KENDRIYA VIDYALAYA SANGATHAN

BENGALURU REGION

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केन्द्रीय विद्यालय संगठन

SUPPORT MATERIAL

SESSION: 2024-25

CLASS X

MATHS

PREFACE

This study material is the culmination of an extensive collaborative effort involving a dedicated team of educators and subject matter experts. With meticulous care, we have meticulously designed this resource to provide students with a succinct yet comprehensive tool for consolidating their knowledge.

Under the diligent guidance of our esteemed subject experts and the unwavering enthusiasm of our team, we have incorporated the entire curriculum and an extensive collection of practice questions spanning all chapters. Our paramount objective has been to ensure perfect alignment with the latest curriculum and examination patterns as set forth by the CBSE.

We firmly believe that this material will prove to be an invaluable resource, serving as a clear and concise repository of essential information for effective subject revision. It encompasses all the critical components necessary to assist in students' preparation and enhance their understanding of the subject matter.

Our aspiration is that this study material will emerge as a dependable aid for swift and efficient revision, instilling confidence in students and ultimately contributing to their academic success. We strongly encourage you to actively engage with the content, pose questions, and fully utilize this resource in your educational journey.

We extend our heartfelt best wishes for your studies and sincerely hope that this material becomes your trusted companion on the path to academic excellence.

KENDRIYA VIDYALAYA SANGATHAN

REGIONAL OFFICE

K. KAMARAJA ROAD

BENGALURU 560042

MESSAGE FROM THE DEPUTY COMMISSIONER

Dear students and teachers!

It is a matter of great pride and delight that KVS Bengaluru Region is putting forward the Students' Support Material (SSM) for class Xth subject MATHS for the session 2024-25. I believe firmly that; the subject experts have left no stone unturned to enable our students to add on more to their quality of performance by deep rooting more towards accessing required understating in the subject. Certainly, use of this SSM will help students in empowering themselves as one of the tools and will lead in bringing success.

With devotion, dedication & persistent hard work the team of experts has crafted out this SSM meticulously to complement the classroom learning experience of the students as well as to cope up with the Competency Based Questions as per the new pattern of examinations aligned with NEP-2020 and NCFSE-2023. This SSM, being well-structured and presented in a manner which makes it to be comprehended easily, will definitely serve as a precious supplement for self-study of students.

I am pleased to place on record my appreciation and commendation for the commitment and dedication of the team comprising of the subject experts in carving out such a useful edition of Students' Support Material for the students.

Wishing all the best!

(DHARMENDRA PATLE)
DEPUTY COMMISSIONER
KVS BENGALURU REGION

Our Patron

SHRI DHARMENDRA PATLE

DEPUTY COMMISSIONER, RO BENGALURU

SHRI P C RAJU

AC, RO BENGALURU

SHRI R PRAMOD

AC, RO BENGALURU

SMT HEMA K

AC, RO BENGALURU

SHRI DAVINDER SINGH

PRINCIPAL,PM SHRI KV CHAMARAJANAGAR

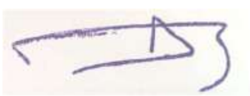
MESSAGE FROM THE COORDINATOR

Dear Student's,

I feel thrilled to commence on the study material for the mathematics for class X. My sincere appreciation and gratitude to the diligent team for the designing the practice material that caters to the revised pattern of CBSE. Congratulations to the committed team for their vital role in designing the practice material with inclusive competencies, analytical and critical reasoning questions summarizing all concepts.

I feel greatly honoured to be associated as a coordinator of diligent team in bringing out the Support Material for class X Mathematics for the year 2024-25 and truly convinced that it would definitely help in learning and scoring high in exams.

Wishing success to all in the journey of learning.



Davinder Singh

Principal,

PM SHRI K V Chamarajanagar,

Karnataka.

CONTENT DEVELOPEMENT TEAM FOR CLASS X 2024-25				
S.NO.	NAME OF THE CHAPTER	NAME OF THE TEACHER	NAME OF THE KV	REVIEW TEAM
1	REAL NUMBERS	MS. SANDHYA JOSHI	ASC @ CENTRE	MR. RAJASHREE RAJAN KV ASC @ CENTRE
		MS. ARCHANA C	ASC @ CENTRE	
2	POLYNOMIALS	MS. MONIKA TOMAR	ASC @ CENTRE	MS. P S KAVITHA KV DRDO
		MS. M DEEPTHY	ASC @ CENTRE	
3	PAIR OF LINEAR EQUATIONS IN TWO VARIABLES	MS. JESTINA JOHN	DRDO	MS. BINDU GOPA KUMAR KV DRDO
		MS. AARTI GUPTA	HEBBAL	
4	QUADRATIC EQUATIONS	MS. DEEPTI PRADEEP TIWARI	IISC	MS. MADHU NARAYAN KV HEBBAL
		MS. VARSHA	IISC	
5	AIRTHMATIC PROGRESSION	MS. MANORANCHITAN VELU	JALAHALLI NO 1	MS. DEEPA K KV HEBBAL
		MS. M SUBHA	JALAHALLI NO 1	
6	TRIANGLE	MS. BINDU K K	JALAHALLI NO 1	MS. ARCHANA HASTU KV IISC
		MS. TEJASVI PANDOLE	JALAHALLI NO 1	
7	COORDINATE GEOMETRY	MS. REENA RANI	CHAMARAJANAGAR	MS. JYOTI AGARWAL MALLESHWARAM
		MR. GIRRAJ PRASAD	CHAMARAJANAGAR	
8	INTRODUCTION TO TRIGONOMETRY	MS. UMA P	MALLESHWARAM	ASA FRANKLIN MALLESHWARAM
		YAMANAPALLI SHYAMALA	MALLESHWARAM SHIFT 2	
9	APPLICATION OF TRIGONOMETRY	MR. OMPRAKASH SINHA	JALAHALLI NO 2	MS. SANTHI SIDHARTHAN KV K.R. PURAM
		MS. MINAKSHI RAWAT	JALAHALLI NO 2	
10	CIRCLES	MS. RACHANA	MEG & CENTRE	MR. RASOOL SHAIK KV NAL
		MS. STAYA TIWARI	MEG & CENTRE	
11	AREA RELATED TO CIRCLES	MS. SOOSY JOHN	KV NAL	MS.VIDYA KUMARI P KV YELAHANKA-AFS
		MS. PUSHPA KUMARI	KV NAL	
12	SURFACE AREAS AND VOLUMES	MR. NAVEEN PANDEY	KV YELAHANKA-AFS	MR. M A DESHPANDE KV BELAGAVI NO 2 (CANTT)
		MR. P V RAMANA	KV YELAHANKA-AFS	

13	STATISTICS	MR. CHETAN ASTEKAR	KV BELAGAVI NO 2 (CANTT)	MS. LALITHA P BEML NAGAR
14	PROBABILITY	MR. N VENKATESULU	BELLARI	
15	2 SAMPLE QUESTION PAPER WITH MARKING SCHEME & BLUE PRINT (BASIC)	MR. CHINTAPALLI VIJAYASHREE	KV BELAGAVI NO 2 (CANTT)	MS. GODBOLE JAISHREE KV BIDAR-AFS
17	2 SAMPLE QUESTION PAPER WITH MARKING SCHEME & BLUE PRINT (STANDARD)	MS. PRIYA G NATH	BELLARI	

STUDY MATERIAL COMPILATION TEAM

SL NO	NAME OF THE TEACHER	DESIGNATION	NAME OF THE KV
1.	MS. REENA RANI	TGT MATHS	PM SHRI K V CHAMARAJANAGAR
2.	MR GIRRAJ PRASAD	TGT MATHS	PM SHRI K V CHAMARAJANAGAR

CONTENT INDEX

COURSE STRUCTURE CLASS –X

Units	Unit Name	Marks
I	NUMBER SYSTEMS	06
II	ALGEBRA	20
III	COORDINATE GEOMETRY	06
IV	GEOMETRY	15
V	TRIGONOMETRY	12
VI	MENSURATION	10
VII	STATISTICS & PROBABILTY	11
	Total	**80**

UNIT I: NUMBER SYSTEMS

1. REAL NUMBER (15) Periods

Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples, Proofs of irrationality of $\sqrt{2}, \sqrt{3}\ \sqrt{5}$

UNIT II: ALGEBRA

1. POLYNOMIALS (8) Periods

Zeros of a polynomial. Relationship between zeros and coefficients of quadratic polynomials.

2. PAIR OF LINEAR EQUATIONS IN TWO VARIABLES (15) Periods

Pair of linear equations in two variables and graphical method of their solution, consistency/inconsistency.

Algebraic conditions for number of solutions. Solution of a pair of linear equations in two variables algebraically - by substitution, by elimination. Simple situational problems.

3. QUADRATIC EQUATIONS (15) Periods

Standard form of a quadratic equation $ax^2 + bx + c = 0, (a \neq 0)$. Solutions of quadratic equations (only real roots) by factorization, and by using quadratic formula. Relationship between discriminant and nature of roots.

Situational problems based on quadratic equations related to day to day activities to be incorporated.

4. ARITHMETIC PROGRESSIONS (10) Periods

Motivation for studying Arithmetic Progression Derivation of the n^{th} term and sum of the first n terms of A.P. and their application in solving daily life problems.

UNIT III: COORDINATE GEOMETRY

Coordinate Geometry **(15) Periods**

Review: Concepts of coordinate geometry, graphs of linear equations. Distance formula. Section formula (internal division).

UNIT IV: GEOMETRY

1. **TRIANGLES** **(15) Periods**

Definitions, examples, counter examples of similar triangles.

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.
2. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.
3. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.
4. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.
5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.

2. **CIRCLES** **(10) Periods**

Tangent to a circle at, point of contact

1. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
2. (Prove) The lengths of tangents drawn from an external point to a circle are equal.

UNIT V: TRIGONOMETRY

1. **INTRODUCTION TO TRIGONOMETRY** **(10) Periods**

Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios whichever are defined at 0^{o} and 90^{o}. Values of the trigonometric ratios of 30^{0}, 45^{0} and 60^{0}. Relationships between the ratios.

2. TRIGONOMETRIC IDENTITIES (15) Periods

Proof and applications of the identity $sin^2A + cos^2A = 1$. Only simple identities to be given.

3. HEIGHTS AND DISTANCES: Angle of elevation, Angle of Depression. (10)Periods

Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation / depression should be only 30°, 45°, and 60°.

UNIT VI: MENSURATION

1. AREAS RELATED TO CIRCLES (12) Periods

Area of sectors and segments of a circle. Problems based on areas and perimeter / circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60°, 90° and 120° only.

2. SURFACE AREAS AND VOLUMES (12) Periods

Surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones.

UNIT VII: STATISTICS AND PROBABILITY

1. STATISTICS (18) Periods

Mean, median and mode of grouped data (bimodal situation to be avoided).

2. PROBABILITY (10) Periods

Classical definition of probability. Simple problems on finding the probability of an event.

MATHEMATICS-Standard QUESTION PAPER DESIGN CLASS – X (2024-25)

Time: 3 Hours **Max. Marks: 80**

S. No.	Typology of Questions	Total Marks	% Weightage (approx.)
1	**Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	43	54
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	19	24
3	**Analysing :** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	18	22
	Total	80	100

INTERNAL ASSESSMENT MARKS	**20**
Pen Paper Test and Multiple Assessment (5+5) Marks	10
Portfolio Marks	05
Lab Practical (Lab activities to be done from the prescribed books) Marks	05

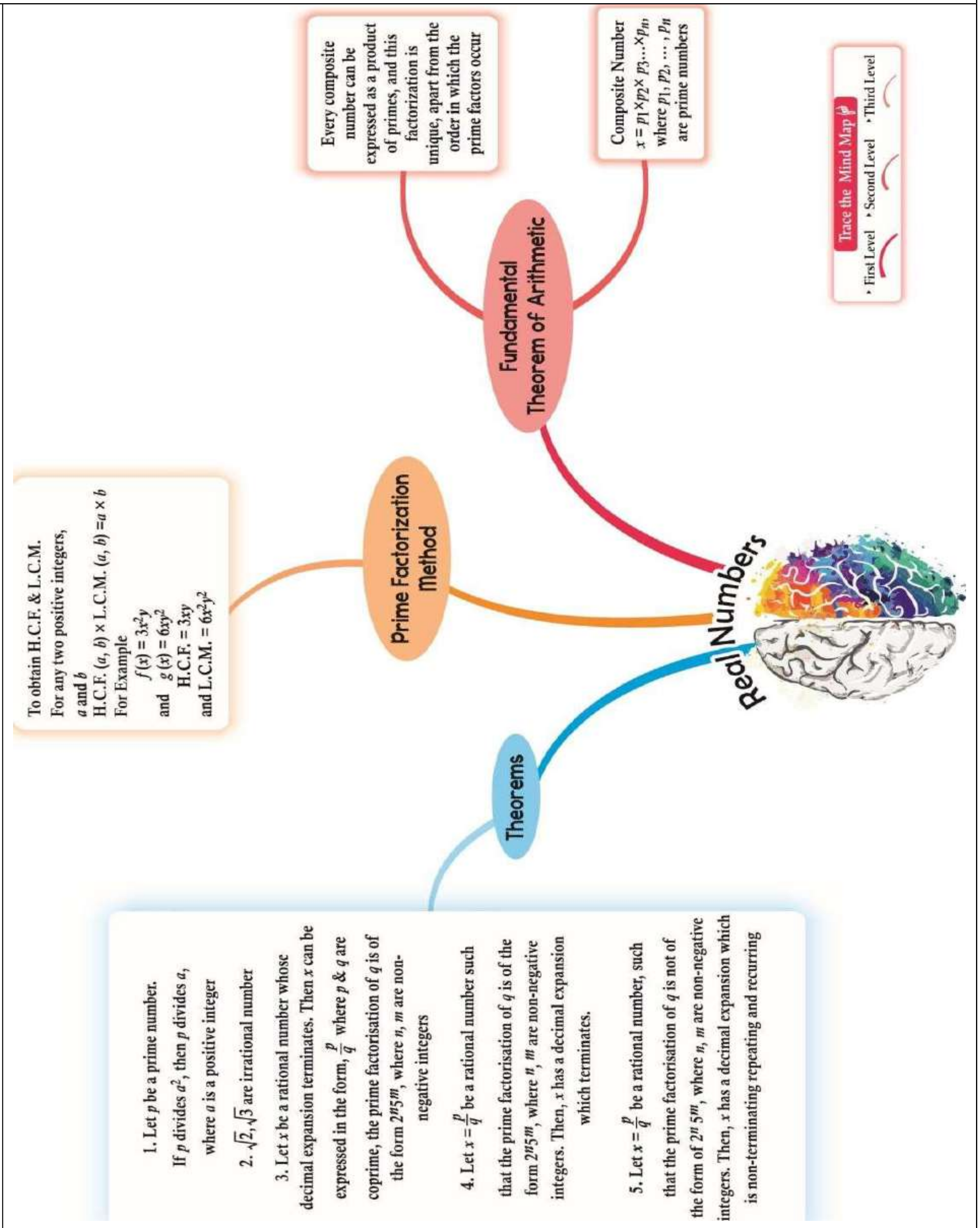
MATHEMATIC Basic QUESTION PAPER DESIGN CLASS – X (2024-25)

Time: 3Hours **Max. Marks: 80**

S. No.	Typology of Questions	Total Marks	% Weightage (approx.)
1	**Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	60	75
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	12	15
3	**Analysing :** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	8	10
	Total	80	100

INTERNAL ASSESSMENT MARKS	**20**
Pen Paper Test and Multiple Assessment (5+5)	10 Marks
Portfolio	05 Marks
Lab Practical (Lab activities to be done from the prescribed books)	05 Marks

CHAPTER 1- REAL NUMBERS

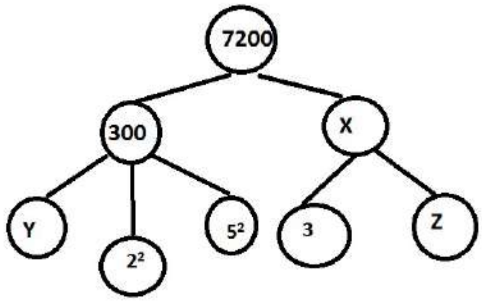


KEY POINTS

	➢ Recalling the definition of prime number, composite number, rational number and irrational number ➢ Fundamental theorem of arithmetic: Every composite number can be expressed as a product of primes and this factorization is unique. ➢ Let p be a prime number. If p divides a^2, then p divides a, where a is a positive integer. ➢ For any 2 positive integers a and b, **HCF (a,b) × LCM (a,b) = a × b** ➢ Proving the irrationality of √2, √3, etc using the method of contradiction
	MULTIPLE CHOICE QUESTIONS (EACH CARRIES 1 MARK)
1.	The sum of a rational and irrational number is always…………. (a) Rational (b) irrational (c) 0 (d) 1
2.	LCM of the numbers 'x' and 'y' where y is a multiple of 'x' is given by (a) X (b) y (c) xy (d) x+y
3.	If two positive integers A and B can be expressed as A = xy^3 and B = xy^2; x, y being prime numbers, the HCF (A, B) is ……………. (a) Xy (b) xy^2 (c) xy^3 (d) x^2y
4.	Express 98 as product of prime factors (a) 7×2^2 (b) $7^2\times2^2$ (c) $7^2\times2$ (d) 7×2^3
5.	If HCF (16, y) = 8 and LCM (16, y) = 48, then the value of y is……… (a) 24 (b) 16 (c) 8 (d) 48
6.	The exponent of 2 in the prime factorisation of 144, is (a) 4 (b) 5 (c) 6 (d) 3
7.	The LCM of two numbers is 1200. Which of the following cannot be their HCF? (a) 600 (b) 400 (c) 200 (d) 500
8.	The HCF of 12, 21, 15 are (a) 3 (b) 4 (c) 12 (d) 15
9.	The LCM and HCF of two rational numbers are equal, then the numbers must be (a) Prime (b) co-prime (c) composite (d) equal
10.	The ratio of LCM and HCF of the least composite number and the least prime number is (a) 1:2 (b) 2:1 (c) 1:3 (d) 3:1
	SHORT ANSWER TYPE- I QUESTIONS(EACH CARRIES 2 MARKS)
1.	Express each number as a product of its prime factors: a) 280 b) 156

2.	Given that HCF (306, 657) = 9, find LCM (306, 657).
3.	Given that √3 is irrational, prove that 2 - 5√3 is irrational.
4.	Check whether 8^n can end with the digit 0 for any natural number n.
5.	Find HCF and LCM of 252 and 244 and verify that HCF × LCM = Product of the two given numbers
6.	Given that √2 is irrational, prove that $\frac{3}{5\sqrt{2}}$ is an irrational number.
7.	X and y are two positive numbers greater than 21 The H C F of x and y is 21 and their L C M is 210 find x and y .
8.	If the HCF of 136 and 344 is expressible in the form 344 × 2 - 136 × q , then find the value of q.
9.	Explain why (21 × 15 × 11 ×17 × 2 + 2 × 17) is a composite number?
10.	In a marathon, three athletes step off together and their steps measure 54 cm, 60 cm, and 48 cm, respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps?
	SHORT ANSWER TYPE- II QUESTIONS(EACH CARRIES 3 MARKS)
1.	Given √5 is irrational, prove that 3+2√5 is irrational. Let 3+2√5 be rational 3+2√5 = p/q, where p and q are coprime √5 = (p-3)/ 2q Given √5 is irrational Since p/q is rational, (p-3)/ 2q is rational. A contradiction
2.	Find the LCM and HCF of 120 and 84 and verify its relation with the two Numbers.
3.	Find the largest number which when divided by 615 and 963 leaves a remainder 6 in each case
4.	Find the least length of rope which can be cut into whole numbers of pieces of length 45cms,75cms and 81 cms .
5.	Prove that √7 is an irrational, using the method of contradiction
	LONG ANSWER TYPE (EACH CARRIES 5 MARKS)
1.	The length, breadth, and height of a room are 8 m 50 cm, 6 m 25 cm and 4 m 75 cm respectively. Find the length of the longest rode that can measure the dimensions of the room exactly
2.	The local bus services has 2 lines of buses that start together at 8 A.M .Buses on line A leave after every 15 minutes while buses on line B leave after every 20 mins .In a day how many times do both line A and B leave together between 8 A.M and 11 A.M ?
3.	Six bells commence tolling together and toll at intervals of 2,4,6,8,10,12 minutes respectively .in 30 minutes how many times do they toll together excluding the beginning ?
	CASE STUDY(1+1+2 =4 MARKS)
1.	A mathematical exhibition was conducted in the school. Ramya made the following factor tree for the exhibition with a few blanks and asked the students to complete it.

Observe the factor tree and answer the following questions.



a)Find the exponent of y.

b) Express 7200 as the product of its prime factors

c) Find the value of x+y+z

2. There is a circular path around a sports field. Kamal takes 32 minutes to drove one round of the field while Rahul takes 24 minutes to do the same. Suppose they start at the same point and go in the same direction.

1. After how many minutes do they meet at the starting point again?

2. How many rounds should Kamal complete to meet Rahul again?

3. Find the HCF of 32 and 24.

3. A college conducts a seminar for various subjects. The number of participants for English ,Maths and Sceince are 60,84 and 108 respectively.

Every room has to accommodate equal number of participants.

1. Find the maximum number of participants in each room.

2. How many rooms are required?

3. Find the LCM of 60,84 and 108

ASSERTION AND REASON

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.

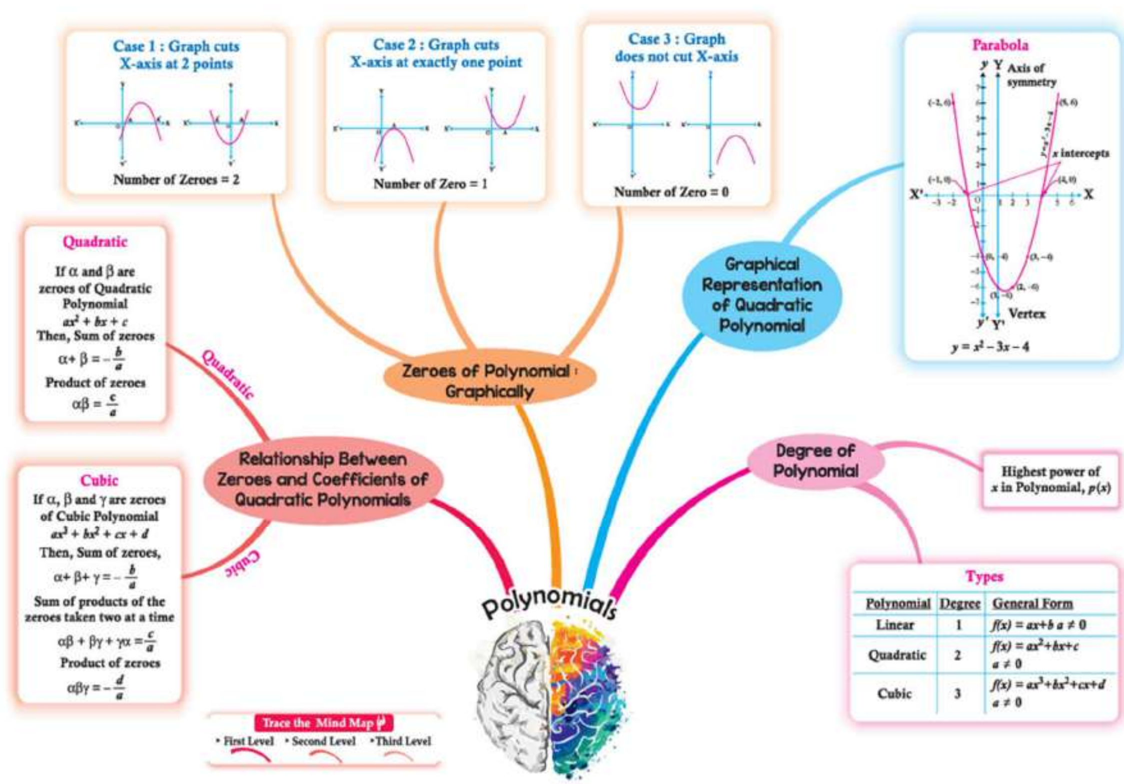
1.	Assertion: The HCF of two numbers is 15 and their product is 2250. Then their LCM is 150. Reason: If a, b are two positive integers, then HCF x LCM=a x b.
2.	Assertion:7^n ends with the digit zero, where n is any natural number. Reason: Any number ends with digit zero, if its prime factor is of the form 2^m x 5^n, where m and n are natural numbers.
3.	Assertion: HCF of 126 and 65 numbers is 1. Reason: 126 and 65 are coprime numbers.
4.	Assertion: √289 is an irrational number. Reason: Square root of any prime number is an irrational number.
5.	Assertion: (5 x 8 x 11 + 8) is a composite number. Reason: A composite number has factors one, itself and any other natural number.
6.	Assertion: (3-√7) is an irrational number. Reason: The sum or difference of a rational and an irrational number is irrational.
7.	Assertion: 27, 28 and 29 are co-prime numbers. Reason: Consecutive numbers are co-prime numbers.
8.	Assertion: LCM (85,95)=5. Reason: LCM is the lowest common multiple of two numbers
9.	Assertion: HCF (p, q)= x^5y^3 if p = x^5y^2, q = x^3y^3, where x, y are prime numbers . Reason: HCF of two prime numbers is 1.
10.	Assertion: LCM (25,35,45)=1575 and HCF(25,35,45)=5. Reason: LCM(a, b, c) X HCF(a, b, c)= a x b x c where a , b and c are three positive integers

	ANSWERE KEY
	MCQS
1.	B- irrational
2.	B - Y
3.	B – XY^2
4.	C - $7^2 \times 2$
5.	A – 24
6.	A – 4
7.	D – 500
8.	A - 3
9.	D- EQUAL
10.	B – 2:1
	SHORT ANSWER TYPE- I QUESTIONS (2MARKS)
1.	1(a) - 2^3 X5X7 1(b) - 2^2X3X13
2.	22338
7.	42 AND 105
8.	5

9.	34 X 3466 X 1
10	2160
	SHORT ANSWER TYPE- II QUESTIONS(3 MARKS)
1.	
3.	87
4.	2025
	LONG ANSWER TYPE (5 MARKS EACH)
1.	Length of the longest rod = 25 cm
2.	2.
3.	15
	CASE STUDY (1+1+2 =4 MARKS)
1.	a) y = 3 Exponent = 1 (b) $7200 = 2^5 \times 3^2 \times 5^2$ (c) x + y+ z = 24 + 3 + 8 = 35
2.	(a) LCM of 32 and 24 = 96 (b) 96 / 32 = 3 min (c) HCF = 8
3.	(a) HCF = 12 (b) total number of participants = 252 Number of rooms = 252 / 12 = 21 (c) LCM = 3780
	ASSERTION AND REASON
	1-a **2-d** **3-a** **4-d** **5-a** **6-a** **7-c** **8-d** **9-d** **10-c**

CHAPTER 2- POLYNOMIALS

MIND MAP



KEY POINTS

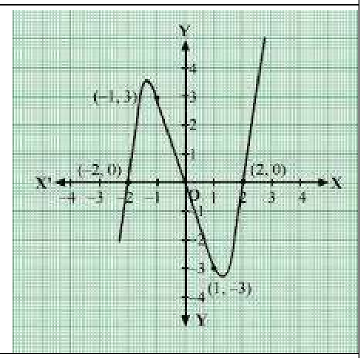
- "Polynomial" comes from the word 'Poly' (Meaning Many) and 'nomial' (in this case meaning Term)-so it means many terms.
- A polynomial is made up of terms that are only added, subtracted or multiplied.
- Degree – The highest power of the variable in the polynomial is called the degree of polynomial. Example: $3x^3 + 4$, here degree is 3.
- Polynomials of degrees 1 is called linear polynomial.eg $2x + 3$
- Polynomials of degrees 2 is quadratic polynomial.eg $3x^2 – 4x - 7$
- Polynomials of degrees 3 is cubic polynomial.eg $x^3 + 3x^2 + 3x + 1$
- A quadratic polynomial in x with real coefficients is of the form $ax^2 + bx + c$, where a, b, c are real numbers with $a \neq 0$.
- For Quadratic Polynomial: If α and β are the zeroes of a quadratic polynomial ax^2+bx+c, then,

Sum of zeroes $= \alpha + \beta = -\frac{b}{a}$ = -coefficient of x /coefficient of x^2

Product of zeroes $= \alpha\beta = \frac{c}{a}$ = constant term / coefficient of x^2

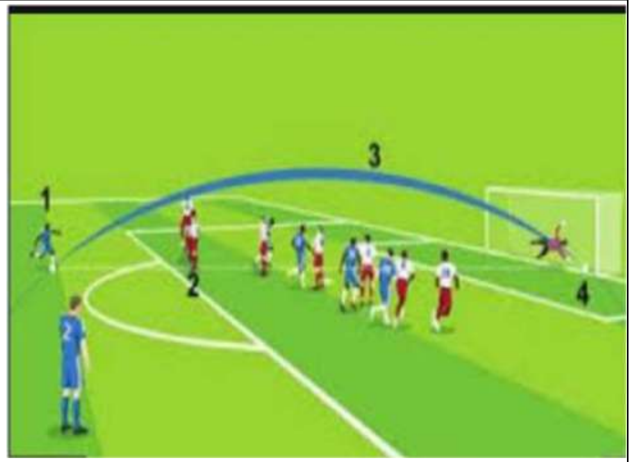
	MULTIPLE CHOICE QUESTIONS (EACH CARRIES 1 MARK)
	SOLVED EXAMPLES
1.	The quadratic polynomial, the sum of whose zeroes is -5 and their product is 6, is a) $x^2 + 5x + 6$ b) $x^2 - 5x + 6$ c) $x^2 - 5x - 6$ d) $-x^2 + 5x + 6$ Sol: Option (a) is correct. Let α and β are the zeroes of the quadratic polynomial $\alpha+\beta = -5$ $\alpha\beta = 6$ We know, $x^2 - (\alpha+\beta)x + \alpha\beta = x^2 - (-5)x + 6$ $= x^2 + 5x + 6$
	PRACTICE QUESTIONS
1.	If the zeroes of the quadratic polynomial ax^2+bx+c, $c\neq0$ are equal, then (a) c and b have opposite signs (b) c and a have opposite signs (c) c and b have same signs (d) c and a have same signs
2.	A quadratic polynomial, whose zeroes are -3 and -4, is (a) $x^2 - x + 12$ (b) $x^2 + 7x + 12$ (c) $x^2 - 7x + 12$ (d) $2x^2 + 2x - 24$
3.	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
4.	The number of polynomials having zeroes as -2 and 5 is (a) 1 (b) 2 (c) 3 (d) more than 3
5.	The zeroes of the quadratic polynomial $x^2 + 9x + 18$ are (a) both positive (b) both negative (c) one positive and one negative (d) both equal
6.	The number of zeroes that polynomial $f(x) = (x - 2)^2 + 4$ can have is:

	(a) 1 (b) 2 (c) 0 (d) 3
7.	Graph of a quadratic polynomial is a (a) straight line (b) circle (c) parabola (d) ellipse
8.	Zeroes of a polynomial can be determined graphically. Number of zeroes of a polynomial is equal to number of points where the graph of polynomial (a) intersects y-axis (b) intersects x-axis (c) intersects y-axis or intersects x-axis (d) none of these
9.	If graph of a polynomial does not intersects the x-axis but intersects y-axis in one point, then number of zeroes of the polynomial is equal to (a) 0 (b) 1 (c) 0 or 1 (d) none of these
10.	A polynomial of degree n has (a) only 1 zero (b) exactly n zeroes (c) atmost n zeroes (d) more than n zeroes
	SHORT ANSWER TYPE- I QUESTIONS (EACH CARRIES 2 MARKS)
	SOLVED EXAMPLE
1.	If the product of the zeroes of the polynomial p(x) = $x^2 - 2x - (k^2 - 10)$ is 1, then find the value of k. Solution: p(x) = $x^2 - 2x - (k^2 - 10)$ Here a = 1, b = -2, c = $-(k^2 - 10)$ Product of the zeroes, $(\alpha \times \beta) = 1$ …[Given] $\Rightarrow \frac{c}{a} = 1$ $\Rightarrow -(k^2 - 10) = 1$ $\Rightarrow k^2 - 10 = -1$ $\Rightarrow k^2 = -1 + 10 = 9$ $\Rightarrow k = \pm 3$
	PRACTICE QUESTIONS
1.	**Find a quadratic polynomial if its zeroes are 0, $\sqrt{5}$.**
2.	**Find the value of "x" in the polynomial $2a^2 + 2xa + 5a - 10$ if (a + x) is one of its factors.**
3.	**How many zeros does the polynomial $(x - 9)^2 - 4$ have? Also, find its zeroes.**
4.	**If the sum of zeroes of the quadratic polynomial $3x^2 - kx + 6$ is 3, then find the value of k.**

5.	**If the sum of the zeroes of the polynomial p(x) = $(k^2 - 14)x^2 - 2x - 12$ is 1, then find the value of k.**
6.	**Form a quadratic polynomial whose zeroes are $3 + \sqrt{2}$ and $3 - \sqrt{2}$.**
7.	**Find the quadratic polynomial whose sum and product of zeroes are $\sqrt{2}$ and $\frac{1}{3}$ respectively.**
8.	If one zero of the polynomial $5z^2 + 13z - p$ is reciprocal of the other, then find p.
9.	Find the quadratic polynomial, the sum of whose zeroes is 8 and their product is 12. Hence, find the zeroes of the polynomial.
10.	Write the number of zeroes and what are the zeroes of the polynomial whose graph is given in the figure. 
	SHORT ANSWER TYPE- II QUESTIONS (EACH CARRIES 3 MARKS)
	SOLVED EXAMPLE
1.	p(x) = ax^2-8x+3, where a is a non-zero real number. One zero of p(x) is 3 times the other zero. (i) find the value of a. (ii) what is the shape of the graph of p(x)? Sol: p(x) = ax^2-8x+3 Here , a = a, b = -8 and c=3 Let zeroes be α and 3α $\alpha + 3\alpha = -b/a = 8/a$ $4\alpha = 8/a$ or $\alpha = 2/a$ …………………(i) $\alpha \times 3\alpha = c/a = 3$ $\alpha^2 = 1$ $\alpha = \pm 1$ Therefore a = 2 0r -2 The shape of the graph will be a parabola
	PRACTICE QUESTIONS
1.	If the sum of the zeroes of the polynomial $(a+1)x^2 + (2a+3)x + (3a+4)$ is -1, then find the product of the zeroes.
2.	If the sum of square of the zeroes of the polynomial $x^2 + px + 45$ is equal to 135 , find the value of p.
3.	If one of the zero of the polynomial $3x^2 - 8x + 2k + 1$ is seven times the other, find the value of 'k'.
4.	If the zeroes of p(x) $=2x^2 - 6x - 3$ are $\frac{3 \pm \sqrt{k}}{2}$,where k is a real number. Find 'k'.

5.	If α and β are zeroes of the polynomial $x^2 - 17x + 72$, find a polynomial whose zeroes are -2α and -2β.
	LONG ANSWER TYPE (EACH CARRIES 5 MARKS)
	SOLVED EXAMPLE
1.	If α and β are zeroes of $x^2 + 7x + 12$, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta$.Also find a quadratic polynomial whose zeroes are 2α+β and α+2β **Sol:** $p(x)= x^2 + 7x + 12$ α+β= -b/a= -7 αβ = c/a = 12 $\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta = \frac{\alpha+\beta}{\alpha\beta} - 2\alpha\beta = \frac{-7}{12} - 2(12) = -295/12$ 2α+β + α+2β = 3α+3β = 3(α+β) = -21 (2α+β) x (α+2β) = $2\alpha^2 + 4\alpha\beta + \alpha\beta + 2\beta^2$ $=2(\alpha^2 + \beta^2) + 5\alpha\beta$ $=2 [(\alpha+\beta)^2 - 2\alpha\beta] + 5\alpha\beta$ =2[49-24]+60 =110 Polynomial will be $x^2 + -Sx + P$ $= x^2 -21x + 110$
	PRACTICE QUESTIONS
1.	If α and β are the zeroes of the polynomial $p(x)=2x^2 + 5x + k$ satisfying the relation, $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$, then find the value of 'k'.
2.	If one zero of the polynomial $p(x)=2x^2 - 4kx + 6x - 7$ is the negative of other find the zeroes of $x^2 - kx - 1$. Verify the relation between the zeroes and coefficient of the polynomial
3.	If α and β are zeroes of the polynomial $x^2 + x - 12$, such that $\alpha > \beta$.Verify the relation between the zeroes and coefficient of the polynomial. If $\frac{1}{\alpha}$ is one of the zeroes of the polynomial $kx^2 + 5x - 3$, find the value of 'k'.
	CASE STUDY (1+1+2 =4 MARKS)
	SOLVED EXAMPLE

1. Basketball and soccer are played with a spherical ball. Even though an athlete dribbles the ball in both sports, a basketball player uses his hands and a soccer player uses his feet. The projectile (path traced) of soccer ball and basketball are in the form of parabola representing quadratic polynomial. If $y = -x^2$ +represents the path traced where y-axis represents the height of the ball in metres and x -axis represents the time in minutes ,answer the following questions.?



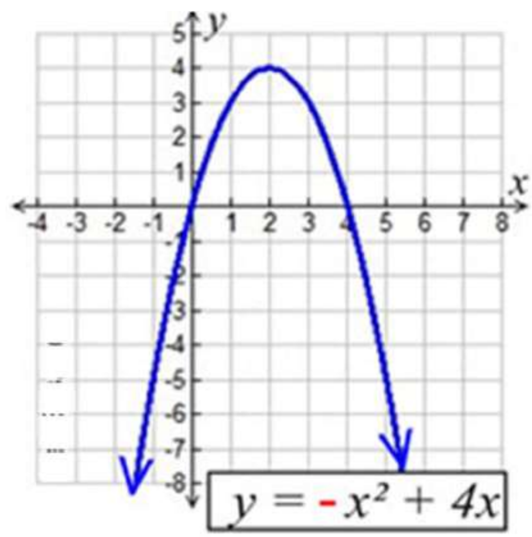
(i) Write the zeroes of the given graph.

(ii) At what time was the ball at the highest position?

(iii) (a).What will be the height of the ball when x= ½ seconds?

OR

(b). At what time , the height of the ball was 4m?



Sol: (i) Zeroes are 0, 4

(ii) At 2 min

(iii)(a)Height y $= -\left(\frac{1}{2}\right)^2 + 4\left(\frac{1}{2}\right) = -\frac{1}{4} + 2 = \frac{7}{4}$

(b) $4 = -x^2 + 4x$

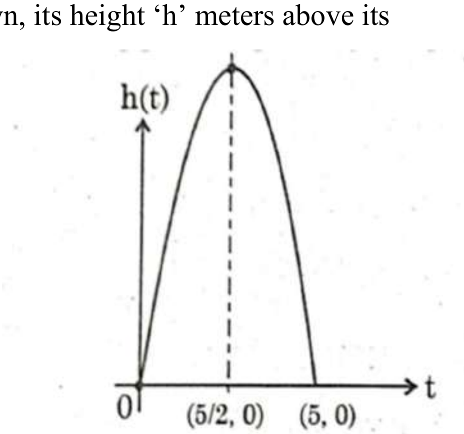
$x^2 - 4x + 4 = 0$

$(x - 2)(x - 2) = 0$

$x = 2$

PRACTICE QUESTIONS

2. A ball is thrown in the air so that t seconds after it is thrown, its height 'h' meters above its starting point is given by the polynomial $h = 25t - 5t^2$.

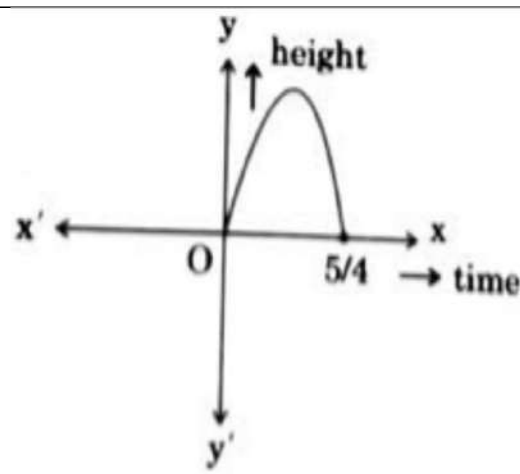


Observe the graph of the polynomial and answer the following questions:

(i) Write zeroes of the given polynomial.

(ii) Find the maximum height achieved by ball.

(iii) (a) After throwing upward, how much time did the ball take to reach the height of 30m?

	OR (b) Find the two different values of t when the height of the ball was 20m.
2.	Pankaj's father gave him some money to buy avocado from the market at the rate of p(x) = x^2 - 24x + 128. Let α and β are the zeroes of p(x) and $\alpha > \beta$ Based on the above information, answer the following questions.  (i) Find the value of $(\alpha + \beta)^2$. (ii) Find the zeroes of p(x). (iii)(a) Form a polynomial whose zeroes are $(\alpha+2)$ and $(\beta-1)$ OR (b) If β is one of the zero of the polynomials $kx^2 + 6x + 12$, find the value of 'k'.
3.	In a pool at an aquarium, a dolphin jumps out of the water travelling at 20 cm per second. Its height above water level after t seconds is given by h = 20t - 16t².  Based on the given graph, answer the following questions : (i) Find zeroes of polynomial p(t) = 20t - 16t² (ii) What would be the value of h at t= 3/2 ? (iii) (a)How much distance did the dolphin cover before hitting the water level again? OR (b)After jumping out of water, at what time will the dolphin be at a height of 4cm?
	ASSERTION AND REASON
	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.
	SOLVED EXAMPLE

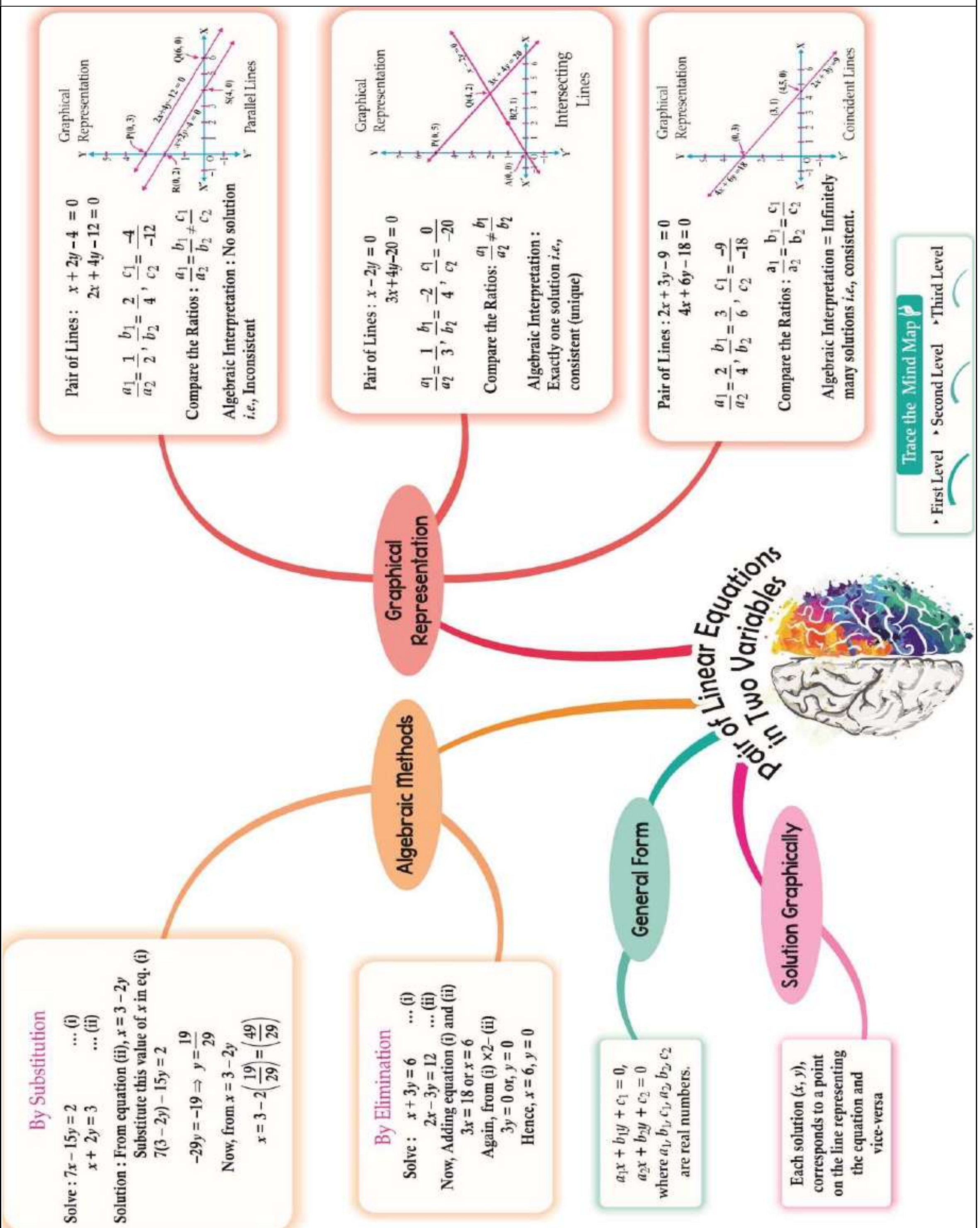
	Que 1 Assertion: If 3 -$\sqrt{5}$ is one zero of the quadratic polynomials then other zero will be 3 -$\sqrt{5}$. **Reason: Irrational zeroes(roots)always occur in pairs.** **Ans:** (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
	PRACTICE QUESTIONS
1.	**Assertion:** P(x) = x^2+3x-2 is a polynomial of degree 2. **Reason:** The highest power of x in the polynomial P(x) is the degree of the polynomial.
2.	**Assertion:** x^2+4x+5 has two zeroes. **Reason:** A quadratic polynomial can have at the most two zeroes.
3.	**Assertion:** The polynomial p(x) = 5x – $\frac{1}{2}$ is a linear polynomial. **Reason:** The general form of linear polynomial is ax+b.
4.	**Assertion:** The graph of a polynomial intersect x-axis at 3 points and y-axis at 1 point, the polynomial has 3 zeroes. **Reason:** The number of zeroes that a polynomial p(x) can have are the number of times polynomial intersect y axis.
5.	**Assertion**: The sum and product of the zeroes of a quadratic polynomial are −14 and 14 respectively. Then the quadratic polynomial is $4x^2+x+1$ **Reason**: The quadratic polynomial whose sum and product of zeroes are given is k{x^2- (Sum of zeroes) x+ product of zeroes}.
6.	**Assertion:** If the sum of the zeroes of the quadratic polynomial $x^2-2kx+8$ is 2 then value of k is 1. **Reason:** Sum of zeroes of a quadratic polynomial ax^2+bx+c is -b/a.
7.	**Assertion:** Degree of zero polynomial is not defined. **Reason:** Degree of a non-zero constant polynomial is 0.
8.	**Assertion:** P(x) = $4x^3-x^2+5x^4+3x-2$ is a polynomial of degree 3. **Reason:** The highest power of x in the polynomial P(x) is the degree of the polynomial.
9.	**Assertion:** $(2 - \sqrt{3})$ is one zero of the quadratic polynomial then other zero will be $(2 + \sqrt{3})$. **Reason:** Irrational zeroes (roots) always occurs in pairs.
10.	**Assertion:** $3x^2 - 6x + 3$ has equal zeroes. **Reason**: The quadratic polynomial has a degree of 2.

	ANSWERE KEY (POLYNOMIALS)
	MCQS
1.	(d) c and a have the same sign
2.	(b) $x^2 + 7x + 12$
3.	(d) a = 0, b = -6
4.	(d) more than 3

5.	(b) both negative
6.	(b) 2
7.	(c) parabola
8.	(b) intersects x-axis
9.	(a) 0
10.	(c) at most n zeroes
	SHORT ANSWER TYPE- I QUESTIONS (2MARKS)
1.	$x^2 - \sqrt{5}\,x$
2.	2
3.	2 zeroes are 7 and 11
4.	9
5.	±4
6.	$x^2 - 6\,x + 7$
7.	$3x^2 - 3\sqrt{2}\,x + 1$
8.	-5
9.	$x^2 - 8x + 12$ zeroes are 6 and 2
10	3 zeroes are -2 , 0 and 2
	SHORT ANSWER TYPE- II QUESTIONS(3 MARKS)
1.	2
2.	±15
3.	.$\frac{2}{3}$
4.	15
5.	$x^2 + 34x + 288$
	LONG ANSWER TYPE (5 MARKS EACH)
1.	2
2.	2 and - $\frac{1}{2}$

3.	$\alpha = 3$, $\beta = -4$, k = 12
	CASE STUDY(1+1+2 =4 MARKS)
1.	(i)0,5 (ii) 31.25 units (iii) a. 3,2 **OR** (iii) b. 4,1
2.	(i) 576 (ii) 16, 8 (iii) a. $x^2 - 25x + 126$ **OR** (iii) b. $\frac{-15}{16}$
3.	(i) $\frac{5}{4}, 0$ (ii) -6 (iii)a t=0 ,t=$\frac{5}{4}$ **OR** (iii) b. $\frac{1}{4}, 1$
	ASSERTION AND REASON
1.	(a)
2.	(a)
3.	(a)
4.	(c)
5.	(d)
6.	(a)
7.	(a)
8.	(d)
9.	(a)
10.	(b)

CHAPTER 3 - PAIR OF LINEAR EQUATIONS IN TWO VARIABLES



KEY POINTS

1) General form of a pair of linear equations in two variables is given by
$\mathbf{a_1x + b_1y + c_1 = 0}$ **and** $\mathbf{a_2x + b_2y + c_2 = 0}$

2) Graph of a linear equation (in one or two variables) is always a **straight line**

3) **<u>Graphical Method</u>** : The graph of a pair of linear equations in two variables is represented by two lines.

(i) If the lines intersect at a point, then that point gives the unique solution of the two equations. In this case, the pair of equations is consistent.

(ii) If the lines coincide, then there are infinitely many solutions — each point on the line being a solution. In this case, the pair of equations is dependent (consistent).

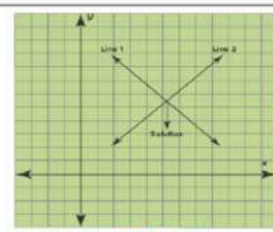
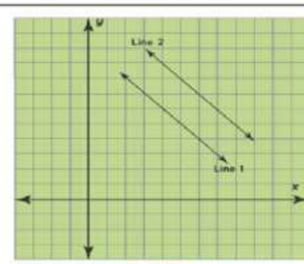
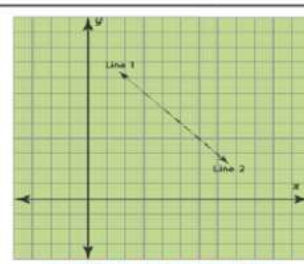
(iii) If the lines are parallel, then the pair of equations has no solution. In this case, the pair of equations is inconsistent.

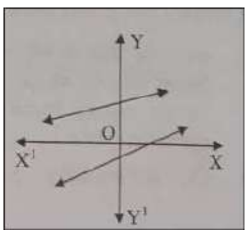
4) **<u>Algebraic Methods</u>** : The following methods for finding the solution(s) of a pair of linear equations :

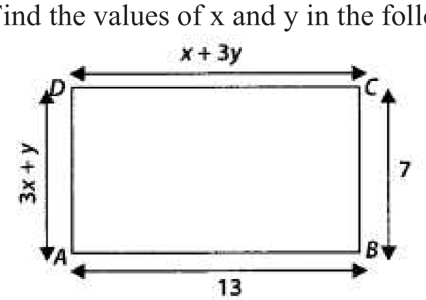
(i) Substitution Method

(ii) Elimination Method

5) If a pair of linear equations is given by $a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$, then the following situations can arise :

Type of solution	Conditions	Graphical Representation
Unique Solution (Consistent and Independent)	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	 Unique Solution (Consistent and independent)
No Solution (Inconsistent and Independent)	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	 No Solution (Inconsistent and independent)
Infinite Number of Solutions (Consistent and Dependent)	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	 Infinite number of solutions (consistent and dependent)

	MULTIPLE CHOICE QUESTIONS (EACH CARRIES 1 MARK)
1.	The pair of equations x= -m and y = n graphically represents lines which are: (a) parallel (b) intersecting at (n , -m) (c) coincident (d) intersecting at (-m , n)
2.	For what value k, do the equations $2x - y + 3 = 0$ and $6x - ky + 9 = 0$ represent coincident lines? (a) 2 (b) – 2 (c) 3 (d) -3
3.	The value of k for which the pair of equations kx =y+2 and 6x=2y+3 has infinitely many solutions, (a) is k = 3 (b) does not exist (c) is k-3 (d) is k = 4
4.	One of the equations of a pair of inconsistent linear equations is $2x - 3y = -5$. The second equation can be: (a) $4x - 6y = -10$ (b) $4x - 6y + 6 = 0$ (c) $6x - 9y + 15 = 0$ (d) $8x - 12y + 20 = 0$
5.	In the given figure, graphs of two linear equations are shown. The pair of these linear equations is:  (a) Consistent with unique solution. (b) Consistent with infinitely many solutions. (c) Inconsistent. (d) Inconsistent but can be made consistent by extending these lines.
6.	For what value of k the given pair of linear equations have no solution 5x+2y-7=0 and 2x+ky +1 =0 (a) $\frac{2}{5}$ (b) $\frac{5}{4}$ (c) $\frac{4}{5}$ (d) $\frac{5}{2}$
7.	The area of the triangle formed by the line $\frac{x}{a^2} + \frac{y}{b^2} = 1$ with the coordinate axis is: (a) a^2b^2 (b) $\frac{1}{2}a^2b^2$ (c) $\frac{1}{2}ab$ (d) $2a^2b^2$
8.	If $bx + ay = a^2 + b^2$ and $ax - by = 0$, then the value of (x-y) is: (a) a-b (b) $a^2 + b^2$ (c) $a^2 - b^2$ (d) b-a
9.	The pair of linear equations $2x+ky-3 = 0$, $6x + \frac{2}{3}y + 7 = 0$ have unique solution if (a) $k = \frac{2}{3}$ (b) $k \neq \frac{2}{3}$ (c) $k = \frac{2}{9}$ (d) $k \neq \frac{2}{9}$
10.	If a pair of linear equations is consistent, then the lines are: (a) Intersecting or coincident (b) Always coincident

	(c) Always intersecting (d) Parallel
	SHORT ANSWER TYPE I QUESTIONS (EACH CARRIES 2 MARKS)
11.	Solve the pair of equations x = 0 and y = - 7 graphically.
12.	The angles of a triangle are x+5, y -5 and 30°. The difference between the two angles x+5 and y-5 is 40°. Find x and y.
13.	Find the value of k for which the following pair of linear equations have infinitely many solutions: 2x+3y=7 and (k−1) x+(k+2) y=3k.
14.	In a box, total number of Rs. 2 coins and Rs. 5 coins is 20. If total coins amount to Rs. 76, find the number of coins of each denomination.
15.	Twice the perimeter of a rectangular garden whose length is 8m more than its width is 72m. **Find the dimensions of the garden.**
16.	The sum of two numbers is 49. The greater number exceeds thrice the smaller number by 1. Find the larger number.
17.	Ram can row downstream 40km in 4 hours and upstream 8km in 4 hours. What will be the speed of rowing in still water?
18.	The sum of the digits of a two-digit number is 14. If 18 is subtracted from the number, the digits are reversed. Find the number.
19.	Mala has some goats and hens in her shed. Upon counting, Mala found that the total number of legs is 112 and the total number of heads in 40. Find the number of hens in her shed.
20.	The age of father is 22 years more than his son. In three years, the father's age will be twice that of his son. Find the present age of his son.
	SHORT ANSWER TYPE II QUESTIONS (EACH CARRIES 3 MARKS)
21.	If 51x+49y=150 and 49x+51y=50 then obtain the value of x−y : x+y
22.	A train covered a certain distance at a uniform speed. If the train would have been 6 km/h faster, it would have taken 4 hours less than the scheduled time. And, if the train were slower by 6 km/hr; it would have taken 6 hours more than the scheduled time. Find the length of the journey.
23.	If 2x + y = 23 and 4x – y = 19, find the values of 5y – 2x and (y/x)– 2.
24.	Find the values of x and y in the following rectangle 

25. Solve the following pairs of equation

$$\frac{x}{3}+\frac{y}{4}=4,\quad \frac{5x}{6}-\frac{y}{8}=4$$

LONG ANSWER TYPE QUESTIONS (EACH CARRIES 5 MARKS)

26. Draw the graph of $2x + y = 6$ and $2x – y + 2 = 0$. Shade the region bounded by these lines and x-axis. Find the area of the shaded region.

27. The age of the father is twice the sum of the ages of his two children. After 20 years, his age will be equal to the sum of the ages of his children. Find the age of the father.

28. There are some students in the two examination halls A and B. To make the number of students equal in each hall, 10 students are sent from A to B. But if 20 students are sent from B to A, the number of students in A becomes double the number of students in B. Find the number of students in the two halls.

CASE STUDY BASED QUESTIONS (EACH CARRIES 4 MARKS)

29. Dipesh bought 3 notebooks and 2 pens for Rs. 80. Lokesh also bought the same types of notebooks and pens as Dipesh. He paid Rs.110 for 4 notebooks and 3 pens

i) Let the cost of one notebook be Rs.x and that of pen be Rs.y. Then form a pair of linear equations for Rs.80 and Rs.110.

ii) What is the exact cost of each notebook?

iii)What is the exact cost of each pen?

(OR)

iii)What is the total cost if they will purchase the same type of 15 notebooks and 12 pens?

30. A test consists of ‘True’ or ‘False’ questions. One mark is awarded for every correct answer while ¼ mark is deducted for every wrong answer. A student knew answers to some of the questions. Rest of the questions he attempted by guessing. He answered 120 questions and got 90 marks.

Type of Question	Marks given for correct answer	Marks deducted for wrong answer
True/False	1	0.25

i)If answer to all questions he attempted by guessing were wrong, then how many

	questions did he answer correctly? ii) How many questions did he guess? iii) If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks he got? **(OR)** iii) If answer to all questions he attempted by guessing were wrong, then how many questions answered correctly to score 95 marks?
31.	From Bengaluru bus stand, if Riddhima buys 2 tickets to Malleswaram and 3 tickets to Yeswanthpur, then the total cost is Rs 46; but if she buys 3 tickets to Malleswaram and 5 tickets to Yeswanthpur, then the total cost is Rs 74. Consider the fares from Bengaluru to Malleswaram and from Bengaluru to Yeswanthpur as Rs.x and Rs. y respectively, then answer the following questions. i)Write the linear equation in two variables for the 1st situation. ii)Form the linear equation in two variables for the 2nd situation. iii) Find the fare from Bengaluru to Malleswaram. **(OR)** iii) Find the fare from Bengaluru to Yeswanthpur.
	ASSERTION AND REASON BASED QUESTIONS (EACH CARRIES 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.
32.	**Assertion (A):** The area of the rectangle formed by the lines representing x=5, y= 7 with the coordinate axis is 35 sq. units **Reason (R):** The system of equations x=5, y=7 is consistent with a unique solution.
33.	**Assertion (A):** Point P (2, -1) is the point on the line 3x + 2y = 4. **Reason (R):** The distance of point P (2, -1) from x-axis is 2 units.
34.	**Assertion (A): If the lines given by 6x + 2ky = -2, 4x + 5y - 1 = 0 are parallel, then the value of k is $\frac{15}{4}$** **Reason (R): For parallel lines $a_1/a_2 = b_1/b_2 \neq c_1/c_2$**

35.	**Assertion (A): If the lines intersect at a point, then that point gives the unique solution of the two equations.** **Reason (R): The pair of linear equation given by $a_1x+ b_1y+ c_1=0$ and $a_2x +b_2y +c_2=0$ where** **$a_1/a_2 = b_1/b_2 \neq c_1/c_2$, in this case, the pair of linear equations are consistent.**
36.	**Assertion (A):** The graph of the linear equations $4x+y=12$ and $4x-2y=4$ represents a pair of intersecting lines. **Reason (R):** The graph of linear equations $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ represents a pair of intersecting lines if $a_1/a_2 \neq b_1/b_2$
37.	**Assertion (A): The angles of cyclic quadrilaterals ABCD are: $A = (6x+10)^0$, $B=(5x)^0$,** **$C= (x+y)°$ and $D=(3y-10)°$. The value of x and y is 20° and 30°** **Reason (R): In cyclic quadrilaterals, the sum of the opposite angles is 180°.**
38.	**Assertion (A): The lines represented by the pair of linear equations $8x- 3y =0$ and $4x - 3y = 8$ intersect each other.** **Reason (R): The pair of linear equations $6x - 5y = 0$ and $3x - 3y = 8$ are inconsistent.**
39.	**Assertion (A): If two lines are parallel; then the pair of equations have infinite solutions.** **Reason (R): The pair of linear equation representing parallel line is inconsistent.**
40.	**Assertion (A): If the lines coincide, then there are infinitely many solutions for the given pair of equation.** **Reason (R): The pair of linear equations representing coincident lines are inconsistent.**
41.	**Assertion (A): The graphical representation of a pair of equations $4x + 3y – 1 = 5$ and $12x + 9y = 15$ will be parallel lines.** **Reason (R): If the given pair of equations have no solution. That means, the lines representing the given pair of equations are parallel to each other.**

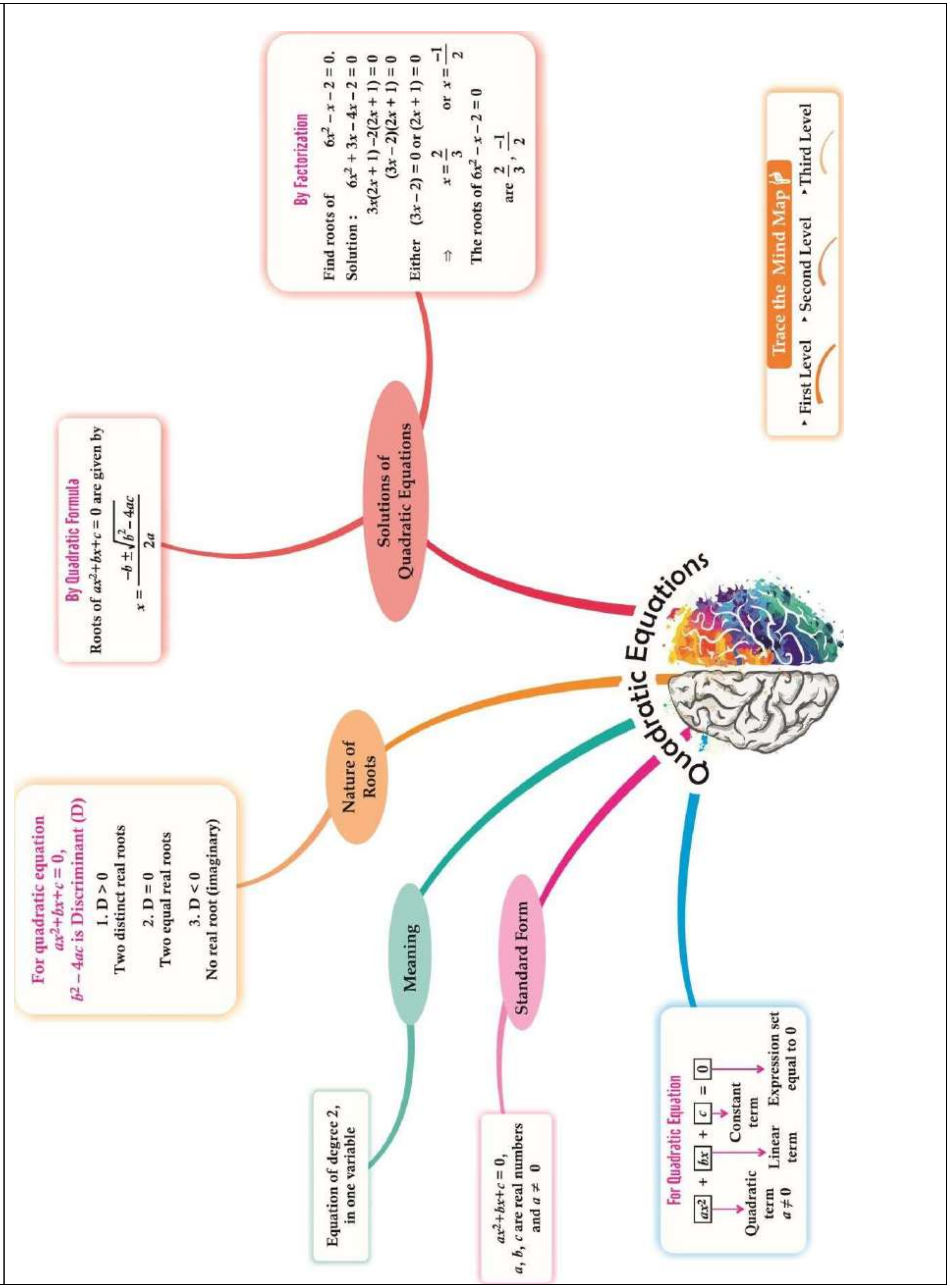
	ANSWER KEY
	MCQs (1 MARK EACH)
1.	d
2.	c
3.	b
4.	b

5.	a
6.	c
7.	b
8.	d
9.	d
10.	a
	SHORT ANSWER TYPE I QUESTION (2 MARKS EACH)
11.	Drawing correct graph Solution is $x = 0$ and $y = -7$
12.	$x=90°$ and $y=60°$
13.	$k=7$
14.	Rs. 2 = 8 coins and Rs. 5 = 12 coins
15.	Length is 13m and width is 5m
16.	Larger number is 37.
17.	Speed of boat = 6 km/hr
18.	Number is 86
19.	24 hens
20.	19 years
	SHORT ANSWER TYPE II QUESTION (3 MARKS EACH)
21.	25 : 1
22.	720
23.	$x = 7$ and $y = 9$ $5y - 2x = 5 \times 9 - 2 \times 7 = 45 - 14 = 31$ and $\frac{y}{x} - 2 = \frac{9}{7} - 2 = \frac{9-14}{7} = -\frac{5}{7}$
24.	$x = 1$, $y = 4$
25.	$x = 6$ and $y = 8$.
	LONG ANSWER TYPE QUESTIONS (5 MARKS EACH)
26.	$x = 1$, $y = 4$ is the solution of the given system of equations. Area of $\Delta = (1/2) \times 4 \times 4 = 8$ sq. units.

27.	Father's age is 40 years.
28.	100 students are in hall A and 80 students are in hall B.
	CASE STUDY BASED QUESTION (4 MARKS EACH)
29.	i)$3x+2y = 80$, $4x+3y = 110$ ii) Rs 20 iii) Rs 10 **(OR)** iii) Rs 420
30.	Let the no of questions whose answer is known to the student x and questions attempted by guessing be y $x + y = 120$ and $x - \frac{1}{4}y = 90$ and solving these two we get $x=96$ and $y= 24$ i) He answered 96 questions correctly. ii)He attempted 24 questions by guessing. iii)Marks = $80 - \frac{1}{4}$ of $40 = 70$ **(OR)** iii) $x - \frac{1}{4}$ of $(120-x) = 95$ and $x = 100$
31.	i)$2x+3y=46$ ii) $3x+5y=74$ iii)$x=8$ **(OR)** iii) $y=10$
	ASSERTION AND REASON BASED QUESTIONS (1 MARK EACH)
32.	a
33.	b
34.	a
35.	c
36.	a
37.	a
38.	c

39.	d
40.	c
41.	a

CHAPTER-4 QUADRATIC EQUATIONS
MIND MAP



	Key points of the chapter
1	The quadratic equation is of the form ax^2+bx+c=0,where a,b and c are constants.
2	b^2- 4ac is called the discriminant.
3	The solutions (roots) of a quadratic equation ax^2+bx+c=0, can be found using the quadratic formula: x = $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
4	Nature of the roots: A quadratic equation ax^2 + bx + c = 0 has (i) two distinct real roots, if b^2 – 4ac > 0, (ii) two equal real roots, if b^2 – 4ac = 0, (iii) no real roots, if b^2 – 4ac < 0.

1 Mark (MCQs)

1. If one root of the equation $ax^2 + bx + c = 0$ is 7 times the other, then
$(a) b^2 = 16ac$ $(b) b^2 = 3ac$ $(c) 7b^2 = 64ac$ $(d) 64b^2 = 7ac$
2. The number of real roots of the equation $(x+1)^2 + (x-2)^2 + (x+3)^2 = 0$ *are*
(a) 1 (b) 2 (c) 0 (d) None of these
3. If 6 is a root of the equation $x^2 - kx - 12 = 0$ and the equation $x^2 + kx + q = 0$ has equal roots, find the value of q.
(a) 6 (b) 4 (c) -4 (d) 3
4. Find the value of k for which the quadratic equation $3x^2 + 6x + k = 0$ has real and equal roots.
(a) 4 (b) 3 (c) -1 (d) 7
5. 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

6. The nature of the roots of quadratic equation $\sqrt{5}\ x^2 - \sqrt{3}\ x - \frac{1}{\sqrt{5}} = 0$ is

(a)Real and distinct (b) Real and repeated (C) Not Real (d) 8
7. If sinα and cosα are the roots of the equation px^2+qx+r =0 then q^2 =

(a)$p^2 - 2pr$ (b) $p^2 + 2pr$ (c) $p^2 - pr$ (d) $p^2 + pr$
8. A quadratic equation, one root is 4 and the product of the roots is zero is

(a)$x^2 + 4x = 0$ (b) $x^2 - 4x = 0$ (c) $2x^2 + 4x = 0$ (d) $2x^2 + 2x^2 = 0$
9. If the equation $x^2 + 6x + k = 0$ has real and distinct roots, then

(a)k < 9 (b) k > 9 (c) k ≥ 9 (d) $k \le 9$
10. If one root of the equation $3x^2 + 10x + (\lambda - 5) = 0$
be the reciprocal of the other, then λ =

(a) 5 (b) 8 (c) 3 (d) - 8

(VERY SHORT QUESTIONS 2 Marks)

1. Solve the following quadratic equation by factorization method:

$$\frac{x+3}{x-4} - \frac{6-x}{x} = 3$$

2. A two digits number is such that the product of its digits is 56. if 9 is subtracted from the number, the digits interchange their places. Find the number.
3. Solve: $P + \frac{1}{P} = 26\frac{1}{26}$
4. Find two consecutive odd positive integers, sum of whose square is 202.
5. There consecutive positive integers are such that the sum of the square of the first and the product of the other two is 92. Find the integers.
6. The length of the sides forming right angle of a right-angled triangle are $2x$ cm and $(x-1)$ cm. If the area of the triangle is $30cm^2$, find its hypotenuse.
7. A shopkeeper sells a book for ₹ 75 and gains as much percent as the cost price of the book. Find the cost price of the book.
8. Determine the nature of the roots of the following quadratic equation :

   (i) $3a^2\,b^2\,x^2 - 16abcx + 4c^2 = 0$ (ii) $4p^2q^2\,x^2 - 12pqx + 36 = 0$

9. Write all the values of k for which the quadratic equation $x^2 + kx + 64 = 0$ has equal roots. Find the roots of the equation so obtained.
10. If 2 is a root of the quadratic equation $2x^2 + qx - 30 = 0$ and the quadratic equation q $(x^2 + x) + k = 0$ has equal roots, find the value of k.

(SHORT ANSWER TYPE QUESTIONS 3 Marks)

1. Two water taps together can fill a tank in $\frac{15}{4}\,hours$. The larger takes 4 hours less than the smaller one to fill the tank separately. Formulate the quadratic equation and find the time in which each tap can separately fill the tank.
2. Solve: $x = \cfrac{1}{3-\cfrac{1}{3-\cfrac{1}{3-x}}}$ $, x \neq 3$
3. Solve for x : pqrx^2- $(x^2 + pq)x + r = 0$
4. In a flight of 3000 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/hour and the time of flight increased by 320 minutes. Find the duration of flight.
5. Determine the nature of the roots of the following quadratic equation:

   (i) $2x^2 + 3x - 1 = 0$ (ii) $x^2 - 5x + 4 = 0$ (iii) $7x^2 + 9x - 8 = 0$

	ASSERTION AND REASON BASED MCQs **Directions:** a.) Both Assertion and Reason are true and Reason is the correct explanation for Assertion b.) Both Assertion and Reason are true and Reason is not the correct explanation for Assertion. c.) Assertion is true but the reason is false. d.) Assertion is false but the reason is true.
1	Assertion: The roots of the equation $7x^2 + x - 1 = 0$ are real and distinct Reason : if $\boldsymbol{b^2}$-4ac >0 then roots are real and distinct.

2	Assertion: Every quadratic equation has at most two root Reason: Every quadratic equation has atleast one real root.
3	Assertion: The equation $9x^2+3kx + 4 = 0$ has equal roots for k =9. Reason : If discriminant 'D' of a quadratic equation is equal to zero then the roots of equation are real and equal.
4	Assertion: $(2x – 1)^2 – 4x^2 + 5 = 0$ is not a quadratic equation. Reason: An equation of the form $ax^2 + bx + c = 0$, $a \neq 0$, where a, b, c ∈ R is called a quadratic equation.
5	Assertion: $3x^2 – 6x + 3 = 0$ has equal roots. Reason: The quadratic equation $ax^2 + bx + c = 0$ have equal roots if discriminant D > 0.
6	Assertion: $4x^2 – 12x+ 9= 0$ has equal roots. Reason : The quadratic equation $ax^2+ bx^2 + c = 0$ has equal roots if discriminant D > 0.
7	Assertion: The product of two successive positive integral multiples of 5 is 300, then the two numbers are 15 and 20. Reason: The product of two consecutive integrals is a multiple of 2.
8	Assertion: Sum of ages of two friends is 20 years. Four years ago, the product of their ages in years was 48.Then the difference between their ages is 16. Reason: For a quadratic equation $ax^2+bx+c=0$, $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$
9	Assertion: If discriminant D= $\boldsymbol{b^2}$- 4ac< 0 then the roots of quadratic equation $a\boldsymbol{x^2}\times bx +c+ = 0$ are imaginary. Reason: The roots of the quadratic equation $\boldsymbol{x^2} +2x+ 2 = 0$ are imaginary
10	Assertion: If one root of the quadratic equation $2x^2 + kx – 6 = 0$ is 2, the value of k is -1 Reason: x = 2 is a root of the equation $2x^2 + kx -6 = 0$
	CASE BASED QUESTIONS (4 MARKS)
1	Raj and Ajay are very close friends. Both the families decide to go to Ranikhet by their own cars. Raj's car travels at a speed of x km/h while Ajay's car travels 5 km/h faster than Raj's car. Raj took 4 hours more than Ajay to complete the journey of 400 km. i) What will be the distance covered by Ajay's car in two hours? (a) 2(x + 5) km (b) (x − 5) km (c) 2(x + 10) km (d) 2(x + 5) km ii) Which of the following quadratic equation describe the speed of Raj's car? (a) $x^2−5x−500=0$ (b) $x^2−4x−400=0$ (c) $x^2 +5x−500=0$ (d) $x^2−4x+400=0$ iii)What is the speed of Raj's car? (a) 20 km/hour (b) 15 km/hour (c) 25 km/hour (d) 10 km/hour iv) How much time took Ajay to travel 400 km? (a) 20 hour (b) 40 hour (c) 25 hour (d) 16 hour
2	John and Jivanti are playing with marbles.They mixed up their marbles without knowing, how many marbles they had before mixing. But now they have 45 marbles altogether. While playing they lost 10 marbles . Since they are not knowing the number of marbles they had in the beginning, so they agreed that both of them lost 5 marbles each, and the product of the number of marbles they now have is 124. Now they want to know the number of marbles each one brought to play. Help them.

	(i)If John had 'x' marbles then write the expression for number of marbles Jivanti had. (ii)Represent the above information in the form of a quadratic equation. (iii) Find the no. of marbles with John by solving a quadratic equation. (iv)If α and β are the roots of the equation $x^2 - p(x + 1) - c = 0$, then find the value of $(\alpha + 1)(\beta + 1)$.
3	The speed of a motor boat is 20 km/hr. For covering the distance of 15 km the boat took 1 hour more for upstream than downstream. i) Let speed of the stream be x km/hr. then speed of the motorboat in upstream will be (a) 20 km/hr (b) (20 + x) km/hr (c) (20 – x) km/hr (d) 2 km/hr ii) Which is the correct quadratic equation for the speed of the current ? (a) x^2+30x−200=0 (b) x^2+20x−400=0 (c) x^2+30x−400=0 (d) x^2 −20x−400=0 iii) What is the speed of current ? (a) 20 km/hour (b) 10 km/hour (c) 15 km/hour (d) 25 km/hour iv) How much time boat took in downstream? (a) 90 minute (b) 15 minute (c) 30 minute (d) 45 minute
	LONG ANSWERS (5 MARKS)
1	A pole has to be erected at a point on the boundary of a circular park of diameter 13 metres in such a way that the differences of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 metres. Is it possible to do so? If yes, at what distances from the two gates should the pole be erected?
2	A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of production on that day was ` 90, find the number of articles produced and the cost of each article.
3	A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. Find the speed of the train.

(ANSWERS)

(MCQs)

1. (C) $7b^2 = 64ac$ 2. (C) 0 3. (B) 4

4. (B) 3 5. (A) 4 6. (C) Not Real

7. (B) $p^2 + 2pr$ 8. (B) $x^2 - 4x = 0$ 9. (A) k< 9

10. (B) 8

(2 Marks)

1. x= 8or -3
2. 87
3. p=26 or $\frac{1}{26}$
4. 9 ,11
5. 6,7,8
6. 13 cm
7. ₹ 50
8. i) real & distinct ii) not real
9. k= ±16, for k= +16, each root= -8 , for k= -16, each root= +8
10. k= $\frac{11}{4}$

(3 Marks)

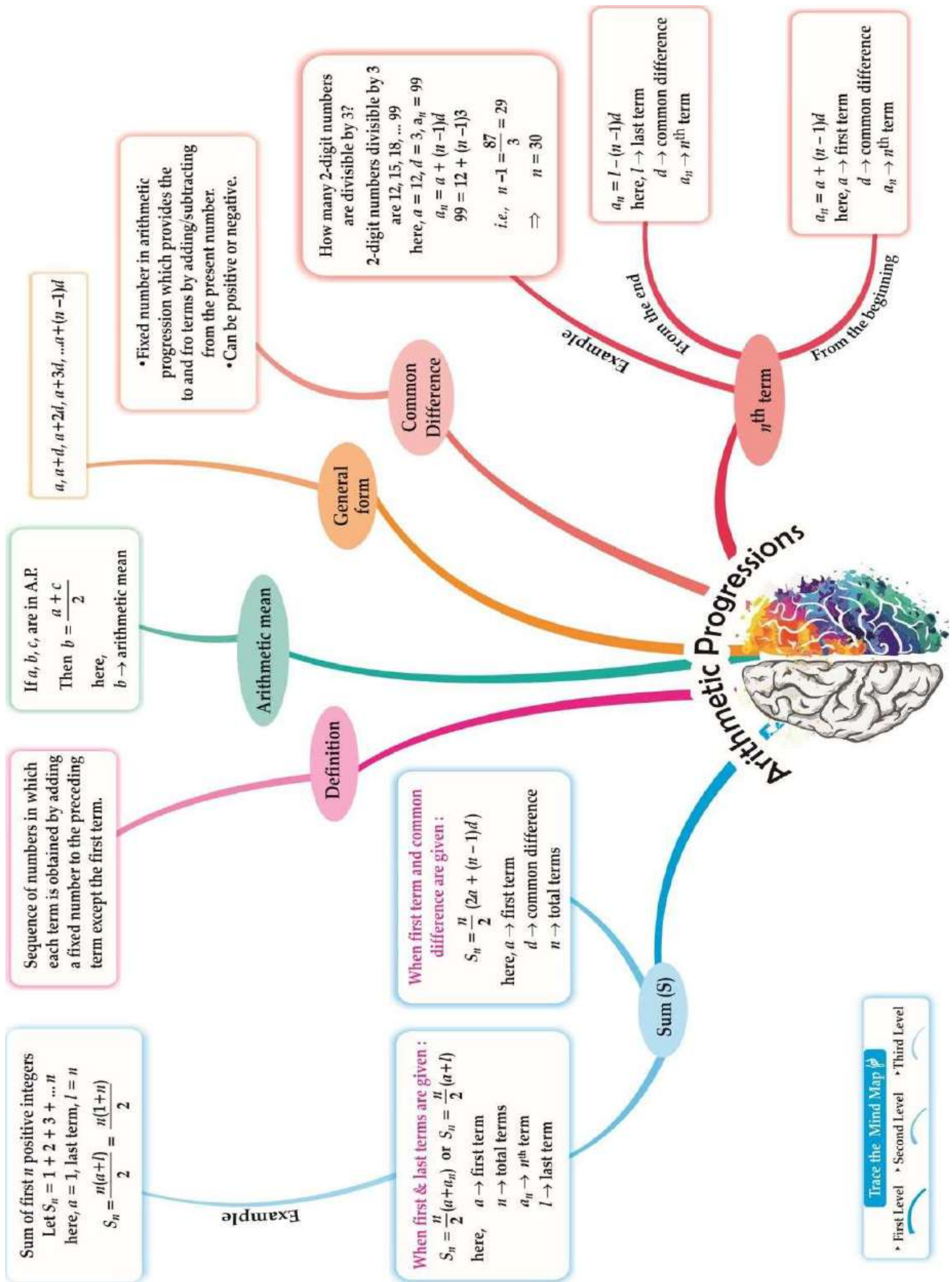
1. 6 hours & 10 hours
2. $\frac{3\pm\sqrt{5}}{2}$
3. $\frac{r}{pq}, \frac{1}{r}$
4. $\frac{20}{3}\,hrs$
5. (i) real & distinct (ii) real &distinct (iii) not real

ANSWER KEY

	ASSERTION AND REASON BASED MCQs
1	a.) Both Assertion and Reason are true and Reason is the correct explanation for Assertion
2	c.) Assertion is true but the reason is false.
3	a.) Both Assertion and Reason are true and Reason is the correct explanation for Assertion
4	a.) Both Assertion and Reason are true and Reason is the correct explanation for Assertion
5	c.) Assertion is true but the reason is false.
6	c) Assertion is true but reason is false
7	a.) Both Assertion and Reason are true and Reason is the correct explanation for Assertion
8	d.) Assertion is false but the reason is true.
9	a) Both assertion and reason are correct and reason is the correct explanation for Assertion.
10	a.) Both Assertion and Reason are true and Reason is the correct explanation for Assertion
	CASE BASED QUESTIONS (4 MARKS)
1	i) (a) 2(x + 5) km ii) (c) $x^2 + 5x - 500 = 0$ iii) (a) 20 km/hour iv) (d) 16 hour
2	(i) 45 – x (ii) x^2-45x+324=0 (iii) x = 36 or x = 9 (iv) (α+1)(β+1)=1-c
3	i) (c) (20 – x) km/hr ii) (c) $x^2 + 30x - 400 = 0$ iii) (b) 10 km/hour iv) (d) 45 minute
	LONG ANSWERS (5 MARKS)
1	The pole has to be erected on the boundary of the park at a distance of 5m from the gate B and 12m from the gate A.

2	The number of articles produced per day is 6 and the cost of each article is Rs 15
3	The speed of the train is 40km/hour

CHAPTER -5 Arithmetic Progressions



Key Concepts:

- An arithmetic progression is a list of numbers in which each term is obtained by adding a fixed number to the preceding term except the first term.
- This fixed number is called the **common difference** of the AP. Common difference can be positive, negative or zero.
- The n^{th} term a_n of the AP with first term a and common difference d is given by $a_n = a + (n - 1) d$.
- $a, a + d, a + 2d, a + 3d, \ldots$ represents an arithmetic progression where a is the first term and d the common difference. This is called the **general form of an AP.**
- The sum of the first n terms of an AP is given by $S_n = \frac{n}{2}(2a + (n-1)d)$ **OR** $S_n = \frac{n}{2}(a + a_n)$
- If S_n denotes the sum of n terms of an A.P. with common difference d,then $a_n = s_n - s_{n-1}$

Solved Examples

01.Find the 17th term of AP 4, 9, 14, …
Soln. Here, a = 4, d = 9 – 4 = 5, n = 17.
$a_n = a+(n-1)d$,
$a_{17} = 4+ (17-1)5$
$= 4+16(5)$
$= 84$

02.What is the general term of the A.P. 4, 7, 10, 13, …?
Soln. Here, a = 4 , d = 7-4 = 3
$a_n = a+(n-1)d$
$a_n = 4 +(n-1)3$
$a_n = 4 + 3n-3$
$a_n = 3n+1$

03. Which term of AP 27, 24, 21, … is 0?
Soln. Here, $a_n = a+(n-1)d$
$0 = 27 +(n-1)(-3)$
$0 = 27 -3n +3$
$0 = 30 – 3n$
$3n = 30$
Hence, n = 10

04. For what value of k will k + 9,2k -1 and 2k + 7 are the consecutive terms of an A.P.?

Soln. $a_3 - a_2 = a_2 - a_1$

$(2k + 7)-(2k -1)=(2k -1)-(k + 9)$

K=18

05.Find how many integers between 201 and 500 are divisible by 8.

Soln. AP formed is 208, 216, 224, …, 496

Here, $a_n = 496$, $a = 208$, $d = 8$

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

$\Rightarrow 208 + (n - 1) \times 8 = 496$

$\Rightarrow 8\,(n - 1) = 288$

$\Rightarrow n - 1 = 36$

$\Rightarrow n = 37$

Practice Questions

I. Multiple choice questions:

01. The next term of the A.P. $\sqrt{18}, \sqrt{50}, \sqrt{98}, \ldots..$ is

(a) $\sqrt{146}$ (b) $\sqrt{128}$ (c) $\sqrt{162}$ (d) $\sqrt{200}$

02. If the common difference of an A.P. is 7, then $a_{25} - a_{21}$ is equal to

(a) 14 (b) 20 (c) 28 (d) 35

03The 10^{th} term from the end of the A.P. 4, 9,14, …, 254 is

(a) 209 (b) 205 (c) 214 (d) 213

04. If 2x, x + 10, 3x + 2 are in A.P., then x is equal to

(a) 0 (b) 2 (c) 4 (d) 6

05. The sum of first 16 terms of the AP: 10, 6, 2,… is

(a) –320 (b) 320 (c) –352 (d) –400

06. The sum of the first n even natural numbers is

(a) 2n (b) n^2 (c) n^2+n (d) n^2-1

07. If the n^{th} term of an A.P. is 7n+12, then its common difference is

(a) 12 (b) 5 (c) 7 (d) 19

08.If the sum of n terms of an A.P. is $S_n = 3n^2+4n$,then common difference of the A.P. is

(a) 7 (b) 5 (c)8 (d)6

09. The common difference of the A.P. $\frac{1}{2q}, \frac{1-2q}{2q}, \frac{1-4q}{2q}$ … … …is

(a)-1 (b) 1 (c)-2q (d) 2q

10. The first term of an A.P. is p and the common difference is q,then its 10^{th} term is

(a) q+9p (b)p-9q (c) p+9q (d)2p+9q

II. Short answer type questions. (2 marks questions)

01. Find the middle term of the A.P. -11,-7,-3,……….,45.

02. How many terms are there in the A.P. 7, 16, 25, ………,349.

03. Find whether −150 is a term of the AP 17, 12, 7,2, … …?

04. If the 8^{th} term of an AP is 31 and the 15^{th} term is 16 more than the 11^{th} term, find the AP.

05. In an Arithmetic Progression, if d= - 4, n=7,a_n=4, then find a.

06. In an A.P. the 6th term is (- 10) and the 10th term is (-26).Determine the 15th term of the A.P.

07. The sum of the 5^{th} and 9^{th} terms of an AP is 30. If its 25^{th} term is three times its 8^{th} term, find the AP.

08. In an Arithmetic progression, the ratio of the 7th term to the 10th term is (-1). If the 16th term is (-15), find the 3rd term.

09. Determine k, so that k^2+4k+8 ,$2k^2+3k+6$, $3k^2+4k+4$ are three consecutive terms of an A.P.

10. For what value of n are the nth terms of two A.P.s 63, 65, 67, … and 3, 10, 17 … equal?

III. Short answer type questions. (3 marks questions)

01. The sum of first six terms of an A.P. is 42. The ratio of its 10th term to its 30th term is 1 : 3. Find the first term of the A.P.

02. Which term of the sequence 114, 109, 104, ……, is first negative term?

03.Find the sum of first n terms of an A.P. whose n th term is $5n-1$. Hence find the sum of first 20 terms.

04. Find the sum of all three digit natural numbers which leave the remainder 3 when divided by 5.

05. If the sum of first m terms of an A.P. is the same as the sum of its n terms, show that the sum of its first (m + n) terms is zero.

IV Long **type answer questions (5 marks questions)**

1. The sum of four consecutive terms of an 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.

2. A man repays a loan of Rs. 3250 by paying Rs. 20 in the first month and then increases the payment by Rs. 15 every month. How long will it take him to clear the loan?

3. A manufacturer of laptop produced 6000 units in 3rd year and 7000 units in the 7th year. Assuming that production increases uniformly by a fixed number every year , find

(i) The production in the first year.

(ii) The production in the 5th year.

(iii)The total production in 7 years

V **Case study questions (4 marks)**

1. A school auditorium has to be constructed to accommodate atleast 1500 students. 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) For 1500 seats in the auditorium, how many rows need to be there?

(iii)If 1500 seats are to be arranged in the auditorium, how many seats are still left to be put after 10th row?

(iv)If there were 17 rows in the auditorium, how many seats will be there in the middle row?

2. In a class the teacher asks every student to write an example of AP. Two boys Aryan and Roshan writes their progressions as -5,-2, 1,4 ……

and 187, 184, 181,….. respectively.Now the teacher asks the various students of the class the following questions on this progressions. Help students to find the answers of the following.

(i) Find the sum of common difference of the two progressions.

(ii) Find the 34th term of the progression written by Roshan.

(iii) Find the sum of first 10 terms of the progression written by Aryan.

OR

Which term of the two progressions will have the same value?

3. Mr Pradeep wants to buy a car and plans to take a 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 , answer the following

(i) Find the amount paid by him in 30^{th} instalment.
(ii) If total instalments are 40, then find the amount paid in the last instalment.
(iii)Find the total amount paid by him in the 30 instalments.

OR

Find the ratio of the 1^{st} instalment to the last instalment.

VI Assertion Reasoning Questions (1 mark 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.

1. Assertion (A):10^{th} term of an AP is 41 whose first term is 5 and common difference is 4

   Reason (R) : nth term of an AP is $a_n = a + (n-1)d$ where a= first term, d=common difference

2. Assertion (A): In an AP with a=15, d=-3 then 6^{th} term will be zero

   Reason (R) : a-d, a , a+d are three numbers in AP

3. Assertion (A): The 6^{th} term from the end of the AP 5,2,-1,-4,….. -31 is -16.

   Reason (R) : general term (nth term) from the beginning is given by $a_n = a + (n-1)d$.

4. Assertion (A): 12^{th} term of the AP 30, 27, 24 ……is the first negative term of the AP

   Reason (R) :Sum of first n terms of an AP a , a+d , a +2d …. Is given by $S_n = \frac{n}{2}(2a + (n-1)d)$

5 Assertion (A): $-5, -\frac{5}{2}, 0, \frac{5}{2}$ ….. is in AP

   Reason (R) :the terms of an AP cannot have both positive and negative rational numbers.

6 Assertion (A): a, b , c are in AP if and only if 2b =a+c

   Reason (R) : The sum of first n odd natural numbers is n^2.

7.. Assertion (A): If nth term of an AP is 7-4n, then its common difference is -4

Reason (R) : common difference of an AP is given by $d=a_{n+1} - a_n$

8. . Assertion (A): 184 is the 50^{th} term of the AP :3,7,11……

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

9. Assertion (A): sum of first hundred even natural numbers divisible by 5 is 500

Reason (R) : sum of first n terms of an AP is $S_n = \frac{n}{2}(a + l)$, l is the last term

10. Assertion (A): Sum of all 11 terms of an AP is whose middle most term is 30 is 330

Reason (R) : sum of first n terms of an AP is $S_n = \frac{n}{2}(a + l)$, l is the last term

****

Answers

I. Multiple choice questions:

1. (c)$\sqrt{162}$
2. (c) 28
3. (a) 209
4. (d) 6
5. (a) –320
6. (c) n^2+n
7. (c)7
8. (d) 6 9.(a) -1 10 .(c) p+9q

II. Short answer type questions.(2 marks questions)

1. Middle term $=a_8=17$

2.39 terms

3. No,-150 is not a term of the AP

4. A.P=3, 7, 11…

5. a=28

6. (-46)

7. A.P.=3,5,7,9,..

8. a3=11

9. k=0

10.n=13

III.Short answer type questions.(3 marks questions)

1).a=2 2) 24^{th} term 3) Sn=n/2[3+5n],S20=1030 4)99090

IV. Long answer type questions (5 marks)

1 Let the four consecutive terms be a-3d, a-d, a+d , a+ 3d

a-3d+ a-d+ a+d + a+ 3d =32

4a =32 a=8

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

$\frac{a^2-9d^2}{a^2-d^2} = \frac{7}{15}$ (cross multiply get d= 2 and -2

When a =8 and d=2 AP : 2, 6, 10, 14

When a= 8 and d= -2 AP : 14, 10 , 6 ,2

2. n=20 instalments

4. (i) 5500 (ii) 6500 (iii) 43750

V Case base study questions

1 (i) 120 (ii) n=15 (iii) 750 (iv) 110

2. (i) 0 (ii) 88 (iii) 85 or n=33

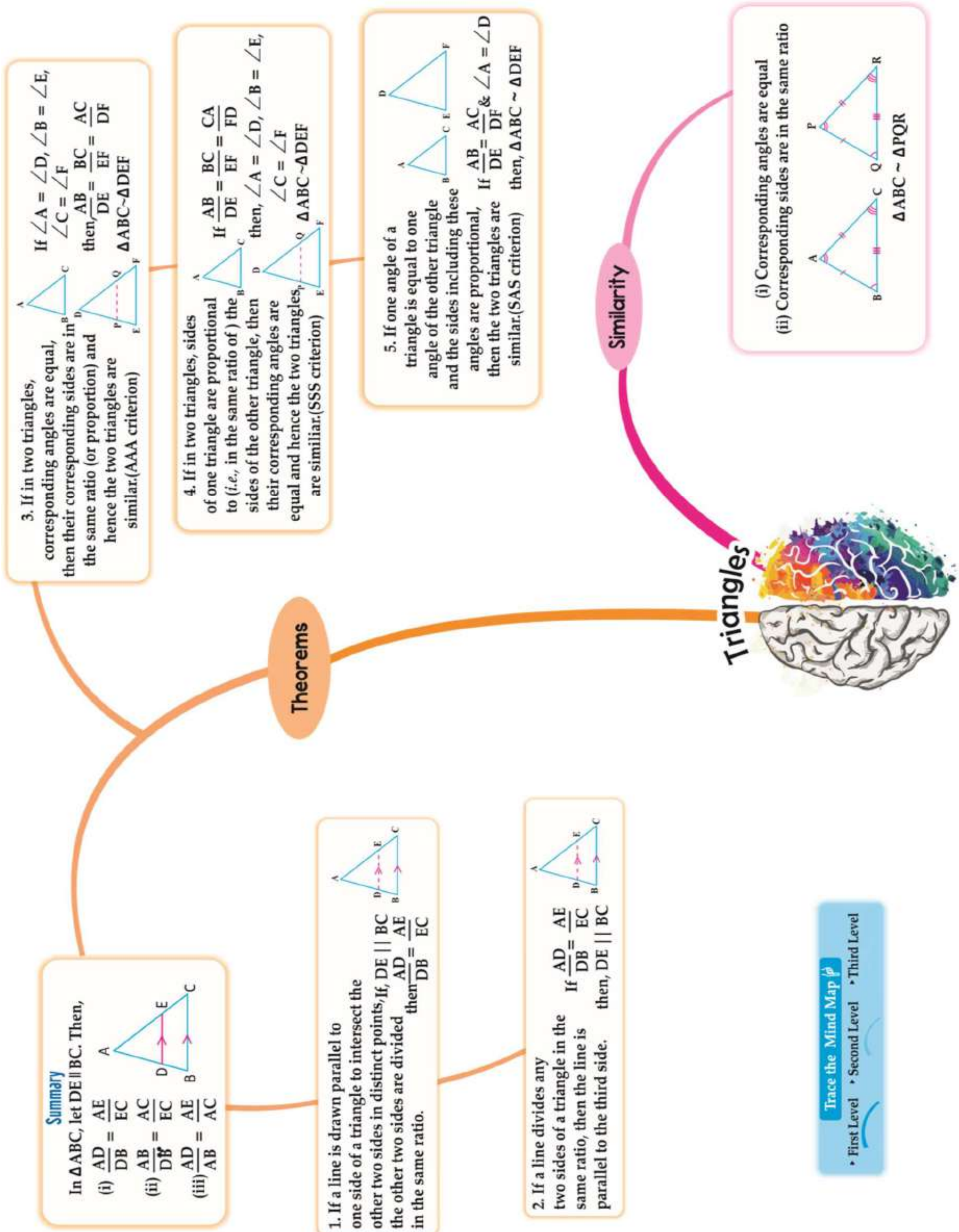
3 (i) 3900 (ii) 4900 (iii) 73500 (iv) 10:49

VI Assertion Reasoning Questions (1 mark each)

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

CHAPTER -6 TRIANGLES

MIND MAP



Key Points

- Two figures having same shape but not necessarily the same size are called similar figures.

- All congruent figures are similar but the converse is not true.
- Pair of all regular polygons are similar figures.
- All circles are similar figures.
- Two polygons with the same number of sides are similar, if

i. their corresponding angles are equal and

ii. their corresponding sides are in the same ratio (i.e. Proportional)

- Similar Triangles: Two triangles are said to be similar, if (i) their corresponding angles are equal and (ii) their corresponding sides are in the same ratio.

We write $\Delta ABC \sim \Delta DEF$ Where symbol $\sim$ 'stands for is similar to'

- Thales Theorem (Basic Proportionality 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.
- Criteria for similarity of triangles:

i. AAA similarity Criterion OR AA similarity Criterion -

If in two triangles, corresponding angles are equal, then the triangles are similar by AAA similarity criterion.

If in two triangles, two angles of one triangle are respectively equal to the two angles of the other triangle, then the two triangles are similar by AA similarity criterion.

ii. SSS similarity Criterion -

If in two triangles, corresponding sides are in the same ratio, then the two triangles are similar by SSS similarity criterion.

iii. SAS similarity Criterion -

If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are in the same ratio, then the two triangles are similar by SAS similarity criterion.

MULTIPLE CHOICE QUESTIONS

1. 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

2. 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

3. 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

4. If in two triangles ABC and PQR, AB/QR = BC/PR = CA/PQ, then

   (a) ΔPQR ~ ΔCAB (b) ΔPQR ~ ΔABC

   (c) ΔCBA ~ ΔPQR (d) ΔBCA ~ ΔPQR

5. 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

6. 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

7. It is given that ΔABC ~ ΔDFE, ∠A = 30°, ∠C = 50°, AB = 5 cm, AC = 8 cm 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°

8. 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

9. Which of the following is not a similarity criterion for two triangles?

   (a) AAA (b) SAS (c) SSS (d) ASA

10. 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

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

1. **Assertion:** If two angles of one triangle are equal to two angles of another triangle, then the two triangles are similar.

   Reason: Angles are the only criteria to determine similarity of triangles.
2. **Assertion:** In similar triangles, corresponding sides are equal in length.

   Reason: Congruent triangles are similar.
3. **Assertion:** If the three angles of a triangle are equal to the three angles of another triangle, then the two triangles are similar.

   Reason: Triangles with equal angles are always similar.
4. **Assertion:** If two triangles have the same area, they must be similar.

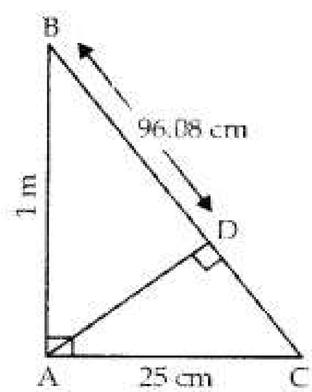
   Reason: Congruent triangles always have the same area.
5. **Assertion:** If two triangles are similar, their altitudes drawn to the corresponding sides are equal.

Reason: Corresponding sides of similar triangles are proportional.

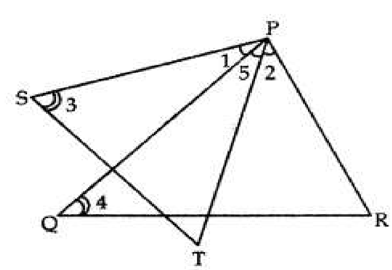
6. **Assertion:** If two triangles have equal corresponding angles, they are similar.
   Reason: Similar triangles have equal corresponding angles.
7. **Assertion**: If the sides of two triangles are in proportion, then the triangles are similar.
   Reason: Triangles with proportional sides are always similar.
8. **Assertion:** If the two corresponding sides of two triangles are in the same ratio, and the included angle between the sides are equal then the triangles are similar.
   Reason: This is called SSA criterion.
9. **Assertion:** If two triangles have equal corresponding medians, they are similar.
   Reason: Similar triangles have proportional medians.
10. **Assertion:** All congruent triangles are similar.
    Reason: Congruent triangles have equal corresponding angles.

2 MARKS QUESTIONS

1. In the given figure, $\angle CAB = 90°$ and $AD \perp BC$. If AC = 25 cm, AB = 1 m and BD = 96.08 cm, then find the value of AD.

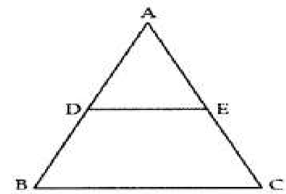


2. In fig., $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$. Show that PT. QR = PR. ST.



3. In ΔABC, D and E are the points on the sides AB and AC respectively such that DE || BC.

If AD = 6x – 7, DB = 4x – 3, AE = 3x – 3, and EC = 2x – 1 then find. the value of ‘x’.

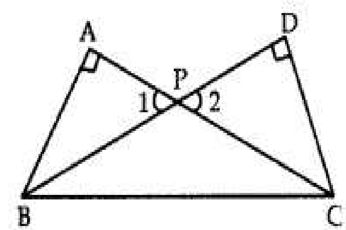


4. If ΔABC ~ ΔPQR, perimeter of ΔABC = 32 cm, perimeter of ΔPQR = 48 cm and PR = 6 cm, then find the length of AC.

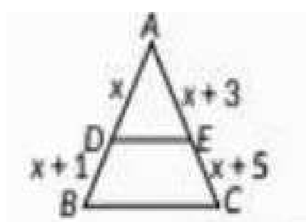
5. ΔABC ~ ΔDEF. If AB = 4 cm, BC = 3.5 cm, CA = 2.5 cm and DF = 7.5 cm, find the perimeter of ΔDEF.

6. In ΔDEW, AB || EW. If AD = 4 cm, DE = 12 cm and DW = 24 cm, then find the value of DB.

7. Two right triangles ABC and DBC are drawn on the same hypotenuse BC and on the same side of BC. If AC and BD intersect at P. Prove that AP × PC = BP × PD.

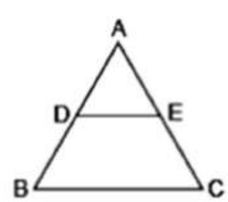


8. In ΔABC, DE || BC, find the value of x



9. In the given figure, DE||BC

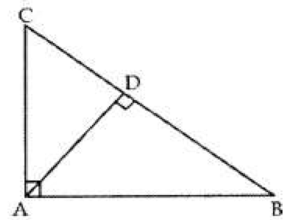
If $\frac{AD}{DB} = \frac{3}{4}$ and AC = 14cm, find EC.



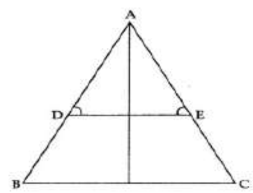
10. In ΔLMN, ∠L=50° and ∠N = 60°, if ΔLMN~ΔPQR, then find ∠Q

3 MARKS QUESTIONS

1 . In fig., ∠CAB = 90° and AD ⊥ BC. If AC = 75 cm, AB = 1 m, and BD = 1.25 m, find AD.

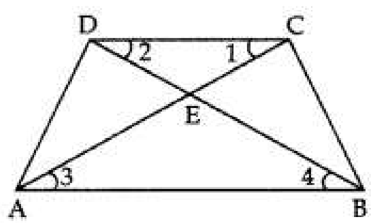


2. In the fig., ∠D = ∠E and $\frac{AD}{DB} = \frac{AE}{EC}$. Prove that ΔBAC is an isosceles triangle

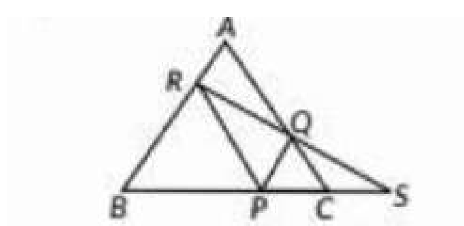


3.In given figure ∠1 = ∠2; ∠2 = ∠4

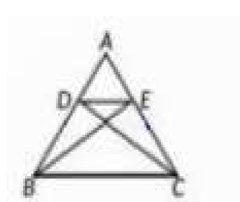
DE = 4; CE = x + 1, AE = 2x + 4; BE = 4x – 2, find x.



4. In the figure P is any point on side BC of ΔABC. PQ||BA and PR∥CA are drawn is extended to meet BC produced at S. Prove that SP^2 = SBXSC

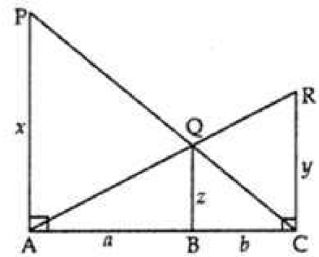


5. In the figure ,if ΔBEA≅ΔCDA, then prove that ΔDEA~ΔBCA.



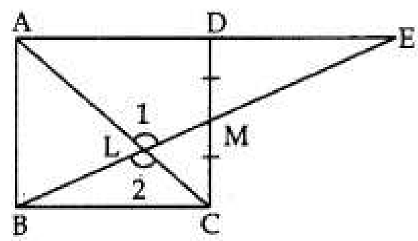
5 MARKS QUESTIONS

1. In the given fig. PA, QB and RC each is perpendicular to AC such that PA = x, RC = y, QB = z, AB = a and BC = b.
   Prove that $\frac{1}{X} + \frac{1}{Y} = \frac{1}{Z}$.

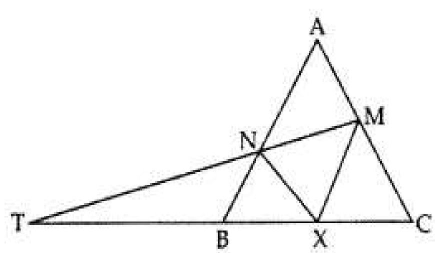


2. In figure, M is mid-point of side CD of a parallelogram ABCD. The line BM is drawn intersecting AC at L and AD produced at E. Prove that

   EL = 2BL.



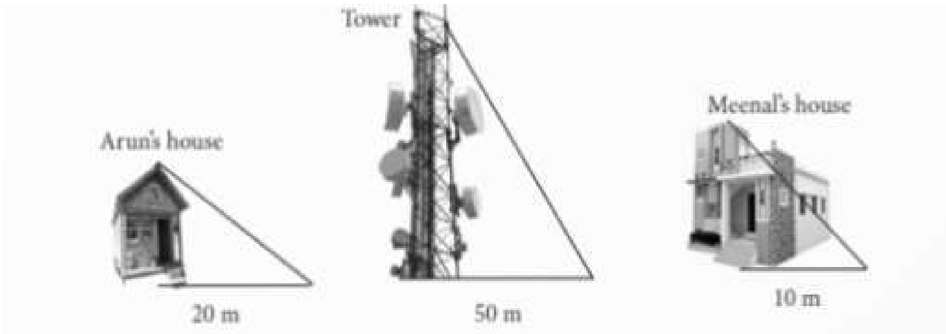
3. Any point X is taken on the side BC of a triangle ABC and XM, XN are drawn parallel to BA, CA meeting CA, BA at M and N respectively. MN meets BC produced in T.
   Prove that: $TX^2 = TB \times TC$.



CASE STUDY QUESTIONS

1 Meenal was trying to find the height of tower near her house. She is using the properties of similar triangles. The height of Meenal's house is 20 m. When Meenal's house casts a shadow of

10m long on the ground, at the same time, tower casts a shadow of 50 m long and Arun's house casts a shadow of 20 m long on the ground as shown below.



Based on the above information, answer the following questions.

1.What is the height of tower?

a) 100 m b) 50m c) 15m d) 45m

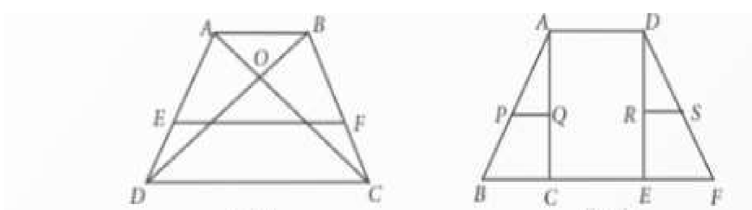
2.What is the height of Arun's house?

a)80m B) 75m c) 60m d) 40m

3.If tower casts a shadow of 40m, then find the length of shadow of Arun's house

a)18m b) 16m c) 17m d)14m

2. Class teacher draw the shape of quadrilateral on board. Ankit observed the shape and explored on his notebook in different ways as shown below.



Based on the above information, answer the following questions.

1.In fig1. If ABCD is a trapezium with AB∥CD, E and F are points on non -parallel sides AD and BC respectively such that EF∥ AB, then find $\frac{AE}{ED}$.

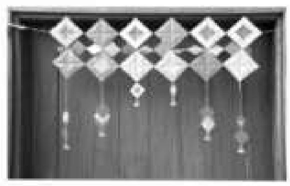
a) $\frac{BE}{CD}$ b) $\frac{AB}{CD}$ c) $\frac{BF}{FC}$ d) none of these

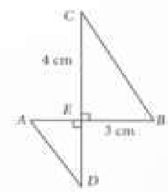
2.In fig 1 OD = 3x-1 , OB = 5x-3, OC = 2x+1 and AO = 6x-5, then find the value of x

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

3.In the fig 2 in ΔDEF, if RS∥EF, DR= 4x-3, DS=8x-7, ER=3x-1 and FS=5x-3, then find the value of x.

3. Ankita wants to make a toran for Diwali using some pieces of card board. She cut some cardboard pieces as shown below. If perimeter of ΔADE and ΔBCE are in the ratio2:3, then answer the following questions.





1.Find the length of BC.

a) 2 cm b) 4 cm c) 5 cm d) none of these

2. If the two triangles are similar by SAS similarity rule then the corresponding proportional sides are

a) $\frac{AE}{CE} = \frac{DE}{BE}$ b) $\frac{BE}{AE} = \frac{CE}{DE}$ c) $\frac{AD}{CE} = \frac{BE}{DE}$ d) none of these

3)Find the length of AD

a) $\frac{10}{3}$ cm b) $\frac{9}{4}$ cm c) $\frac{5}{3}$ cm d) $\frac{4}{3}$ cm

ANSWERS

MCQ's

Q1] (b) 3 Q2] (c) 10 cm Q3] (d) 18 cm Q4] a) ΔPQR ~ΔCAB

Q5] (b) similar but not congruent Q6] (a) 15 cm Q7] (b) DE = 12 cm, ∠F = 100°

Q8] (c) AB/DE = BC/EF = CA/FD Q9] (d) ASA Q10] c) 7.5 cm

ASSERTION REASONING

Q1] (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.

Q2] (d) Corresponding sides of similar triangles are proportional, not equal in length.

Q3] (a) This is a property of similar triangles known as AAA (Angle-Angle-Angle) similarity criterion.

Q4] (d) Two triangles can have the same area without being similar. For example, a triangle with sides 3, 4, and 5 and a triangle with sides 6, 8, and 10 both have the same are

(6 square units), but they are not similar.

Q5] (d) While corresponding sides of similar triangles are proportional, their altitudes need not be equal.

Q6] (a) This is a property of similar triangles known as AA (Angle-Angle) similarity criterion.

Q7] (a) This is one of the criteria for similarity known as SSS (Side-Side-Side) similarity criterion.

Q8] (c) This is SAS criterion.

Q9] (d) While corresponding sides of similar triangles are proportional, their medians need not be equal.

Q10] (a) AAA criterion.

2 MARKS

1. In ΔBAC and ΔBDA, we have

∠BAC = ∠BDA = 90°

∠B = ∠B [Common]

⇒ ΔBAC ~ ΔBDA [By AA similarity)

$\frac{BA}{BD} = \frac{AC}{AD}$

$\frac{100}{96.08} = \frac{25}{AD}$

AD=24.02 cm

2. ∠1 = ∠2 (Given)

⇒ ∠1 + ∠5 = ∠2 + ∠5

or ∠SPT = ∠QPR

and ∠3 = ∠4 (Given)

By AA criterion $\Delta PST \sim \Delta PQR \Rightarrow ST/QR = PT/PR$

Or PT.QR = PR.ST

3. Here AD = 6x – 7, DB = 4x – 3,

AE = 3x – 3, EC = 2x – 1

∵ DE || BC

By BPT $\frac{AD}{DB} = \frac{AE}{EC}$

$\frac{6x-7}{4x-3} = \frac{3x-3}{2x-1}$

X=2cm

4. ΔABC~ΔPQR

$\frac{Perimeter\ of\ \Delta ABC}{Perimeter\ of\ \Delta PQR} = \frac{AC}{PR}$

$\frac{32}{48} = \frac{AC}{6}$

AC=4 cm

5. $\frac{Perimeter\ of \Delta ABC}{Perimeter\ of\ \Delta DEF} = \frac{AC}{DF}$

$\frac{10}{Perimeter\ of\ \Delta DEF} = \frac{1}{3}$

Perimeter of ΔDEF=30 cm

6. Let BD = x cm
then BW = (24 – x) cm, AE = 12 – 4 = 8 cm
In ΔDEW, AB || EW

$\frac{AD}{AE} = \frac{BD}{BW}$

$\frac{4}{8} = \frac{x}{24-x}$

x = 8 cm

DB=8cm

7. In ΔBPA and ΔCPD

∠1 = ∠2 (Vertically opp.angles)
∠BAP = ∠CDP = 90°
∴ ΔBPA ~ ΔCPD
∴ APDP=BPCP

$\Rightarrow$ AP × CP = BP × DP

$\Rightarrow$ AP × PC = BP × PD

8. In ΔABC,DE∥BC

$\frac{AD}{DB} = \frac{AE}{EC}$

$\frac{x}{x+1} = \frac{x+3}{x+5}$

x = 3

9. In ΔABC,DE∥BC

$\frac{AD}{DB} = \frac{A\ E}{EC}$

$\frac{3}{4} = \frac{14-E}{EC}$

EC=8cm

10. ∠L+∠M+∠N=180°

∠M=70°

∠Q=70°

3 MARKS

1.In given fig.,

∠CAB = 90°, AD ⊥ BC

AC = 75 cm, AB = 1 m

and BD = 1.25 m

In ΔABC = ΔDBA

∠CAB = ∠ADB = 90°

∠CBA = ∠ABD

∴ ΔABC ~ ΔDBA

$\frac{BC}{BA} = \frac{AC}{AD} \quad \frac{AB}{DB}$

$\frac{BC}{100} = \frac{75}{AD} \quad \frac{100}{125}$

AD=93.75 cm

2. Here, $\frac{AD}{DB} \qquad = \frac{AE}{EC}$

$\Rightarrow$ DE || BC

[By converse of Basic Proportionality Theorem]
Now, ∠D = ∠B [Corresponding angle]
∠E = ∠C
But ∠D = ∠E [Given]
Hence ∠B = ∠C
[Sides opp. to equal angles of a Δ are equal]
∴ ΔBAC is an isosceles Δ.

3. In ΔDCE and ΔABE, we have
∠2 = ∠4
∠DEC = ∠AEB
[Vertically opposite angles]
Hence, ΔDCE ~ ΔBEA

$\frac{DC}{AB} = \frac{CE}{AE} \quad \frac{DE}{BE}$

$\frac{CE}{AE} \quad \frac{DE}{BE}$

$\frac{x+1}{2x+4} = \frac{4}{4x-2}$

x=3 or x=-32

4. In ΔSRB,PQ∥RB

$\frac{SP}{SB} = \frac{SQ}{SR}$

Also in ΔSPR ,PR∥QC

$\frac{SC}{SP} = \frac{SQ}{SR}$

$\frac{SC}{SP} = \frac{SP}{SB}$

SP^2=SC XSB

5.We have, ΔBEA≅ΔCDA

AB=AC and AE=AD

$\frac{AD}{DB} = \frac{A\ C}{AE}$

In ΔDEA and ΔBCA

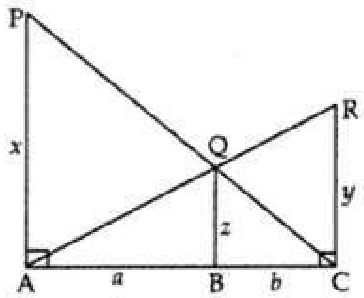
$\frac{AB}{AD} = \frac{AC}{AE}$

∠BAC = ∠DAE

ΔDEA~ΔBCA (SAS similarity)

5 MARKS

1.Here PA ⊥ AC
and QB ⊥ AC
⇒ QB || PA
Thus, in ΔPAC QB || PA.
⇒ ΔQBC ~ ΔPAC



$\frac{QB}{PA} = \frac{BC}{AC}$

$\frac{Z}{X} = \frac{b}{a+b}$ -------(1)

In ΔRAC QR∥ RC

ΔRAC~ΔQAB

$\frac{z}{y} = \frac{a}{a+b}$ ------(2)

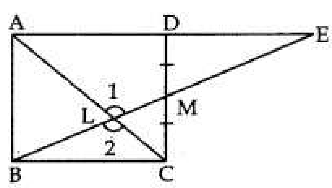
Adding (1) and (2)

$\frac{Z}{X} + \frac{z}{y} = \frac{b}{a+b} + \frac{a}{a+b}$

$Z\,(\frac{1}{X} + \frac{1}{y}) = 1$

$\frac{1}{X} + \frac{1}{y} = \frac{1}{z}$

2.In ΔDEM and ΔCBM



∠DEM = ∠MBC [alt.angles]
∠EDM = ∠MCB [alt.angles]
DM = MC [given]
∠DEM = ∠CBM [AAS congruence]
⇒ DE = BC

but AE = AD + DE
= AD + BC
⇒ AE = 2BC
[∵ AD = BCas ABCD is a || gm] … (i)
In ΔAEL and ΔCBL,

∠1 = ∠2 [vertically opp. angles]

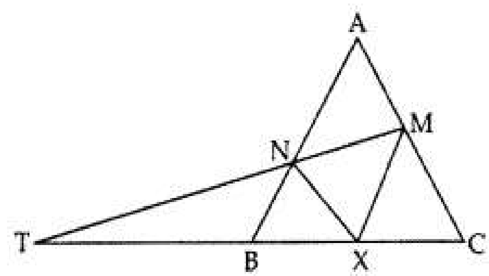
∠AEL = ∠LBC
[Alt. angles as DE || BC, BE acting as transversal]
∴ ΔAEL ~ ΔCBL [By AA similarity

$\frac{AE}{BC} = \frac{EL}{BL}$

$\frac{2BC}{BC} = \frac{EL}{BL}$

EL=2BL

3.



Here BA || XM ⇒ BN || XM
and CA || XN ⇒ CM||XN
Now in ATMX, BN||XM
∴ By Corollary to B.P.T., we have

$\frac{TB}{TX} = \frac{TN}{TM}$

Again, in ATMC, XN || CM
By using corollary to B.P.T., we have

$\frac{TX}{TC} = \frac{TN}{TM}$
From (i) and (ii), we get

$\frac{TX}{TC} = \frac{TB}{TX}$
⇒ TX^2 = TB × TC

CASE STUDY QUESTIONS (4 MARKS)

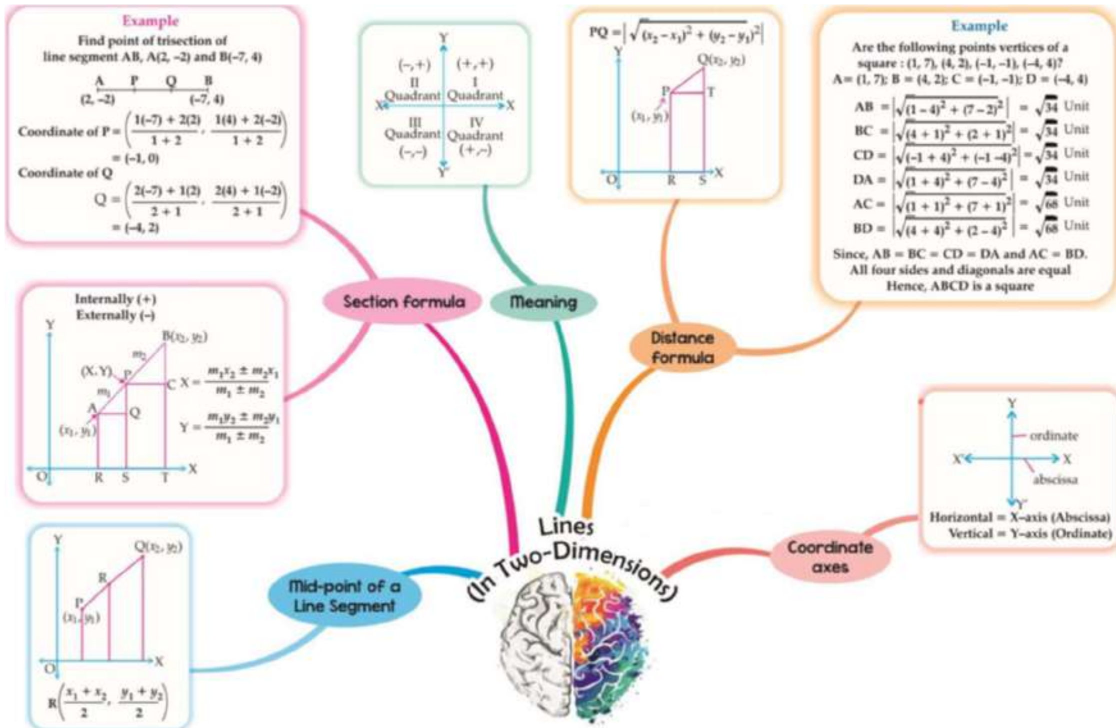
1) 1. 100 2. 40m 3. 16 m

2. 1.c 2. 2 3.1

3.1. c 2. b 3.a

CHAPTER-7 COORDINATE GEOMETRY

MIND MAP



KEY POINTS:

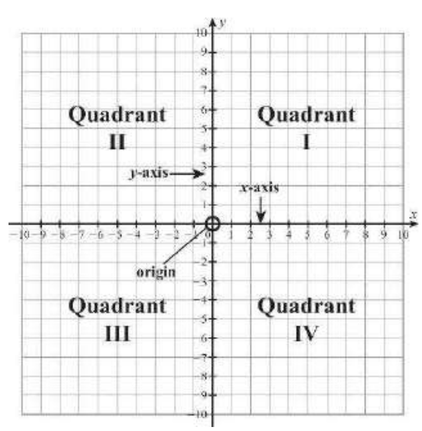
❖ Two perpendicular number lines intersecting at origin are called coordinate axes. The horizontal line is the X-axis and the vertical line is Y-axis.

❖ The point of intersection of X-axis and Y-axis is called origin and denoted by O.

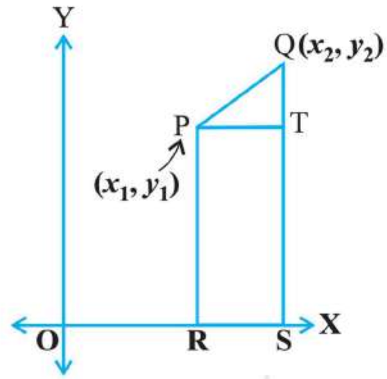
❖ Cartesian plane is a plane obtained by putting the coordinate axes perpendicular to each other in the plane. It is also called coordinate plane or XY -plane.

❖ x coordinate of a point is called abscissa and y coordinate of a point is called ordinate.

❖ The axes divide the Cartesian plane into four parts called quadrants as shown below.



DISTANCE FORMULA:

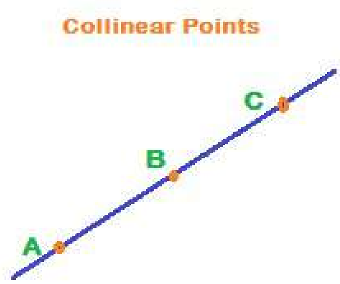


The distance between two points P and Q is calculated by distance formula (using Pythagoras theorem in right angled triangle).

$$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Problems based on Distance Formula

- Diagonals of rhombus, square, rectangle and parallelogram always bisect each other.
- Diagonals of rhombus and square bisect each other at right angles.
- Three points A, B and C are **collinear** if the distance AB, BC and CA are such that the sum of two distances is equal to the third



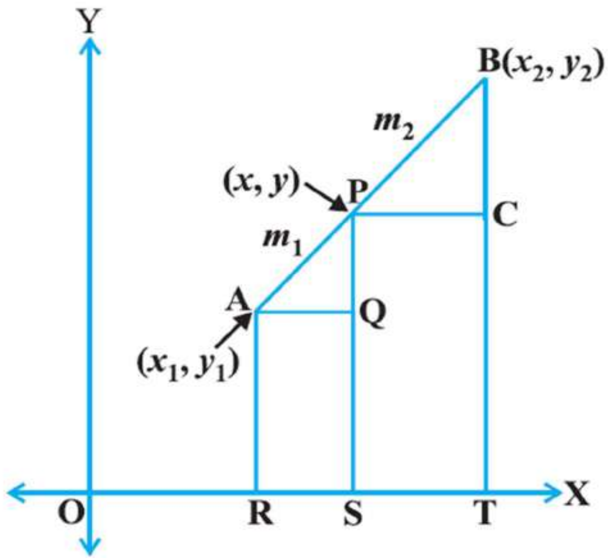
- To show that a given figure is a –

❖ **Parallelogram** – Prove that the opposite sides are equal
❖ **Rectangle** – Prove that the opposite sides are equal and the diagonals are equal.
❖ **Parallelogram but not rectangle** – Prove that the opposite sides are equal and the diagonals are not equal.
❖ **Rhombus** – Prove that the four sides are equal
❖ **Square** – Prove that the four sides are equal and the diagonals are equal.
❖ **Rhombus but not square** – Prove that the four sides are equal and the diagonals are not equal.
❖ **Isosceles triangle** – Prove any two sides are equal.
❖ **Equilateral triangle** – Prove that all three sides are equal.
❖ **Right triangle** – Prove that sides of triangle satisfy Pythagoras theorem.

DISTANCE OF A POINT P (X, Y) FROM ORIGIN

Since coordinate of origin is O (0,0), Then by applying distance formula, distance of P (x, y) from O is $OP = \sqrt{x^2 + y^2}$

SECTION FORMULA:



$$P(x, y) = \left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2} \right)$$

If the ratio in which P divides AB is k:1, then the coordinates of the point P will be

$$P(x, y) = \left(\frac{kx_2 + x_1}{k+1}, \frac{ky_2 + y_1}{k+1} \right)$$

Mid-Point Formula: The mid-point of a line segment divides the line segment in the ratio 1: 1. Therefore, the coordinates of the mid-point P of the join of the points A (x_1, y_1) and B (x_2, y_2) is

$$P(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

MULTIPLE CHOICE QUESTIONS (1 MARK)

1. The distance of the point P (2, 3) from the x-axis is

(a) 2 (b) 3 (c) 1 (d) 5

2. The distance between the point P (1, 4) and Q (4, 0) is

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

3. The distance of the point (α, β) from the origin is

(a) $\alpha + \beta$ (b) $\alpha^2 + \beta^2$ (c) $|\alpha| + |\beta|$ (d) $\sqrt{\alpha^2 + \beta^2}$

4. The midpoint of a line segment joining two points A (2, 4) and B (-2, -4) is

(a) (-2, 4) (b) (2, -4) (c) (0, 0) (d) (-2, -4).

5. If O (p/3, 4) is the midpoint of the line segment joining the points P (-6, 5) and Q (-2, 3), then value of p is:

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

6. 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)

7. The coordinates of a point P, where PQ is the diameter of a circle whose centre is (2, – 3) and Q is (1, 4) is:

(a) (3, -10) (b) (2, -10) (c) (-3, 10) (d) (-2, 10).

8. The ratio in which the line segment joining the points P (-3, 10) and Q (6, –8) is divided by O (-1, 6) is:

(a) 1:3 (b) 3:4 (c) 2:7 (d) 2:5

9. If the points A (6, 1), B (8, 2), C (9, 4) and D (p, 3) are the vertices of a parallelogram, taken in order, then the value of p is

(a) 4 (b) -6 (c) 7 (d) -2.

10. The distance of the point P (–6, 8) from the origin is

(a) 8 units (b) $2\sqrt{7}$ units (c) 10 units (d) 6 units.

VERY SHORT ANSWER TYPE QUESTIONS (2 MARKS)

1. If the point (0, 2) is equidistant from the points (3, k) and (k, 5), find the value of k.
2. Find the ratio in which y-axis divides the line segment joining the points A (5, -6) and B (-1, -4). Also find the coordinates of the point of division.
3. Let P and Q be the points of trisection of the line segment joining the points A (2, -2) and B (-7, 4) such that P is nearer to A. Find the coordinates of P and Q.
4. 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.
5. Point A (- 1, y) and B (5, 7) lie on a circle with centre O (2, -3y). Find the values of y. Hence find the radius of the circle.
6. The x-coordinate of a point P is twice its y-coordinate. If P is equidistant from Q (2, – 5) and R (-3,6), find the coordinates of P.
7. If the distance between the points (4, k) and (1,0) is 5, then what can be the possible values of k?

8. Find distance between A (10 cos θ, 0) and B (0, 10 sin θ).
9. Find the ratio in which the line segment joining the points (– 3, 10) and (6, – 8) is divided by (– 1, 6).
10. Write the coordinates of a point on the x-axis which is equidistant from points A (-2, 0) and B (6, 0).

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. □AOBC is a rectangle whose three vertices are A (0, 4), O (0, 0) and B (3, 0). Find the length of its diagonal.
2. Prove that the points (3, 0), (6, 4) and (-1, 3) are the vertices of a right-angled isosceles triangle.
3. If (1, p/3) is the midpoint of the line segment joining the points (2, 0) and (0,2/9), then show that the line 5x + 3y + 2 = 0 passes through the point (- 1, 3p).
4. The vertices of a triangle are (- 2, 0), (2, 3) and (1, – 3). Is the triangle equilateral, isosceles or scalene?
5. If the point P (x, y) is equidistant from the points A (a + b, b – a) and B (a – b, a + b). Prove that bx = ay.

LONG ANSWER TYPE QUESTIONS (5 MARKS)

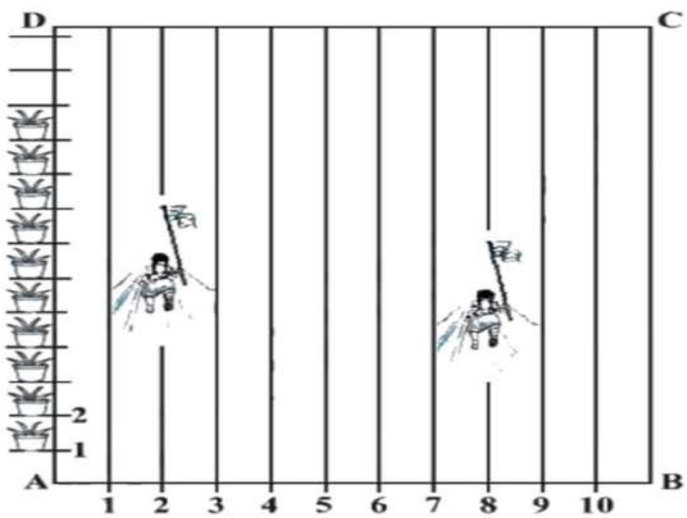
1. Show that ΔABC, where A (-2, 0), B (2, 0), C (0, 2) and Δ PQR where P (- 4, 0), Q (4, 0), R (0, 4) are similar triangles.

2. If A (-2, 1), B (a, 0), C (4, b) and D (1, 2) are the vertices of a parallelogram ABCD, find the values of a and b. Hence find the lengths of its sides.

3. Find the coordinates of the points of trisection of the line segments joining the points A (2, -2) and B (-7,4).

CASE BASED QUESTIONS (4 MARKS)

1. To conduct Sport Day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1m each. 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in figure. Hema runs 1/4 th the distance AD in the 2nd line and posts a blue flag. Preeti runs 1/5 th the distance AD on the 8th line and posts a green flag.



a) Which mathematical concept is used in the above problem?

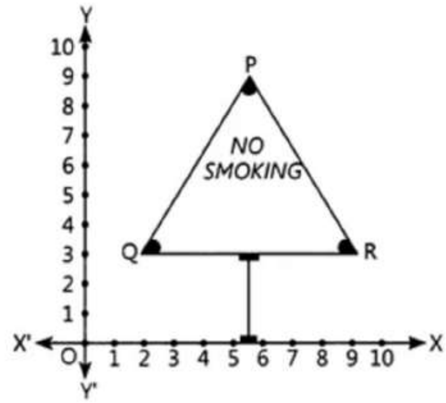
b) What value is depicted in this problem?

c) What is the distance between both the flags?

OR

If Uttara has to post an orange flag exactly halfway between the line segment joining the two flags, where should she post her flag?

2. All of the persons know that smoking is injurious to health. So, college students decided to make a campaign. To raise social awareness about hazards of smoking, school decided to start "NO SMOKING" campaign. Some students are asked to prepare campaign banners in the shape of triangle as shown in the figure:



Based on the above information, give the answer of the following questions:

a) What are the coordinates of P and R.

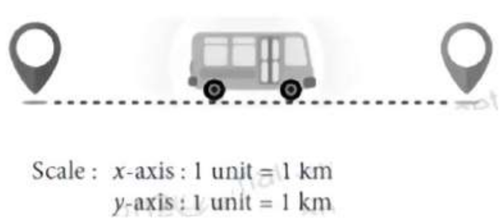
b) Find the coordinates of the mid-point of Q and R.

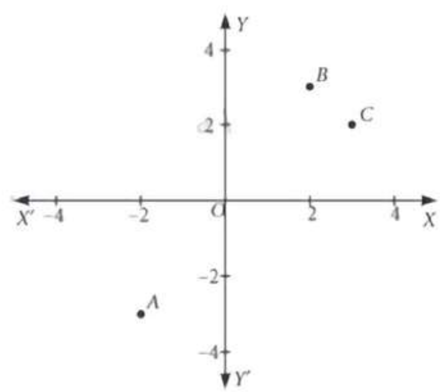
c) Find the distance between P and R.

OR

Find the point on x axis, which is equidistant from Q and R.

3. There are two routes to travel from the place A to B by bus. The first bus reaches the place B via C and the second bus reaches the place B from A directly. The position of A, B and C are represented in the following graph. Observe the graph given below and answer the following





a) What are the coordinates of places B and C?
b) What is the distance between B and C?
c) If a place D lies at the midpoint of AB then what are the coordinates of place D?
OR

If E is the place on the y-axis which is equidistant from the places A(-5, -2) and B(3, 2) , then find the coordinates of place E.

ASSERTION AND REASON (1 MARK)

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R).

Mark the correct choice as: -

a) If 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):** Mid-point of a line segment divides the line in the ratio 1:1
   Reason (R): The distance between the points (a, b) and (c, d) is given by $\sqrt{(c-a)^2+(d-b)^2}$

2. **Assertion (A):** The distance of a point P(4, 8) from the origin is $\sqrt{80}$.
   Reason (R): The distance of a point (a, b) from the origin is $\sqrt{a^2-b^2}$

3. **Assertion (A):** The points (-3, 7) and (7, -3) are at different positions in the coordinate plane.
   Reason (R): The position of (x, y) in the Cartesian plane is different from the position of (y, x).

4. **Assertion (A):** The co-ordinates of the point which divide the join of A (-3, 5) and B (2,3) in the ratio 5:2 is (4/7, 25/7)
   Reason (R): The co-ordinates of the point S (x, y) which divides the line segment joining the points P (x_1, y_1) and Q (x_2, y_2) in the ratio m_1:m_2 is $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$.

5. **Assertion (A):** The point (0, 2) lies on Y-axis
   Reason (R): The X-coordinate of the point on Y-axis is zero.

6. **Assertion (A):** The distance of point P (2,3) from the x-axis is 3.
   Reason (R): The distance from x-axis is equal to its ordinate.

7. **Assertion (A):** The point (4, 0) lies on y-axis.
   Reason (R): The x-coordinate of the point on y-axis is zero.

8. **Assertion (A):** The point (3,0) lies on x-axis.
   Reason (R): The y-coordinate on the point on x-axis is zero.

9. **Assertion (A):** The point (6,0) lies on x-axis.
   Reason (R): The point (0,7) lies on y-axis.

10. **Assertion (A):** The distance of a point from the x -axis is its ordinate.
Reason (R): The distance of a point from the y-axis is called its abscissa

ANSWER KEY

MULTIPLE CHOICE QUESTIONS

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

VERY SHORT ANSWER TYPE QUESTIONS

1. k = 1. 2. Ratio is 5:1, point (0, -13/3) 3. (-1,0) and (-4,2)

4. Ratio=1:1, m=0 5. Y=-1, radius=5 units 6. (16,8)

7. k = ± 4 8. 10 units 9. Required ratio is 2:7
10. The coordinates of a point on the x-axis are (2, 0)

SHORT ANSWER TYPE QUESTIONS

1. 5 Units 4. Scalene triangle

LONG ANSWER TYPE QUESTIONS

2. a=1, b=1; length of each side √10 units 3. (-1,0) and (-4.2)

CASE BASED QUESTIONS

1. (a) Co-ordinate Geometry (b) Team Spirit (c) √61m OR (5, 45/2)

2. (a) P(11/2, 9), R(9, 3) (b) (11/2,3) (c) $\sqrt{193}$ /2 units OR (11/2,0)

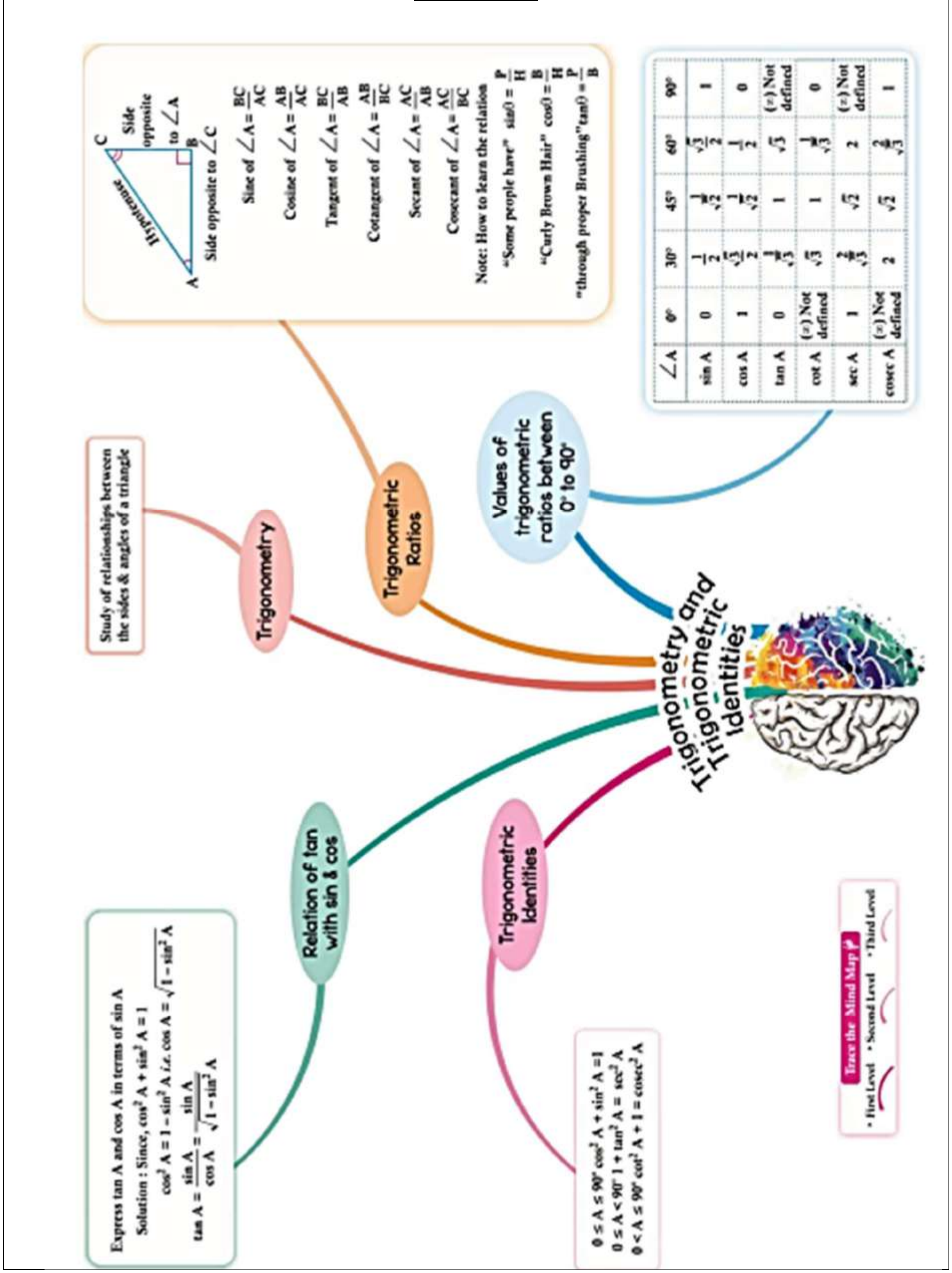
3. (a) B (2, 3), C (3, 2) (b) √2 Km, (c) D (0, 0) OR E (0, -2)

ASSERTION AND REASON

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

CHAPTER -8 INTRODUCTION TO TRIGONOMETRY

MIND MAP



∠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

KEY POINTS:

❖ Trigonometric Ratios of the angle A in a triangle ABC right angled at B are defined as:

sine of $\angle A = \sin A = \frac{\text{side opposite to } \angle A}{\text{hypotenuse}} = \frac{BC}{AC}$

cosine of $\angle A = \cos A = \frac{\text{side adjacent to } \angle A}{\text{hypotenuse}} = \frac{AB}{AC}$

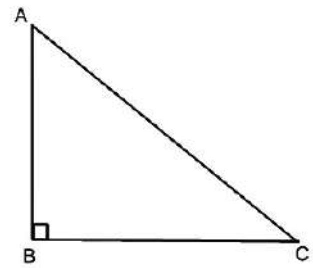
tangent of $\angle A = \tan A = \frac{\text{side opposite to } \angle A}{\text{side adjacent to } \angle A} = \frac{BC}{AB}$

cosecant of $\angle A = \operatorname{cosec} A = \frac{1}{\sin A} = \frac{AC}{BC}$

secant of $\angle A = \sec A = \frac{1}{\cos A} = \frac{AC}{AB}$

cotangent of $\angle A = \cot A = \frac{1}{\tan A} = \frac{AB}{BC}$

$\tan A = \frac{\sin A}{\cos A}$, $\cot A = \frac{\cos A}{\sin A}$



❖ The values of trigonometric ratios of an angle do not vary with the lengths of the sides of the triangle, if the angle remains the same.

❖ If one trigonometric ratio of an angle is given, the other trigonometric ratios of the angle can be determined.

❖ Trigonometric ratios of angles: 0°, 30°, 45°, 60° and 90°.

angle θ / ratio	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	not defined
$\operatorname{cosec}\theta$	not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	not defined
$\cot\theta$	not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

❖ The value of sin A or cos A never exceeds 1, whereas the value of sec A or cosec A is always greater than or equal to 1.

❖	**Trigonometric identities:** $\sin^2 A + \cos^2 A = 1$ $1 + \tan^2 A = \sec^2 A$ $\cot^2 A + 1 = \text{cosec}^2 A$
	MULTIPLE CHOICE QUESTIONS: **(EACH CARRIES 1 MARK)**
1.	The value of $(\sin 30° + \cos 30°) - (\sin 60° + \cos 60°)$ is ….. (a) -1 (b) 0 (c) 1 (d) 2
2.	The value of $\sin^2 30^o + \cos^2 30^o$ is ….. (a) $\frac{-1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) 1 (d) $\frac{2}{3}$
3.	tan A = ……….. (a) $\frac{cosA}{\sqrt{1-cos^2A}}$ (b) $\frac{secA}{\sqrt{1-sec^2A}}$ (c) $\frac{sinA}{\sqrt{1-sin^2A}}$ (d) $\frac{1}{\sqrt{1-sin^2A}}$
4.	If $4 \tan\theta = 3$, then the value of $\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}$ is equal to …… (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{3}{4}$ (d) $\frac{2}{3}$
5.	If $\sin A = \frac{1}{2}$, then the value of cot A is …… (a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) $\frac{\sqrt{3}}{2}$ (d) 1
6.	If $3\cot\theta = 2$, then the value of $\tan\theta$ is …… (a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{3}{\sqrt{13}}$ (d) $\frac{2}{\sqrt{13}}$
7.	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) $\frac{1}{4}$
8.	The value of $\frac{\tan 30^o}{\cot 60^o}$ is …… (a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{\sqrt{3}}$ (c) $\sqrt{3}$ (d) 1
9.	Given that $\sin\alpha = \frac{1}{2}$ and $\cos\beta = \frac{1}{2}$, then the value of $(\alpha + \beta)$ is …. (a) 0^o (b) 30^o (c) 60^o (d) 90^o
10.	If cosec A – cot A = $\frac{4}{5}$, then cosec A = ….

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

	SHORT ANSWER QUESTIONS TYPE I (EACH CARRIES 2 MARKS)
1.	Prove that: $\frac{\text{cosec}^2x-\sin^2x\cot^2x-\cot^2x}{\sin^2x} = 1.$
2.	If tan (A + B) =√3 and tan (A – B) =1/√3, 0° < A + B ≤ 90°; A > B, find A and B.
3.	If sin B= $\frac{12}{13}$, then find cot B
4.	If cos B = 0 then what is the value of $\frac{1}{2}\cos\left(\frac{B}{2}\right)$?
5.	If 5x = sec θ and $\frac{5}{x}$ = tan θ, find the value of $5\left(x^2 - \frac{1}{x^2}\right)$
6.	Prove the identity: $\frac{\sin^3A+\cos^3A}{\sin A+\cos A} = 1 - \sin A\cos A$
7.	Simplify: $\frac{1+\tan^2A}{1+\cot^2A}$
8.	If sin θ – cos θ = 0, find the value of $\sin^4\theta + \cos^4\theta$.
9.	If 2 cos 3θ = √3, find the value of θ.
10.	If x = a cos θ – b sin θ and y = a sin θ + b cos θ, then prove that $a^2 + b^2 = x^2 + y^2$
	SHORT ANSWER QUESTIONS TYPE II (EACH CARRIES 3 MARKS)
1.	Prove that $\frac{\sin A-\cos A}{\sin A+\cos A} + \frac{\sin A+\cos A}{\sin A-\cos A} = \frac{2}{\sin^2A-1}$
2.	Prove that $\frac{\tan A+\sec A-1}{\tan A-\sec A+1} = \frac{1+\sin A}{\cos A}$
3.	If tan A = $\frac{a}{b}$, prove that $\frac{a\sin A-b\cos A}{a\sin A+b\cos A} = \frac{a^2-b^2}{a^2+b^2}$
4.	If $7\sin^2A + 3\cos^2A = 4$, then show that $\tan\theta = \frac{1}{\sqrt{3}}$.
5.	Prove that (sec A− cos A)(cot A + tan A) = tan A sec A
	LONG ANSWER TYPE QUESTIONS (EACH CARRIES 5 MARKS)
1.	If tan θ + sin θ = p ; tan θ – sin θ = q; prove that $p^2 - q^2 = 4\sqrt{pq}$

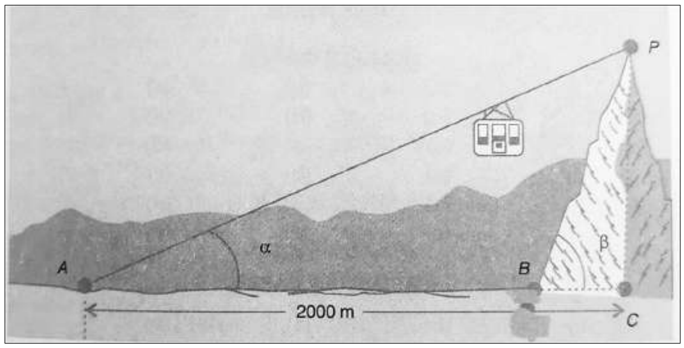
2. If $\sin\theta + \cos\theta = m$ and $\sec\theta + \operatorname{cosec}\theta = n$, then prove that $n(m^2 - 1) = 2m$.

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

CASE STUDY BASED QUESTIONS:

(Subparts of each question carry 1+1+2 marks)

1. A tram transports travellers from the base level at point A to the summit of a mountain chateau at point P. Point A is situated 2000 meters away from point C, which marks the mountain's base. If $\alpha = 30^o$ and $\beta = 60^o$, then,

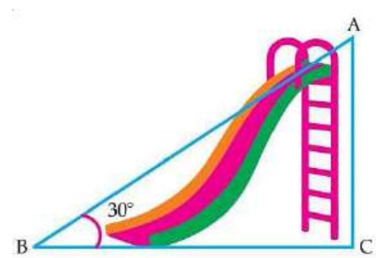


(i) What will be the height of the mountain?
(ii) Assuming the cable is held tight what will be the length of the cable?
(iii) What will be the length of BC?

OR

What will be the distance of point A to the foot of the mountain located at B?

2. The local government plans to build a playground slide in a city park specifically designed for children under 12 years old. They envision the top of the slide positioned 4 meters above ground level, inclined at a 30-degree angle relative to the ground.

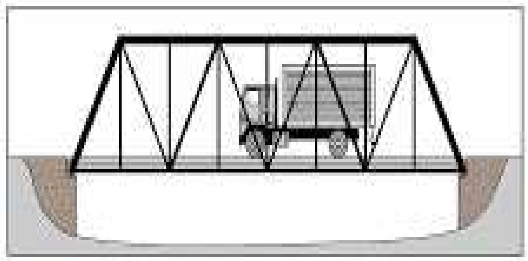


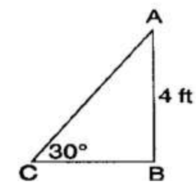
(i) What is the length of AB?
(ii) What is the value of $\sin^2 30^o + \cos^2 60^o$?
(iii) In the given figure, if AB + BC =25m and AC = 5 m, then what is the value of BC?

OR

In the given figure, what is the value of (sin B cos A)?

3. Structural design involves constructing a framework using interconnected triangles. Among the primary engineering structures, trusses play a significant role, particularly in the construction of bridges and buildings. Trusses are engineered to bear various loads, including human weight, and are constructed solely from elongated, straight elements linked by joints at their endpoints. Each truss system features a repeating triangle as its fundamental unit as shown in the figure below:





(i)) If sin A = sin C, what will be the length of BC?

(ii) What is the length of AC?

(iii) If the length of AB doubles, what will become of the length of AC?

OR

What is the length of BC?

ASSERTION –REASON TYPE QUESTIONS:

(EACH CARRIES 1 MARK)

Directions: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice from the following:

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

(b) Both Assertion (A) and Reason (R) are true. Reason (R) does NOT give 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.	**STATEMENT I:** ASSERTION (A): For any acute angle θ, the value of sin θ cannot be greater than 1. **STATEMENT II**: REASON (R)**:** Hypotenuse is the longest side in any right angled triangle.
2.	**STATEMENT I:** ASSERTION (A): For $0 \leq \theta \leq 90^0$, sec x + cos x ≥ 2 **STATEMENT II:** REASON (R): For any x > 0, $x + \frac{1}{x} \geq 2$
3.	**STATEMENT I:** ASSERTION (A): If $\sin\theta + \sin^2\theta = 1$, then $\cos^2\theta + \cos^4\theta = 1$ **STATEMENT II:** REASON (R)**:** $1 - \sin^2\theta = \cos^2\theta$

4.	**STATEMENT I:** ASSERTION (A): In a right angled triangle, if tanθ = $\frac{3}{4}$, the greatest side of the triangle is 5 units. **STATEMENT II:** REASON (R): (greatest side)^2 = (hypotenuse)^2 = (perpendicular)^2 + (base)^2
5.	**STATEMENT I:** ASSERTION (A): For $0 < \theta \leq 90^0$, (cosec θ - cot θ) and (cosec θ + cot θ) are reciprocal of each other. **STATEMENT II:** REASON (R) : $\cot^2\theta - \text{cosec}^2\theta = 1$
6.	**STATEMENT I :** ASSERTION (A): cot A is the product of cot and A. **STATEMENT II:** REASON (R): The value of sin θ increases as θ increases.
7.	**STATEMENT I** : ASSERTION (A): For any acute angle θ, the value of tan θ never exceeds $\sqrt{2}$. **STATEMENT II:** REASON (R): For $0 \leq \theta < 90^0$, tan θ = $\frac{\sin\theta}{\cos\theta}$
8.	**STATEMENT I** : ASSERTION (A): For any acute angle θ ($0 \leq \theta < 90^0$), sec θ ≥ 1. **STATEMENT II**: REASON (R): For any acute angle θ ($0 \leq \theta < 90^0$), cosec θ ≥ 1.
9.	**STATEMENT I** : ASSERTION (A): For $0 < \theta \leq 90^0$, sinθ + cosecθ ≥ 2. **STATEMENT II:** REASON (R): $x + \frac{1}{x} \geq 2$ for all x > 0.
10.	**STATEMENT I :** ASSERTION (A): If tan θ + cot θ =2, then $\tan^2\theta + \cot^2\theta = 4$ **STATEMENT II:** REASON (R): If cosecA = $\sqrt{2}$, then $\frac{2\sin^2 A+3\cot^2 A}{4\tan^2 A-2\cos^2 A} = \frac{4}{3}$

****

ANSWERS

MULTIPLE CHOICE QUESTIONS:

ANSWER KEY: **1.**b **2.**c **3.** c **4.**a **5.**a **6.**b **7.**c **8.** d **9.** d **10.** d

SHORT ANSWER QUESTIONS TYPE I :

ANSWER KEY: **2.** A= 45°, B = 15° **3.** $\frac{5}{12}$ **4.** $\frac{1}{2\sqrt{2}}$ **5.** $\frac{1}{5}$ **7.** $\tan^2$A **8.** $\frac{1}{2}$ **9.** 10^0

CASE STUDY BASED QUESTIONS:

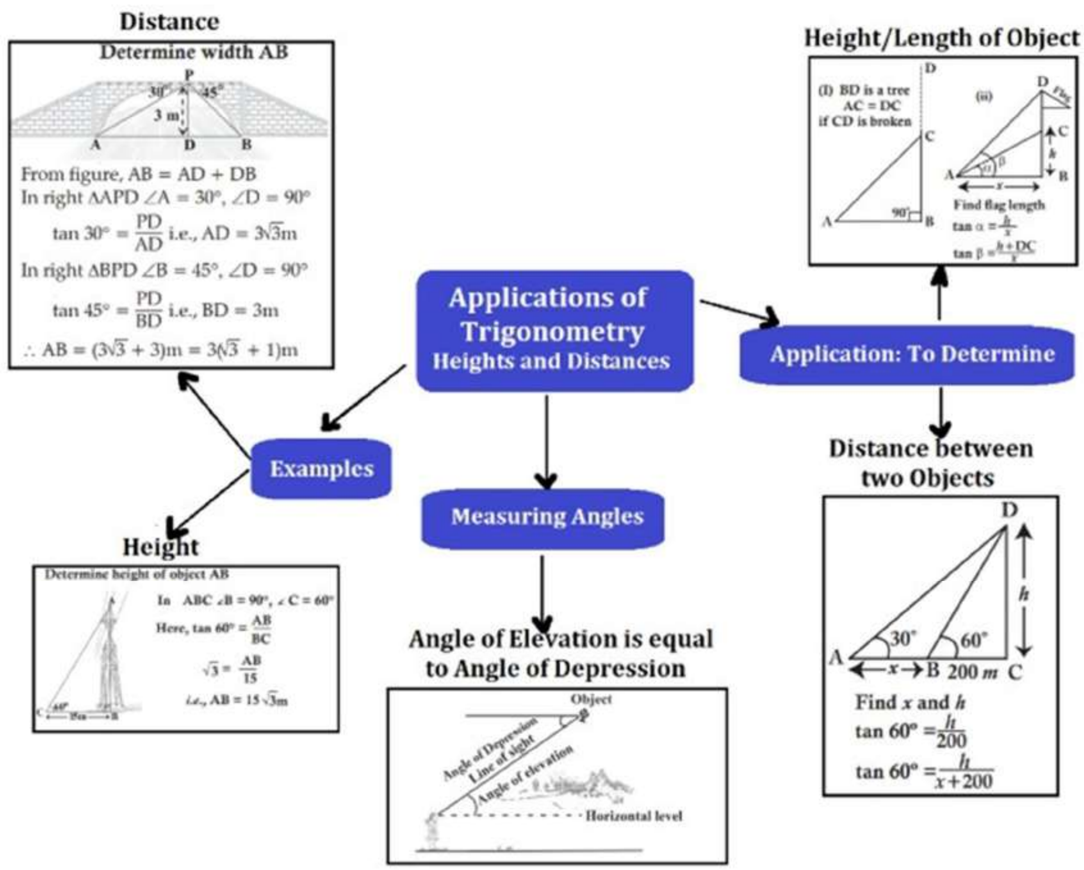
ANSWER KEY: **1.** (i) $\frac{2000}{\sqrt{3}}$m (ii) $\frac{4000}{\sqrt{3}}$m (iii) $\frac{2000}{3}$ m OR $\frac{4000}{3}$ m

2. (i) 8m (ii) $\frac{1}{2}$ (iii) 12m OR $\frac{1}{4}$

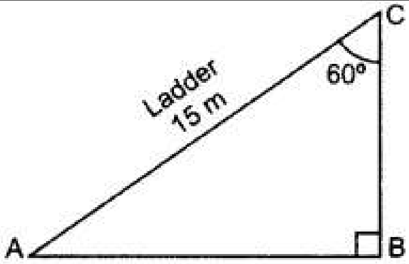
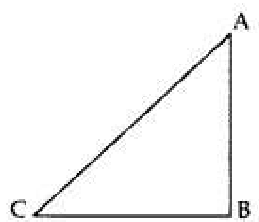
3. (i) 4 ft (ii) 8 ft (iii) doubles the original length OR $4\sqrt{3}$ ft

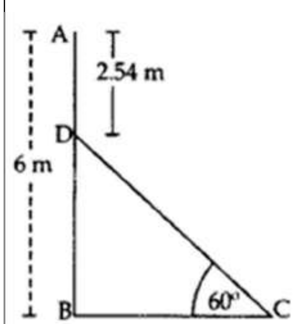
ASSERTION –REASON TYPE QUESTIONS:

ANSWER KEY: **1.**a **2.**a **3.**a **4.**a **5.**c **6.**d **7.**d **8.**b **9.**a **10.**d

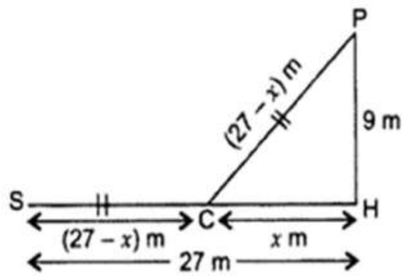
	CHAPTER-9 APPLICATIONS OF TRIGONOMETRY
	
	MULTIPLE CHOICE QUESTIONS (EACH CARRIES 1 MARK)
	Solved examples on MCQs
1	A portion of a 60 m long tree is broken by tornado and the top struck up the ground making an angle of 30° with the ground level. The height of the point where the tree is broken is equal to (a) 30 m (b) 35 m (c) 40 m (d) 20 m Ans (d) 20 m
2	If a pole 6m high casts a shadow $2\sqrt{3}$ m long on the ground, then the sun's elevation is (a) 60^0 (b) 45^0 (c) 30^0 (d) 90^0 Ans (a) 60^0
3	The angle depression of a car , standing on the ground , from the top of 75 m tower, is 30^0 . The distance of the car from the base of the tower(in meters) is (a) $25\sqrt{3}$ (b) $50\sqrt{3}$ c)$75\sqrt{3}$ (d)150 Ans (a) $25\sqrt{3}$
4	The angle of elevation of top of the tower at the point on the ground 50 m away from the foot of the tower is 45^0 .The height of the tower in meter is

	(a) $50\sqrt{3}$ (b) 50 (c) $\frac{50}{\sqrt{2}}$ (d) $\frac{50}{\sqrt{3}}$ Ans (b) 50 m
5	If the altitude of the sun is at 60^0 , then the height of the vertical tower that will cast a shadow of length 30 m is (a) $30\sqrt{3}$ m (b) 15m (c) $\frac{30}{\sqrt{3}}$ m (d) $15\sqrt{2}$ m Ans (d) 20 m
6	If the angle of elevation of the top of the tower from two points distant a and b from the base and in the same straight line with it are complementary, then the height of the tower is (a) ab (b) $\sqrt{ab}$ (c) $\frac{a}{b}$ (d) $\sqrt{\frac{a}{b}}$ Ans (b) $\sqrt{ab}$
7	When the length of shadow of a vertical pole is equal to √3 times of its height, the angle of elevation of the Sun's altitude is (a) 30° (b) 45° (c) 60° (d) 15° Ans 30^0
8	The angles of elevation of the top of a rock from the top and foot of 100 m high tower are respectively 30° and 45°. The height of the rock is (a) 50 m (b) 150 m (c) 5o√3m (d) 50(3 + √3) Ans d) 50(3 + √3)
9	The angle of depression of a car, standing on the ground, from the top of a 75 m high tower, is 30°. The distance of the car from the base of the tower (in m) is: (a) 25√3 (b) 50√3 (c) 75√3 (d) 150 Ans (c) 75√3
10	The tops of two poles of heights 20 m and 14 m are connected by a wire. If the wire makes an angle of 30° with the horizontal, then the length of the wire is (a) 8 m (b) 10 m (c) 12 m (d) 14 m Ans(c) 12 m
	SHORT ANSWER TYPE QUESTIONS (EACH CARRIES 2 MARKS)
	Solved examples short answer type I
1	A ladder 15 m long just reaches the top of a vertical wall. If the ladder makes an angle of 60° with the wall, then calculate the height of the wall Solution:

	 $\angle BAC = 180° - 90° - 60^0 = 30°$ ($\frac{1}{2}$ mark) $\sin 30° = \frac{BC}{AC}$ $\frac{1}{2} = \frac{BC}{15}$ (1 mark) 2BC = 15 BC = $\frac{15}{2}$m ($\frac{1}{2}$mark)
	Practice Questions
1	A tower AB is 20 m high and BC, its shadow on the ground, is $20\sqrt{3}$ m long. Find the Sun's altitude.  Ans Angle C $=30^0$
2	The angle of elevation of an aeroplane from a point on the ground is 60°. After a flight of 30 seconds the angle of elevation becomes 30°. If the aeroplane is flying at a constant height of $3000\sqrt{3}$ m, find the speed of the aeroplane. Ans 720 Km/h
3	From a point 20 m away from the foot of the tower , the angle of elevation of the top of the tower is 30^0.Find height of the tower. Ans $\frac{20}{\sqrt{3}}m$
4	A ladder is 50 m long just reaches the top of vertical wall. If the ladder makes an angle of 60^0 with the wall. Find height of the wall. Ans 25m

5	In a rectangle ABCD, AB=20 cm , $\angle BAC = 60^0$. Find the length of the side AD. Ans $20\sqrt{3}$ cm
6	If a tower 30 m high, casts a shadow $10\sqrt{3}$ m long on the ground, then what is the angle of elevation of the sun? Ans 30^0
7	The tops of two towers of height x and y, standing on level ground, subtend angles of 30° and 60° respectively at the centre of the line joining their feet, then find x : y. Ans 1 : 3
8	The horizontal distance between two poles is 15 m. The angle of depression of the top of first pole as seen from the top of second pole is 30°. If the height of the second pole is 24 m, find the height of the first pole. [Use $\sqrt{3}$ = 1.732] Ans 15.34m
9	The angles of depression of the top and bottom of a 50 m high building from the top of a tower are 45° and 60° respectively. Find the height of the tower and the horizontal distance between the tower and the building. [Use √3 = 1.73]. Ans 68.25 m
10	In the figure, AB is a 6 m high pole and CD is a ladder inclined at an angle of 60° to the horizontal and reaches up to a point D of pole. If AD = 2.54 m. Find the length of the ladder. (Use $\sqrt{3}$ = 1.73)  Ans 4m
	SHORT ANSWER TYPE QUESTIONS (EACH CARRIES 3 MARKS)
	Solved examples short answer type II
1	A peacock is sitting on the top of a pillar, which is 9 m high. From a point 27 m away from the

bottom of the pillar, a snake is coming to its hole at the base of the pillar. Seeing the snake the peacock pounces on it. If their speeds are equal, at what distance from the hole is the snake caught?



(fig 1 mark)

Let PH be the pillar. Let the distance from the hole to the place where snake is caught = x m

Let P be the top of the pillar and S be the point where the snake is
∴ SC = (27 – x) m
SC = PC = (27 – x) m (∵ Their speeds are equal) (1/2mark)
In rt. ΔPHC
PH2 + CH2 = PC2 (Pythagoras' theorem)
92 + x2 = (27 – x)2
81 + x2 = 729 – 54x + x2 (1 mark)
54x = 729 – 81 = 648
x = 64854 = 12 m
Hence, required distance, x =12 m (1/2mark)

Practice Questions

1 From the top of a 60 m high building, the angles of depression of the top and the bottom of a tower are 45° and 60° respectively. Find the height of the tower. (Take √3 =1.73)

Ans : Height = 25.4m

2 The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 45°. If the tower is 30 m high, find the height of the building.

Ans Height of building =10√3 m

3 A man on the deck on a ship 14 m above water level, Observe that the angle of elevation of the top of a cliff is 60°and the angle of depression of the base of the cliff is 30°.Calculate the distance of the cliff from the ship and the height of the cliff.

Ans h = 56m and distance =24.5m

4 Two poles of equal heights are standing opposite to each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles. (√3 =1.73)
Ans 43.25m

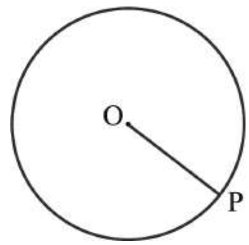
5	The shadow of a tower standing on a level ground is found to be 20 m longer when the Sun's altitude is 45° than when it is 60°. Find the height of the tower. .($\sqrt{3}$ =1.73) Ans $\frac{20\sqrt{3}}{\sqrt{3}\ -1}$

CHAPTER - 10 CIRCLES
KEY POINTS

CIRCLE

The collection of all the points in a plane, which are at a fixed distance from a fixed point in the plane, is called a circle.

- The fixed point is called the *centre* of the circle and the fixed distance is called the *radius* of the circle. In the below figure, O is the centre and the length OP is the radius of the



circle.

- The line segment joining the centre and any point on the circle is also called a *radius* of the circle.

- A circle divides the plane on which it lies into three parts. They are: (i) inside the circle, which is also called the *interior* of the circle; (ii) the *circle* and (iii) outside the circle, which is also called the *exterior* of the circle. The circle and its interior make up the *circular region*.

- The chord is the line segment having its two end points lying on the circumference of the circle.

- The chord, which passes through the centre of the circle, is called a *diameter* of the circle.

- A *diameter is the longest chord and all diameters have the same length, which is equal to two times the radius*.

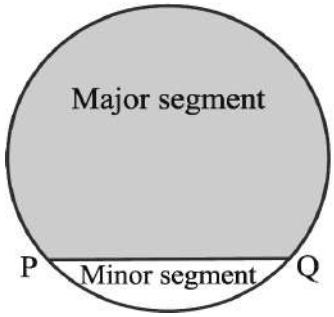
- A piece of a circle between two points is called an *arc*.

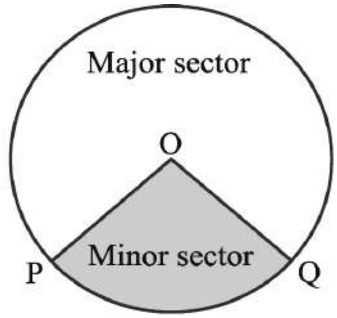
- The longer one is called the *major arc* PQ and the shorter one is called the *minor arc* PQ.

- The length of the complete circle is called its *circumference*.

- The region between a chord and either of its arcs is called a *segment* of the circular region or simply a *segment* of the circle. There are two types of segments also, which are the *major segment* and the *minor segment*.

- The region between an arc and the two radii, joining the centre to the end points of the arc is called a *sector*. The minor arc corresponds to the *minor sector* and the major arc corresponds to the *major sector*.





Points to Remember :

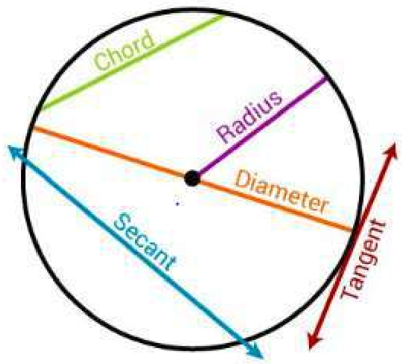
- A circle is a collection of all the points in a plane, which are equidistant from a fixed point in the plane.
- Equal chords of a circle (or of congruent circles) subtend equal angles at the centre.
- If the angles subtended by two chords of a circle (or of congruent circles) at the centre (corresponding centre) are equal, the chords are equal.
- The perpendicular from the centre of a circle to a chord bisects the chord.
- The line drawn through the centre of a circle to bisect a chord is perpendicular to the chord.
- There is one and only one circle passing through three non-collinear points.
- Equal chords of a circle (or of congruent circles) are equidistant from the centre (or corresponding centres).
- Chords equidistant from the centre (or corresponding centres) of a circle (or of congruent circles) are equal.
- Congruent arcs of a circle subtend equal angles at the centre.
- The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle.
- Angles in the same segment of a circle are equal.
- Angle in a semicircle is a right angle.
- If a line segment joining two points subtends equal angles at two other points lying on the same side of the line containing the line segment, the four points lie on a circle.
- The sum of either pair of opposite angles of a cyclic quadrilateral is 180°.
- If the sum of a pair of opposite angles of a quadrilateral is 180°, then the quadrilateral is cyclic.

Secant to a Circle

A secant to a circle is a line that intersects the circle at exactly two points.

Tangent to a Circle

A tangent to a circle is a line that intersects the circle at only one



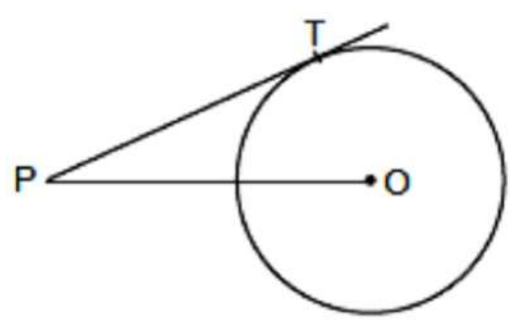
- The tangent to a circle is perpendicular to the radius through the point of contact.
- *The lengths of tangents drawn from an external point to a circle are equal*.(Theorem)
- The centre lies on the bisector of the angle between the two tangents.

If a line in the plane of a circle is perpendicular to the radius at its endpoint on the circle, then the line is **Multiple choice questions**

Q1. A circle has a number of tangents equal to

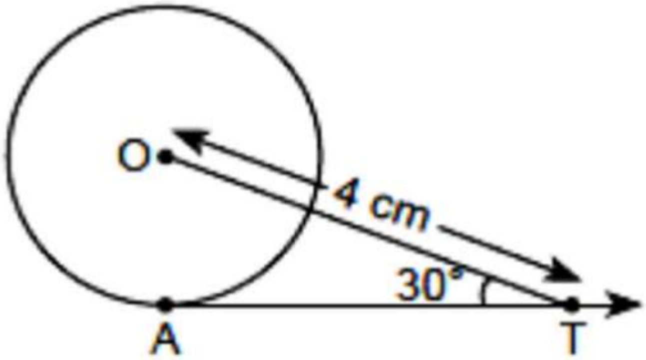
a) 0 b) 1 c) 2 d) Infinite

Q2. In the given below figure, point P is 26 cm away from the centre O of a circle and the length PT of the tangent drawn from P to the circle is 24 cm. Then the radius of the circle is



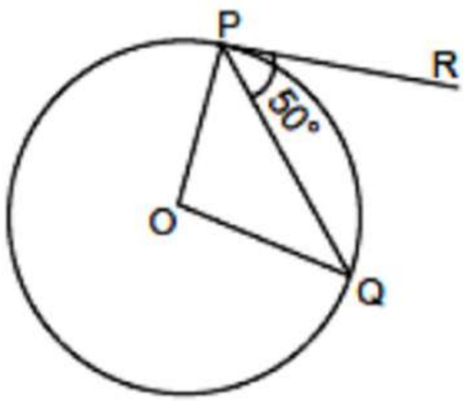
a) 25 cm b) 26 cm c) 24cm d)10cm

Q3. In the figure AT is a tangent to the circle with centre O such that OT = 4 cm and OTA = 30°.Then AT is equal to



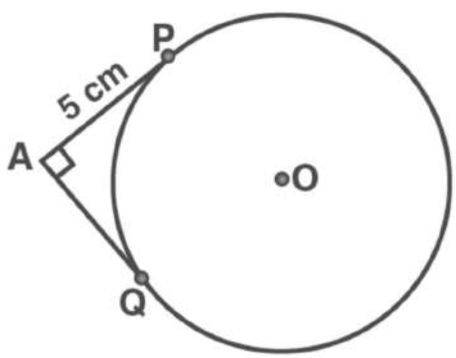
a). 4 cm b) 2cm c) $2\sqrt{3}$ cm d) $4\sqrt{3}$cm

Q4 . In 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, then POQ is equal to



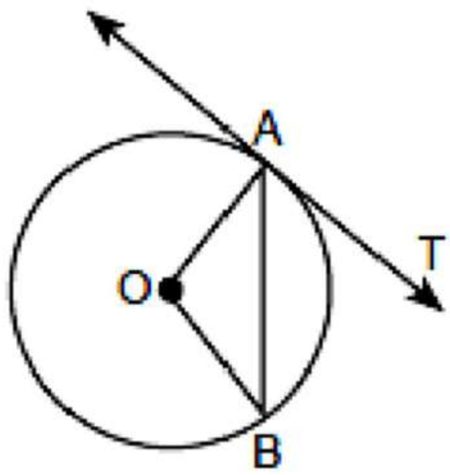
a). 100° b) 80° c)75° d) 90°

Q5. In the figure below, the pair of tangents AP and AQ drawn from an external point A to a circle with centre O are perpendicular to each other and length of each tangent is 5 cm. Then the radius of the circle is



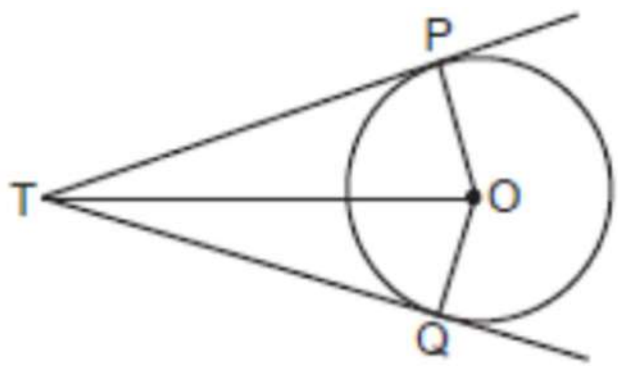
a) 10cm b) 2.5cm c) 5cm d) 7.5cm

Q6. 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



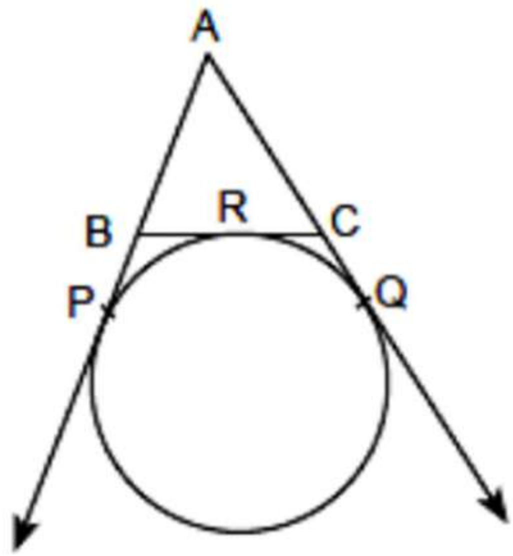
a) 100° b) 40° c)50° d) 90°

Q7. In the given figure, TP and TQ are two tangents to a circle with centre O, such that POQ =110°. Then PTQ is equal to



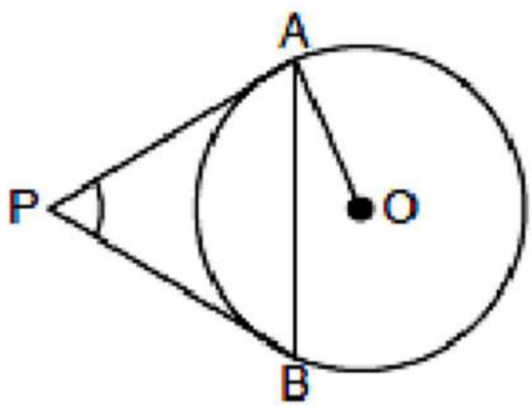
a) 90° b) 70° c) 110° d)55°

Q8 . 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

Q9. In the figure PA and PB are tangents to the circle with centre O. If APB = 60°, then OAB is



a) 90° b) 45° c) 30° d) 15°

Q10. Two concentric circles are of radii 10 cm and 8 cm, then the length of the chord of the larger circle which touches the smaller circle is:

(a) 6 cm b) 12 cm c) 18 cm d) 9 cm

Answer key:

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

Assertion Reason questions:

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).

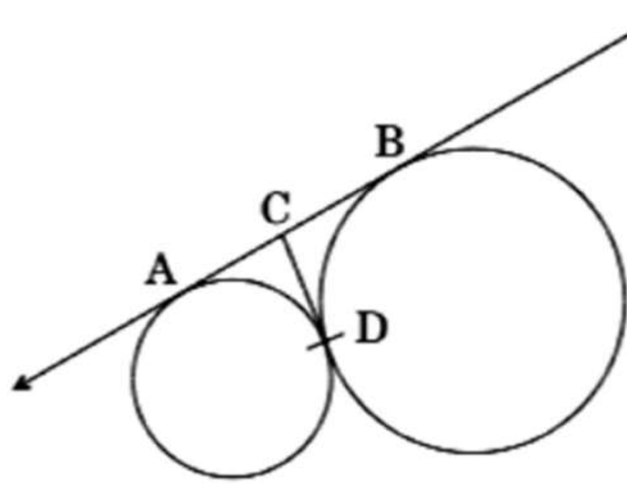
(c) Assertion (A) is true but reason (R) is false.

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

Q1. **Assertion (A):** From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25 cm then the radius of the circle is 7 cm.

Reason (R): A tangent to a circle is perpendicular to the radius through the point of contact.

Q2. **Assertion (A):** In the below figure, AB and CD are common tangents to circles which touch each other at D. If AB = 8 cm, then the length of CD is 4 cm.



Reason (R): A tangent to a circle is perpendicular to the radius through the point of contact.

Q3. **Assertion :** If length of a tangent from an external point to a circle is 8 cm, then length of the other tangent from the same point is 8 cm.

Reason : length of the tangents drawn from an external point to a circle are equal.

Q4. **Assertion :** If in a cyclic quadrilateral, one angle is 40°, then the opposite angle is 140°

Reason : Sum of opposite angles in a cyclic quadrilateral is equal to 360°.

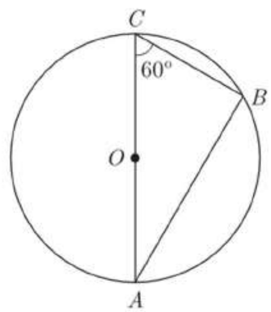
Q5. **Assertion :** If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.

Reason : $(\textbf{hypotenuse})^2 = (\textbf{base})^2 + (\textbf{height})^2$

Q6. **Assertion :** The two tangents are drawn to a circle from an external point, than they subtend equal angles at the centre.

Reason : A parallelogram circumscribing a circle is a rhombus.

Q7. **Assertion :** In the given figure, O is the centre of a circle and AT is a tangents at point A, then ∠BAT = 60°

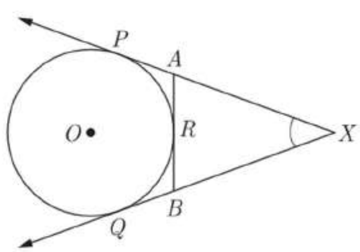


Reason : A straight line can meet a circle at one point only.

Q8. **Assertion :** PA and PB are two tangents to a circle with centre O . Such that ∠AOB =110° , then ∠APB = 90° .

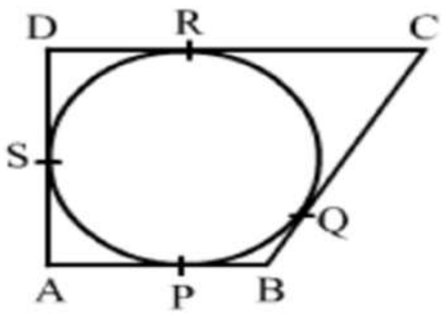
Reason : The length of two tangents drawn from an external point are equal.

Q9. **Assertion :** In the given figure, XA + AR = XB + BR where ,XP, XQ and AB are tangents



Reason : A tangent to the circle can be drawn from a point inside the circle.

Q10. **Assertion :** In the given figure, a quadrilateral ABCD is drawn to circumscribe a given circle, as shown. Then AB + BC = AD + DC.



Reason : In two concentric circles, the chord of the larger circle, which touches the smaller circle, is bisected at the point of contact.

Answer key:

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

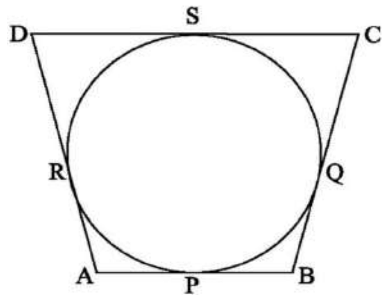
☞ tangent to the circle .

PRACTICE QUESTIONS(2 marks each)

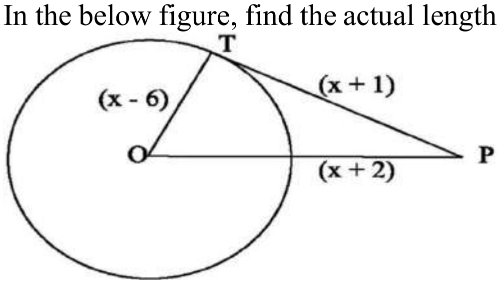
1. Prove that "The tangent at any point of a circle is perpendicular to the radius through the point of contact".
2. Prove that "The lengths of tangents drawn from an external point to a circle are equal."
3. Prove that "The centre lies on the bisector of the angle between the two tangents drawn from an external point to a circle."
4. Find the length of the tangent drawn to a circle of radius 3 cm, from a point distant 5 cm from the centre.
5. A point P is at a distance 13 cm from the centre C of a circle and PT is a tangent to the given circle. If PT = 12 cm, find the radius of the circle.
6. From appoint Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre of the circle is 25 cm. Find the radius of the circle.
7. The tangent to a circle of radius 6 cm from an external point P, is of length 8 cm. Calculate the distance of P from the nearest point of the circle.

8. Prove that the parallelogram circumscribing a circle is a rhombus.

9. A circle touches all the four sides of a quadrilateral ABCD with AB = 6 cm, BC = 7cm and CD = 4 cm. Find AD.



10. In the below figure, find the actual length of sides of □OTP



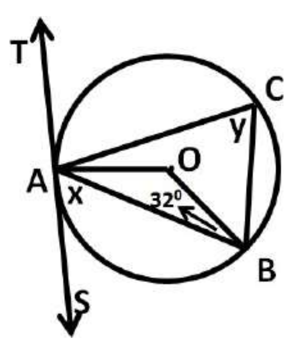
ANSWERS
Q5. 5 cm Q 6. r = 7 cm Q7. 4 cm. Q9. AD = 3 cm Q10. Hint: use Pythagoras theorem

PRACTICE QUESTIONS(3 marks each)

1. A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC

2. Prove that the perpendicular at the point of contact to the tangent to a circle passes through the centre

3. In the given figure TAS is a tangent to the circle, with centre O, at the point A. If □*OBA* □ 32^0 , find the value of x and y.



4. Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that

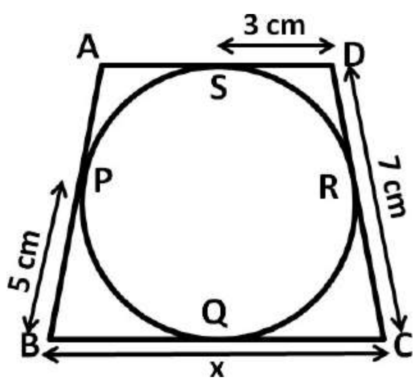
$\angle PTQ = 2\angle OPQ$.

5. If PA and PB are tangents from an outside point P, such that PA = 10 cm and $\angle APB = 60^0$. Find the length of chord AB

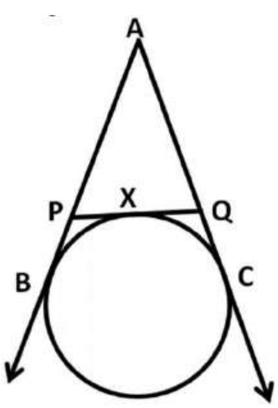
ANSWERS
Q3.x = 32, y=58 Q 5. 10 cm

PRACTICE QUESTIONS(5 marks each)

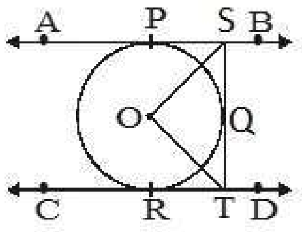
1. Prove that the tangents drawn at the end of the diameter are parallel to each other. Also In the below figure, □ABC is circumscribed, find the value of x.



2. Prove that the lengths of tangents drawn from an external point to a circle are equal. Also If AB, AC, PQ are tangents in below figure and AB = 5 cm, find the perimeter of □APQ



3. In figure, AB and CD are two parallel tangents to a circle with center O. ST is tangent segment between the two parallel tangents touching the circle at Q. Show that ∠SOT=90∘.

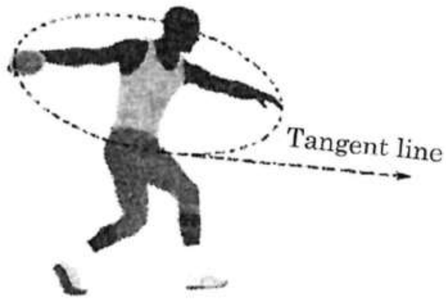


ANSWERS

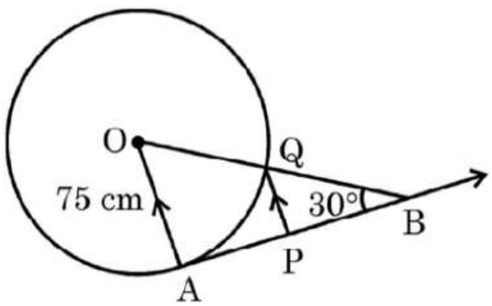
Q1. 9cm   Q 2. 10 cm

Case study based questions

Q1. The discus throw is an event in which an athlete attempts to throw a discus. The athlete spins anti-clockwise around one and a half times through a circle, then releases the throw. When released, the discus travels along tangent to the circular spin orbit.



In the given figure, AB is one such tangent to a circle of radius 75 cm. Point O is centre of the circle and ∠ABO = 30°. PQ is parallel to OA.



Based on the above, information:

(a) Find the length of AB. (1)

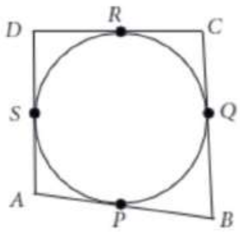
(b) Find the length of OB. (1)

(c) Find the length of AP. (2)

OR

(c) Find the length of PQ. (2)

Q2. In a park, four poles are standing at positions A,B,C and D around the circular fountain such that the cloth joining the poles AB,BC,CD and DA touches the circular 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. (1)

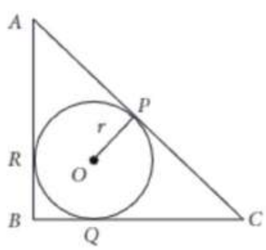
ii) If AB=AD, then write the name of the figure ABCD. (1)

iii) If DR=7 cm and AD=11 cm, then find the length of AP. (2)

OR

iii) If O is centre of fountain, with $\angle QCR = 60°$ then find $\angle QOR$. (2)

Q3. A backyard is in the shape of a triangle with right angle at B, AB = 6 m and BC = 8 m. A pit was dig inside it such that it touches the walls AC, BC and AB at P, Q and R respectively such that AP = $\varkappa$ m.



Based on the above information, answer the following questions.
(i) Find length of AR . (1)

(ii) The value of BQ. (1)

(iii) Find value of $\varkappa$. (2)

OR

iii) Find area of Δ ABC. (2)

Answer key :

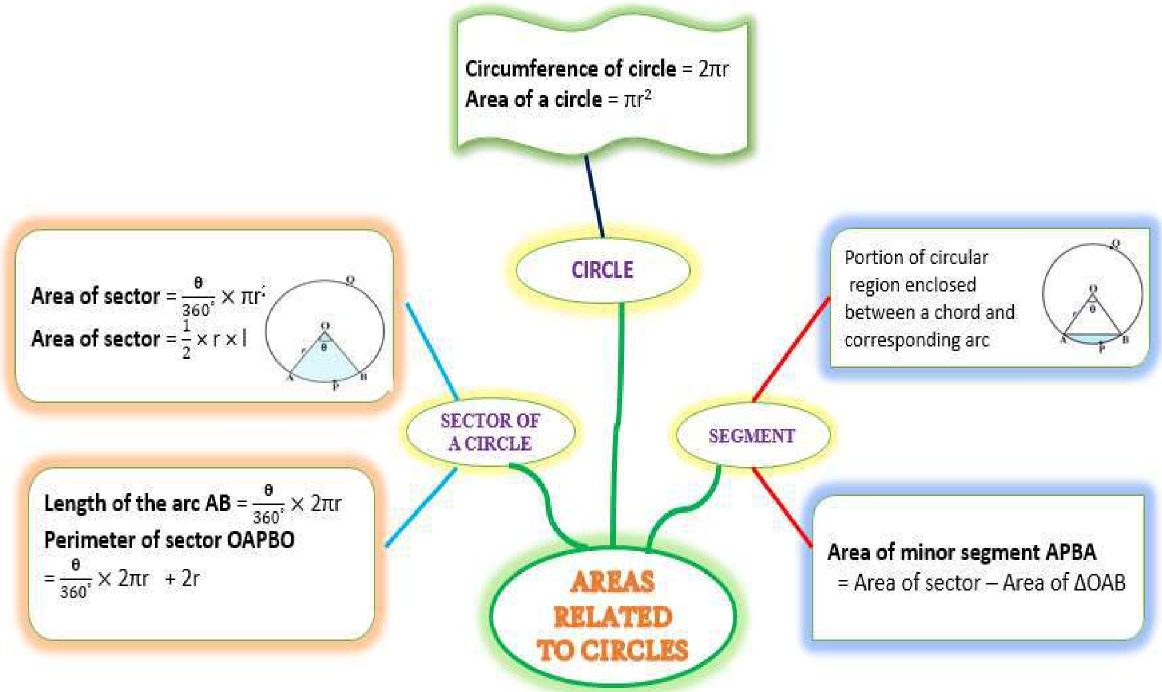
Q1 i) AB = $75\sqrt{3}\ cm$ ii) OB = 150 cm iii) AP = $\frac{75\sqrt{3}}{2}$ cm , PQ = $\frac{75}{2}$ cm

Q2 i) ∠OSA = 90° ii) Rhombus iii) AP = 4cm, ∠QOR =120°

Q3. i) $\varkappa$ m ii) (6- $\varkappa$) m iii) $\varkappa = 4\ m$, area of Δ ABC = 24 m^2

CHAPTER-11 - AREA RELATED TO CIRCLES

MIND MAP

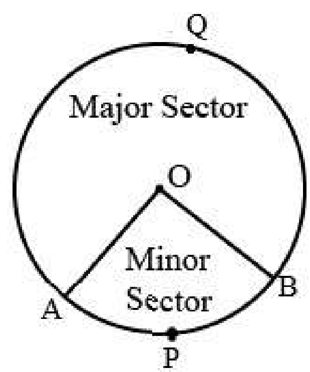


KEY POINTS

- Circumference of a circle = $2\pi r = \pi d$
- Area of a circle = πr^2

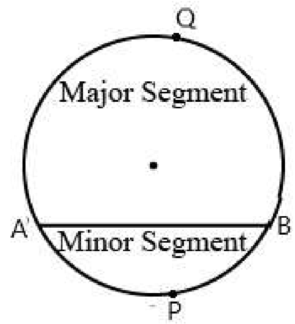
SECTOR OF A CIRCLE

- It is the region between two radii and corresponding arc



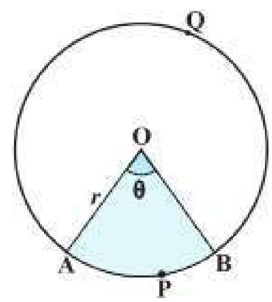
SEGMENT OF A CIRCLE

- It is the region between a chord and corresponding arc



AREA OF SECTOR

- Area of circle = πr^2
- Area of sector = $\frac{\theta}{360^\circ} \times \pi r^2$



LENGTH OF AN ARC

- Circumference of the circle = $2\pi r$
- Length of the arc AB = $\frac{\theta}{360^\circ} \times 2\pi r$
- **Area of sector =** $\frac{1}{2} \times r \times l$ **,** where l is length of corresponding arc.
- **Perimeter of sector OAPBO** = Length of arc AB + 2r

$$= \frac{\theta}{360^\circ} \times 2\pi r + 2r$$

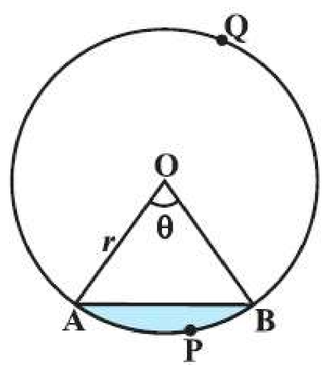
AREA OF SEGMENT

- Area of minor segment APBA

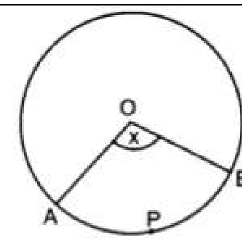
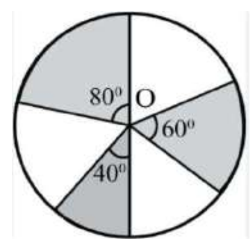
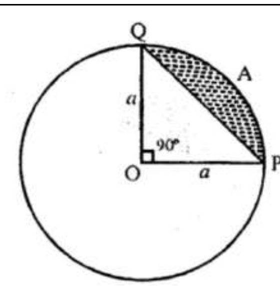
= Area of sector OAPBO– Area of ΔOAB

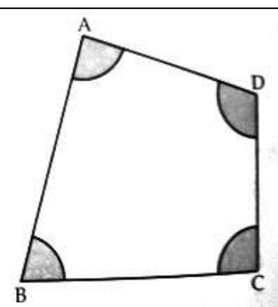
- Area of major segment AQBA

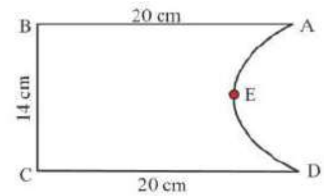
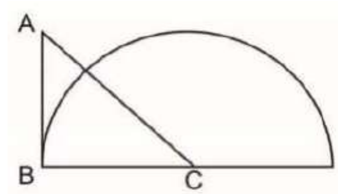
= Area of the circle – Area of minor segment

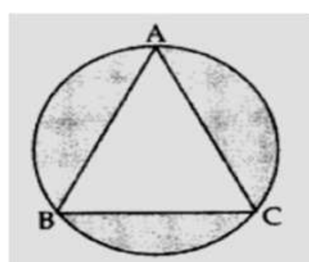


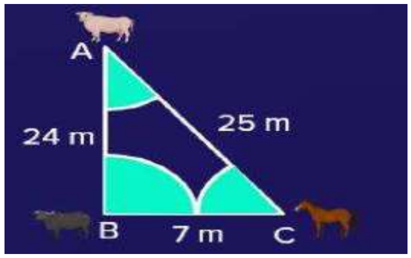
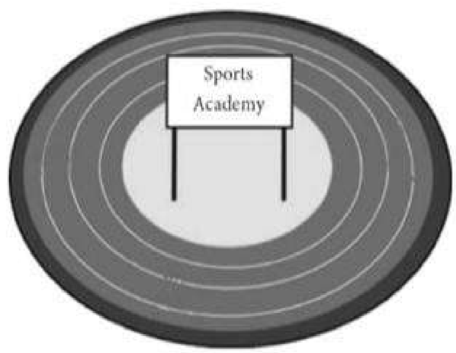
	MULTIPLE CHOICE QUESTIONS (EACH CARRIES 1 MARK)

1	If the perimeter and the area of a circle are numerically equal, then the radius of the circle is (a) 2 units (b) π units (c) 4 units (d) 7 units
2	The area of a quadrant of a circle whose circumference is 44 cm is (a) 88 cm^2 (b) 38.5cm^2 (c) 154cm^2 (d) 132.5 cm^2
3	The diameter of a circle whose area is equal to the sum of areas of two circles of radii 24 cm and 7cm is (a) 31cm (b) 25cm (c) 62cm (d) 50cm
4	The area of the sector of a circle with radius 6 cm and of angle 60° is (a) 9.42 cm^2 (b) 37.68 cm^2 (c) 18.84 cm^2 (d) 19.84 cm^2
5	In the fig, O is the centre of a circle. The area of sector OABP is $\frac{5}{18}$ of the area of the circle. Then x is (a) 50° (b) 70° (c) 100° (d) 110° 
6	In figure, three sectors of a circle of radius 7 cm making angles of 60°, 80° and 40° at the centre are shaded. The area of the shaded region is (a) 154 cm^2 (b) 77cm^2 (c) 120.5cm^2 (d) 180 cm^2 
7	The 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
8	If the ratio of areas of two circles is 16:25 the ratio of their circumference is (a) 4:5 (b) 5:4 (c) 25:16 (d) 3:5
9	The area of the segment PAQ is (a) $\frac{a^2}{4}(\pi+2)$ (b) $\frac{a^2}{4}(\pi-2)$ (c) $\frac{a^2}{4}(\pi+1)$ (d) $\frac{a^2}{4}(\pi-1)$ 
10	If the sum of the areas of two circles with radii R_1 and R_2 is equal to the area of a circle of radius R, then (a) $R_1 + R_2 = R$ (b) $R_1^2 + R_2^2 = R^2$ (c) $R_1 + R_2 < R$ (d) $R_1^2 + R_2^2 < R^2$

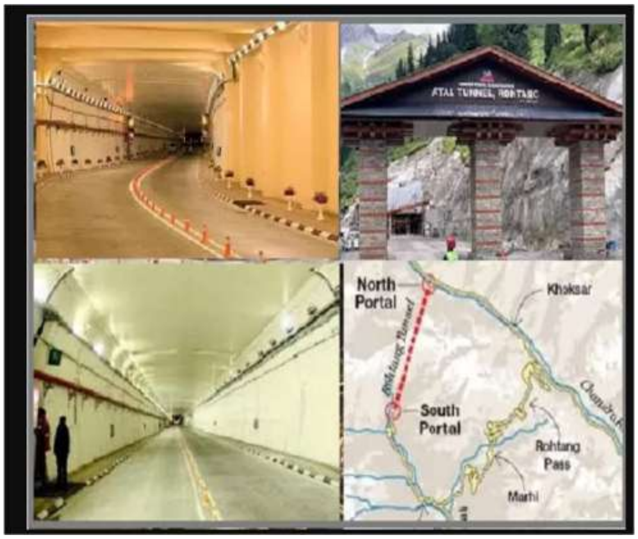
	SHORT ANSWER TYPE I QUESTIONS (EACH CARRIES 2 MARKS)
1	The length of minute hand of a clock is 5 cm. Find the area swept by minute hand during the time period 6:10 am and 6:45 am.
2	Find the lengths of the arcs cut off from a circle of radius 18 cm by a chord 18 cm long.
3	The circumference of a circle exceeds its diameter by 45 cm. Find the radius of the circle.
4	The area of the sector of a circle of radius 10.5 cm is 69.3 cm^2. Find the central angle of the sector.
5	Find the area of the sector of a circle of radius 35 cm and central angle 45°.
6	Find the area of the sector of a circle of radius 18 cm, if the corresponding length of arc is 11cm.
7	The sum of the radii of two circles is 11cm and the difference of their circumference is 44cm. Find the radii of the circles.
8	In a circle of radius 21cm, an arc subtends an angle of 60° at the centre. Find the perimeter of sector formed by the arc.
9	Area of a sector of a circle of radius 36 cm is $54\ \pi\ cm^2$. Find the length of the corresponding arc of the sector.
10	If a square is inscribed in a circle, find the ratio of the areas of the circle and the square.
	SHORT ANSWER TYPE II QUESTIONS (EACH CARRIES 3 MARKS)
1	A circle of radius 12cm subtends an angle of 120° at the centre of the circle. Find the area of minor segment of the circle.
2	In the given figure, arcs have been drawn of radius 21cm each with vertices A, B, C and D of quadrilateral ABCD as centres. Find the area of the shaded region. 

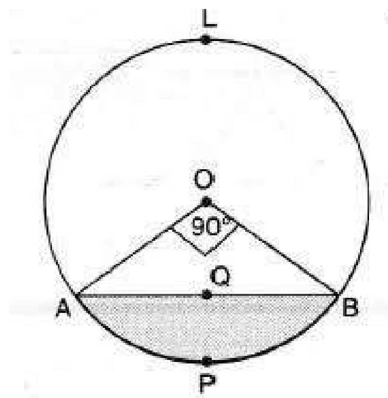
3	In a circle with centre O and radius 5 cm, AB is the chord of length $5\sqrt{3}$ cm .Find the area of sector AOB.
4	Find the perimeter of given figure, where AED is a semicircle and ABCD is a rectangle. 
5	C is the centre of the circle with radius BC = 35 cm. ABC is an isosceles right triangle. Calculate the area of the triangle outside the circular region? (Use π=3.14) 

	5 MARK QUESTIONS
1	**In Figure, an equilateral triangle has been inscribed in a circle of radius 6 cm.** **Find area of the triangle ABC and area of the three minor segments.** **[Use π = 3.14 and $\sqrt{3}$ = 1.73]** 
2	**Ram bought a pendulum clock for his new house. The minute hand and hour hand of the clock are 9 cm and 6 cm long respectively Find the area swept by the by the minute hand in 10 minutes. Also find the area swept by hour hand between 11am and 5.00 pm.**

3	**In the given below figure a triangular shaped grass field is seen. At the three corners of the field, a cow, a buffalo and a horse are tied separately to the pegs by means of ropes of 3.5 m each to graze in the field. Sides of the triangular field are 25 m, 24 m and 7m. Find the area of the triangular field that cannot be grazed by the animals.** 
	CASE STUDY BASED QUESTIONS (4marks each)
1	 **There is a race competition between all students of a sports academy, so that the sports committee can chose better students for a marathon. The race track in the academy is in the form of a ring whose inner most circumference is 264 m and the outer most circumference is 308m.** **Based on the above information, answer the following questions:-** **i)Find the radius of the outermost circle.** **ii)Find the area of the race track** **iii)If the cost of painting on the race track is Rs. 6 per m^2, then find the total cost for the painting of the whole race track.**

2 **In Himachal Pradesh, World's longest highway tunnel opened which will reduce the distance between Manali to Leh by 46 km. It will connect Solang Valley near Manali to Sissu in Lahaul and Spiti district. It is named after the former Prime Minister Atal Bihari Vajpayee**





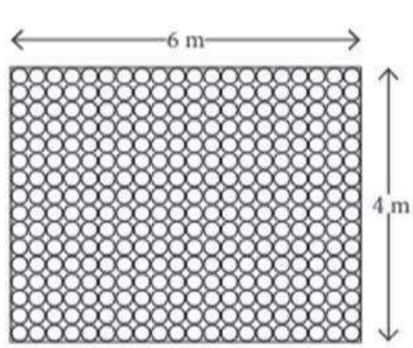
At a length of 9.02km, it is the longest tunnel above 10,000feet in the world. The cross-section of the tunnel is shown in the figure.The radius of the circular part is $5\sqrt{2}$ m and the central angle is 90^0 . Based on the above information answer the following questions:

(i)Find the width of the tunnel?

(ii)Find the height of the tunnel?

(iii)Find the area of the segment APBQ?

3 **Reena wants to change the design of the floor of her living room which is of the dimension 6m X 4m and it is covered with circular tiles of diameter 50cm each as shown below.**



Based on the above information, answer the following questions:-

	i)Find the number of circular tiles along the length and breadth of the room. **ii)Find the total number of tiles in the floor.** **iii)Find the area of the floor that remains uncovered by the tiles.**
	ASSERTION AND REASON QUESTIONS (1 mark 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.
1	**Assertion (A): 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 77/2 sq.m.** **Reason (R) :Area of the quadrant =** $\frac{90}{360} \times \pi r^2$
2	**Assertion (A):.If the perimeter of a circle is equal to that of a square, then the ratio of their areas is 14:11** **Reason (R): If the perimeter of a circle is equal to that of a square, then their areas are equal.**
3	**Assertion (A) A boy is cycling such that the wheels of the cycle are making 70 revolutions per minute If the diameter of the wheel is 20cm,then speed of the cycle is 88 m/minute.** **Reason (R) Total distance travelled by the wheel = 70 X** $2\pi r$
4.	**Assertion (A) The area of a quadrant of a circle with circumference 22 cm is 77/8** cm^2 **Reason (R) Area of a circle =** πr^2.
5.	**Assertion (A) The length of the minute hand of a clock is 14 cm. The area swept by the minute hand in 5 minutes is 51.3** cm^2 **Reason (R) The angle formed by the minute hand in 5 minutes is 5°**

6.	**Assertion (A): In a circle of radius 6 cm, the area of the semicircle is 396/7 cm^2** **Reason (R): Area of the quadrant with radius r is $\frac{1}{4}\pi r^2$.**
7.	**Assertion (A): If the circumference of a circle is 176 cm, then its radius is 28 cm.** **Reason (R): radius $= \frac{Circumference}{2\pi}$**
8.	**Assertion (A): If the outer and inner diameter of a circular path is 10 m and 6 m respectively, then area of the path is $16\pi m^2$.** **Reason (R): If R and r be the radius of outer and inner circular path respectively, then area of circular path is $\pi(R^2 - r^2)$.**
9.	**Assertion (A): The diameter of a circle is 14cm and the angle of the sector at the centre is 60°. Then the area of the sector is 25.67 sq cm.** **Reason (R): Area of a sector $= \frac{\theta}{360} 2\Pi r$**
10	**Assertion (A):If a square is inscribed in a circle, then the ratio of the areas of the circle and the square is $\pi : 2$** **Reason (R):If a square is inscribed in a circle of radius 'r' the diameter of circle is the diagonal of square and ratio of the areas of the circle and the square is $\frac{\pi r^2}{2r^2} = \pi : 2$**

ANSWERS: MCQ: (1MARK EACH)

(1) (a) 2 units (2) (b) 38.5cm^2 (3) (d) 50cm (4) (c) 18.84 cm^2 (5) (c) 100°
(6) (b) 77cm^2 (7) (d) 9 π cm^2 (8) (a) 4:5 (9) (b) $\frac{a^2}{4}(\pi - 2)$
(10) (b) $R_1^2 + R_2^2 = R^2$

SHORT ANSWER TYPE I (2MARKS EACH)

(1) 45.83 cm^2 (2) 18.84 cm^2 (3) 10.5 cm (4) 72° (5) 481.25 cm^2

(6) 99 cm^2 (7) r_1 = 9cm , r_2 = 2cm (8) 64 cm (9) 9.42 cm

(10) 22:14

SHORT ANSWER TYPE II (3 MARKS EACH)

(1) 88.44 cm (2) 1386 cm^2 (3) 26.17 cm^2 (4) 76 cm (5) 131.25 cm^2

LONG ANSWERS TYPE (5MARKS EACH)

(1) 46.71 sq.cm ; 66.33 sq.cm

(2) 42.42 sq.cm ; 56.57 sq.cm

(3) 64.75 sq.m

CASE STUDY BASED QUESTIONS (4marks each)

1) i) 49m ii)2002 sqm iii)Rs 12012/-
2) i)10m ii) 5m iii) 14.28 sq.m
3) i)12 and 8 ii)96 iii) 5.14 sq m

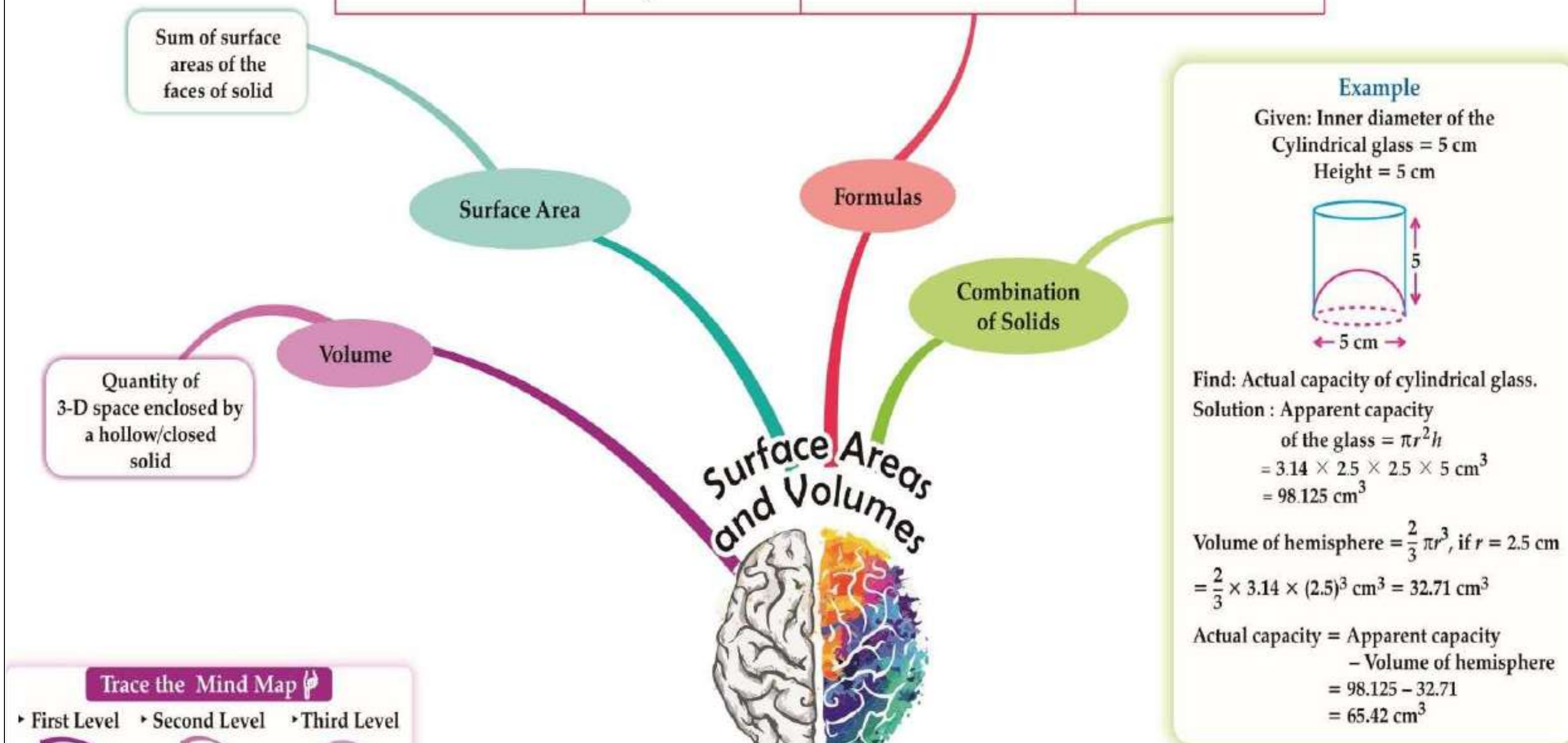
ASSERTION & REASONING QUESTIONS (1 MARK EACH)

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

6) b 7) a 8) a 9) c 10) a

CHAPTER 12 – SURFACE AREA AND VOLUMES

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	$V = \frac{1}{3}\pi r^2 h$	TSA = $\pi r(l + r)$	CSA = πrl
Sphere	$V = \frac{4}{3}\pi r^3$	TSA = $4\pi r^2$	CSA = $4\pi r^2$
Hemisphere	$V = \frac{2}{3}\pi r^3$	TSA = $3\pi r^2$	CSA = $2\pi r^2$



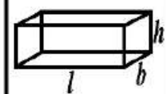
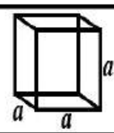
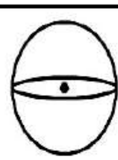
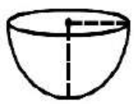
KEY POINTS

CHAPTER 12 – SURFACE AREA AND VOLUMES

GIST OF THE LESSON WITH FORMULAE

FORMULAE TO FIND CSA/TSA/VOLUME OF SOLID SHAPES

Formulae Table

S. No.	Name of the solid	Figure	Lateral / Curved surface area	Total surface area	Volume	Nomen-clature
1.	Cuboid		$2h(l+b)$	$2(lb+bh+hl)$	lbh	l:length b:breadth h:height
2.	Cube		$4a^2$	$6a^2$	a^3	a:side of the cube
3.	Right prism		Perimeter of base $\times$ height	Lateral surface area+2(area of the end surface)	area of base $\times$height	-
4.	Regular circular Cylinder		$2\pi rh$	$2\pi r(r+h)$	$\pi r^2 h$	r:radius of the base h:height
5.	Right pyramid		$\frac{1}{2}$(perimeter of base)$\times$ slant height	Lateral surfaces area+area of the base	$\frac{1}{3}$ area of the base $\times$height	-
6.	Right circular cone		πrl	$\pi r(l+r)$	$\frac{1}{3}\pi r^2 h$	r:radius of the base h:height l:slant height
7.	Sphere		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$	r:radius
8.	Hemisphere		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$	r:radius

MULTIPLE CHOICE QUESTIONS (EACH CARRIES 1 MARK)

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SOLVED EXAMPLES

1.	The ratio of the total surface area to the lateral surface area of a cylinder with base radius 80 cm and height 20 cm is (a) 1 : 2 (b) 2 : 1 (c) 3 : 1 (d) 5 : 1 Sol :TSA of cylinder/CSA of cylinder = $\frac{2\pi r(r+h)}{2\pi rh} = \frac{r+h}{h} = \frac{80+20}{20} = \frac{100}{20} = \frac{5}{1}$ = 5:1 ANS : d : 5:1
2.	The ratio of the total surface area of a hemisphere to the area of a square of side equal to radius of hemisphere is (a) 2π : 1 (b) 3π : 1 (c) 4π : 1 (d) 1 : 4π
3.	If the surface areas of two spheres are in the ratio 16 : 9 , then their volumes will be in the ratio (a) 27 : 64 (b) 64 : 27 (c) 4 : 3 (d) 3 : 4
4.	Volume of a cylinder of base radius 1 cm and height 1 cm is (a) 2π cubic units (b) 4π cubic units (c) π cubic units (d) 16π cubic units
5.	The circumference of the base of a right circular cylinder is 176 cm and it is 1 m high. Find the lateral surface area of the cylinder. (a) 176 cm2 (b) 1760 cm2 (c) 17600 cm2 (d) None
6.	Two identical solid cubes of side k units are joined end to end. What is the volume, in cubic units, of the resulting cuboid? (a) k3 (b) 2k3 (c) 3k3 (d) 6k3
7.	If a solid sphere with total surface area 48 cm2 is bisected in to two hemispheres, then the total surface area of each hemisphere is (a) 24 cm2 (b) 36 cm2 (c) 12 cm2 (d) None
8.	A right triangle with sides 3 cm, 4 cm and 5 cm is rotated about the side of 3 cm to form a cone. The volume of the cone so formed is (a) 12π cm3 (b) 14π cm3 (c) 16π cm3 (d) 18π cm3

9.	The total surface area of a hemisphere of radius r is (a) πr^2 (b) $2\pi r^2$ (c) $3\pi r^2$ (d) $4\pi r^2$
10.	How many litres makes 1 cubic meter? (a) 100 l (b) 1000 l (c) 1 l (d) 10 l

ANSWERS OF MCQ

1.D) 5:1 2. B) 3π : 1 3. B) 64:27 4.C) π cubic units

5.c. 17600 sq.cm 6.b. $2k^3$ 7. b. 36 sq.cm 8)c. 16π cubic cm

9)c. $3\pi r^2$ 10.b. 1000L

	ASSERTION AND REASON BASED QUESTIONS
	1 MARKS EACH
	Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as: (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
1.	**Assertion:** If the volumes of two spheres are in the ratio 27:8 then their surface area are in ratio 9:4. **Reason:** Volume of sphere= $^4/_3\pi r^3$ and its Surface area = $4\pi r^2$ a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion(A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation ofAssertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true.

2.	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 = $\sqrt{(h^2+r^2)}$ (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
3.	Assertion: Total surface area of the cylinder having radius of the base 14 cm and height 30 cm is 3872 cm2. Reason: If r be the radius and h be the height of the cylinder, then total surface area = $(2\pi rh + 2\pi r^2)$. (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
4.	Assertion: If the radius of a cone is halved and volume is not changed, then height remains same. Reason: If the radius of a cone is halved and volume is not changed then height must become four times of the original height.

	(a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
5.	Assertion: If a ball is in the shape of a sphere has a surface area of 221.76 cm2, then its diameter is 8.4 cm. Reason: If the radius of the sphere be r, then surface area, $S = 4\pi r^2$, i.e., $r = \sqrt{(S/4\pi)}$ (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
6.	Assertion: in a right circular cone , the cross section made by a plane parallel to base is a circle Reason: if the volume and the surface area of the solid hemisphere are numerically equal, then the radius of hemisphere is 9/2. (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
7.	Assertion: The volume of right circular cylinder of base radius 7 cm and height 10 cm is 1540 cm^3

	Reason: According to the assertion , the CSA of cylinder is 440 cm^2 (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
8.	Assertion: if the height of the cone is 10 cm and radius is 7cm the volume of cone is 513.3 cm^2 Reason: according to assertion if $(149)^{½}$ is 12.2 the CSA of cone is 268.4 cm^2 (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
9.	Assertion: Rampal decided to donate canvas for 10 tents conical in shape with base diameter 14 m and height 24 m to a centre for handicapped persons welfare. The slant height of tent is 25 Reason : According to assertion the surface area of 10 tents is 5500 m^2 (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true
10.	Assertion: the surface area of the cube is $6a^2$

	Reason: the length of diagnol of cube is $4a^2$ (a) Both Assertion (A) & Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) & Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true

ANSWERS OF ASSERTION & REASONING:

1. a   2. a   3.a   4.d   5.a   6.b

7.a   8.c   9.a   10. c

	SHORT ANSWER TYPE I QUESTIONS(EACH CARRIES 2 MARKS)
1.	If the total surface area of a solid hemisphere is 462 cm2, find its volume. (Take π=22/7) Solution: 462 sq.cm = 3πr2 R = 7 cm Volume of solid hemisphere = 2/3πr3 = 2/3(22/7) 7^3 = 718.67 cubic cm

2. **Volume and surface area of a solid hemisphere are numerically equal. What is the diameter of the hemisphere?**

Solution

Volume of hemisphere = Surface area of hemisphere ... (Given)

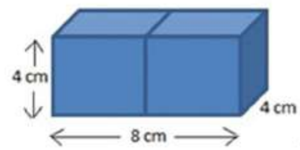
$\Rightarrow 2/3\pi r^3 = 3\pi r^2$

$\therefore r = 9/2$

$\therefore$ Diameter of hemisphere $= 2r = 2(9/2) = 9$ cm

3. 2 cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboid

Given,



The Volume (V) of each cube is = 64 cm^3

This implies that $a^3 = 64\ cm^3$

$\therefore$ a = 4 cm

Now, the side of the cube = a = 4 cm

Also, the height and breadth of the resulting cuboid will be 4 cm each, while its length will be 8 cm.

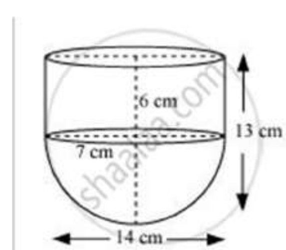
So, the surface area of the cuboid = 2(lb+bh+lh)

$= 2(8\times4+4\times4+4\times8)\ cm^2$

$= 2(32+16+32)\ cm^2$

$= (2\times80)\ cm^2 = 160\ cm^2$

4. 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



The given parameters are:

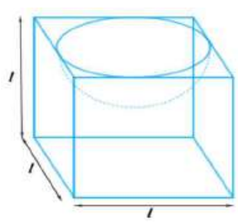
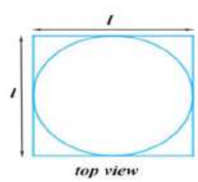
The diameter of the hemisphere = D = 14 cm

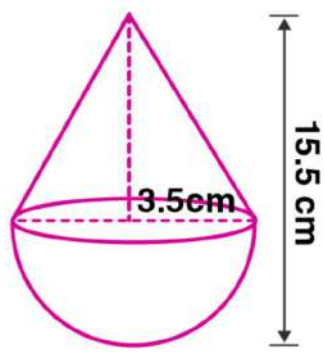
The radius of the hemisphere = r = 7 cm

Also, the height of the cylinder = h = (13-7) = 6 cm

And the radius of the hollow hemisphere = 7 cm

	Now, the inner surface area of the vessel = CSA of the cylindrical part + CSA of the hemispherical part $(2\pi rh+2\pi r^2)$ cm^2 = $2\pi r(h+r)$ cm^2 $2\times(22/7)\times7(6+7)$ cm^2 = 572 cm^2
5.	Find the total surface area of a solid hemisphere of radius 7 cm. Surface area of the hemisphere $=2\pi r^2$ $=2\times227\times72$ $=308$cm^2
6.	Total surface area of a cube is 216 cm^2. Find its volume. total surface area of cube $=6(a)^2$. $\therefore 6(a)^2=216$ $\Rightarrow (a)^2=2166$ $\Rightarrow (a)^2=36$ $\Rightarrow$ a =6.
7.	Two cones have their heights in the ratio 1 : 3 and radii in the ratio 3 : 1. What is the ratio of their volumes? t is given that the heights of two cones are in the ratio 1:3 that is: h1/h2=1/3.......(1) It is also given that the ratio of the radius of the cones is 3:1 that is: r1/r2=3/1.......(2) We know that the volume of a cone with radius r and height h is V=13πr2h, therefore, using equations 1 and 2, we have: V1/V2=1/3π$r^2{}_1$h113πr22h2

	⇒V1V2=r21r22×h1h2 ⇒V1V2=(r1r2)2×h1h2 ⇒V1V2=32×13 ⇒V1V2=31 ⇒V1:V2=3:1 Hence, the ratio of the volume of two cones is 3:1.
8.	A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter l of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid. **Answer:**   Now, the diameter of the hemisphere = Edge of the cube = l So, the radius of the hemisphere = l/2 ∴ The total surface area of solid = surface area of cube + CSA of the hemisphere – Area of the base of the hemisphere The surface area of the remaining solid = 6 $(\text{edge})^2+2\pi r^2-\pi r^2$

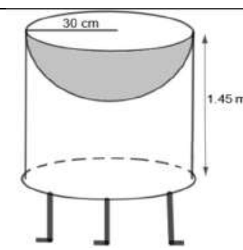
	$= 6l^2 + \pi r^2$ $= 6l^2+\pi(l/2)^2$ $= 6l^2+\pi l^2/4$ $= l^2/4(24+\pi)$ sq. units
9.	A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. If the total height of the toy is 15.5 cm, find the total surface area of the toy.  Given radius of the cone, r = 3.5 cm Radius of hemisphere, r = 3.5 cm Total height of the toy = 15.5 cm Height of the cone = 15.5 – 3.5 = 12 cm Slant height of the cone, $l = \sqrt{(h^2+r^2)}$ $l = \sqrt{(12^2+3.5^2)}$ $l = \sqrt{(144+12.25)}$ $l = \sqrt{(156.25)}$ l = 12.5 cm Total surface area of the toy = curved surface area of cone + curved surface area of the hemisphere $= rl + 2r^2$ $= r(l+2r)$ $= (22/7)\times3.5\times(12.5+2\times3.5)$ $= (77/7)\times(12.5+7)$ $= 11\times19.5$

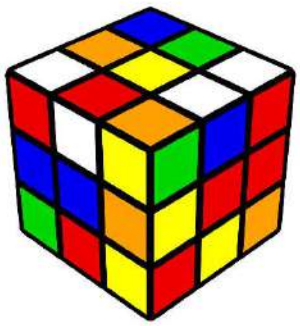
	$= 214.5\ cm^2$ Hence the total surface area of the toy is $214.5\ cm^2$.
10.	A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid. **Answer:** It is given that each side of the cube is 7 cm. So, the radius will be 7/2 cm. We know, The total surface area of solid (TSA) = surface area of the cubical block + CSA of the hemisphere – Area of the base of the hemisphere ∴ TSA of solid $= 6\times(\text{side})^2+2\pi r^2-\pi r^2$ $= 6\times(\text{side})^2+\pi r^2$ $= 6\times(7)^2+(22/7)\times(7/2)\times(7/2)$ $= (6\times49)+(77/2)$ $= 294+38.5 = 332.5\ cm^2$ So, the surface area of the solid is $332.5\ cm^2$

	SHORT ANSWER TYPE II QUESTIONS (EACH CARRIES 3 MARKS)
	SOLVED EXAMPLES
1.	Three cubes of a metal whose edges are in the ratio 3:4:5 are melted and converted into a single cube whose diagonal is $12\sqrt{3}$ cm. Find the edges of the three cubes. Let the edges of three cubes (in cm) be 3x, 4x and 5x, respectively. Volume of the cubes after melting is $= (3x)^3 + (4x)^3 + (5x)^3 = 216x^3\ cm^3$ Let a be the side of a new cube so formed after melting. Therefore, $a^3 = 216x^3$

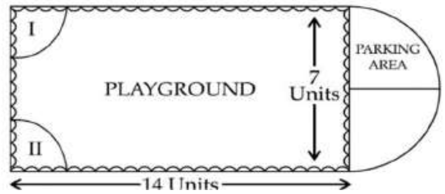
	So, $a = 6x$ Given that, diagonal of a single cube = $12\sqrt{3}$ cm i.e. $\sqrt{(a^2 + a^2 + a^2)} = 12\sqrt{3}$ $a\sqrt{3} = 12\sqrt{3}$ Therefore, $a = 12$ Thus, $12 = 6x$ $x = 2$ Now, $3x = 3 \times 2 = 6$ $4x = 4 \times 2 = 8$ $5x = 5 \times 2 = 10$
2.	A cubical ice-cream brick of edge 22 cm is to be distributed among some children by filling ice-cream cones of radius 2 cm and height 7 cm up to its brim. How many children will get the ice cream cones? ANS- 363 children
3.	A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m, respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of Rs 500 per m^2. (Note that the base of the tent will not be covered with canvas.) Ans: Rs 22000
	LONG ANSWER TYPE QUESTIONS (EACH CARRIES 5 MARKS)
	SOLVED EXAMPLES
1.	A vessel is a hollow cylinder fitted with a hemispherical bottom of the same base.The depth of the cylinder is 14/3m and the diameter of the hemisphere is 3.5m.calculate the volume and the internal surface area of the solid Solution: Diameter of base = 3.5m, radius = 7/4 m Height of the cylindrical part = 14/3 m (i) Volume of vessel = $\pi r^2 h + \frac{2}{3}\pi r^3$ $= \pi r^2 (h + \frac{2}{3}\pi r)$ $= \frac{22}{7} \text{ X } \frac{7}{4} \text{ X } \frac{7}{4} (\frac{14}{3} + \frac{2}{3} \text{ X } \frac{7}{4})$

	$=\frac{2695}{48} = 56.15\ m^3$ (ii) CSA of vessel = $2\pi rh + 2\pi r^2$ $= 2\pi r(h+r)$ $=2 \times \frac{22}{7} \times \frac{7}{4} \times (\frac{14}{3} + \frac{7}{4})$ $=847/12 = 70.58\ m^2$
2.	A solid is in the shape of hemisphere surmounted by cone . If the radius of hemisphere and base radius is 7 cm and height of cone is 3.5 cm find volume of solid . The volume of the given solid is given as: V = Volume of cone + Volume of hemisphere Where, Volume of cone = **$1/2\ \pi r^2 h$** Volume of hemisphere = **$2/3\ \pi r^3$** Now, **$V = (1/2\ \pi r^2 h) + (2/3\ \pi r^3)$** Where, r = 7 cm (Given) h = 3.5 cm (Given) On substituting the values, we get, **$V = (1/2 \times \pi \times 7 \times 7 \times 3.5) + (2/3 \times \pi \times 7 \times 7 \times 7)$** V = 269.39 + 718.37 **∴ $V = 987.76\ cm^3$**
3.	Due to the floods in a state thousands were rendered home less . 50 schools collectively decided to provide place and canvas for 1500 tents and share the whole expenditure equally . The lowest part of each tent is cylindrical with base radius 2.8 m and height 3.5 m and the upper part is conical with same base radius ,but the height 2.1 m . If the canvas used to make the tents costs rs 120 per m^2, find the amount shared by each school to set up the tents . Answer: It is known that a tent is a combination of a cylinder and a cone. From the question, we know that Diameter = 4 m The slant height of the cone (l) = 2.8 m

	Radius of the cone (r) = Radius of cylinder = 4/2 = 2 m Height of the cylinder (h) = 2.1 m So, the required surface area of the tent = surface area of the cone + surface area of the cylinder = πrl+2πrh = πr(l+2h) = (22/7)×2(2.8+2×2.1) = (44/7)(2.8+4.2) = (44/7)×7 = 44 m^2 ∴ The cost of the canvas of the tent at the rate of ₹500 per m^2 will be = Surface area × cost per m^2 44×500 = ₹22000 So, Rs. 22000 will be the total cost of the canvas.
	CASE BASED STUDY QUESTIONS (EACH CARRIES 4 MARKS)
	SOLVED EXAMPLES
1.	Mayank a student of class 7th loves watching and playing with birds of different kinds. One day he had an idea in his mind to make a bird-bath on his garden. His brother who is studying in class 10th helped him to choose the material and shape of the birdbath. They made it in the shape of a cylinder with a hemispherical depression at one end as shown in the Figure below. They opted for the height of the hollow cylinder as 1.45 m and its radius is 30 cm. The cost of material used for making bird bath is Rs. 40 per square meter.  1)Find the curved surface area of the hemisphere. (Take π = 3.14) 2) Find the total surface area of the bird-bath. (Take π = 22/7) 3)What is total cost for making the bird bath? OR 3) 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? **Solution:** (i) Let r be the common radius of the cylinder and hemisphere and h be the height of the hollow cylinder. Then, r = 30 cm and h = 1.45 m = 145 cm. Curved surface area of the hemisphere = 2πr2 =2 x 3.14 x 302 = 0.56 m (ii) Let S be the total surface area of the birdbath. S = Curved surface area of the cylinder + Curved surface area of the hemisphere ⇒ S = 2πrh+ 2πr 2 = 2πr(h + r) ⇒ S = 2 x 22 7 x 30(145 + 30) = 33000 cm^2 = 3.3 m^2 (iii) Total Cost of material = Total surface area x cost per sq m^2 = 3.3 x 40 = Rs. 132 OR We know that S = 3.3 m^2 S=2πr(r+h) 3.3 = 2 x 22/7 x 35/100 (35/100 + h) 3.3=22/10(35/100+h)

	33/22= 35/100 + h h = 3/2-7/20 =23/20 -1.15m
2.	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-:  
	(i)The length of the diagonal if each edge measures 6cm is ? (1 mark) Ans: length of each edge =6cm Thus, length of the diagonal =a√3 =6√3 cm
	(ii)Volume of the solid figure if the length of the edge is 7cm is? (1 mark) Ans: length of each edge =7cm Volume $= a^3$ $= 7^3 = 343cm^3$
	(iii)What is the surface area of hemisphere (ice cream) if the base radius is 7cm? Radius= 7cm Surface area of the hemisphere $=2\pi r^2$ $=2\times227\times72$ $=308cm^2$ Or If the slant height of the conical part is 5 cm, and its radius is 4 cm, find its height. Ans: Given that l = 5cm ,radius =4cm and let h be the height $L = \sqrt{r^2+h^2}$ $5^2= \sqrt{4^2+h^2}$

	H= 3cm
3.	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 are 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?

i. Given, Length of rectangular playground = 14 units

Breadth of rectangular playground = 7 units

Total perimeter of parking area = Perimeter of semi-circle + Breadth of rectangle

$= \pi R + 7 \quad ...\begin{pmatrix}\text{Diameter of semi-circle} = 7\\ R = \frac{7}{2}\end{pmatrix}$

$= \pi \times \dfrac{7}{2} + 7$

$= \dfrac{22}{7} \times \dfrac{7}{2} + 7$

$= 11 + 7$

$= 18$ units

(ii) (a) What is the total area of parking and the two quadrants?

ii. (a) Given, radius of the quadrant = 2 units

Area of two quadrants $= 2 \times \left(\dfrac{\pi r^2}{4}\right)$

$= 2 \times \dfrac{\pi(2)^2}{4}$

$= 2\pi$ sq. units

Area of parking area $= \dfrac{\pi R^2}{2}$

$= \dfrac{\pi}{2} \times \left(\dfrac{7}{2}\right)^2 \quad ...\left(\because \text{Radius (R) of semicircle} = \dfrac{7}{2}\right)$

$= \dfrac{22}{7} \times \dfrac{7}{2} \times \dfrac{7}{2} \times \dfrac{1}{2}$

$= \frac{77}{4}$

= 19.25

Total area of parking and two quadrants

$= 2 \times \frac{22}{7} + 19.25$

= 6.28 + 19.25

= 25.53 sq. units

OR

(b) What is the ratio of area of playground to the area of parking area?

(b) Required Ratio $= \frac{\text{Area of playground}}{\text{Area of parking area}}$

$= \frac{7 \times 14}{\frac{77}{4}}$

$= \frac{14 \times 4}{11}$

$= \frac{56}{11}$

(iii) Find the cost of fencing the playground and parking area at the rate of Rs. 2 per unit.

Perimeter of rectangular part =2(L+B)

=2(14+7)=42unit

Perimeter of parking area = πR

$= \pi \times \frac{7}{2}$

$= \frac{7}{2} \times \frac{22}{7}$

= 11 units

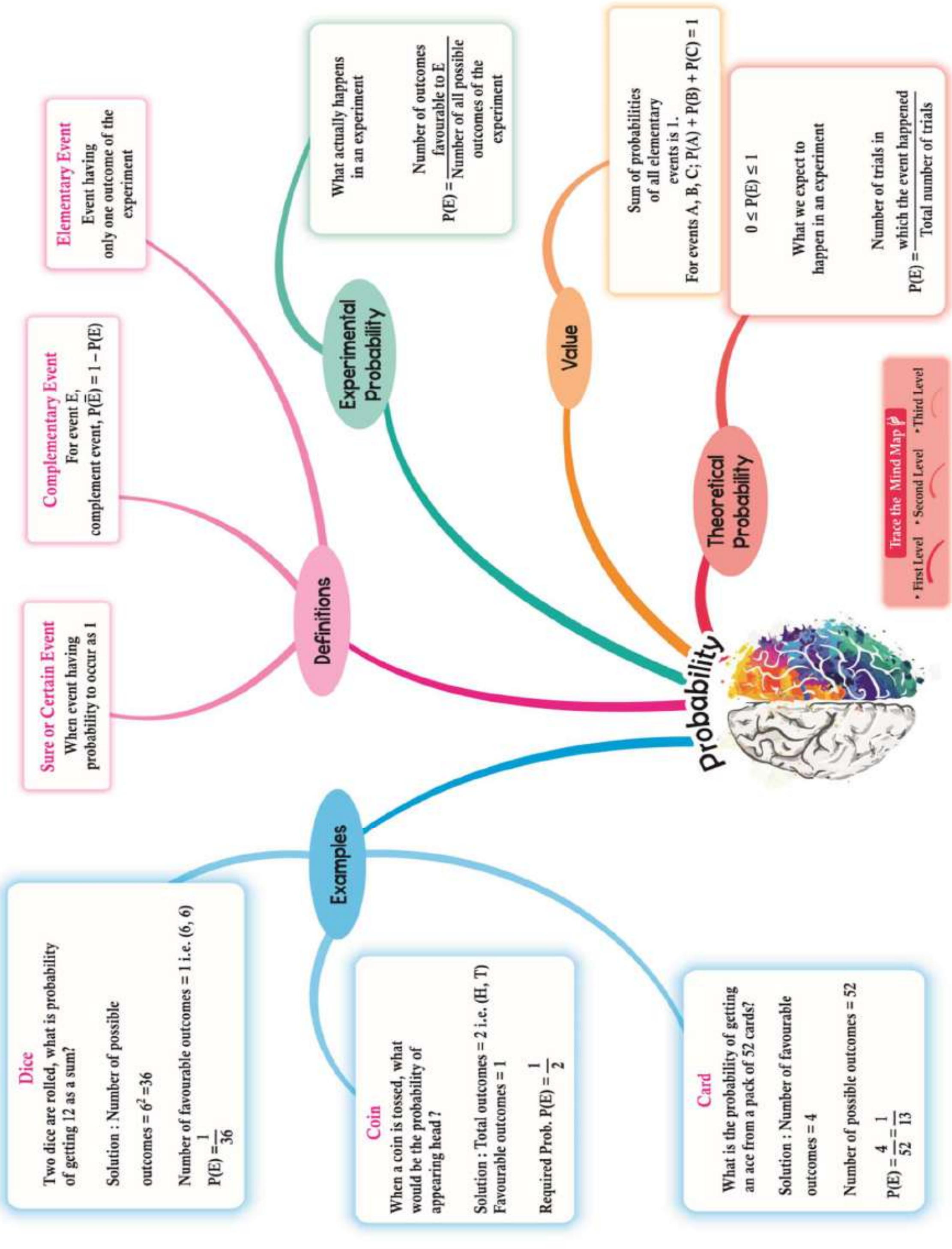
∴ Perimeter of entire region = Perimeter of rectangular part + Perimeter of parking area

= 42 + 11 = 53 units

∴ Cost of fencing = ₹ 2 per unit

∴ Total cost = 53 × 2 = ₹ 106

Chapter-13 STATISTICS



KEY POINTS:-

Statistics is one of the parts of mathematics in which we study about the collecting, organizing, analyzing, interpreting and presenting data.

Ungrouped data - Ungrouped data is data in its original or raw form. The observations are not classified into groups.

Grouped data - In grouped data, observations are organized in groups

Frequency (f) - Frequency is the number of times a particular observation occurs in data.

Class Interval - Data can be grouped into class intervals such that all observations in that range belong to that class.

Class width/size (h) = upper class limit – lower class limit

Class mark (x_i) = $\frac{lower\ limit + upper\ limit}{2}$

Central Tendency

Statistics is very helpful in real life situations as it is easy to understand if we represent a data in a particular number which represents all numbers. This number is called the measure of central tendency. Some of the central tendencies commonly in use are –

A) Mean ($\underline{x}$) B) Median C) Mode

Mean

It is the average of "n" numbers, which is calculated by dividing the sum of all the numbers by n.

The mean $\underline{x}$ of n values x_1, x_2, x_3, ... x_n is given by

$$\underline{x} = \frac{x_1+x_2+x_3+\cdots\ldots\ldots\ldots+x_n}{n}$$

Mean of Grouped Data (With Class-Interval)

When the data is grouped in the form of class interval then the mean can be calculated by three methods.

1. Direct Method

In this method, we use a midpoint which represents the whole class. It is called the class mark. It is the average of the upper limit and the lower limit.

$$\underline{x} = \frac{\Sigma\ f_i x_i}{\Sigma\ f_i}$$

2. Deviation or Assumed Mean Method

If we have to calculate the large numbers then we can use this method to make our calculations easy. In this method, we choose one of the x's as assumed mean and let it as "a". Then we find the deviation which is the difference of assumed mean and each of the x. The rest of the method is the same as the direct method.

$$\underline{x} = a + \frac{\Sigma\ f_i d_i}{\Sigma\ f_i}$$

where a = assumed mean
di = xi - a

3. Step Deviation Method

In this method, we divide the values of d with a number "h" to make our calculations easier.

$\underline{x} = a + (\frac{\Sigma \quad f_i u_i}{\Sigma \quad f_i}) \times h$

where $u_i = \frac{d_i}{h}$

Mode of Grouped Data

In the ungrouped data the most frequently occurring no. is the mode of the sequence, but in the grouped data we can find the class interval only which has the maximum frequency number i.e. the modal class.

The value of mode in that modal class is calculated by

Mode = $l + (\frac{f_1 - f_0}{2f_{1-f_0-f_2}}) \times h$

l = lower class limit of the modal class

h = class interval size

f_1 =frequency of the modal class
f_0 =frequency of the preceding class
f_2 = frequency of the succeeding class

Median of Grouped Data

To find the median of a grouped data, we need to find the cumulative frequency and n/2 .Then we have to find the median class, which is the class of the cumulative frequency near or greater than the value of n/2.

Cumulative Frequency is calculated by adding the frequencies of all the classes preceding the given class.

Then substitute the values in the formula

Median = $l + (\frac{\frac{n}{2} - cf}{f}) \times h$

where l = lower limit of median class

n = no. of observations

cf = cumulative frequency of the class preceding to the median class

f = frequency of the median class

h = size of class

Remark: There is a empirical relationship between the three measures of central tendency:

3 Median = Mode + 2 Mean

1 MARK QUESTIONS (Multiple Choice Questions)

1. The relationship between mean, median and mode for a moderately skewed distribution is

   a) mode = median – 2 mean　　b) mode = 3 median – 2 mean

   c) mode = 2 median – 3 mean　　d) mode = median – mean

2. If the arithmetic mean of x, x + 3, x + 6, x + 9 and x + 12 is 10, then x = ?

   a) 1　　b) 2　　c) 6　　d) 4

3. If Mode of data 64, 60, 48, x, 43, 48, 43, 34 is 43 then x+3 is

   a) 44　　b) 45　　c) 46　　d) 48

4. If the mode of a distribution is 8 and its mean is also 8, then its median is

   a) 10　　b) 8　　c) 7　　d) 6

5. If the mean of the following distribution is 2.6, then the value of y is

variable(x)	1	2	3	4	5
frequency(f)	4	5	m	1	2

   a) 3　　b) 13　　c) 24　　d) 8

6. Mode is the

   a) middle most frequent value　　b) least frequent value
   c) maximum frequent value　　d) none of these

7. The Mean of five number is 15. If we include one more number, the mean of 6 numbers become 17. The included number is

   a) 24　　b) 26　　c) 2　　d) 27

8. Mean of 100 items is 49. It was discovered that three items which should have been 60, 70, 80 were wrongly read as 40, 20, 50 respectively. The correct mean is

   a) 48　　b) 49　　c) 50　　d) 60

9. If the difference of mode and median of a data is 24, then difference of median and mean is

   a) 12　　b) 24　　c) 8　　d) 16

10. Consider the following distribution:

Marks obtained	0 or more	10 or more	20 or more	30 or more	40 or more	50 or more

No. of students	63	58	55	51	48	42

The frequency of the class 30 - 40 is

a) 3 b) 4 c) 48 d) 5

2 MARKS QUESTIONS

1. Calculate the median from the following data

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	5	15	30	8	2

2. Find the mean of the following distribution

Class	3-5	5-7	7-9	9-11	11-13
Frequency	5	10	10	7	8

3. Find the value of p, if the arithmetic mean of the following distribution is 25:

Class interval	0-10	10-20	20-30	30-40	40-50
Frequency	5	18	15	p	6

4. Find the mode of the following frequency distribution

Marks	10-20	20-30	30-40	40-50	50-60
No. of students	15	30	45	12	18

5. Find the median of the data using an empirical formula, when it is given that mode = 35.3 and mean = 30.5.

6. Determine the missing frequency x, from the following data, when Mode is 67.

Class	40-50	50-60	60-70	70-80	80-90
Frequency	5	x	15	12	7

7. Find the unknown values in the following:

Class interval	0-10	10-20	20-30	30-40	40-50
Frequency	5	7	a	5	b

Cumulative frequency	5	c	18	d	30

8. The following data gives the information observed life times (in hours) of 225 electrical components. Determine the modal life times of the components.

Life time(in hours)	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	29

9. For the following distribution,

Class interval	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

Find the sum of lower limits of Median class and upper limit of Modal class.

10. For the following distribution find the modal class

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of students	3	12	27	57	75	80

3 MARKS QUESTIONS

1. Find the unknown entries a,b,c,d,e and f in the following distribution and hence find mode.

Height(in cm)	Frequency	Cumulative frequency
150-155	12	a
155-160	b	25
160-165	10	c
165-170	d	43
170-175	e	48
175-180	2	f
Total	50	

2. If the mean of the following data is 14.7, find the values of p and q

Class	0-6	6-12	12-18	18-24	24-30	30-36	36-42	Total
Frequency	10	p	4	7	q	4	1	40

3. The median of the distribution given below is 14.4. Find the values of ‘x’ and ‘y’, if the sum of frequency is 20.

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	4	x	5	y	1

4. Find the mean of the following data.

Class interval	Less than 20	Less than 40	Less than 60	Less than 80	Less than 100
Frequency	15	37	74	99	120

5. The following table gives the number of participants in a yoga camp

Age(in years)	20-30	30-40	40-50	50-60	60-70
No. of participants	8	40	58	90	83

Find modal age of the participants.

5 MARKS QUESTIONS

1. The mode of the following frequency distribution is 55.Find the missing frequencies ‘a’ and ‘b’

Class interval	0-15	15-30	30-45	45-60	60-75	75-90	Total
Frequency	6	7	a	15	10	b	51

2. The median of the following data is 50. Find the values of ‘p’ and ‘q’, if the sum of all frequencies is 90.

Marks obtained	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of students	p	15	25	20	q	8	10

3. The distribution given below shows the number of wickets taken by bowlers in one day cricket matches. Find the mean and median of the number of wickets taken.

No. of wickets	20-60	60-100	100-140	140-180	180-220	220-260
No. of bowlers	7	5	16	12	2	3

CASE STUDY QUESTIONS

1. Apples are most widely planted and are commercially the most important fruit crop in Jammu and Kashmir. The cultivation of apple crop in Jammu and Kashmir shows particular interest for a number of reasons. In terms of both area and production, apple is very beneficial fruit crop. This provides a major source of income and employment in Jammu and Kashmir.

Horticultural department has tasked their statistical officer to create a model for farmers to be able to predict their produce output based on various factors. A box containing 250 apples was opened and each apple was weighed. The distribution of the weight of the apples is given in the following table:

Weight (in grams)	80-100	100-120	120-140	140-160	160-180
No. of apples	20	60	70	40	60

Base on the above information, answer the following questions.

a) How many apples weighs more than 140 grams?
b) What is the sum of lower and upper limit of the median class?
c) What is the modal mass of the apples?
d) What is the mean weight of the apples?

2. Transport department of a Jaipur wants to buy some Electric buses for the city. For which they wants to analyze the distance travelled by existing public transport buses in a day.

The following data shows the distance travelled by 60 existing public transport buses in a day.

Daily distance travelled(in km)	200-210	210-220	220-230	230-240	240-250
Number of buses	4	14	26	10	6

Base on the above information, answer the following questions.
a) Find the median class of daily distance travelled?
b) What is the cumulative frequency of the class preceding the median class?
c) Find the median of the distance travelled.
d) Find the average distance travelled by bus in a day.

3. 100 Meters Race: The 100 meters is a sprint race in track and field competitions. The shortest common outdoor running distance, it is one of the most popular and prestigious events in the sport of athletics. It has been contested at the summer Olympics since 1896 for men and since 1928 for women. The World Championships 100 meters have been contested since 1983. The reigning 100 m Olympic or world champion is often named "the fastest man or woman in the world".

A stopwatch was used to find the time that it took a group of students to run 100 m.

Time (in sec)	0-20	20-40	40-60	60-80	80-100
No. of students	8	10	13	6	3

Based on the above information, answer the following questions.
a) Estimate the mean time taken by a student to finish the race.
b) What will be the upper limit of the modal class ?
c) What is the sum of lower limits of median class and modal class ?
d) How many students finished the race in less than 1 minute?

ASSERTION REASON QUESTIONS

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.

1. Assertion: If the value of mode and mean is 60 and 66 respectively, then the value of median is 64.
Reason: Median = (mode + 2 mean)/2

2. Assertion: The arithmetic mean of the following given frequency distribution table is 13.81.

x	4	7	10	13	16	19
f	7	10	15	20	25	30

Reason: $\underline{x} = \frac{\Sigma \quad f_i x_i}{\Sigma f_i}$

3. Assertion: If the numbers of runs scored by 11 players of a cricket team of India are 5, 19, 42, 11, 50, 30, 21, 0, 52, 36, 27 then median is 30.
Reason: Median = (n+1)/2, if n is odd.

4. Assertion: Class width = upper class limit – lower class limit
Reason: Class mark = (Upper Class Limit + Lower Class Limit)/2

5. Assertion: the mode of the call received on 7 consecutive day 11,13,13,17,19,23,25 is 13.
Reason: Mode is the value that appears most frequent.

6. Assertion: Frequency is the number of times a particular observation occurs in data.
Reason: Data can be grouped into class intervals such that all observations in that range belong to that class.

7. Assertion: The mean of x, y and z is y, then x + z = 3y.
Reason: Mean = $\frac{sum\ of\ observations}{total\ number\ of\ observations}$

8. Assertion: If the median and mode of a frequency distribution are 150 and 154 respectively. Then its mean is 148.
Reason: Mean, Median and Mode of a frequency distribution are related as 3 Median = Mode + 2 Mean.

9. Assertion: If the median of the given data 26, 29, 42, 53, x, x+2, 70, 75, 82, 93 is 65 then the value of x is 64.
Reason: When the number of observations (n) is odd the median is the value of the $(\frac{n+1}{2})$th observation.

10. Assertion :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: The value of the variable which occurs most often is the mode.

ANSWER KEY

1 MARK QUESTION

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

2 MARKS QUESTIONS

1. 23.33
2. 8.15
3. 16
4. 33.125
5. 32.1
6. 8
7. a=6, b=7, c=12, d=23
8. 65.625
9. 30
10. 30-40

3 MARK QUESTIONS

1. a=12, b=13,c=35, d=8, e=5, f=50
2. p=11, q=3
3. x=4, y=6
4. 52.5
5. 58.2

5 MARKS QUESTIONS

1. a=5, b=8
2. p=5, q=7
3. Mean=125.33, Median= 126.25

CASE STUDY QUESTIONS

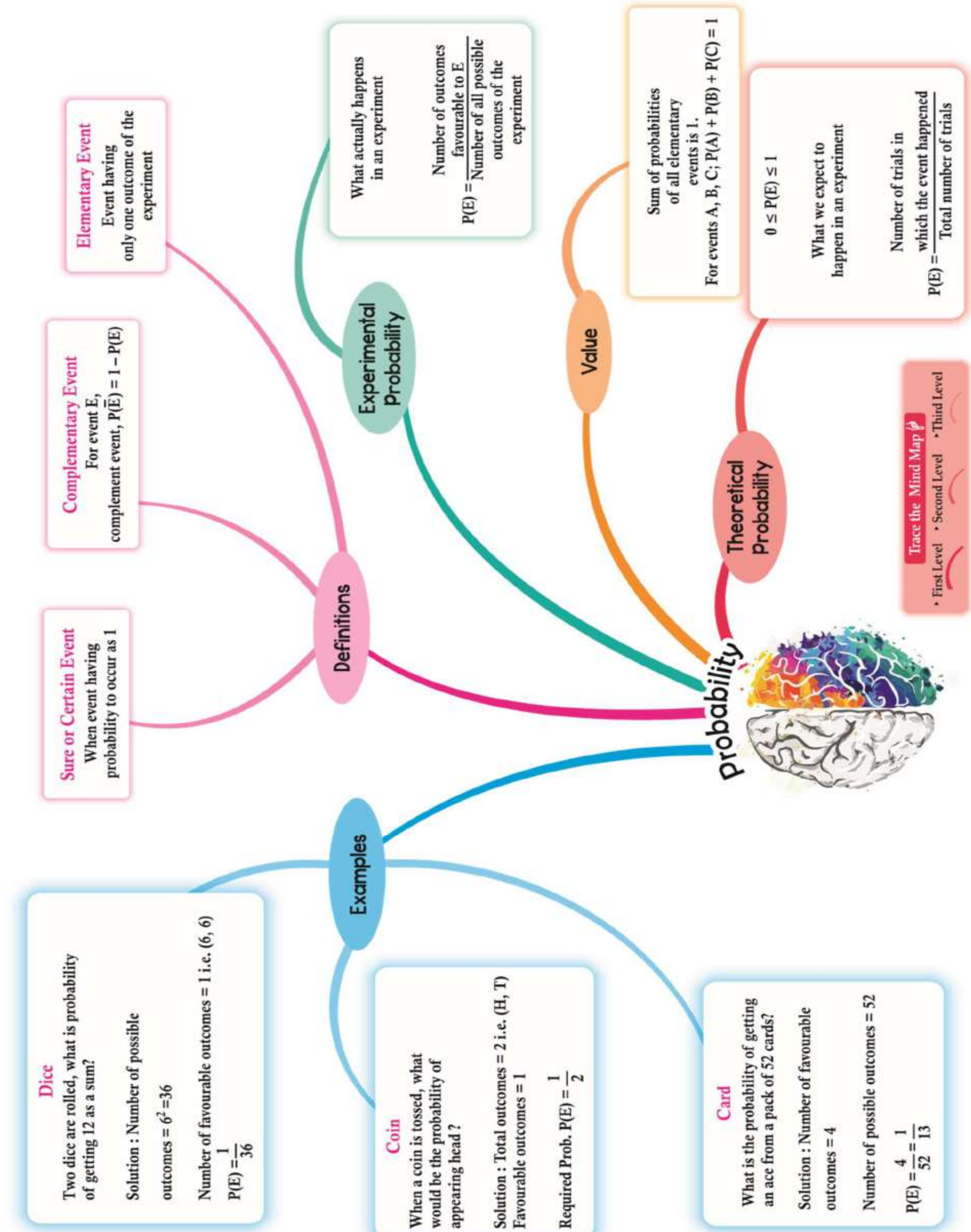
1.a) 100	b)260	c)120-140	d)134.8
2.a) 220-230	b)18	c)224.61	d)225
3.a) 43	b)60	c)80	d)31

ASSERTION REASON QUESTIONS

1. c
2. a

3. **d**
4. **b**
5. **a**
6. **a**
7. **d**
8. **a**
9. **b**
10. **b**

CHAPTER-14 PROBABILITY



KEY POINTS

1)Probability: The measure of uncertainty is called probability.

2)Performing experiments:
(a) Tossing a coin
(b) Throwing a die
(c) Drawing a card from a deck of 52 cards, etc.

3) Sample Space: The set of all possible outcomes in an experiment is called sample space.

4) An event is a subset of a sample space.

5) Equally likely events: If one event cannot be expected in preference to the other event then they are said to be equally likely.

6)The theoretical probability of an event E, is written as P(E) , is defined as

$$P(E) = \frac{Number\ of\ out\ comes\ Favourable\ to\ E}{Number\ of\ all\ possible\ out\ comes\ of\ the\ experiment}$$

When we assume that the outcomes of the experiment are equally likely.

7)The probability of a sure event (or certain event) is 1

8)The probability of an impossible event is 0.

9)For any event E, $P(E) + P(\bar{E}) = 1, where\ \bar{E}$ stands for 'not E', E and $\bar{E}$ are called complementary Events

10)The probability of an event E is a number P (E) such that $0 \leq P(E) \leq 1$

11)Elementary events: - An event having only one outcome is called an elementary event. The sum of the probabilities of all the elementary events of an experiment is 1.

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MULTIPLE CHOICE QUESTIONS

1)Which of the following cannot be the probability of an event

(a) 0 (b) 1 (c) 12% (d) – 0.5

2) The probability of getting bad egg in a lot of 400 is 0.035. Then the number of bad eggs in the lot
is

(a) 14 (b) 1.4 (c) 0.14 (d) 14.5

3)The probability of getting 53 Sundays in a non – leap year is

(a) $\frac{1}{365}$ (b) $\frac{53}{365}$ (c) $\frac{1}{7}$ (d) $\frac{2}{7}$

4)A jar contains 54 marbles of blue, green and white colour. The probability of getting a blue marble from the jar is $\frac{1}{3}$ and the probability of getting a green marble is $\frac{4}{9}$. The number of white marbles in the jar is

(a) 42 (b) 18 (c) 24 (d) 12

5)Two dice are thrown at the same time. The probability of getting a prime number on both dice is

(a) $\frac{1}{6}$ (b) $\frac{1}{4}$ (c) $\frac{7}{36}$ (d) $\frac{5}{36}$

6)Two coins are tossed simultaneously . The probability of getting at most one head

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) 0.5

7)A box contains cards numbered 6 to 55. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square , is

(a) $\frac{7}{50}$ (b) $\frac{7}{55}$ (c) $\frac{1}{10}$ (d) $\frac{5}{49}$

8)If P(A) denotes the probability of an event A, then

(a) P(A) < 0 (b) P(A) > 1 (c) $0 \le P(A) \le 1$ (d) $-1 \le P(A) \le 1$

9)In a lottery there are 10 prizes and 25 blanks .The probability of getting a prize is

(a) $\frac{10}{25}$ (b) $\frac{1}{35}$ (c) $\frac{2}{35}$ (d) $\frac{2}{7}$

10)A card is drawn from a well shuffled deck of 52 cards . The probability of getting a black face card or a king

(a) $\frac{3}{26}$ (b) $\frac{2}{26}$ (c) $\frac{2}{13}$ (d) $\frac{5}{26}$

ASSERTION AND REASON QUESTIONS

Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

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

1) **Assertion:** The probability of getting a prime number when a die is thrown once is 2/3.
Reason: Prime numbers on a die are 2, 3, 5.

2) **Assertion:** If a box contains 5 white, 2 red and 4 black marbles, then the probability of not drawing a white marble from the box is 5/11.
Reason: $P(\overline{E}) = 1 - P(E)$, where E is any event.

3) **Assertion:** Card numbered as 1, 2, 3..………..15 are put in a box and mixed thoroughly, one card is then drawn at random. The probability of drawing an even number is 7/15.
Reason: For any event E, we have $0 \le P(E) \le 1$.

4) **Assertion:** If a die is thrown once, the probability of getting a number less than 3 & greater than 2 is zero.
Reason: Probability of an impossible event is zero.

5) **Assertion : . A bag has 3 red balls and 5 green balls. If we take a ball from the bag, then probability of getting red balls only 3/8.**
Reason : Probability of getting red balls = number of red balls / total number of balls

6) **Assertion: The probability of getting exactly one head in tossing a pair of coins is 1/2.**
Reason: The sample space of two coin tossed is ={HH,TT,HT,TH}=4

7) Assertion: The probability of winning a game is 0.4, then the probability of losing it, is 0.6.
Reason: P(E) + P (not E) = 1

8) **Assertion** : -- 0.4 cannot be the probability of an event.
Reason : The probability of an event can neither be a negative value, nor it can exceed unity.

9)**Assertion** **:** A letter is chosen from the word 'MATHEMATICS'. The probability that the chosen letter is a vowel is 4/26 = 2/13 .
Reason **:** There are 26 letters in English alphabets .

10) **Assertion :** The probability of getting a red face card from a deck of 52 cards is 3/13
Reason **:** There are 12 face cards in a deck of 52 playing cards.

SHORT ANSWER TYPE- I QUESTIONS (EACH CARRIES 2 MARKS)

1)A letter is chosen at random from the letters of the word "ASSASSINATION", then the probability that the letter chosen is a vowel is in the form of 6/ (2x+1), if so find the value of x.

2) A box contains 20 cards numbered from 1 to 20 . A card drawn at random from the box. Find the probability that the card drawn at random is divisible by 2 or 3.

3) One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will
(i) be an ace, (ii) not be an ace.

4) An integer is chosen between 0 and 100. What is the probability that it is
(i) divisible by 7? (ii) not divisible by 7?

5) In a lottery of 50 tickets numbered 1 to 50, one ticket is drawn. Find the probability that the drawn ticket bears a prime number.

6) A bag contains 5 black, 7 red and 3 white balls. A ball is drawn from the bag at random. Find the
probability that the ball drawn is:
(i) black or white (ii) not black

7) What is the probability that a number selected at random from the numbers 1, 2, 2, 3, 3, 3, 4, 4, 4,
4 will be their average?

8) It is given that in a group of 3 students, the probability of 2 students not having the same birthday
is 0.992. What is the probability that the 2 students have the same birthday?

9) A bag contains lemon-flavoured candies only. Malini takes out one candy without looking into the bag. What is the probability that she takes out:
(i) an orange-flavoured candy (ii) a lemon-flavoured candy

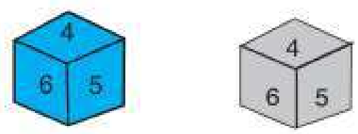
10) A bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag?

SHORT ANSWER TYPE- II QUESTIONS (EACH CARRIES 3 MARKS)

1)The probability of selecting a blue marble at random from a jar that contains only blue, black and green marbles is 1/5. The probability of selecting a black marble at random from the same jar is 1/4. If the jar contains 11 green marbles, find the total number of marbles in the jar.

2) All the three face cards of spades are removed from a well- shuffled pack of 52 cards. A card is drawn at random from the remaining pack. Find the probability of getting
(i) a black face cards (ii) a queen (iii) a black card

3) Two dice, one blue and one grey, are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is (i) 8? (ii) 13? (iii) less than or equal to 12?

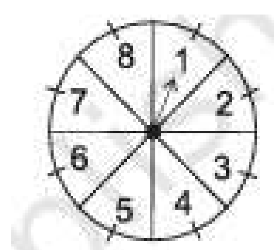


4) A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears
(i) a two-digit number (ii) a perfect square number (iii) a number divisible by 5.

5) A bag contains 24 balls of which x are red 2x are white and 3x are blue. Find x . A ball is selected at random. What is the probability that
(i) it is red (ii) it is blue (iii) neither red nor blue

LONG ANSWER QUESTION (EACH CARRIES 5 MARKS)

1)A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 (see Fig.), and these are equally likely outcomes. What is the probability that it will point at
(i) 8 ? (ii) an odd number? (iii) a number greater than 2? (iv) a number less than 9?
(v) a perfect square number.



2) Two customers Shyam and Ekta are visiting a particular shop in the same week (Tuesday to Saturday). Each is equally likely to visit the shop on any day as on another day. What is the probability that both will visit the shop on (i) the same day? (ii) consecutive days? (iii) different days?

3) A die is numbered in such a way that its faces show the numbers 1, 2, 2, 3, 3, 6. It is thrown two times and the total score in two throws is noted. Complete the following table which gives a few values of the total score on the two throws:

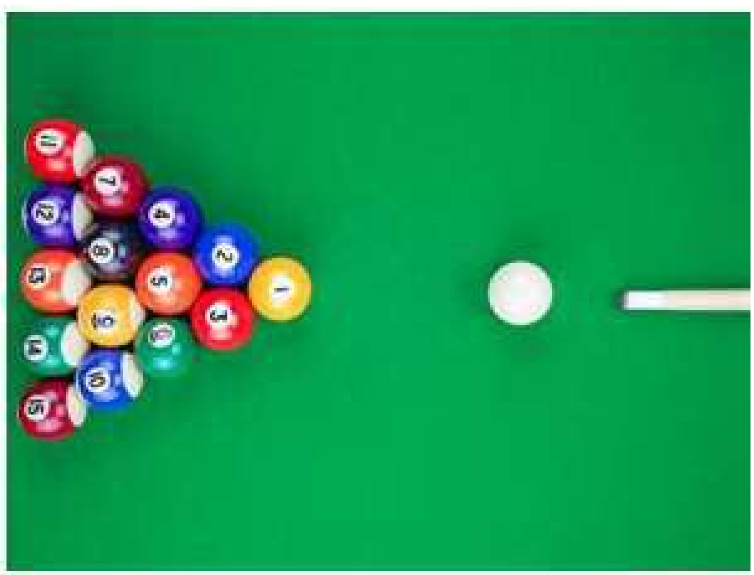
Number in second throw	Number in first throw						
	+	1	2	2	3	3	6
	1	**2**			**4**		
	2						
	2						
	3	**4**		**5**			**9**
	3				**6**		
	6		**8**				

What is the probability that the total score is
(i) even? (ii) 6? (iii) at least 6 ?

CASE BASED STUDY QUESTIONS (EACH CARRIES 1+1+2 =4 MARKS)

1) Two friends, Neha and Sneha, decided to play the game pockets billiard on their holiday. This game is similar to the carom game, except but it has 6 holes on the board to strike the balls into it. This game consists of 15 numbered color balls, and 1 cue ball, which is used to strike the other 15 numbered color balls to the holes. These balls are arranged in the pyramid form. The first player strikes them using the white ball(cue ball) to break the formation and then tries to sink the ball into the holes. Each player takes alternate turns to strike the balls.

(Note: Ignore the cue ball while taking the total number of balls.)



(a) If Neha plays first, then find the probability that she successfully sinks the ball numbered 10 (1M)

(b) Find the probability that Sneha sinks a ball is a prime number (1 M)

(c) (i) Find the probability that Neha sinks a ball numbered neither a prime nor an odd number.(2M)

(OR)

(d) (ii) Find the probability that Sneha sinks a ball numbered as a multiple of 2 or 3 (2M)

2)Rohit wants to distribute chocolates in his class on his birthday. The chocolates are of three types: Milk chocolate, White chocolate and Dark chocolate. If the total number of students in the class is 54 and everyone gets a chocolate, then answer the following questions.

(a) If the probability of distributing milk chocolates is 1/3, then find the number of milk chocolates with Rohit. (1M)

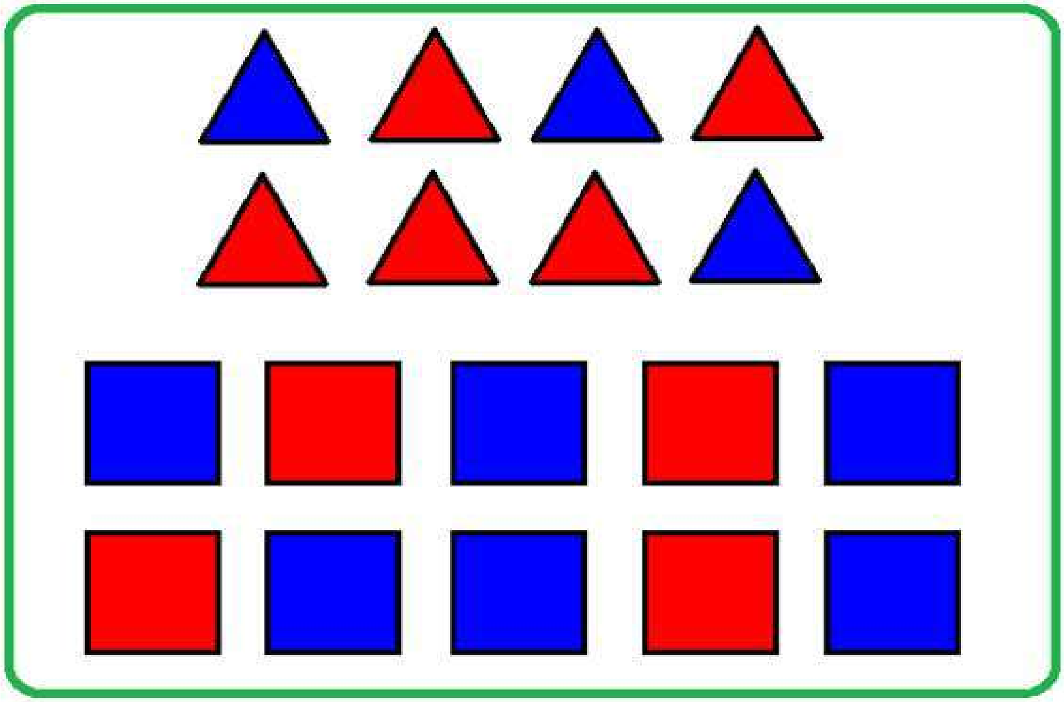
(b) Find the probability of getting at least one chocolate ? (1M)

(c) (i) If the probability of distributing white chocolates is 1/2 , then find the probability of distributing dark chocolate. (2M)

(OR)

(ii) Find the number of milk and dark chocolates distributed . (2M)

3)Aditya went to shop to purchase a child's game along with his friend. He selected one child's game which has 8 triangles of which 3 are blue and rest are red, and 10 squares of which 6 are blue and rest are red. While checking the game, one piece is lost at random.



(a)How many triangles are of red colour and how many squares are of red colour ? (1 M)

(b)Find the probability that lost piece is a square ? (1M)

(C)(i)Find the probability of getting either a red colour triangle or blue colour square. (2M)

(OR)

(ii) Find the probability of getting neither a red colour square nor blue colour triangle. (2M)

****

ANSWERS

MULTIPLE CHOICE QUESTIONS

1) D (-- 0.5)
2) A (14)
3) C (1/7)
4) D (12)
5) A (1/6)
6) B (3/4)
7) C (1/10)
8) C ($0 \leq P(A) \leq 1$)
9) D (2/7)
10) A (3/26)

ASSERTION AND REASON QUESTIONS

1) D
2) B
3) B
4) A
5) A
6) A
7) A
8) A
9) D
10) D

SHORT ANSWER TYPE- I QUESTIONS (EACH CARRIES 2 MARKS)

1)6/(2x+1) = 6/13
2x+1 = 13
2x = 13 – 1 = 12
x=6

2)No.of favourable cases = 10 + 6 = 16
Probability = 16/20 = 4/5

3)(i)4/52 = 1/13 (ii)48/52 = 12/13

4)(i)14/100 = 0.14 (ii) 86/100 = 0.86

5)Prime numbers from 1 to 50 are 2,3,5,7,11,13,17,19,23,29,31,37,41,43,47
Probability = 15/50 = 3/10 = 0.3

6) (i)8/15 (ii) 10/15 = 2/3

7)Average = 3, P(getting 3) = 3/10 = 0.3

8) 1—0.992 = 0.008

9) (i) 0 (ii) 1

10)Total No.of balls = 15 + x
P(a black ball) = 3 X P(a white ball)

$$\frac{x}{15+x} = 3\,X\,\frac{15}{15+x}$$

$$x = 45$$

No. of black balls are 45.

SHORT ANSWER TYPE- II QUESTIONS (EACH CARRIES 3 MARKS)

1)Let total no. of marbles be 'x'
11 / x = 1/5
X = 55

2)(i) 3/49 (ii) 3/49 (iii)23/49

3)(i) 5/36 (ii) 0 (iii) 1

4) (i) 81/90 = 9/10 = 0.9 (ii) 9/10 = 0.9 (iii) 18/90 = 1/5

5) 6x /24 = 1 =≫ x = 4

(i)4/24 = 1/6 (ii) 12/24 = ½ (iii) 8/24 = 1/3

LONG ANSWER QUESTION (EACH CARRIES 5 MARKS)

1)(i)1/8 (ii)1/2 (iii)6/8 = ¾ (iv) 1 (v)2/8 = ¼

2)Sample space = $\begin{Bmatrix} (T,T),(T,W),(T,Thu),(T,F),(T,S) \\ (W,T),(W,W),(W,Thu),(W,F),(W,S) \\ (Thu,T),(Thu,W),(Thu,Thu),(Thu,F),(Thu,S) \\ (F,T),(F,W),(F,Thu),(F,F),(F,S) \\ (S,T),(S,W),(S,Thu),(S,F),(S,S) \end{Bmatrix} = 25$ -------- (2M)

(i)5/25 = 1/5 (ii)8/25 (iii)20/25 = 4/5

3)

	Number in first throw						
Number in second throw	+	1	2	2	3	3	6
	1	2	3	3	4	4	7
	2	3	4	4	5	5	8
	2	3	4	4	5	5	8
	3	4	5	5	6	6	9
	3	4	5	5	6	6	9
	6	7	8	8	9	9	12

(i)17/36 (ii)4/36 = 1/9 (iii)15/36 = 5/12

CASE BASED STUDY QUESTIONS (EACH CARRIES 1+1+2 =4 MARKS)

1)
(a)1/15 (b)6/15 = 2/5 (c) (i) 6/15 = 2/5 (OR) (ii) 10/15 = 2/3

2) (a)18 (b) 1

(c)(i) $\frac{1}{3} + \frac{1}{2} + P(dark\ chocolate) = 1$

$P(dark\ chocolate) = \frac{1}{6}$

(OR)

(ii) 18+9 = 27

3)(a) 4+4 = 8 (b) 10/17 (c) (i) 7/17 (OR) (ii) 10/17

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केन्द्रीय विद्यालय संगठन, बेंगलुरु संभाग

KENDRIYA VIDYALAYA SANGATHAN, BANGALORE REGION

SAMPLE PAPER -1 (2024-25)

BLUE PRINT

CLASS: X **MAX.MARKS: 80**

SUBJECT: MATHEMATICS (STANDARD) **TIME: 3 Hours.**

S.No	LESSON	VSA 1m	SA -I 2m	SA-II 3m	LA 5m	Case Based 4m	TOTAL
1	Real Numbers	1	1	1			6
2	Polynomials	1				1	5
3	Pair of linear equations in two variables	1			1		6
4	Quadratic Equations	1		1			4
5	Arithmetic Progression	2		1			5
6	Triangles	3			1		8
7	Coordinate Geometry	2	2				6
8	Introduction to Trigonometry	2	1	1			7
9	Some Applications of Trigonometry				1		5
10	Circles	2	1	1			7
11	Areas related to Circles				1		5
12	Surface Areas and Volumes	1				1	5
13	Statistics	2		1			5
14	Probability	2				1	6
		1x20=20	2x5=10	3x6=18	5x4=20	4x3=12	80(38)

केन्द्रीय विद्यालय संगठन, बेंगलुरु संभाग

KENDRIYA VIDYALAYA SANGATHAN, BANGALORE REGiON SET -1 (2024-25)

CLASS: X **MAX.MARKS: 80**

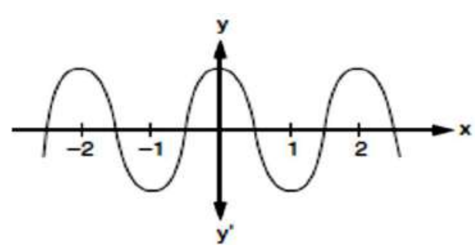
SUBJECT: MATHEMATICS (STANDARD) **TIME: 3 Hours.**

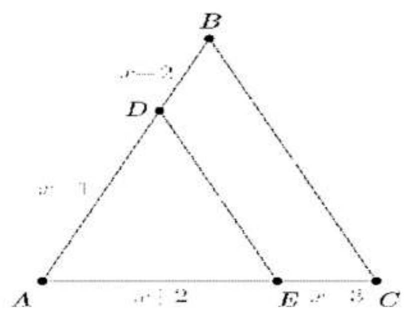
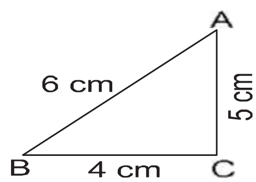
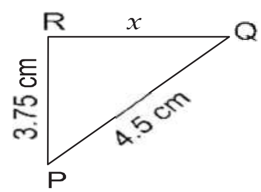
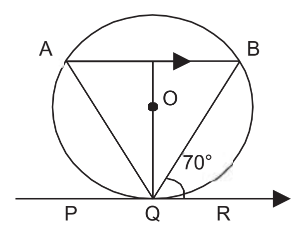
General Instructions:

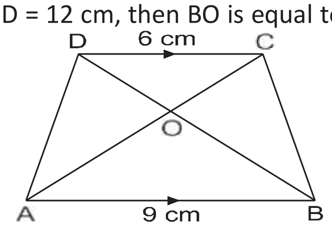
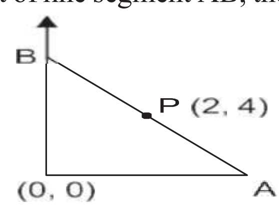
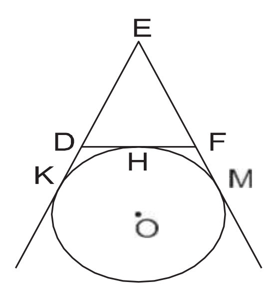
(i) This question paper contains **38** questions. **All** questions are **compulsory.**
(ii) This question paper is divided into **five** sections - **A,B,C,D and E.**
(iii) In **Section A**, Questions number **1** to **18** are multiple choice questions (**MCQ**) and question number **19** and **20** are **Assertion-Reason** based questions of **1** mark each.
(iv) In **Section B**, Questions number **21** to **25** are very short answer (**SA-1**) type questions, carrying **2** marks each.
(v) In **Section C**, Questions number **26** to **31** are short answer (**SA-II**) type questions, carrying **3** marks each.
(vi) In **Section D**, Questions number **32** to **35** are long answer (**LA**) type questions, carrying **5** marks each.
(vii) In **Section E**, Questions number **36** to **38** are case based questions carrying **4** marks each. Internal choice is provided in 2 marks questions in each case study.
(viii) There is no overall choice. However, an internal choice has been provided in 2 questions in section B, 2 questions in section C, 2 questions in section D and 3 questions in section E.
(ix) Draw neat diagrams wherever required. Take π = 22/7 wherever required, if not stated.
(x) Use of calculators is **not** allowed.

SECTION - A

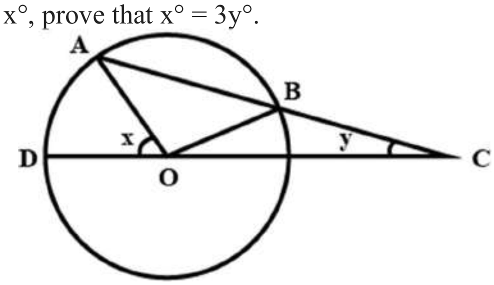
This section comprises multiple choice questions (MCQs) of 1 mark each.

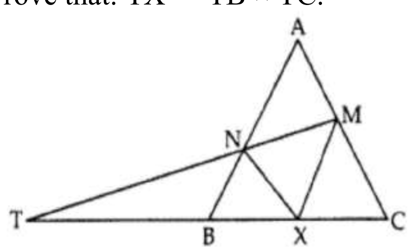
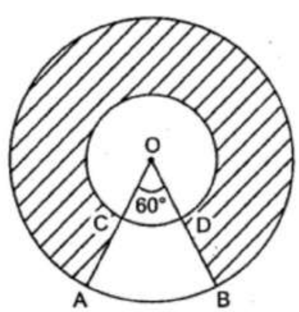
1	The LCM and HCF of two rational numbers are equal ,then the numbers must be (a) prime (b) co-prime (c) composite (d) equal	1
2	The graph of $y = f(x)$, where $f(x)$ is a polynomial in x is given below. Find the number of zeroes lying between –2 to 0.  (a) 0 (b) 1 (c) 2 (d) none of these	1
3	The system of equations 2x + y = 3 and 4x + 2y = 5 has	1

	(a) no solution (b) 1 solution (c) 2 solutions (d) infinite solutions	
4	If no roots of the equation $x^2 - p\,x + 1 = 0$ is real, then (a) $p > 2$ (b) $p < -2$ (c) $p = 2$ (d) $-2 < p < 2$	1
5	In the given figure DE ∥ BC, then **x** equals  (b) 1 (b) 0.5 (c) -2 (d) -0.5	1
6	$\Delta ABC \sim \Delta PQR$. The value of x is  (a) 2.5cm (b) 3cm (c) 2.75cm d) 3.5cm	1
7	If PQR is a tangent to a circle at Q whose centre is O, ABis a chord parallel to PR and $\angle BQR = 70°$, then $\angle AQB$ is equal to  (a) 25^0 (b) 50^0 (c)30^0 (d) 40^0	1
8	The measure(s) of central tendency that would be best suited to determine the consumer item in demand is (a) mean (*b*) median (*c*) mode (*d*) mean and median	1
9	The perpendicular bisector of the line segment joining the points A(2, 3) and B(5, 6) cuts the y-axis at (a) (8, 0) (b) (0, 8) (c) (0, – 8) (d) (0, 7)	1

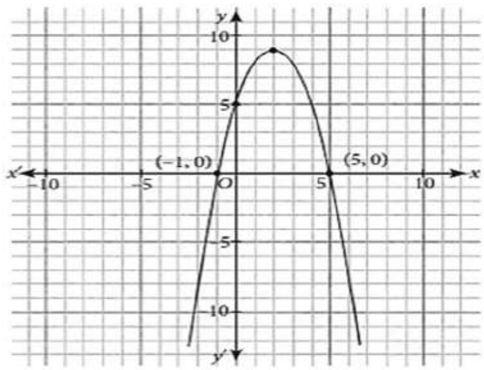
10	In a ΔABC right angled at B, the value of sin (A+C) is (a) 0 (b) $\frac{1}{2}$ (c) 1 (d) $\frac{\sqrt{3}}{2}$	1
11	In trapezium ABCD, if AB || DC, AB = 9 cm, DC = 6 cm and BD = 12 cm, then BO is equal to  (a) 7.4cm (b) 7cm (c)7.2cm (d) 7.5cm	1
12	If a, b, c, d and e are in AP, then the value of a – 4b + 6c – 4d + e is (a) 0 (b) 1 (c) 2 (d) 3	1
13	The nth term of an AP whose sum of n terms is Sn, (a) $S_n + S_{n+1}$ (*b*) $S_n - S_{n-1}$ (*c*) $S_n + S_{n-1}$ (*d*) $S_n - S_{n+1}$	1
14	In the figure given alongside, point P(2, 4) is the mid-point of line segment AB, then the coordinates of A and B respectively are  (*a*) A(0, 4), B(8, 0) (*b*) A(8, 0), B(0, 4) (*c*) A(4, 0), B(0, 8) (*d*) A(2, 6), B(6, 2)	1
15	In the figure, a circle touches the side DF of Δ EDF at H and touches ED and EF produced at K and M respectively. If EK = 9 cm, then perimeter of ΔEDF (in cm) is  (a) 18 (b) 13.5 (c)12 (d) 9	1
16	The empirical relationship between the three central tendencies is	1

	(a) Mode = 2median – 3 mean (b) Mode = median – 2 mean (c Mode = 2 median – mean (d) Mode = 3 median – 2 mean	
17	If a coin is tossed three times, then the probability of getting at most 2 heads is (a) $\frac{5}{8}$ (b) $\frac{3}{8}$ (c) $\frac{7}{8}$ (d) $\frac{3}{4}$	1
18	A bag contains 5 red balls and *n* green balls. If the probability of drawing a green ball is three times that of a red ball, then the value of *n* is (a) 18 (b) 15 (c) 10 (d) 20	1
	Direction for question numbers 19 and 20 : A statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.	
19	Assertion(A) : The value of $\sin 60^0 \cos 30^0 + \sin 30^0 \cos 60^0 = 1$ Reason (R) : $\sin 90^0 = 1$ and $\cos 90^0 = 0$ (a) Both Assertion(A) and Reason(R) are true and the Reason(R) is the correct explanation of Assertion(A). (b) Both Assertion(A) and Reason(R) are true but the 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
20	Assertion(A) : A cone, a hemisphere and a cylinder stand on equal bases and have same height, then their volumes are in ratio 1:2:3. Reason (R) : $\frac{1}{3}\pi r^2 x\ r$ **:** $\frac{2}{3}\pi r^3$ **:** $\pi r^2 x\ r$ (a) Both Assertion(A) and Reason(R) are true and the Reason(R) is the correct explanation of Assertion(A). (b) Both Assertion(A) and Reason(R) are true but the 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
	SECTION B ***This section comprises of 5 very short answer type questions of 2 marks each***	
21	Explain why 17 X 11 X 7 + 11 is a composite number.	2
22	If tan θ + cot θ = 2 find the value of $\sqrt{\tan^2\theta + \sec^2\theta}$ OR Evaluate : $\frac{\cos 45°}{\sec 30° + \operatorname{cosec} 30°}$	2

23	Find the value of x if A(6, 1), B(8, 2), C(9, 4) and D(x, 3) are the vertices of a parallelogram ABCD.	2
24	Find the value of x if the distance between the points P(-2, 3) and Q (x, 7) is $4\sqrt{5}$ units. OR Find the coordinates of the point which divides the join of A(4,-3) and (8, 5) in the ratio 3:1 .	2
25	Prove that the tangents drawn from an external point to a circle are equal.	2
	SECTION C ***This section comprises of 6 short answer type questions of 3 marks each***	
26	Prove that $\sqrt{3}$ is an irrational number.	3
27	A teacher on attempting to arrange the students for a mass drill in the form of a solid square, found that 24 students were left over. When he increased the size of the square by one student, he found he was short of 25 students. Find the number of students.	3
28	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 numbers of the houses preceding the house marked x is equal to the sum of the houses following it. Find this value of x. OR If the 9^{th} term of an AP is zero, prove that its 29^{th} term is twice its 19^{th} term.	3
29	Prove that (1+cotA – cosec A) (1+tanA+secA) = 2	3
30	In the given figure, AB is the chord of a circle with centre O. AB is produced to C such that BC = OB. CO is joined and produced to meet the circle in D. If ∠ACD = y° and ∠AOD = x°, prove that x° = 3y°.  OR Prove that the parallelogram circumscribing a circle is a rhombus.	3
31	The mean of the following frequency distribution is 50. Find the missing frequencies m and n. <table><tr><td>Class</td><td>0 – 20</td><td>20 – 40</td><td>40 – 60</td><td>60 – 80</td><td>80 – 100</td><td>Total</td></tr><tr><td>Frequency</td><td>17</td><td>$f1$</td><td>32</td><td>f 2</td><td>19</td><td>120</td></tr></table>	3
	SECTION D ***This section comprises of 4 long answer type questions of 5 marks each***	

32	Solve graphically : $2x + 3y = 12$ $x - y = 1$ Find the coordinates of the vertices of the triangle formed by the two straight lines and the y- axis. **OR** One says, "Give me a hundred, friend! I shall then become twice as rich as you." The other replies, "If you give me ten, I shall be six times as rich as you." Tell me what is the amount of their (respective) capital? [From the Bijaganita of Bhaskara II]	5
33	Prove that if a line is drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio. **OR** Any point X is taken on the side BC of a triangle ABC and XM, XN are drawn parallel to BA & CA meeting CA &BA at M and N respectively. MN meets BC produced in T. Prove that: $TX^2 = TB \times TC$. 	5
34	Two pillars of equal height stand on either side of a roadway which is 150m wide. From a point on the roadway between the pillars, the angles of elevation of the top of the pillars are 60^0 and 30^0 respectively. Find the height of the pillars and the distance of the point from the pillars.	5
35	In figure, two concentric circles with centre O, have radii 21 cm and 42 cm. If $\angle AOB = 60°$, find the area of the shaded region. 	5
	SECTION E ***This section comprises of 3 case study-based questions of 4 marks each***	

36 A construction company got the contract of making speed humps on roads. Speed humps are parabolic in shape and prevents over speeding, minimise accidents and gives a chance for pedestrians to cross the road. The mathematical representation of a speed hump is shown in the given graph. **4**



Based on the above information, answer the following questions.

(i) Name the type of polynomial represented by the graph.
(ii) Find the zeroes of the polynomial represented by the graph.
(iii) Write the expression of the polynomial represented by the graph

OR

Give the expression of the polynomial if its zeroes were 2 and -3

37 **4**

All the students were excited about the coming festival Diwali.
To reduce the air pollution, the government decided to ban bursting of crackers. To cheer them up, their math teacher asked to decorate the classroom by hanging models of crackers/rockets. The radius and height of the cylindrical part of rocket is 3 cm and 10 cm respectively and the radius and slant height of the conical part of rocket is 5cm and 13cm respectively.

Based on the above information, answer the following questions.

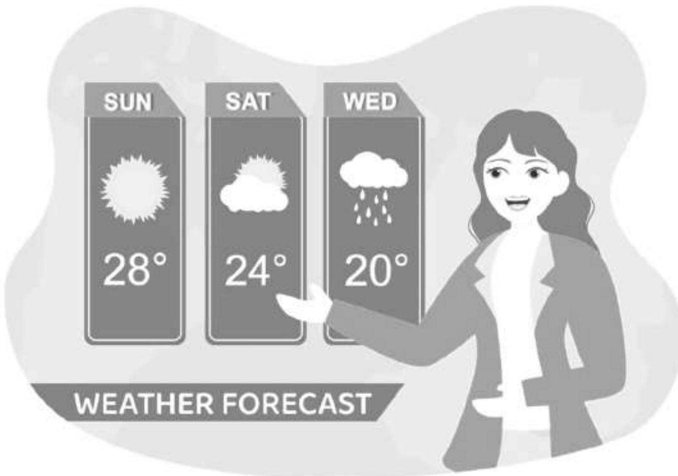
(i) Name the combination of solids used to make these rockets.
(ii) How much paper is used to cover the conical part.
(iii)What is the total height of the rocket model?

OR

How much paper is used to cover the cylindrical part

38 In the month of May, the weather forecast department gives the prediction of weather for the month of June .The given table shows the ***probabilities*** of forecast of different days :

Days	Sunny	Cloudy	Partially cloudy	Rainy
Probability	$\frac{1}{2}$	x	$\frac{1}{5}$	y



Consider the forecast is 100% correct for June.

Use the above information to answer the questions that follow .(consider each question independent of each other)

(i) Find the number of sunny days in June.

(ii) If the number of cloudy days in June is 5 , then find the value of x

(iii) If the number of rainy days in June is 6 and the sum of x and y is $\frac{3}{10}$, then find the number of cloudy days in June.

OR

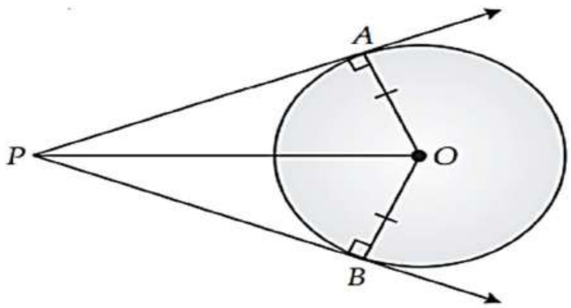
If the number of cloudy days in June is 3 , then find the probability that the day is not rainy.

केन्द्रीय विद्यालय संगठन, बेंगलुरु संभाग
KENDRIYA VIDYALAYA SANGATHAN,BANGALORE REGION

Set -1 (2024-25)
MARKING SCHEME MATHEMATICS (STANDARD)
CLASS X

Q - No.	**SECTION - A**	Marks
1	(d)	1
2	(c)	1
3	(a)	1
4	(d)	1
5	(d)	1
6	(b)	1
7	(d)	1
8	(c)	1
9	(b) 8	1
10	(c) 1	1
11	(c)	1
12	(a)	1
13	(b)	1
14	(c)	1
15	(a)	1
16	(d)	1
17	(c)	1
18	(b)	1
19	(b)	1
20	(a)	1
	SECTION - B	
21	17 X 11 X 7 + 11 = 11 (17 X 7 +1) = 11 X 120 The given number has more than two factors so it's a composite number.	1 1
22	$\tan\theta + \cot\theta = 2$ squaring both sides ,we get $\tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta = 4$ $\tan^2\theta + \cot^2\theta + 2 = 4$ $\tan^2\theta + \cot^2\theta = 4 - 2 = 2$ OR Putting the value of each trigonometric ratios, we get $\dfrac{\frac{1}{\sqrt{2}}}{\frac{2}{\sqrt{3}}+2} = \dfrac{\frac{1}{\sqrt{2}}}{\frac{2+2\sqrt{3}}{\sqrt{3}}} = \dfrac{\sqrt{3}}{\sqrt{2}(2+2\sqrt{3})} = \dfrac{\sqrt{3}}{2\sqrt{2}+2\sqrt{6}}$ $= \dfrac{\sqrt{3}}{2\sqrt{2}+2\sqrt{6}} \times \dfrac{2\sqrt{2}-2\sqrt{6}}{2\sqrt{2}-2\sqrt{6}} = \dfrac{2\sqrt{6}-2\sqrt{18}}{(2\sqrt{2})^2-(2\sqrt{6})^2} = \dfrac{2\sqrt{6}-6\sqrt{2}}{8-24} = \dfrac{-2(3\sqrt{2}-\sqrt{6})}{-16}$ $= \dfrac{3\sqrt{2}-\sqrt{6}}{8}$	1 1 1 1

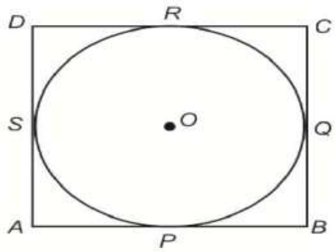
23	diagonals of a parallelogram bisect each other. midpoint of AC = midpoint of BD Now, $[(8 + x)/2, (2 + 7)/2] = [15/2, 5/2]$ $(8 + x)/2 = 15/2$ $8 + x = 15$ $x = 15 – 8 = 7$	1 1
24	$PQ^2 = \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$ $80 = (x + 2)^2 + (7- 3)^2$ $x^2 + 4x – 60 = 0$ solving we get , $x = 6$, $x = -10$ OR Let P(x, y) be the required point. Using the section formula $P(x, y) = (\frac{m \cdot x_2 + m_2 x_1}{m_1 + m_2}, \frac{m \cdot y_2 + m_2 y_1}{m_1 + m_2})$, we get $x = \frac{3(8) + 1(4)}{3 + 1} = \frac{24 + 4}{4} = \frac{28}{4} = 7,$ $y = \frac{3(5) + 1(-3)}{3 + 1} = \frac{15 - 3}{4} = \frac{12}{4} = 3$ P(x, y) = (7, 3) is the required point.	
25		1 1

	Given : AP and BP are tangents of circle having centre O.  **To prove :** $AP = BP$ Construction Join OP, AO and BO. **Proof :** ΔOAP and ΔOBP $OA = OB$ (Radius of circle) $OP = OP$ (Common side) $\angle OAP = \angle OBP = 90°$ (Radius $\perp$ to the tangent) $\therefore$ $\Delta OAP \cong \Delta OBP$ (RHS congruency rule) $\therefore$ $AP = BP$ (cpct) **Hence proved.**	
	SECTION – C	
26	Assume that $\sqrt{3}$ is a rational number. Then, $\sqrt{3} = \frac{a}{b}$, where a, b are integers, $b \neq 0$ and HCF $(a, b) = 1$ ...(i) $\Rightarrow$ $\sqrt{3}b = a$ $\Rightarrow$ $\sqrt{3}b^2 = a^2$ (squaring both sides) $\Rightarrow$ a^2 is dividible by 3 $\Rightarrow$ a is divisible by 3 ...(ii) $\Rightarrow$ $a = 3c$, where c is an integer. $\therefore$ $\sqrt{3}b = 3c$ $\Rightarrow$ $3b^2 = 9c^2$ $\Rightarrow$ $b^2 = 3c^2$ $\Rightarrow$ b^2 is divisible by 3 $\Rightarrow$ b is divisible by 3 ...(iii) From (ii) and (iii), we get 3 is the common factor of a and b which contradicts (i). Thus, our assumption was wrong. $\sqrt{3}$ is an irrational number.	½ ½ 1 1

27	Let the side of the square be x. No. of students = $x^2 + 24$ New side = x + 1 No. of students = $(x + 1)^2 - 25$ APQ $\Rightarrow x^2 + 24 = (x + 1)^2 - 25$ $\Rightarrow x^2 + 24 = x^2 + 2x + 1 - 25$ $\Rightarrow 2x = 48$ $\Rightarrow x = 24$ $\therefore$ side of square = 24 No. of students = 576 + 24 = 600	1 1 1
28	Here, $a = 1$, $d = 1$ and $x = 49$ $\therefore$ Sum of the numbers of the houses preceding the house numbered $x = S_{x-1}$. According to the question, we have $S_{x-1} = S_{49} - S_x$ $\Rightarrow \frac{x-1}{2}[2a + (x-1-1)d] = \frac{49}{2}[2a + 48d] - \frac{x}{2}[2a + (x-1)d]$ $\Rightarrow \frac{x-1}{2}[2a + (x-2)d] = \frac{49}{2}[2a + 48d] - \frac{x}{2}[2a + (x-1)d]$ $\Rightarrow x - 1[2a + (x-2)d] = 49[2a + 48d] - x[2a + xd - d]$ Substituting the value of a and d, we get: $(x-1)(2 + x - 2) = 49(2 + 48) - x(2 + x - 1)$ $\Rightarrow (x-1)x = 49 \times 50 - x(x+1)$ $\Rightarrow x(x-1) + x(x+1) = 49 \times 50$ $\Rightarrow 2x^2 = 2450 \Rightarrow x^2 = \frac{2450}{2}$ $= 1225 = (35)^2$ $\Rightarrow x = \mathbf{35}$ OR	1 1 1

	Let a and d respectively be the first term and common difference of the AP. Given $a_9 = 0$ So, a + (9-1)d = 0 a+8d=0 a= -8d Now, 29th term = a+28d =-8d+28d = 20d = 2 x 10d = 2(-8d + 18d) =2(a+18d) = 2 x 19th term Thus, the 29th term of the AP is twice the 19th term.	
29	$LHS = (1+\cot A-\cos ecA)(1+\tan A+\sec A)$ $= \left(1+\frac{\cos A}{\sin A}-\frac{1}{\sin A}\right)\left(1+\frac{\sin A}{\cos A}+\frac{1}{\cos A}\right)$ $= \left(\frac{\sin A+\cos A-1}{\sin}\right)\left(\frac{\cos A+\sin A+1}{\cos A}\right)$ $= \frac{(\sin A+\cos A)^2-1}{\sin A\cos A}$ $= \frac{1+2\sin A\cos A-1}{\sin A\cos A}$ $\quad [\because \sin^2 A+\cos^2 A=1]$ $= 2.$	1 1
30	It is given that AB is a chord of a circle with centre O and AB is produced to C such that BC = OB We know that ∠BOC and ∠BCO form isosceles triangle ∠BOC = ∠BCO = y° Given that, BC = OB ⇒ ∠OCB = ∠BOC = y°. In ΔOBC, Exterior ∠OBA = ∠BOC +∠OCB = y° + y° = 2y° Now, OA = OB (Radii of same circle) ⇒ ∠OAB = ∠OBA = 2y° In ΔAOC, Exterior ∠AOD = ∠OAC + ∠OCA = 2y° + y° = 3y° But, ∠AOD = x° (Given that) ∴ x° = 3y°	1 1 1

OR



1

Given ABCD is $||^{gm}$ such that its sides touch a circle with centre O.

\ AB = CD and AB || CD,

AD = BC and AD || BC

Now, P, Q, R and S are the touching point of both the circle and the $||^{gm}$

We know that, tangents to a circle form an exterior point are equal to length.

∴ AP = AS [tangents form point A] ...(1)

BP = BQ [tangents form point B] ...(2)

CR = CQ [tangents form point C] ...(3) 1

DR = DS [tangents form point D] ...(4)

On adding (1), (2), (3) and (4), we get.

AP + BP + CR + DR = AS + BQ + CQ + DS

Þ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)

Þ AB + CD = AD + BC

Þ AB + AB = BC + BC [∵ ABCD is a $||^{gm}$ \ AB = CD and AD = BC]

Þ 2AB = 2BC

Þ AB = BC 1

Therefore, AB = BC implies

AB = BC = CD = AD

Hence, ABCD is a rhombus.

31

Class	Mid-point (x_i)	Frequency (f_i)	x_if_i
0 - 20	$\frac{0+20}{2} = 10$	17	170
20–40	$\frac{20+40}{2} = 30$	f_1	$30f_1$
40–60	$\frac{40+60}{2} = 50$	32	1600
60–80	$\frac{60+80}{2} = 70$	f_2	$70f_2$
80–100	$\frac{80+1000}{2} = 90$	19	1710
Total		$\sum f_i = 120 = 68+f_1+f_2$	$\sum f_ix_i = 3480 + 30f_1 + 70f_2$

1

$17 + f_1 + 32 + f_2 + 19 = 120$ 1

$\Rightarrow 68 + f_1 + f_2 = 120$

$\Rightarrow f_1 + f_2 = 52$

or, $f_2 = 52 - f_1$ ...(ii)

By putting the value of f 2 in (i), we get:

$2520 = 30f_1 + 70(52 - f_1)$

$\Rightarrow 2520 = 30f_1 + 3640 - 70f_1$

$\Rightarrow 40f_1 = 1120$

$\Rightarrow f_1 = 28$ 1

Substituting the value in (ii), we get:

$f_2 = 52 - f_1 = 52 - 28 = 24$

SECTION – D

32

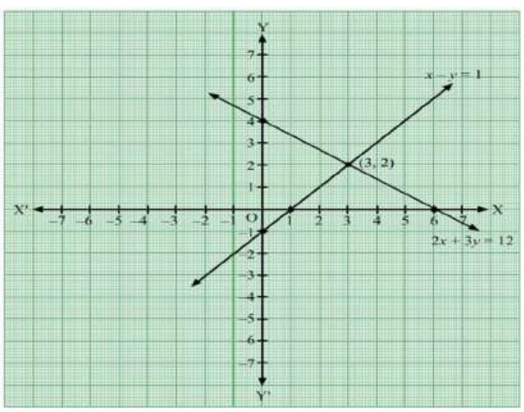
(1) $2x + 3y = 12$

x	0	6	3
y	4	0	2

1

$x - y = 1$

x	0	1	3
y	−1	0	2



2

Solution: x=3 & y=2

The vertices of the triangle are (-1,0) , (3,2) and (0,4)

OR

1

Let the first friend have ₹ x

And the second friend has ₹ y

Using the information given in the question,

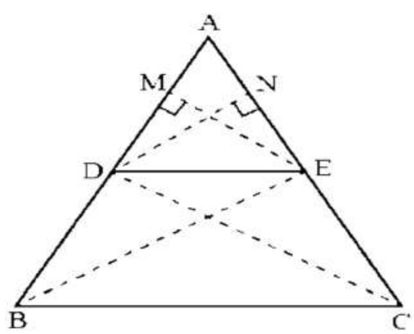
Condition 1: When second friend gives ₹ 100 to first friend; 1

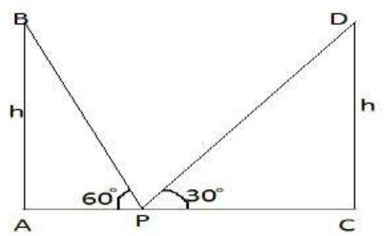
x + 100 = 2 (y - 100) 1

x + 100 = 2y - 200

x - 2y = - 300 ....(1)

Condition 2: When first friend gives ₹ 10 to second friend;

	y + 10 = 6 (x -10) y + 10 = 6x - 60 6x - y = 70 ....(2) Multiplying equation (2) by 2, we obtain 12x - 2y = 140 ....(3) Subtracting equation (1) from equation (3), we obtain 12x - 2y - (x - 2y) = 140 - (- 300) 11x = 440 x = 440/11 x = 40 Substituting x = 40 in equation (1), we obtain 40 - 2y = - 300 2y = 40 + 300 y = 340/2 y = 170 Therefore, the first friend has ₹ 40, and the second friend has ₹ 170 with them.	1 1 1 1 1
33	Given, In ΔABC, DE ∥ BC  To prove: $\frac{AD}{DB} = \frac{AE}{EC}$ Construction : Draw EM ⊥ AB and DN ⊥ AC. Join B to E and C to D Proof: In ΔADE and ΔBDE $\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2} \times AD \times EM}{\frac{1}{2} \times DB \times EM} = \frac{AD}{DB}$ . . . (i) [Area of $\Delta = \frac{1}{2} \times$ base × corresponding altitude] [Δs on the same base and between the same parallel sides are equal in area]	1 ½ ½ 1 1

	From eq. (i), (ii) and (iii) $\frac{AD}{DB} = \frac{AE}{EC}$ OR In triangle TXM, XM ∥ AB & XN ∥ AC, $\therefore \frac{TN}{NM} = \frac{TB}{BX}$ ---- (i) [By B.P.T.] In ΔTMC, seg XN ∥ seg CM ---- [Given] $\therefore \frac{TN}{NM} = \frac{TX}{CX}$ ---- (ii) [By B.P.T.] $\therefore \frac{TB}{BX} = \frac{TX}{CX}$ ---- [From (i) and (ii)] $\therefore \frac{BX}{TB} = \frac{CX}{TX}$ ---- [By invertendo] $\therefore \frac{BX+TB}{TB} = \frac{CX+TX}{TX}$ ---- [By componendo] $\therefore \frac{TX}{TB} = \frac{TC}{TX}$ ---- [T–B–X, T–X–C] $\therefore TX^2 = TB \cdot TC$	1 1 1 1 1 1
34	 Let AB and CD be two pillars ,each of height hmetres. Let P be a point on the road such that AP=xm. Then,CP = $(150 - x)$m In triangle PAB , we have $\tan 60° = \frac{AB}{AP}$ $= \sqrt{3} = \frac{h}{x}$ $= \sqrt{3}x = h$....................1 In triangle PCD , we have $\tan 30° = \frac{CD}{CP}$ $= \frac{1}{\sqrt{3}} = \frac{h}{150 - x}$ $= h\sqrt{3} = 150 - x$....................2 Eliminating h between eq. 1 and 2, we get $3x = 150 - x$ $= x = 37.5$	1 1 1 1

	Substituting x = 37.5 in eq.1 we get , h = 64.95 Thus the required point is at the distance of 37.5 m from the first pillar and 112.5 m from the second pillar. The height of the pillars is 64.95 m So the height of the pillars is **64.95m** and the distance of the point from the pillars is **37.5m**.	1
35	*Solution :* $Radius\ of\ inner\ circle\ (r) = 21cm$ $Radius\ of\ outer\ circle\ (R) = 42cm$ $Area\ of\ between\ circles = \pi(R^2 - r^2)$ $= \frac{22}{7}(42^2 - 21^2)$ $= \frac{22}{7} \times 1323$ $= 4158cm^2$ $Area\ ABCD = Area\ AOB - Area\ COD$ $= \frac{\Theta}{360^0}\pi R^2 - \frac{\Theta}{360^0}\pi r^2$ $= \frac{\Theta}{360^0}\pi(R^2 - r^2)$ $= \frac{60^0}{360^0}\pi(42^2 - 21^2)$ $= \frac{1}{6} \times \frac{22}{7} \times 1323$ $= 693cm^2$ $Area\ of\ shaded\ region$ $= Area\ of\ between\ circles - Area\ ABCDD$ $= 4158 - 693 = 3465cm^2$	1 1 1 1 1
	SECTION -E	
36	(i) Quadratic (ii) Zeroes are -1 and 5 (iii) $x^2 - 4x - 5$ OR $x^2 + x - 6$.	1 1 2
37	(i) cylinder and cones (ii) 204 cm^2 approx	1 1

	(iii) 22cm Or 188.4 cm^2 z	2
38	(i) 15 (ii) 1/6 (iii) 3 (iv) 4/5	1 1 2
	~~	

Class X :Session(set2) (2024-25)

MATHEMATICS STANDARD (Code No.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 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 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 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
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated

SECTION A

Section A consists of 20 questions of 1 mark each.

1. LCM of smallest composite number and smallest prime number is

(A) 2 (B) 3 (C)5 (D) 4.

2. 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.

3 The pair of equations:$6x - 3y + 24 = 0$, $2x-y+8=0$ Graphically represents two lines which are:

(A) Intersecting at exactly one point. (B) Intersecting at exactly two points (C) Parallel (D) Coincident.

4.The quadratic equation $2x^2 - \sqrt{5}x + 1 = 0$ has

(A) two distinct real roots (B) two equal real roots. (C) no real roots (D)more than 2 real roots.

5. A bag contains 5 red balls and n green balls. If the probability of drawing a green ball is three times that of a red ball, then the value of n is :

(A) 18 (B) 15 (C) 10 (D) 20

6. In ΔABC, DE || AB. If CD = 3 cm, EC = 4 cm, BE = 6 cm, then DA is equal to.

(A) 7.5cm (B)4.5cm (C)3cm (D)6cm.

7.The length of the tangent from a point which is at a distance of 10cm from the centre of the circle having radius 6cm is

(A)8cm (B) 10cm (C)4cm (D)16cm.

8. PA and PB are two tangents to the circle with centre O such that $\angle APB = 50$. Then, the measure of $\angle OAB$ is :

(A) 25^o (B) 50^o (C) 75^o (D) 100^o.

9. If 2x, x + 10, 3x + 2 are three consecutive terms of an A.P., then the value of x is :

(A) 4 (B) 5 (C) 8 (D) 6

10.If sinA=¾ then $(\sec^2 A-1)\cos^2 A$ equals

(A) 3/5 (B) 3/4 (C) 9/16 (D) 9/4.

11. $5 \tan^2 A – 5 \sec^2 A - 1$ is equal to

(A) 6. (B)-6 (C) -4(D)1.

12. If the length of the shadow of a tower is increasing, then the angle of elevation of the sun.

(A) is decreasing (B) is increasing (C) remains unaffected (D) Don't have any relation with length of shadow

13.Area of quadrant of a circle with radius 7 cm is

(A) 77cm² (B) 156cm² (C) 77/2 cm² (D) 77/4 cm²

14. If the sum of the areas of two circles with radii R_1 and R_2 is equal to the area of a circle of radius R, then

(A) $R_1 + R_2 = R$ (B) $R_1^2 + R_2^2 = R^2$ (C) $R_1 + R_2 < R$ (D) $R_1 + R_2 > R$

15.If two solid hemispheres of same base radii r, are joined together along their bases, then curved surface area of this new solid is

(A) $3\pi r^2$ (B)$6\pi r^2$ (C) $4\pi r^2$ (D)$8\pi r^2$

16. If (a/3, 4) is the mid-point of the segment joining the points P(-6, 5) and R(-2, 3), then the value of ‘a’ is.

(a) 12 (b) -6 (c)12 (d) -12.

17.The mode and mean are 8 and 9 respectively, then median is

(A) 8.5 (B) 8.67 (C) 8.07 (D) 9.67.

18.If P(A) denotes the probability of an event A, then

(a) $P(A) < 0$ (b) $P(A) > 1$ (c) $0 \leq P(A) \leq 1$ (d) $-1 \leq P(A) \leq 1$

Directions for question numbers19and20,:a statement of Assertion (A)is followed by a statement of Reason(R). Choose the correct option.

19.Assertion (A) : When two coins are tossed together, the probability of getting two heads is ¼.

Reason (R) : The probability P(E) of an event E satisfies $0 \leq P(E) \leq 1$.

(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.

20.Assertion (A) : -5,-5/2,0,5/2,....is an arithmetic progression

Reason (R) The terms of arithmetic progression cannot have positive and negative rational numbers. (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.

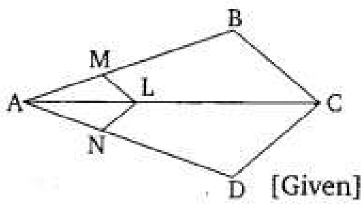
Section B

Section B consists of 5 questions of 2 marks each.

21.Prove that √2 is an irrational number.

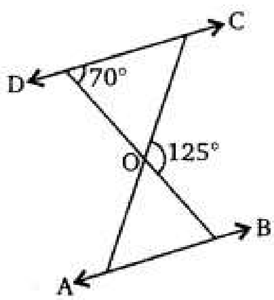
22. In the given figure, if LM || CB and LN || CD.

Prove that AM/AB=AN/AD



OR.

In the given figure, $\Delta ODC \sim \Delta OBA$, $\angle BOC = 125°$ and $\angle CDO = 70°$. Find $\angle DOC$ and $\angle DCO$



23.Find: $\sin^2 90° + 2\tan 45° - \cos^2 90°$.

24 .prove that the length of tangents drawn from an external point to a circle are equal.

25 . Find the diameter of a circle whose area is equal to the sum of the areas of two circles of radii 40cm and 9cm.

OR

A chord of a circle of radius 10cm subtends a right angle at the centre. Find the area of minor sector.(useπ=3.14)

Section C.

Section c consists of 6 questions of 3 marks each

26.Find Zeros of the quadratic polynomial $x^2 - 2x - 8$ and verify the relationship between the Zeroes and the coefficients.

27.The coach of a cricket team buys 4 bats and 1 ball for Rs. 2050. Later, she buys 3 bats and 2 balls for 1600. Find the cost of each bat and each ball.

OR

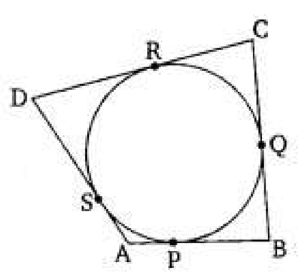
A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Saritha paid ₹27 for a book kept for seven days, while Susy paid ₹21 for the book she kept for five days. Find the fixed charge and the charge for each extra days.

28. Prove that. $(\text{cosec}\theta\text{-}\cot\theta)^2 = (1\text{-}\cos\theta)/(1+\cos\theta)$

OR

Prove that :$\sec A\,(1 - \sin A)\,(\sec A + \tan A) = 1$.

29. Circle touches all the four sides of quadrilateral ABCD. Prove that AB + CD = AD + BC.



30. 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 artf 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 art form. How many rooms are required if eachgroup will be allotted a room?

31.The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is ₹ 18. Find the missing frequency.

Daily pocket allowances (in ₹)	No. of children
11 – 13	7
13 – 15	6
15 – 17	9
17 – 19	13
19 – 21	f
21 – 23	5
23 – 25	4

Section D

Section D consists of 4 questions of marks 5 each

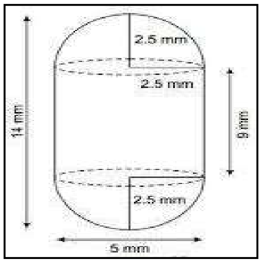
32. A train travels 360km at a uniform speed. If the speed had been 5km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

OR

If the equation $(1 + m^2) x^2 + 2mcx + c^2 - a^2 = 0$ has equal roots, show that $c^2 = a^2 (1 + m^2)$.

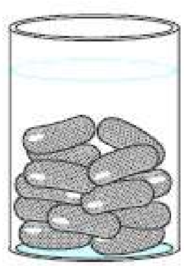
33. State and prove the Basic proportionality Theorem.

34.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 14 mm and the diameter of the capsule is 5 mm. Find its surface area.



OR

A gulab jamun, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab jamuns, each shaped like cylinder with two hemispherical ends with length 5cm and diameter 2.8cm.



35.The following data gives information on the observed lifetimes (in hours) of 225 electrical components:

Life times (in hours)	Frequency
0 – 20	10
20 – 40	35
40 – 60	52
60 – 80	61
80 – 100	38
100 – 120	29

Determine the modal lifetimes of the components.

Section E

Case study questions

36.Manpreet Kaur is the national record holder for women in the shot-put discipline. Her throw of 18.86m at the Asian Grand Prix in 2017 is the maximum distance for an Indian female athlete. Keeping her as a role model, Sanjitha is determined to earn gold in Olympics one day. Initially her throw reached 7.56m only. Being an athlete in school, she regularly practiced both in the mornings and in the evenings and was able to improve the distance by 9cm every week. During the special camp for 15 days, she started with 40 throws and every day kept increasing the number of throws by 12 to achieve this remarkable progress.

(i) How many throws Sanjitha practiced on 11th day of the camp? 1

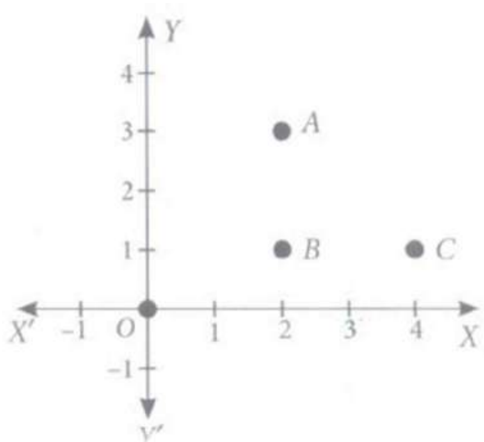
(ii) What would be Sanjitha's throw distance at the end of 6 weeks? 2

OR

When will she be able to achieve a throw of 11.16 m?

(iii) How many throws did she do during the entire camp of 15 days ? 1.

37.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 he



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 C. Based on the above information, choose the correct option of the following questions.

(i) Distance between Alia's house from Shagun's house is

(a)2 units (b)3 units (c) 2.5 units (d) 4units. 1

(ii)Distance between the library from Shagun's house is

(a)3 units (b)2units (c) 2.5 units (d) 4units. 1

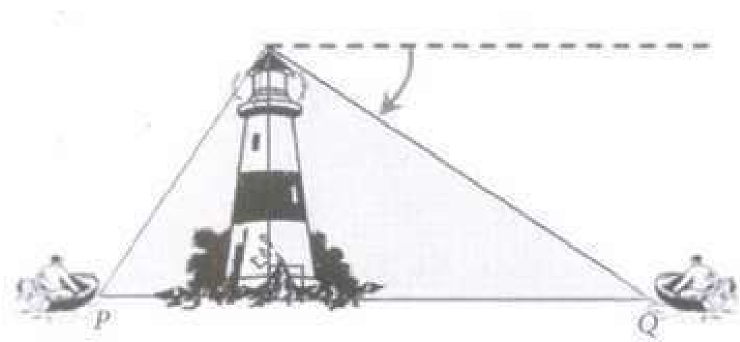
(iii) Show that for Shagun, school is farther compared to Alia's house and library. 2

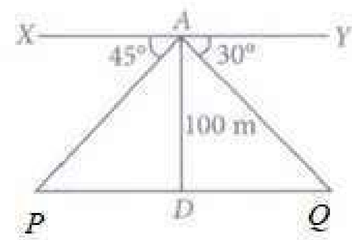
OR

Show that Alia’s house, shagun’s house an library for an isosceles right ttriangle.

CASE STUDY 3

38. A boy is standing on the top of light house. He observed that boat P and boat Q are approaching the light house from opposite directions. He finds that angle of depression of boat P is 45° and angle of depression of boat Q is 30°. He also knows that height of the light house is 100 m.





Based on the above information, answer the following questions.

(i)Measure of ∠APD is (a) 30º (b)45º (c)25º(d)50º. 1

(ii) If ∠YAQ = 30°, then ∠AQD is (a) 30º (b)35º (c)25º(d)40º. 1

(iii) Find length of PD 2

OR Find length of DQ

Pre – Board Exam (2024-25)

Class- X

Subject- Maths(Standard)– Marking Scheme(set2)

SECTION - A

Section A consists of 20 questions of 1 mark each.

S.NO		Marks
1	A	1
2	C	1
3	D	1
4	C	1
5	B	1
6	B	1
7	A	1
8	A	1
9	D	1
10	C	1
11	B	1
12	A	1
13	C	1
14	B	1
15	C	1
16	D	1
17	B	1
18	C	1

19	A	1
20	C	1

21. Let us assume, to the contrary, that $\sqrt{2}$ is rational.

So, we can find integers a and b such that $\sqrt{2} = a/b$

where a and b are coprime. 1/2

So, $b\sqrt{2} = a$.

Squaring both sides,

we get $2b^2 = a^2$. 1/2

Therefore, 2 divides a2 and so 2 divides a.

So, we can write a = 2c for some integer c.

Substituting for a, we get 2b2 = 4c2, that is, $b^2 = 2c^2$. 1/2

This means that 2 divides b2, and so 2 divides b

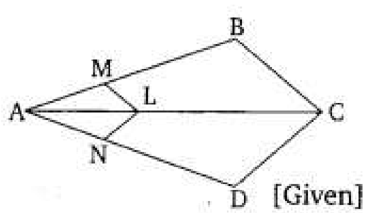
Therefore, a and b have at least 2 as a common factor.

But this contradicts the fact that a and b have no common factors other than 1. 1/2

This contradiction has arisen because of our incorrect assumption that $\sqrt{2}$ is rational.

So, we conclude that $\sqrt{2}$ is irrational.

22.

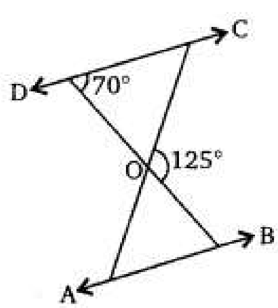


In ΔABC, LM II CB, AM/AB=AL/AC. (By BPT). ….(1) 1

In ΔADC, LNII CD, AN/AD=AL/AC. (By BPT). ……(2)

from (1) &(2) AM/AB=AN/AD. 1

OR



. <DOC+125°=180°. (Linear pair) 1.

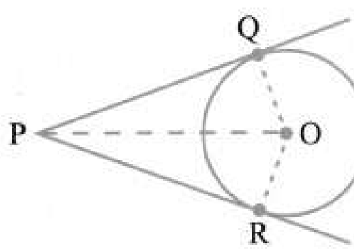
And <DCO=55^0 1

23. $\sin^2 90^\circ + 2\tan 45^\circ - \cos^2 90^\circ$.

$=(1)^2+2\times1-0$. 1

$=1+2=3$. 1.

24.**Given:** Let circle be with centre O and P be a point outside circle PQ and PR are two tangents to circle intersecting at point Q and R respectively.



To Prove: Lengths of tangents are equal

i.e. PQ = PR

Construction: Join OQ,OR and OP. 1

Proof: Now in right triangles OQP and ORP,

OQ = OR (Radii of the same circle)

OP = OP (Common)

And, $\angle PRO = \angle PQR\ (90^\circ)$

Therefore, $\Delta\ OQP \cong \Delta\ ORP$ (RHS)

This gives PQ = PR (CPCT). 1

25.Area of the circle= sum of areasof 2 circles

$\pi r^2 = \pi(40)^2 + \pi(9)^2$ 1/2

$\pi r^2 = \pi x\ (40^2 + 9^2)$. 1/2

$r^2 = 1600 + 81$

$r^2 = 1681$

$r = 41$. 1/2

$= 41\times 2 = 82$ 1/2

OR

radius of circle = 10cm, $\theta = 90^\circ$

Area of minor sector=$\pi r^2 \theta/360^0$. 1/2

$=3.14\times10^2\times90/360$ 1/2

$314/4=78.5\ cm^2$. 1.

Section C.

26. $x^2 - 2x - 8 = 0$

$\Rightarrow x^2 - (4-2)\,x - 8 = 0$. . 1/2

$\Rightarrow x^2 - 4\,x + 2\,x - 8 = 0$

$\Rightarrow x\,(x-4) + 2(\,x-4) = 0$

$\Rightarrow (x+2)(\,x-4) = 0$

$\Rightarrow x = -2$ or $x = 4$ 1.5

Hence,the zeroes of a quadratic polynomials are – 2 and4

For Verification,

Sum Of Zeros=– 2 + 4=2 $= -\frac{(-2)}{1} = -\ \frac{coefficient\ of\ x}{coefficient\ of\ x^2}$ 1/2

Product of roots=(– 2) x 4= $\frac{(-8)}{1} = \frac{constant\ term}{coefficient\ of\ x^2}$ 1/2

Therefore, the relationship between zeros and their coefficients is verified.

27.Let cost of one bat be Rs x

Let cost of one ball be Rs y 1/2

ATQ

4x + 1y = 2050___________(1) 1/2

3x + 2y = 1600___________(2). 1/2

y = 2050 – 4x.

$3x + 2(2050 - 4y) = 1600$

$3x + 4100 - 8x = 1600$

$-5x = -2500$

$x = 500$ 1/2

(1)

$y = 50$ 1/2

Hence

Cost of one bat = Rs. 500 1/2

Cost of one ball = Rs. 50

OR

Let the fixed charge for first 3 days= Rs. x

And additional charge after 3 days= Rs. Y 1/2

ATQ

$x + 4y = 27$---------------(1)

$x + 2y = 21$ --------------(2) 1/2

Subtract eqn

(2) from (1)

$2y = 6$

$y = 3$ 1

Substitute value of y in (2)

$x + 2(3) = 21$

$x = 21 - 6$

$x = 15$ 1

Fixed charge= Rs. 15

Additional charge per day = Rs. 3. .

28. L.H.S.= $(\operatorname{cosec} \theta - \cot \theta)^2$

The above equation is in the form of $(a-b)^2$,

Since $(a-b)^2 = a^2 + b^2 - 2ab$

Here $a = \operatorname{cosec} \theta$ and $b = \cot \theta$

$= (\mathrm{cosec}^2\theta + \cot^2\theta - 2\,\mathrm{cosec}\,\theta \cot\theta.$ 1

$= (1/\sin^2\theta + \cos^2\theta/\sin^2\theta - 2\cos\theta/\sin^2\theta)$

$= (1 + \cos^2\theta - 2\cos\theta)/(1 - \cos^2\theta).$ 1

$= (1-\cos\theta)^2/(1 - \cos\theta)(1+\cos\theta)$

$= (1-\cos\theta)/(1+\cos\theta)$ = R.H.S.

So, $(\mathrm{cosec}\,\theta - \cot\theta)^2 = (1-\cos\theta)/(1+\cos\theta)$. 1 Hence proved.

OR.

LHS= $\sec A\,(1 - \sin A)\,(\sec A + \tan A)$ secA

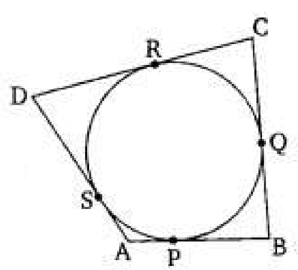
$=(\sec A\times\sin A)(\sec A + \tan A)$ 1

$=(\sec A-1/\cos A\times\sin A)(\sec A + \tan A)$

$=\sec^2A-\tan^2A=1=$RHS. 1

Hence proved.

29.



Proof: Tangents on the circle from points D, B, A, and C, respectively.

So, (i) DR = DS

(ii) BP = BQ

(iii) AP = AS

(iv) CR = CQ. 1

adding the LHS and RHS of the above equations, we get,

DR+BP+AP+CR = DS+BQ+AS+CQ. . 1

By rearranging them, we get,

(DR+CR) + (BP+AP) = (CQ+BQ) + (DS+AS). 1/2

By simplifying,

AD+BC= CD+AB. 1/2

30. Number of students in each group subject to the given condition = HCF (60,84,108)

HCF (60,84,108) = 12 1

Number of groups in Music = 60/12=5. 1/2

Number of groups in Dance = 84/12=7. 1/2

Number of groups in Handicrafts=□108/12=9. 1/2

Total number of rooms required =21. 1/2

31. find out the missing frequency, use the mean formula.

Given, mean $\bar{x}$ = 18.

C.I	F	XI	FIXI
11-13	7	12	84
13-15	6	14	84
15-17	9	16	144
17-19	13	18	234
19-21	f	20	20f
21-23	5	22	110

23-25	4	24	96	1
Total	fi = 44+f.		Sum fixi = 752+20f	

The mean formula is 1

Mean = $\bar{x} = \sum f_i x_i / \sum f_i$ = (752 + 20f)/ (44 + f)

Now substitute the values and equate to find the missing frequency (f)

⇒ 18 = (752 + 20f)/ (44 + f)

⇒ 18(44 + f) = (752 + 20f)

⇒ 792 + 18f = 752 + 20f

⇒ 792 + 18f = 752 + 20f

⇒ 792 – 752 = 20f – 18f

⇒ 40 = 2f

⇒ f = 20 1

So, the missing frequency, f = 20. .

Section D.

32.Let the speed of train be $x\ km/hr$ 1/2

distance= 360 km

Speed =Distance/Time

Time = 360/x. 1/2

New speed = (X + 5) km/hr

Time = D/S

x + 5 = 360/(360/x -1). 1

x^2+5x-1800=0.

x^2 + 45x – 40x − 1800 = 0

$x(x + 45) - 40(x + 45) = 0$

$(x + 45)(x - 40) = 0$ 2

$x + 45 = 0$, $x - 40 = 0$x=-40 and x=45.Speed cannot be negative Speed of train =40km/hr. 1

Or.

Given equation is,

$(1 + m^2) x^2 + 2mcx + c^2 - a^2 = 0$

∵ Roots are equal.

∴ D = 0. 1

$B^2 - 4AC = 0$

$(2mc)^2 - 4 (1 + m^2) (c^2 - a^2) = 0.$ 2

or $4m^2c^2 - 4 [c^2 - a^2 + m^2c^2 - m^2a^2] = 0$

or $4[m^2c^2 - c^2 + a^2 - m^2c^2 + m^2a^2] = 0.$ 1

or $- c^2 + a^2 (1 + m^2) = 0$

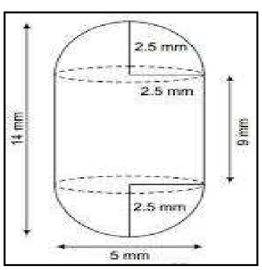
or $c^2 = a^2 (1 + m^2).$ 1

33. Statement 1

Given ,to prove, figure , construction. …… 2

and proof of the theorem. 2

34. Diameter of cylinder and hemisphere = 5mm radius, (r) =5/2 mm



Total length = 14mm

Height of cylinder = 14 - 5 = 9mm …. 1

CSA of cylinder = $2\pi rh$

= 2 x 22/7×5/2×9

=990/7mm². 1

CSA of hemispheres = $2\pi r^2$

= 2x 22/7×5/2×5/2=275/7mm². 1

CSA of 2 hemispheres = 2 x275mm²=550mm². 1
Total area of capsule = (990/7)+550/7

= 220 mm² 1 Or

Diameter of cylinder = 2.8 cm

$radius$ of cylinder = 1.4cm

=$radius$ of cylinder = $radius$ of hemisphere = 1.4 cm Height of cylinder = 5-2.8 1

= 2.2 cm

Volume of 1 Gulab jamun = vol. of cylinder + 2 x vol. of hemisphere

$= \pi r^2 h + 2\times 2/3 \pi r^3 = \pi r^2 (h + 4/3 \times r)$. 1

= 13.55 + 11.50

= 25.05 $cm3$. 1

$volume\ of$ 45 $Gulab\ jamun$ = 45 x25.05

$syrup\ in$ 45 $Gulab\ jamun$ = 30% x 45 ×25.05. 1

= 338.175 cm^3.

= 338 cm3. 1 35.

Life times (in hours)	Frequency
0 – 20	10
20 – 40	35
40 – 60	52
60 – 80	61
80 – 100	38
100 – 120	29

Since the maximum frequency 61 is in the class 60 – 80,so,modal class is 60-80. 1

Modal class frequency, f_1 = 61.

Frequency of the class preceding the modal class f_0 = 52

Frequency of the class succeeding the modal class f_2 = 38

Lower Limit of modal class= 60

Height of the class, h = 20. 1

∴ Mode = $l + [(f_1 - f_0)/(2f_1 - f_0 - f_2)] \times h$ 1/2

=60+{(61-52)/(2×61-52-38)}×2. .. 1

=60+(9×20)/32. . 1/2

= 60 + 5.625.

= 65.625 hours. 1 Section E.

36.(i) Number of throws during camp. a = 40; d = 12

a11= $a + 10d$. 1/2

= 40 + 10 × 12

= 160 $throws$. 1/2

(ii) a = 7.56 m; d = 9cm = 0.09 m

n = 6 weeks 1

an = a + (n-1) d 1/2

= 7.56 + 6(0.09)

= 7.56 + 0.54

Sanjitha's throw distance at the end of 6 weeks = 8.1 m 1/2

(or)

a = 7.56 m; d = 9cm = 0.09 m 1/2

tn =11.16 m

tn = a + (n-1) d 1/2

11.16 = 7.56 + (n-1) (0.09)

3.6 = (n-1) (0.09) 1/2

n = 41

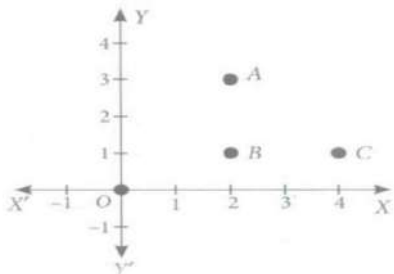
Sanjitha's will be able to throw 11.16 m in 41 weeks. 1/2

(iii) a = 40; d = 12; n = 15. Sn = n/2[2a + (n-1)]. 1/2

=15/2[2(40) + (15-1) (12)]

=1860 throws 1/2

37.(i) (a) 1



(ii) (b) . 1

(iii) O(0,0), B(2,1)

OB= $\sqrt{4} + 1 = \sqrt{5}$ units. 1

Distance between Alia's house and Shagun's house, AB = 2 units

Distance between Library and Shagun's house, CB = 2 units 1/2

OB is greater than AB and CB,

For shagun, school [O] is farther than Alia's house [A] and Library [C]. . 1/2 OR.

C (4, 1), A(2, 3)

CA $= \sqrt{4} + 4 = \sqrt{8}$

$= 2\sqrt{2}$ units $AC^2 = 8$ 1

Distance between Alia's house and Shagun's house, AB = 2 units

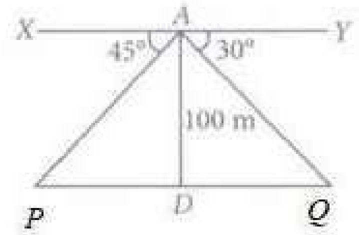
Distance between Library and Shagun's house, CB = 2 units 1/2

$AB^2 + BC^2 = 2$

$= 4 + 4 = 8 = AC^2$

Therefore A, B and C form an isosceles right triangle.

38.(i). (b) 1 (ii)
(a). . 1



(iii)In Δ ADP, θ = 45

tan θ = perp/base

tan 45˚ = 100/PD. 1

PD=100 m 1/2

Boat P is 100 m from the light house 1/2

OR. .

ΔADQ, θ = 30,

tan θ = perp/base. 1/2 tan 30^o = 100/DQ

1/√3=100/DQ. 1

DQ=100√3 m. 1/2

KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION
Class X
SUBJECT: BASIC MATHS
BLUEPRINT (2024-25)

S.NO	CHAPTER	1M	2M	3M	5M	4M	TOTAL
1	REAL NUMBER	1	1	1	-	-	6
2	POLYNOMIALS	2	-	1	-	-	5
3	PAIR OF LINEAR EQUATIONS IN TWO VARIABLES	2	1	-	1	-	9
4	QUADRATIC EQUATIONS	1	-	-	1	-	6
5	ARITHMETIC PROGRESSIONS	1	-	-	-	1	5
6	TRIANGLES	1	1	-		-	3
7	COORDINATE GEOMETRY	2	-	-	-	1	6
8	INTRODUCTION TO TRIGONOMETRY	3	-	1	-	-	6
9	SOME APPLICATIONS OF TRIGONOMETRY	1	-	-	1	-	6
10	CIRCLES	2	1	1	-	-	7
11	AREAS RELATED TO CIRCLES	1	-	1	-	-	4
12	SURFACE AREAS AND VOLUMES	1	-	-	1	-	6
13	STATISTICS	1	-	-	-	1	5
14	PROBABILITY	1	1	1	-	-	6
	TOTAL	20 (20)	5 (10)	6 (18)	4 (20)	3 (12)	80

KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION
SAMPLE QUESTION PAPER SET 1 (2024-25)
CLASS X

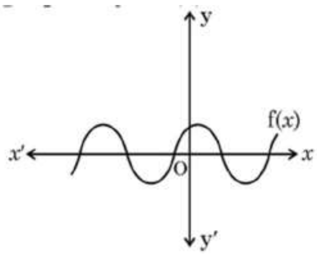
SUBJECT: MATHS BASIC **TIME: 3 HRS**

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 π =22/7 wherever required if not stated.

SECTION A
(Multiple choice questions)

1. If $a = pq^2$, $b = p^3q$ where p and q are prime numbers then LCM (a, b) is
   a) pq b) p^3q^3 c) p^3q^2 d) p^2q^2
2. The sum of zeroes of the polynomial $3x^2 - 5x - 2$ is
   a) 3/5 b) -5/3 c) 5/3 d) -2/3
3. If $ax^2 + bx + c = 0$ has equal roots then c is
   a) -b/2a b) b/2a c) $-b^2/4a$ d) $b^2/4a$
4. The value of k for which $x + 2y - 5 = 0$ and $3x + ky + 15 = 0$ has no solution is
   a) 6 b) -6 c) 3/2 d) 2/3
5. The graph of y = f(x) is shown in the figure for some polynomial f(x).



The number of zeroes of f(x) is:
a) 6 b) 5 c) 4 d) 8

6. The distance of the point (3,5) from x-axis is k, then k =
a) 3 b) 4 c) 5 d) 8

7. If $\Delta ABC \sim \Delta PQR$ then
a) AB/PQ = BC/QR b) AB/PR = BC/QR c) AB/PR = BC/QR d) AB/PR = AC/PQ

8. The pair of linear equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has
a) A unique solution b) exactly one solutions c) infinitely many solutions d) no solutions

9. A line intersecting a circle at two points is called a
a) Tangent b) secant c) diameter b) radius

10. If cos A = 4/5, then sin A =
a) 3/5 b) 4/5 c) 3/4 d) 4/3

11. $1 + \cot^2 A =$
a) $\sin^2 A$ b) $\text{cosec}^2 A$ c) $\tan^2 A$ d) $\sec^2 A$

12. $\sin^2 30° + \cos^2 30° =$
a) 0 b) 2 c) 1 d) -1

13. The area of a sector is 7/20 of the area of circle, then the angle of the sector is
a) 110° b) 130° c) 100° d) 126°

14. The angle of elevation of the top of a 30 m high tower at a point 30 m away from the base of the tower is
a) 30° b) 45° c) 60° d) 90°

15. One card is selected at random from a deck of 52 cards. The probability of getting an ace is:
a) 3/52 b) 1/52 c) 1/26 d) 1/13

16. The lower limit of the modal class of the following distribution is

	5	10	-15	-20	-25

a) 15 b) 20 c) 10 d)5

17. The sum of the areas of two circles of radii r_1 and r_2 is equal to the area of a circle of radius r then,
a) $r^2 = r_1^2 + r_2^2$ b) $r^2 + r_1^2 = r_2$ c) $r^2 = r_1^2 - r_2^2$ d) $r_1^2 = r_2^2 + r^2$

18. If angle between two radii of a circle is 130°, the angle between the tangents at the ends of the radii is
a) 90° b) 50° c) 70° d) 40°

(Assertion - Reason type questions)

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 (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.

19. Assertion (A): Point P (0, 2) is the point of intersection of y-axis with the line 3x + 2y =4.
Reason (R): The distance of point P (0, 2) from x-axis is 2 units.

20. Assertion (A): a, b, c are in A.P. if and only if 2b = a + c.
Reason (R): The sum of first n odd natural numbers is n^2.

SECTION B

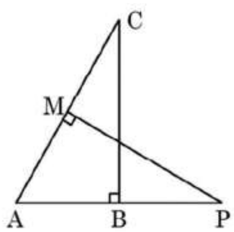
(Very short answer type questions)

21. Find the number of solutions that the following pair of linear equations has.
x + 2y = 6, 2x + 4y = 12

22. a) In ΔABC, if D is the mid-point of the sides AB and DE || BC, show that AE = EC.

OR

b) In the given figure, ABC and AMP are two right triangles, right angled at B and M, respectively. Prove that ΔABC ~ ΔAMP.



23. Prove that tangents drawn at the ends of a diameter are parallel.

24. a) If the HCF (152, 95) is 19, find their LCM.

OR

b) Emily wants to make flower bouquets using two types of flowers. She has 36 roses and 48 lilies. She wants to make the largest bouquets possible with the same number of roses and lilies in each bouquet. How many bouquets can she make?

25. Two players, Sangeeta and Reshma, play a tennis match. It is known that the probability of Sangeeta winning the match is 0.62. What is the probability of Reshma winning the match?

SECTION C

(Short answer type questions)

26. Given that √5 is an irrational, prove that 2 - 3√5 is an irrational number.

27. a) Find the zeroes of the quadratic polynomial $x^2 - 7x + 10$ and verify the relationship between the zeroes and its coefficients.

OR

b) If α and β are the zeroes of a quadratic polynomial $x^2 + 5x - 7$ then write a quadratic polynomial whose zeroes are (α + 1) and (β + 1).

28. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.

29. a) From an external point P, tangents PA and PB are drawn to a circle with center O. If ∠PAB = 50°, then find ∠AOB.

OR

b) Prove that the tangents drawn from an external point to a circle are equal.

30. Two coins are tossed simultaneously. Find the probability of getting
   i) Exactly one head
   ii) At least one tail
   iii) Atmost two heads

31. Find the area of the minor segment of a circle of radius 14 cm, when its central angle is 60°.

SECTION D
(Long answer type questions)

32. a) The diagonals of a rectangular field are 25 m more than the shorter side. If the longer side is 23 m more than the shorter side, find the length of the sides of the field.

OR

b) The sum of the ages of a father and his son is 45 years. Five years ago, the product of their ages (in years) was 124. Determine their present ages.

33. Find the solution of the following pair of linear equation in two variables graphically:

$x + 3y = 6$, $2x - 3y = 12$.

Also find the area of the triangle formed by the two lines and the y-axis.

34. A vessel in the form of a hemispherical bowl is surmounted by a hollow cylinder of same diameter. The diameter of the hemispherical bowl is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel. Also, find the volume of the vessel.

35. a) From the top of a building 60 m high, the angles of depression of top and bottom of a tower are observed to be 30° and 60° respectively. Find the height of the tower. Also, find the distance between the building and the tower. (Use $\sqrt{3} = 1.732$)

OR

b) The angle of elevation of the top of a building from a point A on the ground is 30°. On moving a distance of 30m towards its base to the point B, the angle of elevation changes to 45°. Find the height of the building and the distance of its base from point A. (Use $\sqrt{3} = 1.732$)

SECTION E
(Case Study Questions)

36. Aahana being a plant lover decides to convert her balcony into beautiful garden full of plants. She brought few plants with pots for her balcony. She placed the pots in such a way that number of pots in the first row is 2, second row is 5, third row is 8 and so on.

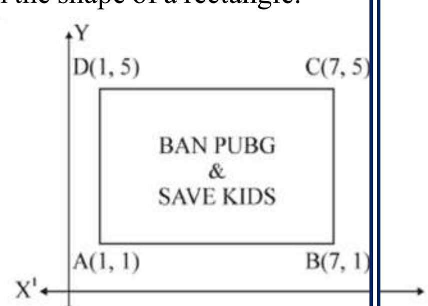
Based on the above information answer the following questions:

(i) Find the number of pots in the 10^{th} row.

(ii) Find the difference in the number of pots placed in 5^{th} and 2^{nd} row.

(iii) If Aahana wants to place 100 pots in total, then find the total number of rows formed in the arrangement.

37. Use of mobile screen for long hours makes your eye sight weak and give you headaches. Children who are addicted to play "PUBG'' can get easily stressed out. To raise social awareness about ill effects of playing PUBG, a school decided to start 'BAN PUBG' campaign, in which students are asked to prepare campaign board in the shape of a rectangle. One such campaign board made by class X student of the school is shown in the figure.



Based on the above information, answer the following questions:

(i) Find the coordinates of the point of intersection of diagonals AC and BD.

(ii) Find the length of the diagonal AC.

(iii) (a) Find the area of the campaign Board ABCD.

OR

(b) Find the ratio of the length of side AB to the length of BC.

38. India meteorological department observes seasonal and annual rainfall every year in different sub-division of our country. It helps them to compare and analyze the results. The table given below show sub-division wise seasonal (monsoon) rainfall (mm) in 2018:

Rainfall (mm)	Number of Sub-divisions
200-400	2
400-600	4
600-800	7
800-1000	4
1000-1200	2
1200-1400	3
1400-1600	1
1600-1800	1

Based on the above information, answer the following questions:

(i) Write the modal class.

(ii) a) Find the mode of the given data.

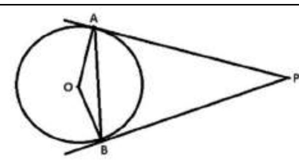
OR

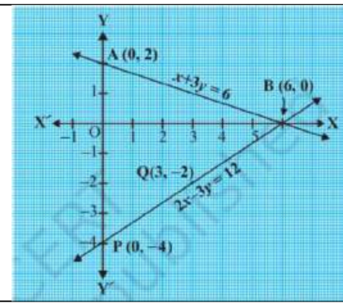
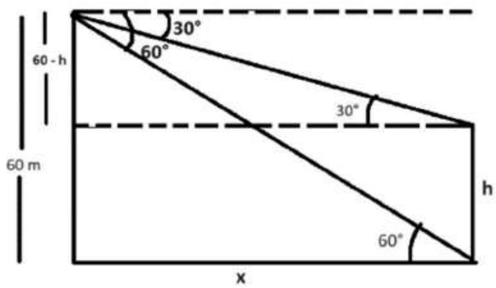
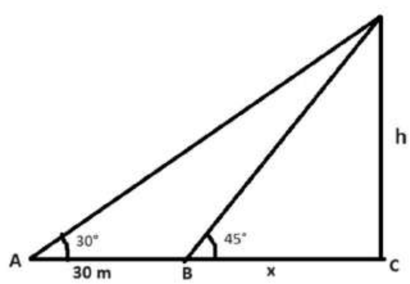
b) Find the mean rainfall in this season.

(iii) If sub-division having at least 1000 mm rainfall during monsoon season, is considered good rainfall sub-division, then how many sub-divisions had good rainfall?

KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION
CLASS X (2024-25)
ANSWER KEY (BASIC MATHS SET 1)

Q. No	Answer	Marks
1	c) p^3q^2	1
2	c) 5/3	1
3	d) $b^2/4a$	1
4	a) 6	1
5	b) 5	1
6	c) 5	1
7	a) AB/PQ = BC/QR	1
8	d) no solutions	1
9	b) secant	1
10	a) 3/5	1
11	b) $\text{cosec}^2 A$	1
12	c) 1	1
13	d) 126°	1
14	b) 45°	1
15	d) 1/13	1
16	a) 15	1
17	a) $r^2 = r_1^2 + r_2^2$	1
18	b) 50°	1
19	b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).	1
20	b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).	1
21	$\frac{a_1}{a_2} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{1}{2}, \frac{c_1}{c_2} = \frac{1}{2}$ ∴ Infinitely many solutions	$1\frac{1}{2}$ ½
22	a) ∵ DE ∥ BC, using BPT $\frac{AD}{DB} = \frac{AE}{EC}$ $1 = \frac{AE}{EC}$ $AE = EC$ OR b) In ΔABC and ΔAMP ∠M = ∠B = 90° ∠A = ∠A (common) ∴ ΔABC ~ ΔAMP (AA Similarity)	1 ½ ½ ½ ½ 1
23	Correct figure, Showing alternate interior angles are equal therefore the tangents are parallel.	1 1

24	a) LCM (152, 95) = $\frac{152\times95}{19}$ = 760 OR b) HCF (36, 48) = 12 She can make 12 bouquets.	2 2
25	P (Reshma winning the match) = 1 – 0.62 = 0.38	2
26	Correct proof	3
27	a) $x^2 - 7x + 10 = (x - 2)(x - 5)$ zeroes are 2 and 5 Sum of zeroes= 2 + 5 = 7; -b/a = 7 Product of zeroes= 2 x 5 = 10; c/a = 10 OR b) α + β = -5 and αβ = -7 Sum of zeroes= (α + 1) + (β + 1) = -3 Product of zeroes = (α + 1) (β + 1) = -11 ∴ required quadratic polynomial is k $(x^2 + 3x - 11)$.	 1 1 1 1 ½ ½ 1
28	Angle of sector θ = 30° Area swept = $\frac{30^0}{360^0}\times\frac{22}{7}\times 14\times 14 = 51.34$ cm^2.	1 1+1
29	a) ∠OAB = 40° OA = OB ∠OAB = ∠OBA = 40° (angles opposite to equal sides) ∠AOB = 100° OR b) Figure, given, to prove, construction Correct proof 	 1 1 1 1 2
30	i) 1/2 ii) 3/4 iii) 1	1 1 1
31	Area of minor segment = $\frac{60^0}{360^0}\times\frac{22}{7}\times 14\times 14-\frac{\sqrt{3}}{4}\times 14\times 14$ = 102.67 – 84.77 = 17.9 cm^2	1 1 1
32	a) $[25+x]^2 = x^2 + [23+x]^2$ $x^2 - 4x - 96 = 0$ (x -12) (x + 8) = 0 x = 12, -8 Length cannot be negative, so x ≠ -8 Length and breadth of the rectangle are 12m and 35 m. OR b) Let father's present age = x years and son's present age = 45 – x (x-5) (40 – x) = 124 $x^2 - 45x + 324 = 0$ x = 36, 9 (x ≠ 9) Father's age = 36 years, Son's age = 9 years	1 1 1 1 1 1 1 2 1

33	Correct graph Solutions is (6, 0) Area of the triangle = ½ x 6 x 6 = 18 sq units.  	2 1 2
34	Height of the cylinder h = 13 – 7= 6 cm Inner surface area of the vessel = $2\pi r^2 + 2\pi rh$ = 572 cm^2 Volume of vessel = $\frac{2}{3}\pi r^3 + \pi r^2 h = \pi r^2\left[\frac{2}{3}r + h\right] = 154\left[\frac{14}{3} + 6\right] = \frac{154\times 32}{3} =$ 1642.67 cm^3	1 2 2
35	 tan 60° = 60/x x = 20√3 m = 20 x 1.732 = 34.64 m tan 30° = $\frac{60-h}{x}$ $\frac{1}{\sqrt{3}} = \frac{60-h}{20\sqrt{3}}$ h = 40 m OR  Tan 45° = h/x x = h tan 30° = $\frac{h}{30+x}$ $\frac{1}{\sqrt{3}} = \frac{h}{30+h}$ $30 + h = \sqrt{3}h$ h = $\frac{30}{\sqrt{3}-1} = 15(\sqrt{3}+1)$ = 15 x 2.732 = 40.98 m AC = 40.98 + 30 = 70.98 m	Fig 1 1 1 1 1 Fig 1 1 1 1 1
36	i) 29 pots ii) 9 iii)$\frac{n}{2}[2a + (n-1)d]$ = 100	1 1

<table>
<tr><td></td><td>$\frac{n}{2}[3n+1] = 100$
$3n^2 + n - 200 = 0$
n = 8, -25/3 (n ≠ -25/3)
total number of rows is 8.</td><td>1

1</td></tr>
<tr><td>37</td><td>i) (4, 3)
ii) √52 units
iii) a) AB = 6 units, BC = 4 units
Area = 24 sq units
OR
b) AB = 6 units, BC = 4
AB : BC = 3 : 2</td><td>1
1
1
1

1
1</td></tr>
<tr><td>38</td><td>i) 600-800
ii) a) Modal class = 600-800, l = 600, f_0 = 4, f_1 = 7, f_2 = 4 , h =200
mode = $600 + \left(\frac{7-4}{14-4-4}\right) \times 200$ = 700
OR

b)
<table>
<tr><th>Rainfall (mm)</th><th>No of sub-divisions</th><th>x_i</th><th>$f_i x_i$</th></tr>
<tr><td>200-400</td><td>2</td><td>300</td><td>600</td></tr>
<tr><td>400-600</td><td>4</td><td>500</td><td>2000</td></tr>
<tr><td>600-800</td><td>7</td><td>700</td><td>4900</td></tr>
<tr><td>800-1000</td><td>4</td><td>900</td><td>3600</td></tr>
<tr><td>1000-1200</td><td>2</td><td>1100</td><td>2200</td></tr>
<tr><td>1200-1400</td><td>3</td><td>1300</td><td>3900</td></tr>
<tr><td>1400-1600</td><td>1</td><td>1500</td><td>1500</td></tr>
<tr><td>1600-1800</td><td>1</td><td>1700</td><td>1700</td></tr>
<tr><td></td><td>Σf_i= 24</td><td></td><td>$\Sigma f_i x_i$ = 20400</td></tr>
</table>
Mean = $\frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{20400}{24} = 850$

iii) 7 sub-divisions</td><td>1
1
1

Table
1

1

1</td></tr>
</table>

KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION
SAMPLE PAPER (SET 2) 2024-25
CLASS X

SUBJECT: BASIC MATHS **TIME: 3 HRS**

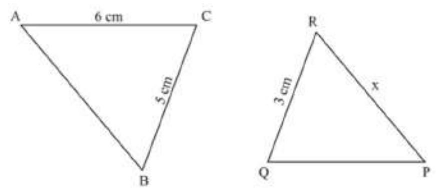
MAX MARKS: 80

General Instructions:

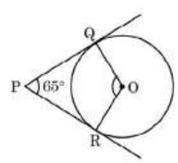
1. This Question Paper has 5 Sections A, B, C, D, and E.
2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.
5. Section 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 π =22/7 wherever required if not stated.

SECTION A

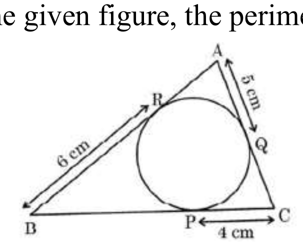
(Multiple choice questions)

1. The zeroes of a quadratic polynomial $16x^2 - 9$ are:
   a) 3/4, 3/4 b) -3/4, 3/4 c) 3/2, 2/3 d) -3/4, -3/4
2. The sum of the exponents of the prime numbers in the factorization of 196 is
   a) 1 b) 2 c) 4 d) 6
3. If y = 1 is a common root of $ay^2 + ay + 3 = 0$ and $y^2 + y + b = 0$, then ab=
   a) 3 b) -7/2 c) 6 d) -3
4. The value of k for which the system of equations kx + 2y = 5 and 3x + 4y = 1 have no solutions, is
   a) k = 3/2 b) k ≠ 3/2 c) k ≠ 2/3 d) k = 15
5. If α and β are the zeroes of the polynomial $x^2 - 1$, then the value of (α + β) is:
   a) 2 b) 1 c) -1 d) 0
6. The distance of the point (-6, 8) from the origin is:
   a) 6 b) -6 c) 8 d) 10
7. 

   In the given figure, ΔABC ~ ΔQRP. If AC = 6 cm, BC = 5 cm, QR = 3 cm and PR = x; then the value of x is:
   a) 3.6 cm b) 2.5 cm c) 10 cm d) 3.2 cm
8. The pair of linear equations 2x = 5y + 6 and 15y = 6x – 18 represents two lines which are:
a) intersecting b) parallel c) coincident d) either intersecting or parallel
9. In the given figure, PQ and PR are tangents drawn from P to the circle with centre O such that ∠QPR = 65°. The measure of ∠QOR is:



   a) 65° b) 125° c) 115° d) 90°
10. If sin A = cos A then A is equal to:
   a) 30° b) 45° c) 60° d) 90°
11. In ΔABC, right angled at C, if tan A = 8/7, then the value of cot B is
   a) 7/8 b) 8/7 c) 7/√113 d) 8/√113
12. Area of a quadrant of a circle of radius 7 cm is:
   a) 154 cm^2 b) 77 cm^2 c) 77/2 cm^2 d) 77/4 cm^2
13. In the given figure, the perimeter of ΔABC is:



   a) 30 cm b) 15 cm c) 45 cm d) 60 cm
14. If a pole 6m height casts a shadow 2√3 m long on the ground, then sun's elevation is:

a) 15° b) 30° c) 45° d) 60°

15. Cards are marked with numbers 1 to 50 are placed in the box and mixed thoroughly. One card is drawn at random from the box. What is the probability of getting a multiple of 5?

a) 1 b) 0 c) 1/25 d) 1/5

16. The value of p for which 2p+1, 10 and 3p+4 are three consecutive terms of an AP is,

a) -1 b) 3 c) 1 d) 2

17. The radius of a spherical balloon increases from 7cm to 14cm when air is pumped in to it. The ratio of the surface area in both the cases is:

a) 4 : 1 b) 1 : 4 c) 3 : 1 d) 1 : 3

18. If mean and median of a distribution are 32 and 30 respectively, then its mode is:

a) 36 b) 26 c) 30 d) 20

ASSERTION AND REASONING PRACTICE QUESTIONS

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.

19. Assertion (A): Mid-point of a line segment divides line in the ratio 1 : 1.

Reason (R): The ratio in which the point (–3, 3) divides the line segment joining the points (– 5, 4) and (–2, 3) is 1 : 2.

20. Assertion: The value of sin 60° cos 30° + sin 30° cos 60° is 1.

Reason: sin 90° = 1 and cos 90° = 0.

SECTION B

(Very short answer type questions)

21. a) Find the value(s) of k for which the pair of equations kx + 3y = k - 3 and 12x + ky = k has infinitely many solutions.

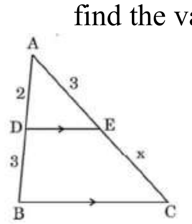
OR

b) Find the value of k if 3x + 2y = 8 and 6x – ky = 9 has no solutions.

22. Find the HCF and LCM of 92 and 510, using prime factorization method.

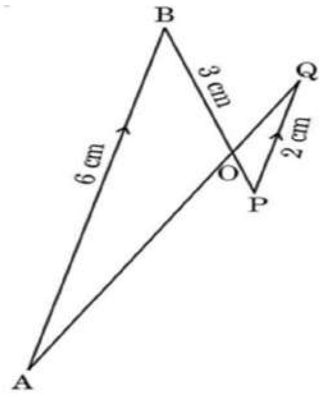
23. PT is a tangent to a circle with radius 8 cm from a point P which is at distance of 17cm from the center. Find the length of the tangent.

24. a) In the given figure, DE|| BC. If AD = 2 units, DB = AE = 3 units and EC = x units, then find the value of x.



OR

b) In the given figure, AB||PQ. If AB = 6 cm, PQ = 2 cm and OB = 3 cm, then find the length of OP.

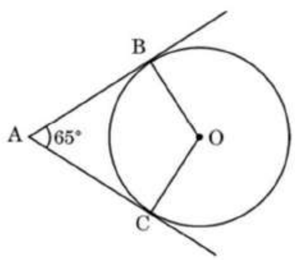


25. One card is drawn at random from a pack of 52 cards. Find the probability of getting
    i) A face card
    ii) a king or a queen.

SECTION C

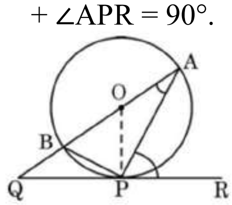
(Short answer type questions)

26. Prove that $\sqrt{5}$ is irrational.
27. Find the zeroes of x^2 -25 and verify the relationship between the zeroes and its coefficients.
28. a) In the given figure, O is the centre of the circle. AB and AC are tangents drawn to the circle from point A. If $\angle BAC = 65°$, then find the measure of $\angle BOC$. Also find $\angle OBC$.



OR

b) In the given figure, O is the centre of the circle and QPR is a tangent to it at P. Prove that $\angle QAP + \angle APR = 90°$.



29. A chord of a circle, of radius 14 cm, subtends and angle of 90° at the center. Find the area of minor segment.
30. a) Prove that $\frac{\cos A}{1+\sin} + \frac{1+\sin}{\cos A} = 2\sec A$.

    OR

    b) Prove that $(\sin A + \operatorname{cosec} A)^2{}_{+}(\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$.

31. A pair of dice is thrown together. Find the probability of getting
    i) A doublet
    ii) the sum of the numbers on two dice as 10.
    iii) Prime numbers on both the dice.

SECTION D

(Long answer type questions)

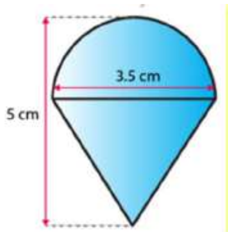
32. Speed of a boat in still water is 15 km/h. It goes 30 km upstream and comes back at the same point in 4 hours 30 minutes. Find the speed of the stream.
33. A two-digit number such that when its digits are reversed the new number obtained is 6 more than 3 times the original number. Also, one's digit is five times that of the other. Find the original number.
34. a) The angles of depression of two ships from the top of a light house and on the same side of it are found to be 45° and 30°. If the ships are 200 m apart, find the height of the light house. (Take $\sqrt{3}$ = 1.73)

    OR

    b) An airplane is flying at a height of 300m above the ground. Flying at this height, the angle of depression from the airplane of two points on both banks of a river in opposite direction are 45° and 60° respectively. Find the width of the river. (Take $\sqrt{3}$ = 1.73)
35. a) In a coffee shop, coffee is served in two types of cups. One is cylindrical in shape with diameter 7 cm and height 14 cm and the other is hemispherical with diameter 21 cm. What is the capacity of the hemispherical cup? Also find the curved surface area of the cylindrical cup.

OR

b) Vijay kumar got a playing top (lattu) as his birthday present, which surprisingly had no colour on it. He wanted to colour it with his crayons. The top is shaped like a cone surmounted by a hemisphere. The entire top is 5 cm in height, and the diameter of the top is 3.5 cm. Find the area he must colour. (Take π = 22/7)



SECTION E

(Case Study Questions)

36. Nayan got his name registered for a sprint race. The race is scheduled for a month later than the time he registered for the race. He started practicing for the race. His current run time is 51 sec for the distance to be covered in the race. He decided to gradually decrease the time by 2 sec every day. He wants to reduce his time to 31 seconds.

i) What is the suitable AP for the above situation?

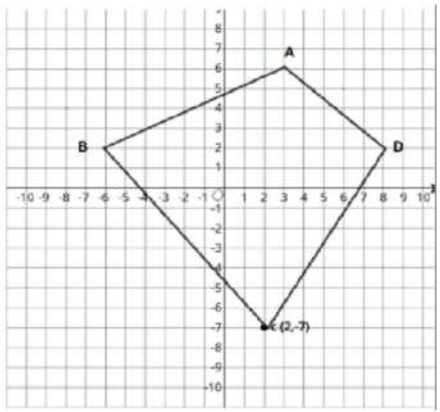
ii) If Nayan is able to achieve his target, then in how many days will he be able to achieve it?

iii) a) On which day will he be able to complete the race in 41 seconds?

OR

b) What is the nth term of this AP?

37. A student drew a quadrilateral ABCD on graph sheet (Cartesian plane). Observe the figure and answer the questions.



i) Find the length of side AB.
ii) Find the coordinates of midpoint of diagonal BD.
iii) a) Find the ratio in which x-axis divides the side CD.

OR

b) Find the coordinate of the point on x-axis equidistant from B and D.

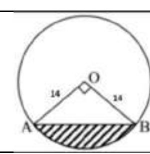
38. In a Vidyalaya there are three sections A, B and C. 30 students are there in section A, in section B there are 41 students and 29 students in section C. A periodic test was conducted to assess the performance of students thereafter analyse and plan the teaching learning process accordingly. The marks obtained out of 40 are given below in the.

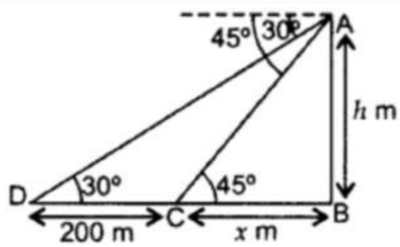
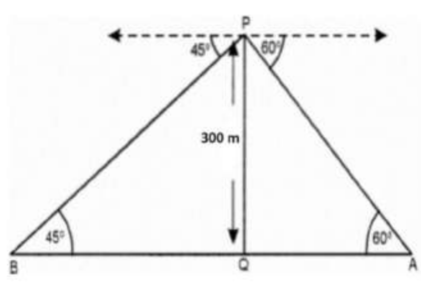
arks Obtained	umber of students
ss than 5	
ss than 10	
ss than 15	
ss than 20	
ss than 25	
ss than 30	
ss than 35	
ss than or equal to 40	0

i) How many students have obtained more than or equal to 35 marks?
ii) Arrange the given data in class interval and write the lower limit of the modal class.
iii) Find the mode of the data.

KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION
CLASS X (2024-25)
ANSWER KEY OF SAMPLE PAPER BASIC MATHS (SET 2)

Q. No	Answers	Marks
1	b) -3/4, 3/4	1
2	c) 4	1
3	a) 3	1
4	a) 3/2	1
5	d) 0	1
6	d) 10	1
7	b) 2.5 cm	1
8	b) parallel	1
9	c) 115°	1
10	b) 45°	1
11	b) 8/7	1
12	c) 77/2 cm^2	1
13	a) 30 cm	1
14	d) 60°	1
15	d) 1/5	1
16	b) 3	1
17	b) 1 : 4	1
18	b) 26	1
19	(c) Assertion (A) is true but reason (R) is false.	1

20	(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).	1
21	a) $\frac{k}{12} = \frac{3}{k} = \frac{k-3}{k}$ k = 6 OR b) $\frac{3}{6} = \frac{2}{-k} \neq \frac{8}{9}$ k = -4	1 1 1 1
22	92 = 2 x 2 x 23, 510 = 2 x 3 x 5 x 17 HCF (92, 510) = 2 LCM (92, 510) = 23460	1 ½ 1/2
23	Length of tangent= $\sqrt{17^2 - 8^2}$ = $\sqrt{225}$ = 15 cm	1 1
24	a) AD/ DB = AE/ EC 2/3 = 3/x X = 4.5 cm OR b) ∠AOB = ∠POQ (vertically opposite angles) ∠B = ∠P (alternate interior angles) Δ AOB ~ ΔPOQ (AA) AB/ PQ = OB/OP 6/2 = 3/OP OP= 1 cm	1 1 1 ½ ½
25	i) 12/ 52 = 3/13 ii) 8/52 = 2/13	1 1
26	Correct proof	3
27	x = 5, -5 Sum of zeroes = 0, -b/a = 0 Product of zeroes = -25, c/a = -25	1 1 1
28	a) ∠BOC = 180°- 65° = 115° In ΔBOC ∠OBC = ∠OCB (angles opposite to equal sides) ∠OBC = 32.5° OR b) OP = OA (radii) ∠OPA = ∠OAP (angles opposite to equal sides) ∠OPR = 90° ∠OPA + ∠APR = 90° ∠QAP + ∠APR = 90°	1 1 1 1 1 1
29	Δ AOB is a right-angled triangle Area of segment = $\frac{90^0}{360^0} \times \frac{22}{7} \times 14 \times 14 - \frac{1}{2} \times 14 \times 14$ = 56 cm^2 	1 2
30	a) $\frac{\cos^2 A+(1+\sin A)^2}{(1+\sin A)\cos A}$ = $\frac{1+\cos^2 A+\sin^2 A+2\sin A}{(1+\sin A)\cos A}$ = $\frac{2+2\sin A}{(1+\sin A)\cos A} = \frac{2(1+\sin A)}{\cos A(1+\sin A)}$ = 2 sec A	1 1 1

	OR b) LHS = $sin^2 A + cosec^2 A + 2\, sin\, A\, cosec\, A + cos^2 A + sec^2 A +$ $2\, cos\, A\, sec\, A$ $= 1 + 2 + 2 + cosec^2 A + sec^2 A = 5 + cosec^2 A + sec^2 A$ $= 5 + 1 + cot^2 A + 1 + tan^2 A = 7 + cot^2 A + tan^2 A$ = RHS	 1 1 1
31	i) 6/36 = 1/6 ii) 3/36 = 1/12 iii) 9/36 = 1/4	1 1 1
32	Let speed of stream = x km/h $\frac{30}{15+x} + \frac{30}{15-x} = \frac{9}{2}$ $\frac{450}{225 - x^2} = \frac{9}{2}$ $200 = 225 - x^2$ $x^2 = 25$ x = 5, -5 (neglect, since speed cannot be negative) Speed of the stream = 5 km/h	 1 1 1 1 1
33	Two-digit number is 10x + y y = 5x---------------(1) 10y + x = 3(10x + y) +6 29x – 7y + 6 = 0 --------(2) Substitute (1) in (2) 29x – 35x + 6 = 0 X = 1 Y = 5 Original number is 15.	½ ½ 1 1 1 ½ 1/2
34	a) tan 45° = h/x x = h --------- 1 tan 30° = $\frac{h}{200+x}$ $\frac{1}{\sqrt{3}} = \frac{h}{200 + h}$ 200 + h = h√3 h(√3 -1) = 200 h =$\frac{200}{\sqrt{3}-1} = \frac{200(\sqrt{3}+1)}{2}$ = 100 $(\sqrt{3} + 1)$ = 100 (1. 73 + 1) h = 100 x 2.73 = 273 m  OR tan 45° = 300/ BQ BQ = 300 m tan 60° = $\frac{300}{QA}$ $\sqrt{3} = \frac{300}{QA}$ QA = $\frac{300}{\sqrt{3}} = \frac{300\sqrt{3}}{3} = 100\sqrt{3}$ = 100 x 1.73 = 173 m Width of the river = BQ + QA = 300 + 173 = 473 m  	Fig 1 1 1 1 1 Fig 1 1 1 1 1
35	a) Volume = $\frac{2}{3}\pi r^3$ $= \frac{2}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} x \frac{21}{2}$ = 2425.5 cm^3	1 2 1+1

<table>
<tr><td></td><td>CSA of Cylindrical cup = $2\pi rh = 2 \times \frac{22}{7} \times \frac{7}{2} \times 14$ = 308 cm^2
OR
b) Height of the cone = 3.25 cm
TSA of the toy = CSA of hemisphere + CSA of cone
= 2(22/7) × (3.5/2) × (3.5/2) + (22/7) × (3.5/2) × 3.7
= 19.25 + 20.35 = 39.6 cm^2</td><td>1

1+1
1+1</td></tr>
<tr><td>36</td><td>i) 51, 49, 47,… 31
ii) 11 days
iii) 41 = 51 – (n-1) 2
n-1 = 5
n = 6
OR
a_n = 51 –(n-1)2
= 51- 2n +2
= 53 -2n</td><td>1
1
1

1

1

1</td></tr>
<tr><td>37</td><td>i) A (3, 6), B (-6, 2)
AB = √97 units
ii) (1, 2)
iii) a) C (2, -7), D (8, 2)
Point on x-axis is (x,0)
$\frac{2k-7}{k+1} = 0$
2k -7 = 0
K = 7/2
Ratio is 7 :2
OR
b) Point on x axis is (x, 0)
$\sqrt{(-6-x)^2+2^2} = \sqrt{(8-x)^2+2^2}$
36 + 12x + x^2 = 64 - 16x + x^2
28 x = 28
x = 1
Point is (1, 0)</td><td>1

1

1
½
½

1

½

½</td></tr>
<tr><td>38</td><td>i) 100 -92 = 8
ii)
<table><tr><td>Marks</td><td>No of students</td></tr><tr><td>0-5</td><td>17</td></tr><tr><td>5-10</td><td>20</td></tr><tr><td>10-15</td><td>18</td></tr><tr><td>15-20</td><td>5</td></tr><tr><td>20-25</td><td>11</td></tr><tr><td>25-20</td><td>14</td></tr><tr><td>30-35</td><td>7</td></tr><tr><td>35-40</td><td>8</td></tr></table>Lower limit of modal class = 5
iii) Mode = 8</td><td>1

1

1
1</td></tr>
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