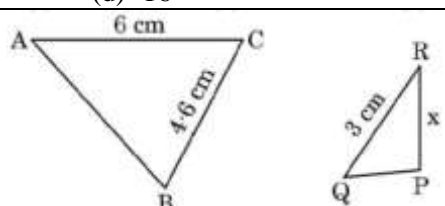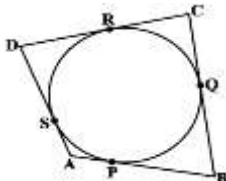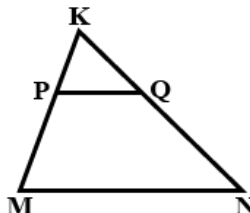
General Instructions:
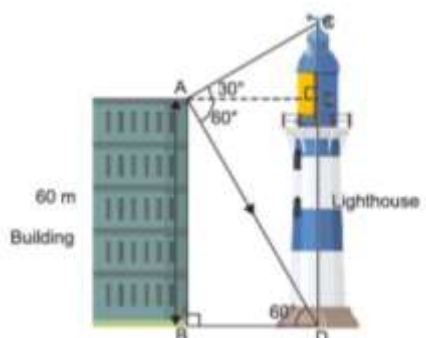
Read the following instructions carefully and follow them:
1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no.
   19 and 20 are Assertion- Reason based 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) 9th (b) 10th (c) 11th (d) 12th	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	1
	(a) 30º (b)45º (c) 60º (d)90º	
11.	The number of quadratic polynomials having zeroes –1 and 3 is :	1
	(a) 1 (b) 2 (c) 3 (d) more than 3	
12.	In figure, if AB = 8 cm and PE = 3 cm, then AE =	1
	(a)11 cm (b) 7 cm (c) 5 cm (d) 3 cm	
13.	The value of $\cos^2 60° + 2 \tan 45° – \sin^2 30°$ is	1
	(a) $\sqrt{3}$ (b) 3 (c) 2 (d) 0	
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	1
	(a) 8 (b)16 (c) -8 (d) -16	
15.	In the given figure, if $\Delta ABC \sim \Delta QPR$, then the value of x is :	1
	(a)5·3 cm (b) 4·6 cm	
	(c) 2·3 cm (d) 4 cm	
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	1
	(a) 6cm (b) 7cm (c) 8cm (d) 9cm	
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	1
	(a) 77 cm² (b) 77/2cm² (c) 154 cm² (d) 77/4cm²	
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.	1
	Reason (R): If a, b are two positive integers, then HCF x LCM = a x b.	
20.	**Assertion (A):**The pair of equations $x + 2y – \frac{1}{2} = 0$ and $–3x – 6y + 1 = 0$ have no solution	1
	Reason (R): Graphical representation of two parallel lines will have no point in common.	
	SECTION B	
21.	If $\cos (A + B) = \frac{1}{2}$ and $\cos (A – B) = \frac{\sqrt{3}}{2}$; $0° < A + B \le 90°$; 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:	2

Marks obtained	0–20	20–40	40–60	60–80	80–100
Number of students	15	18	21	29	17

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

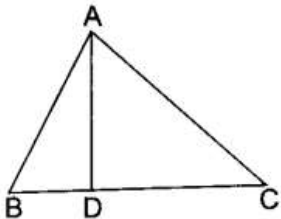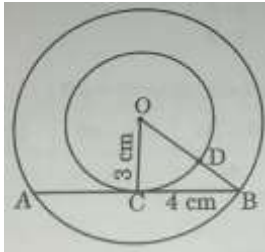| 32.	A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train. **(OR)** A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same 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

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	

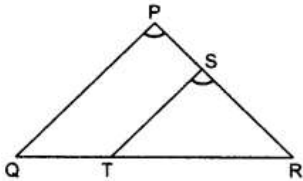|		
35.	A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel. **(OR)** A medicine capsule is in the shape of a cylinder with two hemispheres stuck to 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.	5
	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, IIlrd 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 √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.
	
	(i)Find the curved surface area of the hemisphere.
	        (Take π = 3.14)
	(ii) Find the total surface area of the bird-bath.
	        (Take π = 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?
		1
		
		1
		
		2

Marking scheme for Sample paper 3 Basic Math

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 $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$ (OR) Proving $(\sin \alpha + \cos \alpha)(\tan \alpha + \cot \alpha) = \sec \alpha + \operatorname{cosec} \alpha$

	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

S N	SECTION A	MARKS
	Question number 1 to 20 are Multiple Choice Questions of one mark each	
1	If the quadratic equation $x^2 + 2kx + 9 = 0$ has equal roots, then the value of k is: A. 1B. 3C. ±3D. ±2	1
2.	Distance between the points (4, 0) and (0, 3) is: A. 3B. 4C. 5D. 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 = BC²(B) AB.AC = BC² (C) BD.CD = AD²(D) AB.AC = AD²	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

13	The length of the shadow of a tower when the suns altitude changes from 30° to 60° will 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		2
	If (secA + tanA) (1 − sinA) = K cos A , then find the value of K ? OR Evaluate : $\tan^2 60° - \csc^2 30° - 2\tan^2 30°$	

SECTION C

26	The greater of two supplementary angles exceeds the smaller by 18 °. find measures of these two angles.	3
27	Prove that $(\cot\theta - \csc\theta)^2 = \dfrac{1-\cos\theta}{1+\cos\theta}$	3
28	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	3
29	Prove that the parallelogram circumscribing a circle is a rhombus.	3
30	Prove that $\sqrt{5}$ is an irrational number **Or** Find which among the following numbers, $a, b,$ and $c,$ is/are composite numbers.$a=7×11×13+13$ $b=6×5×4+4$ $c=7×13+6$	3
31	If α and β are zeroes of the polynomial $x^2 + 3x +1$ .Find the polynomial whose zeroes are 2α and 2β	3

SECTION D

32	The difference of squares of two numbers is 180. The square of the smaller number is 8 times the larger number.Find the numbers	5
33	The table displays the daily expenditure of 25 households in a locality. Find the value of x Calculate the mean daily expenditure	5

daily expenditure (in (in ₹))	500-750	750-1000	1000-1250	1250-1500	1500-1750
No of Household	4	2x + 1	12	x	2

34	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
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 ~ ΔPQR. OR State and Prove Basic Proportionality theorem	5

SECTION E

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

Based on the above information, answer the following questions :

1
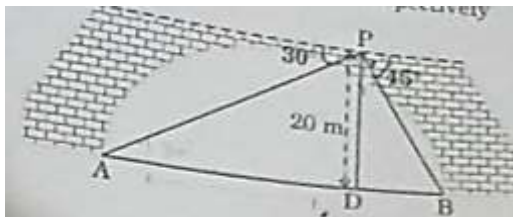
(i) Find the distance travelled by boat A to reach point D in the river, vertically below the point *P*. (Use 3=1.73) 1 1

1

2

(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

37

In a society there is a circular park having two gates.the gates are placedat two pointsA (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

1
1
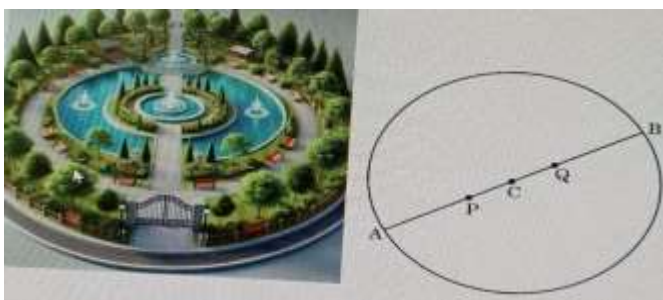
(i) Find the co ordinates of the centre C
(ii) Find the radius of the circular park
(iii) (a) Find the co-ordinates of the point P
            Or
(c) Find the distance of the fountain at Q from gate A

2

38
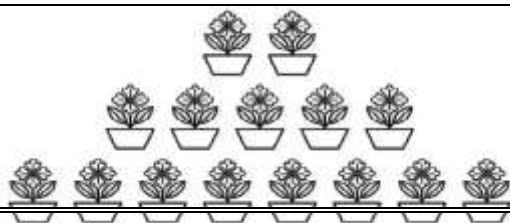
Aahana being a plant lover decides to convert her balcony into beautiful garden full of

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.

1

1

2

Based on the above information, answer the following questions :

(i) Find the number of pots placed in the 10th row   (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.

ANSWER KEY

1	C. ± 3	
2	**C. 5**	
3	(A) 3 and 7	
4	**B)** sin 45° = cos 45°	
5	C) BD.CD = AD²	
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) ∠B = ∠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	1 1

	$= \frac{3}{4} \times 2 \prod r = \frac{3}{4} \times 2 \times \prod \times 10 = 15 \prod$ cm		
	Perimeter $= 20 + 15 \prod$ cm	1	

SECTION B

22	Sol: For x - y = - 2 $\qquad\qquad$ 4x - y = 4	1	

x	0	1
y	2	0

x	0	1
y	- 4	0

1
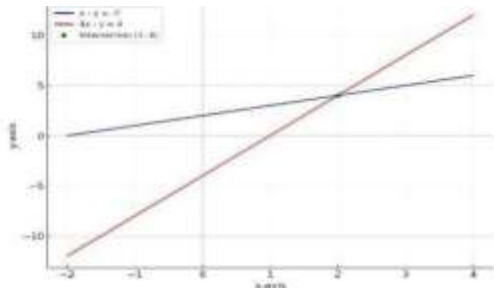
Ans. The solution to the system of linear equation is (2,0)

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.		
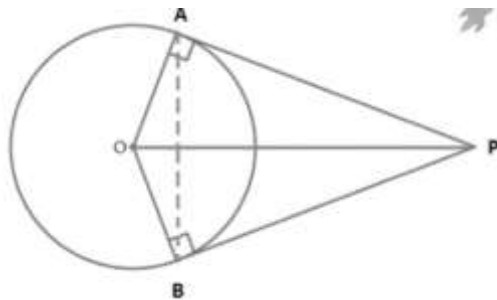
The <u>tangent</u> at any point of a <u>circle</u> is always <u>perpendicular</u> to

the <u>radius</u> through the point of contact.

$\therefore \angle OAP = \angle OBP = 90°$ --- Equation (i)

In a <u>quadrilateral</u>, the sum of interior angles is 360°.

$\therefore$ In OAPB,

$\angle OAP + \angle APB + \angle PBO + \angle BOA = 360°$

Using Equation (i), we can write the above equation as

$90° + \angle APB + 90° + \angle BOA = 360°$

$\angle APB + \angle BOA = 360° - 180°$

$\therefore \angle APB + \angle BOA = 180°$

Hence, proved

24	In ΔRPQ and ΔRTS,		1
	$\angle RPQ = \angle RTS$ (given)		
	$\angle PRQ = \angle TRS$ (common angle)		
	Thus, $\Delta RPQ \sim \Delta RTS$ (AA criterion)		1

25	**L.** H.S. =(secA+tanA)(1−sinA) $=(\frac{1}{cosA}+\frac{sin A}{cosA})(1-sinA)$	1
	$=\frac{(1+sinA)}{cosA}$ x (1−sinA)	
	$=\frac{1-sin^2A}{cosA}=\frac{COS^2A}{cosA}$ = cosA=R.H.S.	1
	OR	
	tan ^{2} 60° - 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	

	SECTION C	
26	Sol: Let the smaller angle be x and greater angle be (x + 18°)	1
	As the angles are supplementary so	
	x+(x + 18°) = 180° = 2x +18° =180°	1
	x = 81° smaller angle	
	X + 18° = 99° larger angle	1
27	L.H.S=(cot θ - cosecθ)^2	
	$(\frac{cosθ}{sin θ} - \frac{1}{sin θ})^2$ =$(\frac{cosθ-1}{sin θ})^2$ = $\frac{(cosθ-1)^2}{sin^2θ}$	
	$=\frac{\{-(1-cos θ)\}^2}{1-cos^2θ}$	
	$=\frac{(1-cosθ)^2}{(1+cosθ)(1-cosθ)}$ = $\frac{(1-cosθ)(1-cosθ)}{(1+cosθ)(1-cosθ)}$ = $\frac{(1-cosθ)}{(1+cosθ)}$ R.H.S	
28	Total number of cards 52	1
	(a) P(getting a king) = 4/52 = 1/13	
	(b) P(getting a black card) = 26/52 = 1/2	1
	(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
29	Sol: ABCD is a parallelogram. Therefore, opposite sides are equal.	
	AB = CD , BC = AD	
	According to Theorem 10.2: The lengths of <u>tangents</u> drawn from an external <u>point</u> 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 <u>parallelogram</u>, 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 <u>rhombus</u>.	

30	Correct proof OR Sol: $a=7\times11\times13+13= 13\ (7\times11+1) = 13$ x 78 (a is a composite number)	1	
	$b=6\times5\times4+4 = 4(6\times5+1) = 4$ x 31 (b is a composite number)	1	
	$c=7\times13+6 = 91 + 6 = 97$ (97 is a prime number , so c is not a composite number) Ans. Only a and b are composite number	1	

31	Sol: the given polynomial is $x^2 + 3x +1$ Sum of zeroes $\alpha + \beta = \dfrac{-b}{a} = \dfrac{-3}{1} = -3$, product of zeroes = α x $\beta = \dfrac{c}{a} = \dfrac{1}{1} = 1$Required polynomial Sum of **new zeroes** $2(\alpha + \beta) = 2x(-3) = -6$ product of **new zeroes** 2α x $2\beta = 4(\alpha$ x $\beta) = 4x\ 1 = 4$ **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) $x^2−8x−180=0$ $\Rightarrow x^2−18x+10x−180=0 \Rightarrow x(x−18)+10(x−18)=0$ $\Rightarrow (x−18)(x+10)=0 \Rightarrow x−18=0$ or $x+10=0$ $\Rightarrow x=18$ or$x=−10$. Now, x=18 ⟹ (smaller number)^2 =(8×18)=144		

232

→ smaller number=12 or −12.

Also, x=−10⇒(smaller number)^2={8×(−10)}=−80, which is not possible.
Hence, the numbers are (18 and 12) or (18 and −12).

	Daily expenditure (in ₹)	No of Household fi	xi	fixi
33	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

= 2πr^2 + 2πrh

= 2πr (r + h)

= 2 × 22/7 × 7cm (7 cm + 6 cm)

= 2 × 22 × 13 cm^2

= 572 cm^2
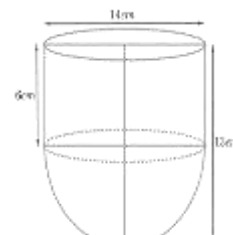
Given : In ΔABC and ΔPQR , AB / PQ = AC / PR = AD / PM

To prove : ΔABC ~ ΔPQR.
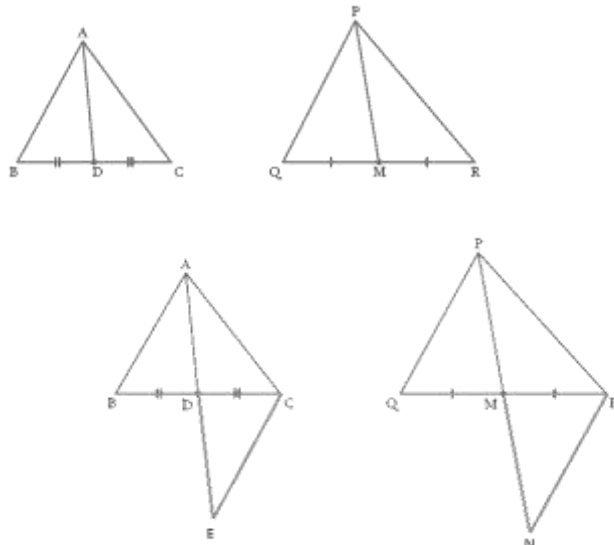
Construction : Produce AD to E so that AD = DE. Join CE

Similarly, produce PM to N such that PM = MN , and join RN.

In ΔABD and ΔCDE

AD = DE [By Construction]

BD = DC [AD is the median]

∠ADB = ∠CDE [Vertically opposite angles]

Therefore, ΔABD ≅ ΔECD [By SAS criterion of congruence]

⇒ AB = CE [CPCT] ...(i)

Also, in ΔPQM and ΔMNR

PM = MN [By Construction]

QM = MR [PM is the median]

∠PMQ = ∠NMR [Vertically opposite angles]

Therefore, ΔPQM = ΔNRM [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, ΔACE ~ ΔPRN [By SSS similarity criterion]

Therefore, ∠CAE = ∠RPN

Similarly, ∠BAE = ∠QPN

Hence, ∠CAE + ∠BAE = ∠RPN + ∠QPN

⇒∠BAC = ∠QPR

⇒∠A = ∠P ....(iii)

Now, In ΔABC and ΔPQR

AB/PQ = AC/PR

∠A = ∠P [from (iii)]

Therefore, ΔABC ~ ΔPQR [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 , $\tan(30°) = \frac{PD}{AD} = \frac{20}{AD}$ $\qquad \frac{1}{\sqrt{3}} = \frac{20}{AD}$, 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	1 1 1 1

		co-ordinates of point Q = $(\frac{110}{3}, 40)$ using distance formula Now AQ = $\frac{100}{3}$ units	
38		*S*ol: (i) Number of pots in each row forms an A.P 2, 5,8………. Using nth term formula $a_n = a + (n-1)d$ **$a_{10} = 29$**	1
		(ii)the difference in the number of pots placed in 5th row and 2nd row $a_5 - a_2 = 14 - 5 = $ **9**	1
		(iii) Formula for sum of n terms $S_n = 100 = \frac{n}{2}\{2a + (n-1)d\}$ $\qquad 3n^2 + n - 200 = 0$, n= 8 or $\frac{-50}{6}$ **total number of rows formed is 8.**	2

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
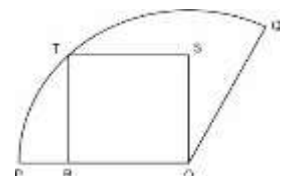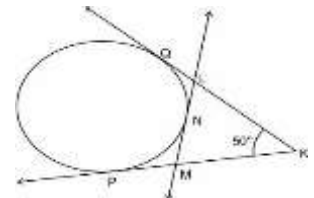
surface area of the solid formed?
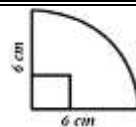
A) 108 π B) 100 π C) 72 π D) 22

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
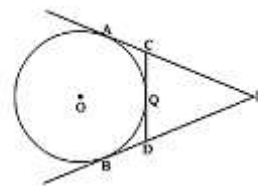
24. If ΔABC and ΔDEF are similar triangles such that ∠A=57°and∠E=83°.Find∠C.

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.
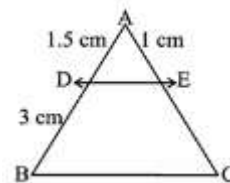
SECTION C

26. Prove that √5 is Irrational.

27. The zeroes of x²- 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
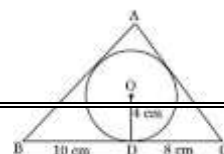
~~and DC are of lengths 10 cm and 8 cm. Find the sides AB and AC given~~
area of ΔABC is 90

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 $(\sin \theta + 1 + \cos \theta)(\sin \theta - 1 + \cos \theta) \sec \theta \csc \theta = 2$

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.
.Find the amount paid by him in 30th instalment?
i.If total instalments are 40 then find the amount paid in the last instalment?
ii.Find the amount paid by him in the 30 instalments?

[OR]
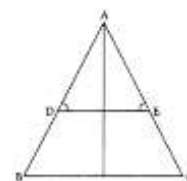
What amount does he still have to pay after 30th instalment?

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 ?
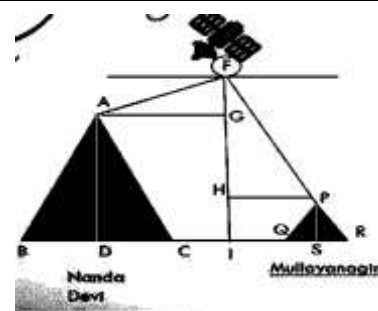
OR

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.

SAMPLE PAPER I STANDARD (041)
SECTION A

1. D) 3   2. A) 7   3. A) 0   4. C) 18   5. B) $\sqrt{128}$ 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=∠E and ∠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 cm²

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
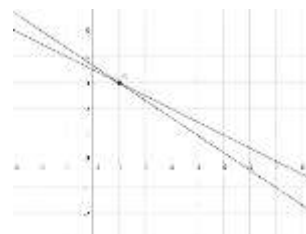
Volume of cylinder is = πr^{2}h

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=π×($\frac{d}{2}$)^2×126000 cm^3

volume of the water that falls into the cylindrical tank = volume of length of water

$\Rightarrow$π×($\frac{d}{2}$)^2×126000=π(40)^{2}325, 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] $\Rightarrow$ DE || BC $\Rightarrow$∠D = ∠B [Corresponding angle]

∠E = ∠C But ∠D = ∠E [Given] Hence ∠B = ∠C …… $\frac{1}{2}$

∴ AB = AC ∴ ∆BAC is an isosceles ∆.

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
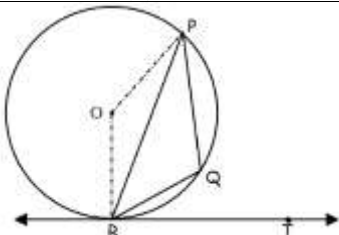## SAMPLE PAPER-2 (MATHEMATICS STANDARD)

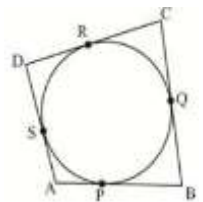**Class: X** **Max Marks: 80**
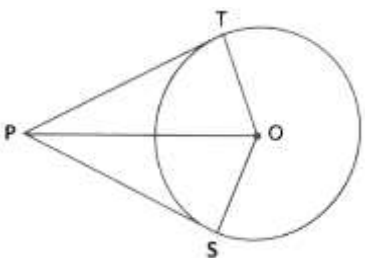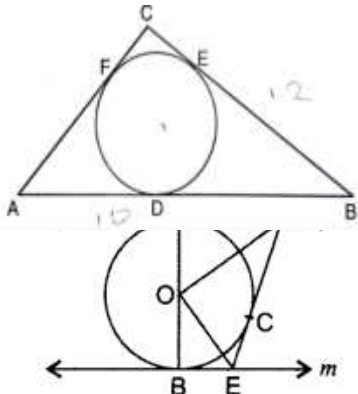**Subject: MATHEMATICS** **Time: 3 hrs.**

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) 9th (b) 10th (c) 11th (d) 22nd	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 circumscribeacircle. IfBC=7cm,CR=3cmand 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 $\triangle$ ABC and $\triangle$ DEF, $\frac{AB}{DE}=\frac{BC}{EF}$. Which of the following makes the two triangles similar . (a) $\angle A = \angle D$ (b) $\angle B = \angle D$ (c) $\angle B = \angle E$ (d) $\angle A = \angle F$	1
16.	$\triangle$ABC is such that AB = 3 cm, BC = 2 cm and CA = 2.5 cm. If $\triangle$DEF ~ $\triangle$ABC and FE = 4 cm, then find the perimeter of $\triangle$DEF. (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 cm² (b) 102.6 cm² (c) 51.3 cm² (d) 205.2 cm²	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	2

Class	0-6	6-12	12-18	18-24	24-30
frequency	6	8	p	9	7

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).	2
		2

24.	If α, β are the zeroes of the polynomial P(x) = 4x² + 3x +7, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$	
25.	In the given figure, from a point P, two tangents PT and PS are drawn to a circle with centre O such that ∠SPT = 120⁰, Prove that OP = 2 PS.	2

<div align="center">SECTION C</div>

26.	Show that 7 - 2√3 is an irrational number, where √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 θ – b sin θ and y = a sin θ + b cos θ, then prove that a² + b² = x² + y². **(OR)** Find an acute angle θ when $\frac{cos\theta - sin\theta}{cos\theta + sin\theta} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$	3

<div align="center">SECTION D</div>

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

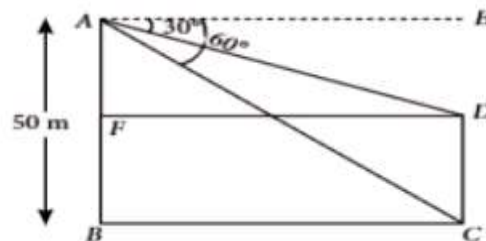| 36.	**CASE STUDY 1**	
	A pathology lab is a specialized medical facility that analyzes tissue, fluid, and cell samples from patients to help diagnose and monitor diseases. These labs play a crucial role in healthcare by providing vital information that helps doctors make accurate diagnoses, determine 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?	1
	Q2. How many samples should be taken into consideration?	1
	Q3. Find the total number of bacteria in the first 15 samples.	2
	(OR)	
	Find the number of samples in which sum of bacteria is 840.	
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:	
		1
		2
	(i)Find the measure of ∠ACB.	
	(ii)What is the height of the other temple?	
	(OR)	1
	Find the width of the river.	
	(iii)Find the difference in the heights of the two temples?	
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:	
		1
		1

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 m² of cloth costs ₹50, estimate the total cost of cloth required to make the outer covering of the tent (excluding the base).

<div align="center">(OR)</div>

iii)Find the number of persons that can be accommodated in tent , if each person needs 1892 m³ of space.

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 cm² **Volume** = 376.8 cm³
	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)∠ACB=90°
	(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 = 4818m²
	(ii)Total volume = 39708m³
	(iii)Total cost of cloth = ₹ 240900
	(OR)
	(iii)Number of persons accommodated = 21

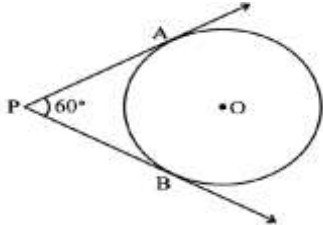TIME : 3 HOURS   M. M. 80
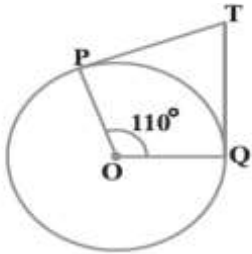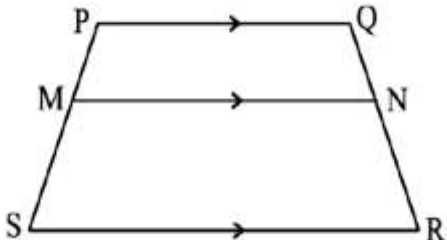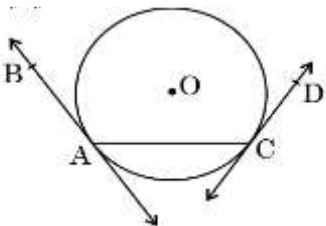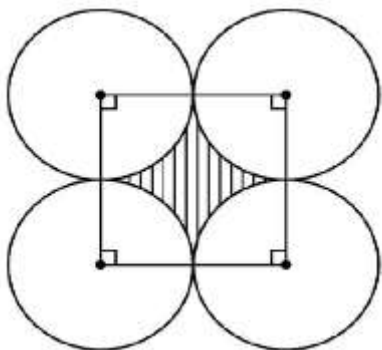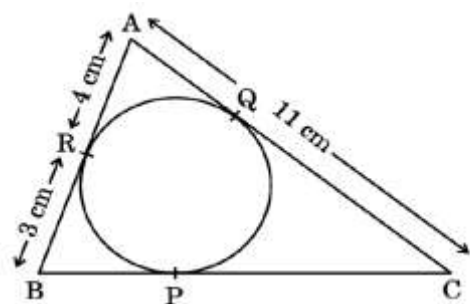
GENERAL INSTRUCTIONS

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.
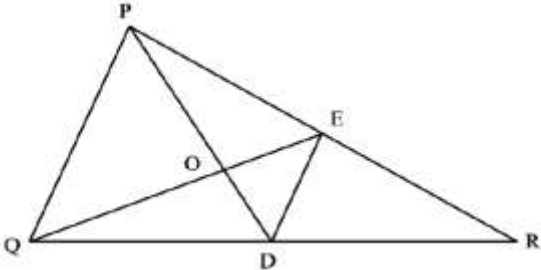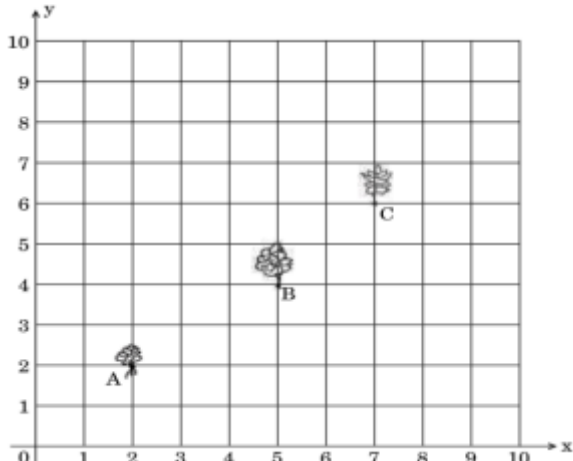
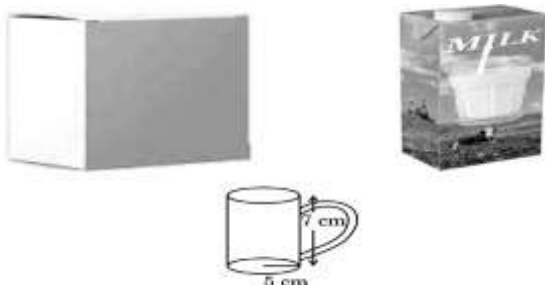| S.NO.	SECTION A	MARKS
1.	Two positive integers m and n are expressed as $m = p^5q^2$ and $n = p^3q^4$ where p, q are prime numbers. The LCM of m and n is (a) P^8q^6 (b) p^3q^2 (c) p^5q^4 (d) $p^5q^2 + p^3q^4$	1
2.	If sum of zeroes of polynomials $p(x) = 2 x^2 – k \sqrt{2} x + 1$ is $\sqrt{2}$, then 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 $6 x – ky + 16 = 0$ 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 	1

	(d) BC is parallel to XY	
9.	If TP and TQ are two tangents to a circle with centre 'o' so that $\angle POQ = 110^0$. Then what will be the measurement of $\angle PTQ$? (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 $\angle APB = 60^0$, 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 $\neq$ 0) , then $\tan\Theta$ 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 $\tan(\Theta + \emptyset)$ 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

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.

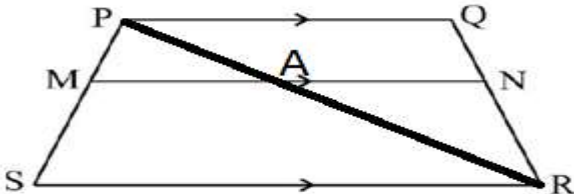| 19.	Assertion (A) : In a cricket match, a batsman hits a boundary 9 times out of 45 balls he plays. The probability that in a given ball, he does not hit the boundary is $\frac{4}{5}$. Reason : $P (E) + P (\text{not } E) = 1$	1
20	Assertion : The sum of the first fifteen terms of the A.P. 21,18,15,12 ………… 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 $3 \tan^2 60^0 - x \sin^2 45^0 + \frac{3}{4} \sec^2 30^0 = 2 \operatorname{cosec}^2 30^0$. **OR** If $\cos (A + B) = \frac{1}{2}$ and $\tan(A- B) = \frac{1}{\sqrt{3}}$, where $0 \le A + B \le 90^0$, then find the value 0f $\sec (2A- 3 B)$.	2

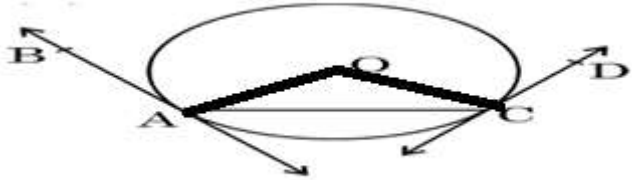| 25.	Find the area of the shaded region if length of radius of each circle is 7 cm. Each circle touches the other two externally. **OR** A chord is subtending an angle of 90^0 at the centre of a circle of radius 14 cm. Find the area of the corresponding minor segment of the circle.	
	SECTION C	
26.	Show that $5 – 7\sqrt{3}$ is an irrational number.	3
27.	If α, β are the zeroes of the polynomial $3 x 2 – 13 x – 10$, 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** 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.	3
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 $\dfrac{\tan A}{1-\cot A} + \dfrac{\cot A}{1-\tan A} = 1 + \sec A \ \csc A$	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 cm³, 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. <table><tr><td>Age in years</td><td>No. of policy holders</td></tr><tr><td>Below 20</td><td>2</td></tr><tr><td>Below 25</td><td>6</td></tr><tr><td>Below 30</td><td>24</td></tr><tr><td>Below 35</td><td>45</td></tr><tr><td>Below 40</td><td>78</td></tr><tr><td>Below 45</td><td>89</td></tr><tr><td>Below 50</td><td>92</td></tr><tr><td>Below 55</td><td>98</td></tr><tr><td>Below 60</td><td>100</td></tr></table>	5

<div align="center">SECTION –E</div>

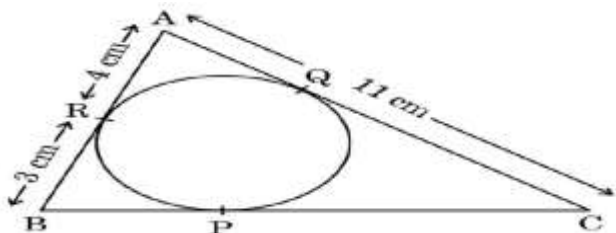| 36.	Seema has a 10 m × 10 m kitchen garden attached to her kitchen. She divides it into a 10 ×10 grid and wants to grow some vegetables and herbs used in the kitchen. She puts some soil and manure in that and sow a green chilly plant at A, a coriander plant at B and a tomato plant at C. Her friend 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.	1 1

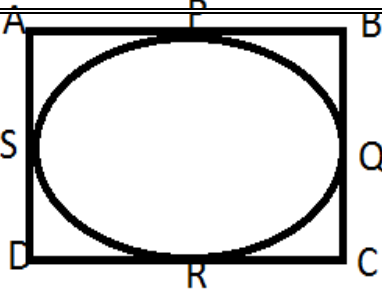|			
		OR What is the mid point of AC.	
37.		A school has decided to plant some endangered trees on World Environment Day in the nearest park. They decide to plant those trees in few concentric circular rows such that each succeeding row has 20 more trees than the previous one. The first row has 50 trees. Based on above given information, answer the following question:	
		(i) How many trees will be planted in the 10th row ?	
		(ii) How many more trees will be palnted in the 8th row than in the 5th row ?	1
			1
		(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 11th row ?	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	ANSWER	MARKS
1	p^5q^4	(c) p^5q^4	1
2	2	(b) 2	1
3	2	(b) 2	1
4	Not real	(d) not real	1
5	5	(b) 5	1
6	(7,0)	(b) (7,0)	1
7	(15,-3)	(b) (15,-3)	1
8	BC is parallel to XY	(d)	1
9	70^0	(b) 70^0	1
10	$5\sqrt{3}$	(b) $5\sqrt{3}$	1
11	$\dfrac{\sqrt{y^2 - x^2}}{x}$	(c) $\dfrac{\sqrt{y^2-x^2}}{x}$	1
12	$\sqrt{3}$	(a) $\sqrt{3}$	1
13	45^0	(b)45^0	1
14	22 cm	(a) 22 cm	1
15	$10\sqrt{2}$	(b)$10\sqrt{2}$	1
16	$\dfrac{2\pi}{3}$ cm^3	(d) $\dfrac{2\pi}{3}$ cm^3	1
17	12	(a) 12	1
18	$\dfrac{1}{8}$	(b)$\dfrac{1}{8}$	1
19	A	(A)	1
20	A	(A)	1
21	No, (15)^{n}can not ends with zero because (15)^n = (3 × 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.	no	
22	 Join PR and take a point A on PR. PQ ‖ SR (given)& MN ‖ PQ (given)		

	Therefore MN ∥ SR In ∆PRS MA ∥ SR By BPT theorem $\frac{PM}{MS} = \frac{PA}{AR}$ …………………………………..(1) In ∆PQR AN∥ PQ By BPT $\frac{QN}{NR} = \frac{PA}{AR}$ …………………………(2) From (1) and (2) $\frac{PM}{MS} = \frac{QN}{NR}$	1 1	
23	 ∠BAO = 90^0 , ∠DCO = 90^0 In ∆ AOC OA=OC ∠ OAC= ∠ OCA (Angles opposite to equal sides of a triangle) ∠ BAO + ∠ OAC =∠DCO + ∠ OCA 　　　∠ BAC = ∠ DCA		½ ½ 1
24	3 $\tan^2 60^0$ – x $\sin^2 45^0$ + $\frac{3}{4}$ $\sec^2 30^0$= 2 $\mathrm{cosec}^2 30^0$. 3 ×($\sqrt{3}$) ^{2} – X ($\frac{1}{\sqrt{2}}$) ^{2} + $\frac{3}{4}$ ($\frac{2}{\sqrt{3}}$) ^{2} = 2 (2) ^{2} 9 – X/2 + 1= 8 -X/2 = 8-1-9 -X/2 = -2 X= 4		1 ½ 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 $\frac{5q-p}{7q}$		½ ½ 1 ½ ½

		Is a rational number .		

Is a rational number .

This contradicts occurs because of our wrong assumption.

So that $5 - 7\sqrt{3}$ is an irrational number.

27	$3x^2 - 13x - 10$		
	$3x^2 - 15x + 2x - 10$		½
	$3x(x - 5) + 2(x - 5)$		½
	$(x - 5)(3x + 2)$		½
	$X = 5, x = -2/3$		½
	$3\alpha + 1 = 3 \times 5 + 1 = 16$		1
	$3\beta + 1 = 3 \times -2/3 + 1 = -1$		
	$(3\alpha + 1)(3\beta + 1) = 15$		

28	For correct points for equations		1
	For correct drawing of graph		1
	For correct solution from graph		1
	Or		
	$2x + y = 160$		½
	$4x + 2y = 300$		½
	For correct graph of equations		2

29			

Tangents drawn from an external point to the circle are equal in length. — 1

AQ = 4 cm — ½

QC = 7 cm — ½

BP= 3cm — ½

PC = 4 cm — ½

BC= BP + PC

BC= 3 + 4

BC = 7 cm — ½

Or

— 1

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.

| 30 | (i) $\frac{3}{4}$
 (ii) $\frac{1}{4}$
 (iii) $\frac{3}{4}$ | | 1
 1
 1 |

| 31 | $\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}=1+\sec A\ \csc A$

 $\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}$

 $\frac{sinA/\cos A}{1-cosA/sinA}+\frac{cosA/sinA}{1-sinA/cosA}$

 $\frac{sinA/\cos A}{sinA-cosA/sinA}+\frac{cosA/sinA}{cosA-sinA/cosA}$

 sinA./ cosA/(sinA-cosA/sinA) + cosA./sinA/cosA-sinA / cosA

 $\sin^3 A - \cos^3 A/$ 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 | 2 | |

	$(x-5)^2 = 5x + 11$	½		
	$X^2 – 10x + 25 = 5x + 11$	½		
	$X^2 – 15x + 25- 11 = 0$	½		
	$X^2 - 15x + 14 = 0$			
	$X^2 – 14x – x +14=0$	½		
	$X(x-14) -1 (x-14)=0$	½		
	$(x-14)(x- 14) =0$	½		
	$X = 14$ years			

33			2	

(i)   QD = DR (given)

PE = ER (given)

D and E are the mid points of QR and PR respectively.

By mid point theorem

DE‖ PQ

By AA similarity criteria

ΔPOQ ~ Δ 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		2.5	

= 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=

				2.5
	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			
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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