KENDRIYA VIDYALAYA SANGATHAN RAIPUR REGION

COMPETENCY BASED QUESTIONS WORKSHOP

(19.09.2022 TO 20.09.2022)

MATHEMATICS QUESTION BANK FOR CLASS – X

2022-23

UNDER THE GUIDANCE OF

SHRI B.S.AHIRE

(PRINCIPAL)

KENDRIYA VIDYALAYA NAYA RAIPUR

KENDRIYA VIDYALAYA SANGATHAN RAIPUR REGION

MATHEMATICS QUESTION BANK FOR CLASS – X
2022-23
INDEX

Editors: 1. Mr Kaustuva Nayak KV B M Y Bhilai

   2. Mr Praneel Kumar Walde KV Kurud

   3. Mrs Seema Singh KV No 1(Shift 1) Raipur

CHAPTER 1 REAL NUMBERS

MCQ

1. The *LCM* of two numbers is 198 and their product is 1188. Find their *HCF*

    a. 18   b. 6   c. 66   d. None of above

2. If two positive integers and are expressible in terms of primes as $a = p^6 q^3$ and $b = p^4 q^8$, then which of the following is true?

    a. $HCF = p^5 q^2 \times LCM$ b. $LCM = p^2 q^5 \times HCF$ c. $LCM = p^5 q^2 \times HCF$ d. $HCF = p^2 q^5 \times LCM$

3. The values of x and y in the given figure are:
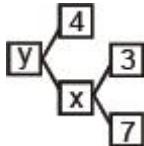
    (a) x = 10; y = 14   (b) x = 21; y = 84   (c) x = 21; y = 25   (d) x = 10; y = 40

4 . The HCF and LCM of two numbers are 33 and 264 respectively. When the first number is completely divided by 2 the quotient is 33. The other number is:
    (a) 66   (b) 130   (c) 132   (d) 196

5. What will be the least possible number of the planks, if three pieces of timber 42 m, 49 m and 63 m long have to be divided into planks of the same length?
    (a) 5   (b) 6   (c) 7   (d)   none of these

6. What is the greatest possible speed at which a man can walk 52 km and 91 km in an exact number of minutes?
    (a) 17 m/min   (b) 7 m/min   (c) 13 m/min   (d) 26 m/min

7. If A = 2n + 13, B = n + 7, where n is a natural number then HCF of A and B is:
    (a) 2   (b) 1   (c) 3   (d) 4

8. Pairs of natural numbers whose least common multiple is 78 and the greatest common divisor is 13 are:
    (a) 58 and 13 or 16 and 29   (b) 68 and 23 or 36 and 49
(c) 18 and 73 or 56 and 93   (d) 78 and 13 or 26 and 39

9. Two natural numbers whose sum is 85 and the least common multiple is 102 are:
    (a) 30 and 55   (b) 17 and 68   (c) 35 and 55   (d) 51 and 34

10. 4 Bells toll together at 9.00 am. They toll after 7, 8, 11 and 12 seconds respectively. How many times will they toll together again in the next 3 hours?
    (a) 3   (b) 4   (c) 5   (d) 6
11. A forester wants to plant 66 apple trees, 88 banana trees and 110 mango trees in equal rows (in terms of number of trees). Also he wants to make distinct rows of trees (i.e., only one type of trees in one row). The number of minimum rows required are

(a) 2   (b) 3   (c) 10   (d) 12

12. The largest number which divides 70 and 125, leaving remainders 5 and 8 respectively, is

     (a) 13   (b) 65   (c) 875   (d) 1750

13. If the HCF of 65 and 117 is expressible in the form $65m - 117$, then the value of m is

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

14. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$; x, y are prime numbers, then HCF (a, b) is

     (a) xy (b) xy^2 (c) x^3y^3 (d) x^2y^2

15. If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3b$; a, b being prime numbers, then LCM (p, q) is

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

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

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

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

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

Q.1. Assertion: The H.C.F. of two numbers is 16 and their product is 3072. Then their L.C.M. = 162.

Reason: If a and b are two positive integers, then H.C.F. × L.C.M. = a × b.

Q.2. Assertion: Denominator of 34.12345. When expressed in the form p/q, q ≠ 0, is of the form $2^m × 5^n$, where m and n are non-negative integers.

Reason: 34.12345 is a terminating decimal fraction.

Q.3. Assertion: A number N when divided by 15 gives the remainder 2. Then the remainder is same when N is divided by 5.

Reason: √3 is an irrational number.

Q.4. Assertion: 2 is an example of a rational number.

Reason: The square roots of all positive integers are irrational numbers.

Q.5. Assertion: For any two positive integers p and q, HCF (p, q) × LCM (p, q) = p × q

Reason: If the HCF of two numbers is 5 and their product is 150, then their LCM is 40.

Direction: **In the following questions, short answer of 2 marks each**

Q.1. Find the largest number that will divide 398, 436 and 542 leaving remainders 7, 11, and 15 respectively.

Q 2. Express 98 as a product of its primes.

Q 3. Zoe and Sam are racing on a circular track. If Zoe takes 48 minutes and Sam takes 80 minutes to complete the round. If they both start at the same point at the same time and go in same direction, after how many minutes will they meet again at the start point?

Q.4. Mitchell and Courtney are racing on a circular track. If Mitchell takes 36 minutes and Courtney takes 24 minutes to complete the round. If they both start at the same point at the same time and go in same direction, then they will meet again at the start point after how many minutes.

Q 5. In a seminar, the number of participants in German, English and French are 130, 130 and 286 respectively. Find the numbers of rooms required to house them if in each room, the same number of participants are to be accommodated and all of them must belong to the same language

Q 6. If the HCF of 408 and 1032 is expressible in the form 1032 × 2 + 408 × p, then find the value of p.

Q 7. HCF and LCM of two numbers is 9 and 459 respectively. If one of the numbers is 27, find the other number

Q 8. Find HCF and LCM of 13 and 17 by prime factorisation method

Q 9. Find LCM of numbers whose prime factorisation are expressible as 3×5^2 and $3^2 \times 7^2$.

Q 10. Find the LCM of 96 and 360 by using fundamental theorem of arithmetic.

Direction: **In the following questions, short answer of 3 marks each**

1. Karan has 180 blue marbles and 150 red marbles. He wants to pack them into packets containing equal number of marbles of the same colour. What is the maximum number of marbles that each packet can hold?

2. Find the largest number that will divide 382 and 710 and leaves a remainder 13 in each case.

3. What is the largest number that divides 437, 732, and 1263 leaving remainder of 24 in each case?

4. What is the largest number that divides 967 and 1767 leaving remainders of 71 and 103 respectively?

5. What is the largest number that divides 170, 220, and 420 leaving remainder 8, 4 and 15 respectively?

6. Find the LCM and HCF of the following :
   $2^5 \times 5^4 \times 7^2 \times 13^6$ and $2^3 \times 5^6 \times 7 \times 17^3.$

7. Prove that 2-3√5 is an irrational number

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

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

10. Three bells toll at intervals of 12 minutes, 15 minutes and 18 minutes respectively. If they start tolling together, after what time will they next toll together?

Long Answer Type Question

1. Find HCF of 378,180 and 420 by prime factorisation method. Is HCF x LCM of three numbers equal to the product of the three numbers?

2. The Muscle Gym has bought 63 treadmills and 108 elliptical machines. The gym divides them into several identical sets of treadmills and elliptical machines for its branches located throughout the city, with no exercise equipment left over. What is the greatest number of branches the gym can have in the city?

3. Katya has 49 paintings and 35 medals. She wants to display them in groups throughout her house, each with the same combination of paintings and medals, with none left over. What is the greatest number of groups Katya can display?

4. Anish goes fishing every 5th day and Balaji goes fishing every 7th day. If Anish and Balaji both went fishing today, how many days until they will go fishing on the same day again?

5. Tamanna is arranging black marbles in groups of 13 and purple marbles in groups of 25. If she has the same number of black and purple marbles, what is the smallest number of marbles of each colour that she could have?

CASE STUDY QUESTION

The department of Computer Science and Technology is conducting an International Seminar. In the seminar, the number of participants in Mathematics, Science and Computer Science are 60, 84 and 108 respectively. The coordinator has made the arrangement such that in each room, the same number of participants are to be seated and all of them being in the same subject. Also, they allotted the separate room for all theofficial other than participants.

(i) Find the total number of participants.
(a) 60   (b) 84   (c) 108   (d) none of these

(ii) Find the LCM of 60, 84 and 108.
(a) 12   (b) 504   (c) 544320   (d) 3780

(iii) Find the HCF of 60, 84 and 108.

(iv) Find the minimum number of rooms required, if in each room, the same number of participants are to be seated and all of them being in the same subject.

(a) 12   (b) 20   (c) 21   (d) none of these

(v) Based on the above (iv) conditions, find the minimum number of rooms required for all the participants and officials.

(a) 12   (b) 20   (c) 21   (d) none of these

Answers of MCQ Questions

1. (B) 6   2. (B) LCM=$P^5 Q^5$ HCF   3. (B) X=21; Y=84   4. (C) 132   5. (C) 7 m
6. (C) 13 m/min   7. (B) 1   8. (D) 78 & 13 or 26 & 39   9. (D) 51 & 34   10. (C) 5
11. (D) 12   12. (A) 13   13. (B) 2   14. (B) XY^2 15. (C) $A^3 B^2$

Answers of Assertion and Reasoning Questions

1. D   2. A   3. B   4. C   5. C

Answers of short Questions of 2 marks each

1. 17   2. 2×7^2 3. 240 mins   4. 72 mins   5. 26
6. -5   7. 153   8. HCF=1 ; LCM= 221   9. $3^2 \times 5^2 \times 7^2$ 10. 1440

Answers of short Questions of 3 marks each

1. 30   2. 41   3. 59   4. 128   5. 27   6. LCM=$2^5 \times 5^6 \times 7^2 \times 13^6 \times 17^3$; HCF = $2^3 \times 5^4 \times 7$
7. Irrational   8. 320   9. 8   10. 90 mins

Answers of long Questions of 3 marks each

1. 6 ; YES   2. 9   3. 7   4. 35   5. 325

Answers of CASE STUDY QUESTION

1. 252   2. 3780   3. 12   4. 21   5. 22

CHAPTER 2 POLYNOMIAL

- "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.

- A quadratic polynomial in x with real coefficients is of the form ax² + bx + c, where a, b, c are real numbers with a ≠ 0.

- Degree – The highest exponent of the variable in the polynomial is called the degree of polynomial. Example: $3x^3 + 4$, here degree = 3.

- Polynomials of degrees 1, 2 and 3 are called linear, quadratic and cubic polynomial respectively.

- A polynomial can have terms which have Constants like 3, -20, etc., Variables like x and y and Exponents like 2 in y².

- These can be combined using addition, subtraction and multiplication but NOT DIVISION.

- The zeroes of a polynomial p(x) are precisely the x-coordinates of the points, where the graph of y = p(x) intersects the x-axis.

If α and β are the zeroes of the quadratic polynomial $ax^2 + bx + c$, then
   sum of zeros, $α+β = -b/a = $ −coefficient of x / coefficient of x^2
   product of zeros, $αβ = c/a = $ constant term / coefficient of x2

If α, β, γ are the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d = 0$, then
   $α+β+γ = -b/a = $ −coefficient of x^2 coefficient of x^3
   $αβ+βγ+γα = c/a = $ coefficient of x / coefficient of x^3
   $αβγ = -d / a = $ −constant term / coefficient of x^3

RELATIONSHIP BETWEEN ZEROES & COEFFICIENTS OF POLYNOMIALS

Type of Polynomial	General Form	No. of Zeros	Relationship between zeroes and coefficients
Linear	ax + b, a ≠ 0	1	K = −b/a , ie, k = Constant term / Coefficient of x
Quadratic	$ax^2 + bx + c$, a ≠ 0	2	Sum of zeroes (α + β) = Coefficient of x / Coefficient of x^2 = - b / a Product of zeroes (α * β) = constant term / Coefficient of x^2 = c / a
Cubic	$ax^3 + bx^2 + cx + d$, a ≠ 0	3	Sum of zeroes(α + β + γ) = = - b / a Product of sum of zeroes taken two at a time (α β + β γ + γ α) = Coefficient of x / Coefficient of x^3 = c / a Product of zeroes (α * β * γ) = - constant term / Coefficient of x^3 = - d / a

A quadratic polynomial whose zeroes are α and β is given by $p(x) = x^2 - (α + β) x + α * β$

i.e. x2 – (Sum of zeroes)x + (Product of zeroes)

A cubic polynomial whose zeroes are α , β and γ is given by $p(x) = x^3 + (α + β + γ) x^2 +(α β + β γ + γ α)x - α * β * γ$

(MCQ)

1. The zeroes of the quadratic polynomial $x^2 + 7x + 10$ are

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

2. The zeroes of the quadratic polynomial $x^2 - 27$ are

(a) +3√3 ,- 3√3   (b) 3 , 3   (c) 9 ,9   (d) +√3 , - √3

3. A quadratic polynomial can have at most _____ zeroes.

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

4. A quadratic polynomial, whose zeroes are -2 and 4, is

(a) $x^2 - 2x + 8$ (b) $x^2 + 2x + 8$ (c) $x^2 - 2x - 8$ (d) $2x^2 + 2x - 24$

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

(a) 1   (b) 2   (c) 3   (d) more than 3

6. The sum and the product of the zeroes of polynomial $6x^2 - 5$ respectively are

(a) 0, (-6)/5   (b) 0, 6/5   (c) 0, 5/6   (d) 0, (-5)/6

7. The zeroes of the quadratic polynomial $x^2 + kx + k$ where $k \neq 0$,

(a) cannot both be positive   (b) cannot both be negative

(c) are always unequal   (d) are always equal

8 If the zeroes of the quadratic polynomial $ax^2 + bx + c$, where $c \neq 0$, are equal, then

(a) c and a have opposite signs   (b) c and b have opposite signs

(c) c and a have same signs   (d) c and b have the same signs

9. If one of the zeroes of a quadratic polynomial of the form $x^2 + ax + b$ is the negative of the other, then it

(a) has no linear term and the constant term is negative

(b) has no linear term and the constant term is positive

(c) can have a linear term but the constant term is negative

(d) can have a linear term but the constant term is positive

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

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

11. If one zero of the quadratic polynomial $x^2 - 4x + 1$ is $2 + \sqrt{3}$, then the other zero is

(a) $-2 + \sqrt{3}$ (b) $-\sqrt{3} - 2$ (c) $2 - \sqrt{3}$ (d) $\sqrt{3} + 1$

12. If 2 is a zero of the polynomial $p(x) = k x^2 + 3x + k$, then the value of k is

(a) 5/6   (b) (-5)/6   (c) 6/5   (d) (-6)/5

13. If one of the zeroes of the quadratic polynomial $(k - 1) x^2 + kx + 1$ is -3, then the value of k is

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

14. If the sum of the zeroes of the quadratic polynomial $k x^2 + 2x + 3k$ is equal to their product, then k is equal to

(a) 1/3   (b) (-2)/3   (c) (-1)/3   (d) 2/3

15. If zeroes of p(x) = 2 x^2 - 7x + k reciprocal of each other

  (a) 1   (b) 2   (c) 3   (d) -7

ASSERTION REASONING QUESTIONS

DIRECTION: In the following questions (Q1-10), 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)if both assertion (A) and reason (R) are true but reason (R) is not the correct   explanation of assertion (A).

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

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

1.   Assertion: x^2 + 4x + 5 has two real zeroes.

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

2.   Assertion: y^3 + 3y has only one real zero.

 Reason: A polynomial of nth degree must have n real zeroes.

3.   Assertion: The graph y = f(x) is shown in figure, for the polynomial f (x). The number of zeros of f(x) is 3.
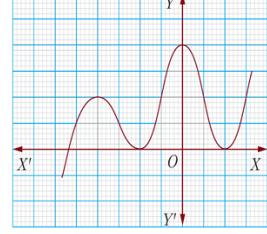
Reason: The number of zero of the polynomial f(x) is the number of points of which f(x) cuts or touches the axes.

4.   Assertion: Degree of a zero polynomial is not defined.
Reason: Degree of a non-zero constant polynomial is '0'.

5.   Assertion: x^2 + 11x + 30 has no real zeroes.
Reason: A quadratic polynomial can have at the most two 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 ax2 + bx + c is (-b)/a .

7.   Assertion: A quadratic polynomial, sum of whose zeroes is 6 and their product is 8 is x^2 – 14x + 48. Reason: If α and β be the zeroes of the polynomial f(x), then polynomial is given by f(x) = x2 - (α + β) x + $\alpha\beta$.

8. Assertion: $P(x) = 3x^3 - 2x^2 + 4x^4 + x - 2$ 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: If the sum and product of zeroes of a quadratic polynomial are 3 and -2 respectively, then quadratic polynomial is $x^2 - 3x - 2$.

Reason: If S is the sum of the zeroes and P is the product of the zeroes of a quadratic polynomial, then the corresponding quadratic polynomial is $x^2 - +P$.

10. Assertion: If $\propto$ and β are the zeroes of the polynomial $x^2 + 2x-15$, then $1/\propto + 1/\beta$ is $2/15$.

Reason: If $\propto$ and β are the zeroes of a quadratic polynomial $ax^2 + bx + c$, then $\propto + \beta$ is $(-b)/a$ and $\propto\beta = c/a$

Short Answer Type Questions

1. If a fifth degree polynomial is divided by a quadratic polynomial, write the possible degree of the quotient

2. What is the value of $p(x) = x^2 - 3x - 4$ at $x = -1$?

3. For what value of k, (−4) is a zero of the polynomial $x^2 - x - (2k + 2)$?

4. If 1 is a zero of the polynomial $p(x) = ax^2 - 3 (a - 1) x - 1$, then find the value of a

5. If the sum of zeroes of the quadratic polynomial $3x2 - kx + 6$ is 3, then find the value of k ?

6. Find a quadratic polynomial whose zeroes are −12 and 4 and verify the relationship between the zeroes and the coefficients

7. 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.

8. Find the value of 'k' such that the quadratic polynomial $3x^2 + 2kx + x - k - 5$ has the sum of zeroes as half of their product**.**

9. Find the product of sum and product of zeroes of the quadratic polynomial $3x^2 + 5x - 2$

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

Short Answe - II Type Questions

1. If the zeroes of the polynomial $x^2 + px + q$ are double in value to the zeroes of $2x^2 - 5x - 3$, find the value of p and q.
2. Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficients of the polynomial.
3. If α and β are zeroes of $p(x) = kx^2 + 4x + 4$, such that $\alpha^2 + \beta^2 = 24$, find k.

4. If α and β are the zeroes of a quadratic polynomial $x^2 + x - 2$ then find the value of $\left(\frac{1}{\alpha} - \frac{1}{\beta}\right)$.

5. If the zeroes of the polynomial $x^2 + px + q$ are double in value to the zeroes of $2x^2 - 5x - 3$, find the value of p and q .

Case Study Questions

CASE STUDY 1:

The below picture are few natural examples of parabolic shape which is represented by a quadratic polynomial. A parabolic arch is an arch in the shape of a parabola. In structures, their curve represents an efficient method of load, and so can be found in bridges and in architecture in a variety of forms.

1. **In the standard form of quadratic polynomial, $ax^2 + bx + c$, what are a, b and c ?**
2. **If the roots of the quadratic polynomial are equal, what is the discriminant D ?**
3. **If α and 1/α are the zeroes of the quadratic polynomial $2x^2 - x + 8k$, then find the value of k ?**

CASE STUDY 2:

Two friends Aryan and Om decided to go for a trekking. During summer vacation, they went to Panchmarhi. While trekking they observed that the trekking path is in the shape of a parabola. The mathematical representation of the track is shown in the graph.
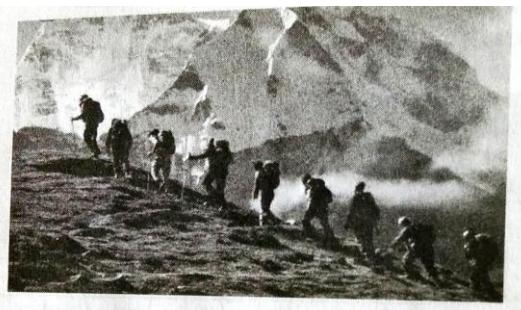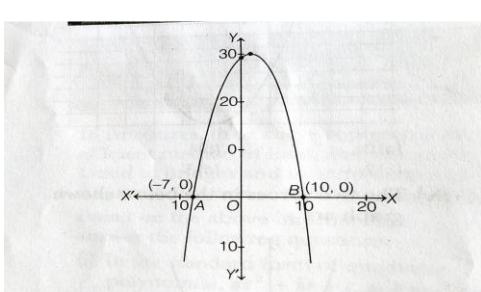
Based on the above information, answer the following questions.

1. What are the zeroes of the polynomial whose graph is given?

2. What will be the expression of the given polynomial p(x)?

3. What is the product of the zeroes of the polynomial which represents the parabola?

4. In the standard form of quadratic polynomial, $ax^2 + bx + c$, what are a, b, and c?

CASE STUDY 3:

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. Usually, soccer is played outdoors on a large field and basketball is played indoor on a court made out of wood. The projectile (path traced) of soccer ball and basketball are in the form of parabola representing quadratic polynomial.

1. Which type the shape of the path traced shown in given figure?
2. Why the graph of parabola opens upwards,?
3. In the below graph, how many zeroes are there ?
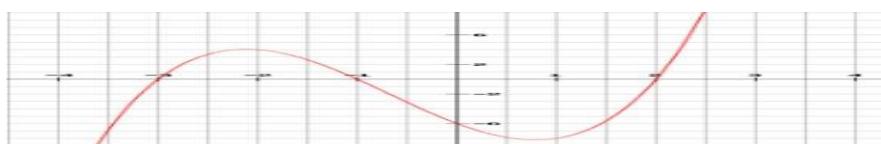
CASE STUDY 4:

An asana is a body posture, originally and still a general term for a sitting meditation pose, and later extended in hatha yoga and modern yoga as exercise, to any type of pose or position, adding reclining, standing, inverted, twisting, and balancing poses. In the figure, one can observe that poses can be related to representation of quadratic polynomial.
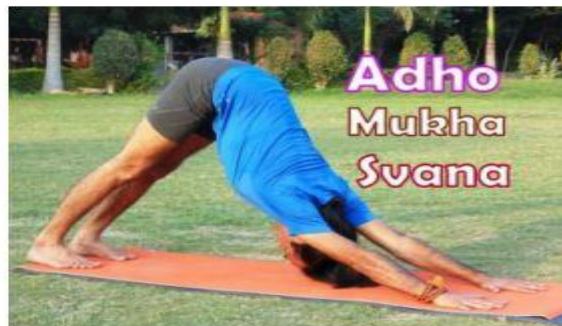
1. Which type the shape of the poses shown in figure?
2. In the graph, how many zeroes are there for the polynomial?

3. Write two zeroes in the above shown graph ?

CASE STUDY 5:

Priya and her husband Aman who is an architect by profession, visited France. They went to see Mont Blanc Tunnel which is a highway tunnel between France and Italy, under the Mont Blanc Mountain in the Alps, and has a parabolic cross-section. The mathematical representation of the tunnel is shown in the graph.
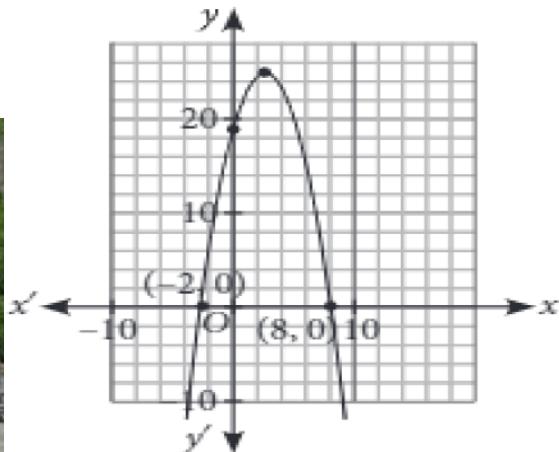
Based on the above information, answer the following questions.

(1) **What will be the expression of the polynomial given in diagram?**
(2) **What is the value of the polynomial. represented by the graph, when x = 4?**
(3) If the tunnel is represented by -x²+3x-2. Then what is its zeroes ?

Answer key (MCQs)

1. c 2. a 3. c 4. c 5. d 6. d 7. a 8. c 9. a 10. b
11. c 12. d 13. a 14. b 15. b

Answer key (Assertion Reasoning Questions)

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

Answer key (VSA)

1. -3/2 **2.** -3/5 **3.** 2X²-7X+3 **4** x²+3x-2 **5.** 2,-1,3 . **6.** 4 **7.** -8 **8.** -3/2 , 2 **9.** not **10.** -5

Answer key (SA)

1. 3 **2.** 0 **3.** 5 **4.** 1 **5.** 9 **6.** X²-8X-48 **7.** 4 **8.** 1 **9.** 10/3 10. x²- $2\sqrt{3}$ x+5

Answer key (LA)

1. p = -5, q = -6   2. 3/2, -1/2   3 -1   4. - 1   5. -5, -6

Answer key (Case Study Based Questions)

1 (i) a is a non zero real number and b and c are any real numbers. (ii) D = 0   (iii) ¼

2 (i). -7 , 10   (ii).) $x^2 - 3x - 70$ (iii). -70   (iv). a is a no zero real number, b and c are any real numbers c

3 (i) parabola   (ii) a > 0   (iii) 3 , 4

4 (i) parabola   (ii)   2   (iii) -2 , 4   5 (i) $-x^2 + 6x + 16$ (ii) 24   (iii)   1, 2

CHAPTER 3 LINEAR EQUATIONS IN TWO VARIABLES

Multiple Choice Question

1. Graphically, the pair of equation

   6x-3y+10=0

   2x-y+9=0

   Represents two lines which are
   - (A)   Intersecting at exactly one point
   - (B)   Intersecting at exactly two point
   - (C)   Coincident
   - (D)   Parallel

2. The pair of equation x+2y+5=0 and -3x-6y+1=0 have :
   - (A)   A unique solution
   - (B)   Exactly two solutions
   - (C)   Infinitely many solutions
   - (D)   No Solution

3. If a pair of linear equations is consistent, then the lines will be:
   - (A)   Parallel
   - (B)   Always coincident
   - (C)   Intersecting or coincident
   - (D)   Always interesting

4. The pair of equation x=a and y=b graphically represents lines which are:
   - (A)   Parallel
   - (B)   Intersecting at (b,a)
   - (C)   Coincident
   - (D)   Intersecting at (a,b)

5. The pair of equation y=0 and y=-7 has:
   - (A)   One solution
   - (B)   Two solution
   - (C)   Infinitely many solution
   - (D)   No solution

6. One equation of a pair of dependent linear equations is -5x+7y=2. The second equation can be:
   - (A)   10x+14y+4=0
   - (B)   -10x-14y+4=0
   - (C)   -10x+14y+4=0
   - (D)   10x-14y = -4

7. For what value of k, do the equations 3x-y+8=0 and 6x-ky=-16 represents coincident lines?
   - (A) $\frac{1}{2}$
   - (B) $\frac{-1}{2}$
   - (C)   2
   - (D)   -2

8. If the lines given by 3x+2y=2 and 2x+5y+1=0 are parallel, then the value of k is

(A) $\frac{-5}{4}$

(B) $\frac{2}{5}$

(C) $\frac{15}{4}$

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

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

(A) x+y=-1 and 2x-3y=-5

(B) 2x+5y=-11 and 4x+10y=-22

(C) 2x-y=1 and 3x+2y=0

(D) X-4y-14=0 and x-y-13=0

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

(A) 35 and 15

(B) 35 and 20

(C) 15 and 35

(D) 25 and 25

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

(A) 4 and 24

(B) 5 and 30

(C) 6 and 36

(D) 3 and 24

12. If x=a, y=b is the solution of the equations x-y=2 and x+y=4, then the values of a and b are, respectively

(A) 3 and 5

(B) 5 and 3

(C) 3 and 1

(D) -1 and 3

13. The larger of the two supplementary angles exceed the smaller by 18°, then the angles are:

(A) 99°, 81°

(B) 98°, 82°

(C) 97°, 83°

(D) None of these.

14. x and y are 2 different digits. If the sum of the two digit numbers formed by using both the digits is a perfect square, then value of x +y is

(a) 10   (b) 11   (c) 12   (d) 13

15. In a number of two digits, unit's digit is twice the tens digit. If 36 be added to the number, the digits are reversed. The number is

(a) 36   (b) 63   (c) 48   (d) 84

Answer Key

1. d	2. d	3. c	4.d	5. d	6. d	7.c	8.c	9.b and d
10. d	11. c	12.c	13.a	14. b	15. c			

Assertion and Reason Based MCQ

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 A and R are true and R is the correct explanation of A
- (B) Both A and R are true but R is the NOT the correct explanation of A
- (C) A is true but R is false
- (D) A is false and R is True

1. **Assertion (A):** If the pair of linear equations 3x+y=3 and 6x+ky =8 does not have a solution, then the value of k=2.
   Reason (R): If the pair of linear equations x+y-4=0 and 2x+ky =3 does not have a solution, then the value of k=2.   Ans: Option B

2. **Assertion (A):** For all real values of c, the pair of equation x-2y=8 and 5x-10y=c have a unique solution.
   Reason (R): Two lines are given to be parallel. The equation of one of the lines is 4x+3y=14, 12x+9y=5   Ans: Option D

3. **Assertion (A):** If the equation 3x-y+8=0 and 6x-ky =-16 represents coincident lines, then the value of k=2.
   Reason (R): If the lines given by 3x+2ky=2 and 2x+5y+1 =0 are parallel, then the value of k=12.   Ans: Option C

4. **Assertion (A):** If 4 chairs and 3 tables cost ₹2100 and 5 chairs and 2 tables cost ₹1750 , then the cost of 1 chair is ₹150.
   Reason (R): Sum of the ages of a father and the son is 40 years. If father's age is 3 times that of his son, then the son's age is 12 years.   Ans: Option C

5. **Assertion (A):** The solution of the pair of linear equations x+y=5 and 2x-3y =4 is x=$\frac{19}{5}$ and y=$\frac{6}{5}$
   Reason (R): The solution of the pair of linear equations 3x+4y=10 and 2x-2y=2 is x=2 and y=1.   Ans: Option B

2 Mark Question

1. Given the linear equation 3x+4y = 9. Write another linear equation in these two variables such that the geometrical representation of the pair so formed is:
   (1) intersecting lines (2) coincident lines.

2. For what value of p does the pair of linear equations given below has unique solution?
   4 x+ py +8 = 0 and 2 x+2 y + 2 =0 .

3. Is the system of linear equations 2 x+3 y − 9 =0 and 4 x+6 y − 18 =0 consistent? Justify your answer.

4. Two lines are given to be parallel. The equation of one of the lines is 4x + 3y = 14, then find the equation of the second line.

5. Find the value(s) of k for which the pair of linear equations kx + y = k^2 and x + ky = 1 have infinitely many solutions.

Answers

1. *One of the possible equation 3x-5y=10*
   One of the possible equation 6x+8y=18
2. *p≠4*
3. *Consistent*
4. *One of the possible solution 12x+9y=5*
5. *K=1 or k= -1*

3 Mark Question

1. Solve graphically: $2x - 3y + 13 = 0$; $3x - 2y + 12 = 0$
2. Find the value of k for which the following pair of equations has no solution :
   $x + 2y = 3$, $(k-1)x+(k+1)y=(k+2)$
3. Solve $x + y = 5$ and $2x - 3y = 4$ by elimination method and the substitution method.
4. Draw the graph of the following equations:
   $2x - y = 1$, $x + 2y = 13$,Find the solution of the equations from the graph and shade the triangular region formed by the lines and the y -axis.
5. Solve the following pair of linear equations graphically: $x - y = 1$, $2x + y = 8$. Also find the co-ordinates of the points where the lines represented by the above equation intersect y - axis.
6. In Figure, ABCD is a rectangle. Find the values of x and y
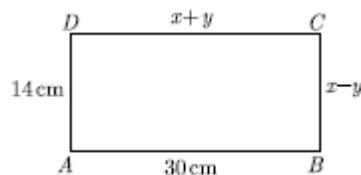
7. In Figure, ABCD is a rectangle. Find the values of x and y
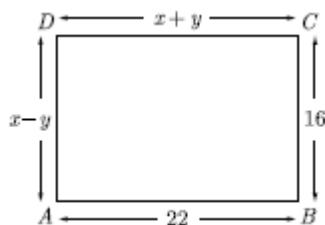
8. Half the perimeter of a rectangular garden, whose length is 4 m more then its width, is 36 m. Find the dimensions of garden.
9. Determine graphically whether the following pair of linear equations :
   $3x - y = 7$
   $2x + 5y + 1 = 0$ has : unique solution infinitely many solutions or no solution.
10. Solve : $99x + 101y = 499$, $101x + 99y = 501$

Answers

1. X= -2 and y=3   2.K=3   3.X=19/5 and y=6/5   4.Draw the graph   5.Draw the graph

6.X=22 and y=8   7.X=19 and y=3   8.Length =20m and width =16m 9.Unique solution 10.X=2 , y=3

5 Mark Question

1. 2 man and 7 boys can do a piece of work in 4 days. It is done by 4 men and 4 boys in 3 days. How long would it take for one man or one boy to do it ?   Ans:15 days

2. A fraction become $\frac{9}{11}$ if 2 is added to both numerator and denominator. If 3 is added to both numerator and denominator it becomes $\frac{5}{6}$. find the fraction. Ans : $\frac{7}{9}$

3. The ratio of incomes of two persons is 11:7 and the ratio of their expenditures is 9:5. If each of them manages to save Rs 400 per month, find their monthly incomes. Ans: 2200 and1400

4. Solve the following pair of equations graphically: 2x + 3y = 12, x − y − 1 = 0. Shade the region between the two lines represented by the above equations and the X -axis.

5. A chemist has one solution which is 50% acid and a second which is 25% acid. How much of each should be mixed to make 10 litre of 40% acid solution. Ans:x=6 ,y=4

Case Based Questions

1. **Read the following text and answer the following questions on the basis of the same:**

   It is common that governments revise travel fares from time to time based on various factors such as inflation (a general increase in prices and fall in the purchasing value of money) on different types of vehicles like auto, Rickshaws, taxis, Radio cab etc. The auto charges in a city comprise of a fixed charge together with the charge for the distance covered. Study the following situations.

Name of the city	Distance travelled (km)	Amount paid (₹)
City A	10	75
	15	110
City B	8	9
	14	145

   SITUATION 1: In a city A, for a journey of 10 km, the charge paid is ₹75 and for a journey of 15 km, the charge paid is ₹110.

   SITUATION 2: In a city B, for a journey of 8 km, the charge paid is ₹91 and for a journey of 14 km, the charge paid is ₹145.

   REFER SITUATION 1
   Q.1 If the fixed charges of auto rickshaw be ₹ x and the running charges be ₹ y km/hr. then write the pair of linear equation representing the situation is ……………………….
   Q.2 A person travels a distance of 50 km. find the amount paid by Him…………………………….

   REFER SITUATION 2
   Q.3 What will a person have to pay for travelling a distance of 30 km?
   Q.4 The graph of lines representing the conditions are …..

2. **Read the following text and answer the following questions on the basis of the same:**
   Place A and B are 100 km apart on a highway. One car starts from A and another form B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour.

Q.1 Assuming that the speed of first car and second car be u km/h and v km/h respectively. What is the relative speed of both cars while they are travelling in the same direction?

Q.2 What is the relative speed of both cars while they are travelling towards each other?

Q.3 What is the actual speed of the car?

Q.4 What is the actual speed of the other car?

3. **Read the following text and answer the following questions on the basis of the same:**

John and Jivanti are playing with the marbles in the playground. They together have 45 marbles and John has 15 marbles more than Jivanti.

Q.1 The number of marbles Jivanti had……………

Q.2 The number of marbles John had………………

Q.3 If 45 is replaced by 55 in the above case discussed in the question, then the number of marbles Jivanti have……………..

Q.4 According to Question 3, the number of marbles John have:

4. **Read the following text and answer the following questions on the basis of the same:**

TOWER OF PISA : To prove that objects of different weights fall at the same rate, Galileo dropped two objects with different weights from the Leaning Tower of Pisa in Italy. The objects hit the ground at the same time. An object dropped off the top of Leaning Tower of Pisa falls vertically with constant acceleration. If s is the distance of the object above the ground (in feet) t seconds after its release, then s and t are related by an equation of the form $s = a + bt^2$ where a and b are constants. Suppose the object is 180 feet above the ground 1 second after its release and 132 feet above the ground 2 seconds after its release.

(i) Find the constants a and b .

(ii) How high is the Leaning Tower of Pisa?

(iii) How long does the object fall?

5. **Read the following text and answer the following questions on the basis of the same:**

Architect : An architect is a skilled professional who plans and designs buildings and generally plays a key role in their construction. Architects are highly trained in the art and science of building design. Since they bear responsibility for the safety of their buildings' occupants, architects must be professionally licensed.

Varsha is a licensed architect and design very innovative house. She has made a house layout for her client which is given below. In the layout, the design and measurements has been made such that area of two bedrooms and kitchen together is 95 sq. m.
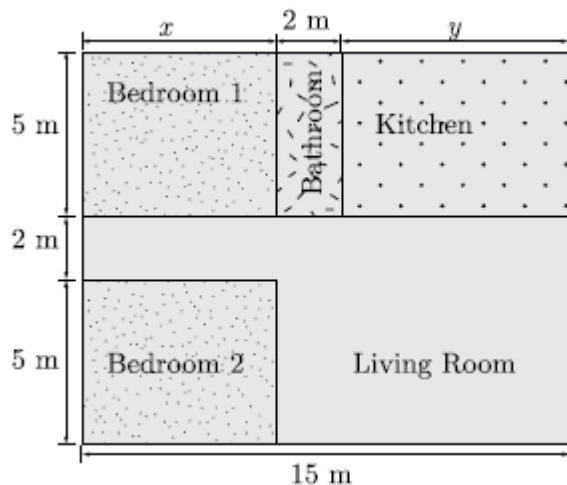
(i)Which pair of linear equations does describe this situation?
(ii) What is the length of the outer boundary of the layout?
(iii) What is the area of bedroom 1 ?
(iv) What is the area of living room in the layout?
 (v) What is the cost of laying tiles in Kitchen at the rate of Rs. 50 per sq.

Answers
Case study 1
i.   *X+10y=75, x+15y=75*
ii.   *Rs. 355*
iii.   *Rs. 289*
iv.   *Draw graph*

Case study 2
i.   *(u-v)km/h*
ii.   *(u+v)km/h*
iii.   *60km/h*
iv.   *40km/h*

Case study 3
i.   *15*
ii.   *30*
iii.   *20*
iv.   *35*

Case study 4
i.   *a=196 , b=-16*
ii.   *196 feet*
iii.   *3.5 sec*

Case study 5
i.   *2x+y=19 and x+y=13*

ii.   54m
iii.   Area of bedroom=30sq.m   Area of kitchen=35sq.m
iv.   75 sq.m
v.   Rs. 1750

Chapter 4 QUADRATIC EQUATION

SECTION-A(VSA)

1. Which one of the following is not a quadratic equation?

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

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

2. Which of the following equations has 2 as a root?

(A) $x^2 - 4x + 5 = 0$ (B) $x^2 + 3x - 12 = 0$ (C) $2x^2 - 7x + 6 = 0$ (D) $3x^2 - 6x - 2 = 0$

3. If $\dfrac{1}{2}$ is a root of the quadratic equation $x^2 + kx - \dfrac{5}{4} = 0$, then value of k is

(A) 2   (B) -2   (C) $\dfrac{1}{4}$ (D) $\dfrac{1}{2}$

4.   Which of the following equations has the sum of its roots as 3?

(A) $2x^2 - 3x + 6 = 0$ (B) $-x^2 + 3x - 3 = 0$

(C) $\sqrt{2}x^2 - \dfrac{3}{\sqrt{2}}x + 1 = 0$ (D) $3x^2 - 3x + 3 = 0$

5. Values of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is

(A) 0 only   (B) 4   (C) 8 only   (D) 0, 8

6. Equation of $(x+1)^2 - x^2 = 0$ has number of real roots equal to:

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

7. The roots of $100x^2 - 20x + 1 = 0$ is:

(a) 1/20 and 1/20(b) 1/10 and 1/20(c) 1/10 and 1/10(d) None of the above

8. The sum of two numbers is 27 and product is 182. The numbers are:

(a) 12 and 13(b) 13 and 14(c) 12 and 15(d) 13 and 24

9. If ½ is a root of the quadratic equation $x^2 - mx - 5/4 = 0$, then value of m is:

(a) 2   (b) -2   (c) -3   (d) 3

10. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, the other two sides of the triangle are equal to:

(a) Base=10cm and Altitude=5cm   (b) Base=12cm and Altitude=5cm

(c) Base=14cm and Altitude=10cm   (d) Base=12cm and Altitude=10cm

11. The roots of quadratic equation $2x^2 + x + 4 = 0$ are:

(a) Positive and negative(b) Both Positive(c) Both Negative(d) No real roots

12. The sum of the reciprocals of Rehman's ages 3 years ago and 5 years from now is 1/3. The present age of Rehman is:

(a) 7   (b) 10   (c) 5   (d) 6

13. If one root of equation $4x^2-2x+k-4=0$ is reciprocal of the other. The value of k is:

(a) -8(b) 8(c) -4(d) 4

14. Which of the following equations has 2 as a root?

(a) $x^2 - 4x + 5 = 0$ (b) $x^2 + 3x - 12 = 0$(c) $2x^2 - 7x + 6 = 0$ (d) $3x^2 - 6x - 2 = 0$

15. The quadratic formula to find the roots of a quadratic equation $ax^2 + bx + c = 0$ is given by

(a) $[-b \pm \surd(b^2-ac)]/2a$(b) $[-b \pm \surd(b^2-2ac)]/a$(c) $[-b \pm \surd(b^2-4ac)]/4a$(d) $[-b \pm \surd(b^2-4ac)]/2a$

ASSERTION AND REASON

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.

16. Assertion: If one root of the quadratic equation $6x^2 - x - k = 0$ is 2/3, then the value of k is 2.
Reason: The quadratic equation $ax^2 + bx + c = 0$, a ≠ 0 has almost two roots.
17.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 ≠ 0, where a, b, c ∈ R is called a quadratic equation.
18. Assertion: The roots of the quadratic equation $x^2 + 2x + 2 = 0$ are imaginary
Reason: If discriminant $D = b^2 - 4ac < 0$ then the roots of quadratic equation $ax^2 + bx + c = 0$ are imaginary.
19. Assertion: $3x^2 - 6x + 3 = 0$ has repeated roots.
Reason: The quadratic equation $ax^2 + bx + c = 0$ have repeated roots if discriminant D>0

SA TYPE – I (2 MARKS)

1. Represent the following situation in the form of quadratic equation: The product of two consecutive positive integers is 306. We need to find the integers.

2. Find the roots of the quadratic equation: $6x^2 - x - 2 = 0$.

3. Find the nature of the roots of the quadratic equation $2x^2 - 3x + 5 = 0$.

4.Solve: $6x^2 + 40 = 31x$.

5. If the discriminant of the equation $6x^2 - bx + 2 = 0$ is 1, then find the value of b.

6. Find the values of k for each of the quadratic equation $kx(x - 2) + 6 = 0$, so that they have two equal roots.

7. Represent the situation in the form of Quadratic equation:
   "The product of Rohan's age (in years) 5 years ago with his age 9 years later is 15

8. The product of two consecutive odd numbers is 483. Find the numbers.

9. Solve: $x - \dfrac{1}{x} = 3$ $(x \neq 0)$

10. Find the sum and product of the roots of the quadratic equation $2x^2 + 7x - 4 = 0$

SA TYPE – I (3 MARKS)

1. The total cost of a certain length of a piece of wire is ₹200. If the piece was 5 metres longer and each metre of wire costs ₹2 less, the cost of the piece would have remained unchanged. How long is the piece and what is its original rate per metre?

2. If the quadratic equation $(1 + m^2) x^2 + 2mcx + c^2 - a^2 = 0$ has equal roots, prove that
   $c^2 = a^2(1 + m^2)$.

3. If a and b are real and a ≠ b then show that the roots of the equation

   $(a - b) x^2 + 5(a + b) x - 2(a - b) = 0$ are real and unequal.

4. Find the roots of quadratic equation $16x^2 - 24x - 1 = 0$ by using the quadratic formula.

5. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

6. Using quadratic formula, solve for x: $abx^2 + (b^2 - ac) x - bc = 0$.

7. Solve the equation:

$$\left| \frac{1}{(x+4)} - \frac{1}{(x-7)} = \frac{11}{30}, \text{ x} \neq -4, 7 \right.$$

8. Solve for x: $\sqrt{2x + 9} + x = 13$

9. Solve the equation: $x^2 - 2ax - (4b^2 - a^2) = 0$

10. In a class test, the sum of Shefali's marks in Mathematics and English is 30. Had she got 2 marks more in Mathematics and 3 marks less in English, the product of their marks would have been 210. Find her marks in the two subjects.

LA TYPE – I (5 MARKS)

1. A train travels at a certain average speed for a distance of 63 km and then travels a distance of 72 km at an average speed of 6 km/h more than its original speed. If it takes 3 hours to complete the total journey, what is its original average speed?

2. A rectangular park is to be designed whose breadth is 3 m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the rectangular park and of altitude 12 m. Find its length and breadth.

3. If the roots of the equation $(a^2 + b^2)x^2 - 2(ac + bd) x + (c^2 + d^2) = 0$ are equal, prove that

a/b=c/d

4. A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

5. Solve for x: 1/(x-1) (x-2) +1/(x-2) (x-3) +1/(x-3) (x-4) =1/6

CASE STUDY BASED QUESTIONS

1. In the picture given below, one can see a rectangular in-ground swimming pool installed by a family in their backyard. There is a concrete sidewalk around the pool of width x m. The outside edges of the sidewalk measure 7 m and 12 m. The area of the pool is 36 sq. m.

(a) Based on the information given above, form a quadratic equation in terms of x.

(b) Find the width of the sidewalk around the pool.

2. The tradition of pottery making in India is very old. In fact, it is older than Indus Valley Civilization. The shaping and baking of clay articles has continued through the ages. The picture of a potter is shown below :

A potter makes a certain number of pottery articles in a day. It was observed on a particular day the cost of production of each article(in RS.) was one more than twice the number of articles produced on that day. The total cost of production on that day was Rs.210

(a) Taking number of articles produced on that day as x, form a quadratic equation in x.

(b) Find the number of articles produced and the cost of each article.

3. Riya has a field with a flowerbed and grass land. The grass land is in the shape of rectangle while flowerbed is in the shape of square. The length of the grassland is found to be 3 m more than twice the length of the flowerbed. Total area of the whole land is 1260m².
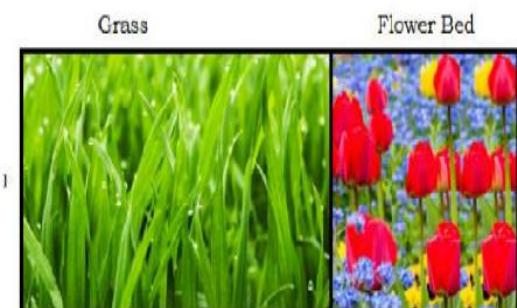
(a)If the length of the square is x m then find the total length of the field i

(b) What will be the perimeter of the whole figure in terms of x?

(c) Find the value of x if the area of total field is 1260 m^2.

(d) Find area of grassland and the flowerbed separately.

4) Jackson throws a ball with a speed of 14 m/s which follows the curve $= -5t^2 + 14t + 3$.where "h" represents

height in meters and time "t" in seconds

(i) What is the height of the ball initially ?

    (a) 12m   (b) 13 m   (c) 3m   (d) - 3 m
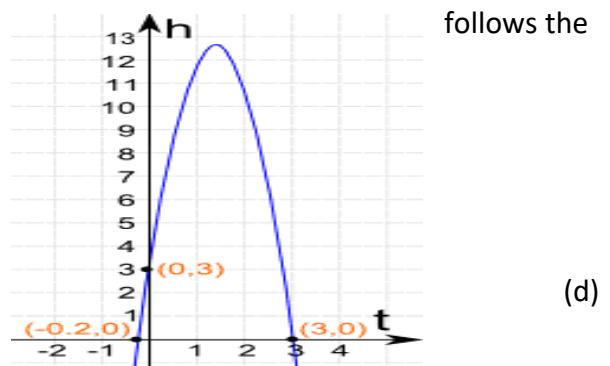
(ii) What is the height of the ball after 3 sec.?

(a) 3m   (b) 12 m   (c) 13 m   (d) 0 m

(iii) Find the possible values of 't' when the ball touches the ground.

(iv) Find the maximum height attained by the ball.

5) The angry Arjun carried some arrows for fighting with Bheeshm. With thehalf of the arrows, he cut down the arrows thrown by Bheeshm on him and with six other arrows, he killed the charioteer of Bheeshm.With one arrow each, he knocked down respectively the chariot, flag and the bow of Bheeshma. Finally, with one more than four times the square root of arrows, he laid Bheeshmunconscious on an arrow bed.

(a) If Arjun had x arrows then by how many arrows he cut down arrows thrown by Bheeshm?

(b) If Arjun had x arrows then by how many arrows he laid Bheeshm unconscious on arrow bed?

(c) Find the total number of arrows Arjun had.

ANSWERS

SECTION-A
1.(c) 2. (c) 3. (b) 4. (b) 5. (d) 6. (a) 7. (c) 8.   (b) 9. (b) 10. (b) 11. (d) 12. (a) 13. (b) 14. (c) 15. (c)

(16) (b) 17. (a) (18) (a) (19) (c)

SECTION-B

(1) $x^2 + x - 306 = 0$, where x is the smaller integer.

(2) -1/2 and 2/3

 (3) no real roots

(4) 8/3 and 5/2

(5) 7, -7

(6) K=6

(7) 6 yrs.

(8) 21,23

(9) x = $(\dfrac{3-\sqrt{13}}{2}, \dfrac{3+\sqrt{13}}{2})$

(10) 7/2, -2

SECTION-C

(1). ₹ 10 per m.

 (2)   x =$\dfrac{3+\sqrt{10}}{4}, \dfrac{3-\sqrt{10}}{4}$

(3) 40 km/h.

 (4) c/a,-b/a

(5)1,2

(6) X= 20 , 8   but x=20 does not satisfy the equation.(34) x= a+2b, a-2b

(7) Marks in mathematics = 12, marks in English = 18; or, Marks in mathematics = 13, marks in English = 17

(8) 42 km/h.

(9) Length = 7m and breadth = 4m.

(10) 5 km/h. (40) -2,7

ANSWERS (Case Study)

1. (a) $2x^2-19x+24=0$ (ii) 3/2 metre

2. (a) $2x^2+x-210=0$ (b) N0. Of articles=10 and cost of each articles =Rs.21

3, (a) (3x+3) m (b) (8x+3) m   (c) 20m (d) 860m^2

4. (i) 3 m (ii) 0m (iii) t=-0.2 0r t=3   (iv) 12.5m to 12.8 m

5. (a) x/2 arrows   (b) 4 $\sqrt{x}$ +1 (c) x=100

Chapter 5 AIRTHMETIC PROGRESSION

An Arithmetic Progression is a sequence of numbers in which we get each term by adding a particular number to the previous term, except the first term. Example AP 2,4,6,8,10……. A first term is 2 common difference = 4-2 =2

- Each number in the sequence is known as term.
- The fixed number i.e. the difference between each term with its preceding term is known as common difference. It can be positive, negative or zero. It is represented as 'd'.

General form of Arithmetic Progression :- a ,a+d a+2d, a+3d ……a+nd

Where the first term is 'a' and the common

difference is 'd'. Finite or Infinite Arithmetic

Progressions

1. Finite Arithmetic Progression

If there are only a limited number of terms in the sequence, then it is known as finite Arithmetic Progression.

$$229, 329, 429, 529, 629$$

2. Infinite Arithmetic Progression

If there are an infinite number of terms in the sequence, then it is known as infinite Arithmetic Progression.

$$2, 4, 6, 8, 10, 12, 14, 16, 18……..$$

The nth term of an Arithmetic Progression

If a_n is the nth term, a_1 is the first term, n is the number of terms in the sequence and d is a common difference then the nth term of an Arithmetic Progression will be

$$a_n = a_1 + (n - 1)d$$

| n^{th} term in the sequence | 1st term in the sequence | number of terms in the sequence | common difference |
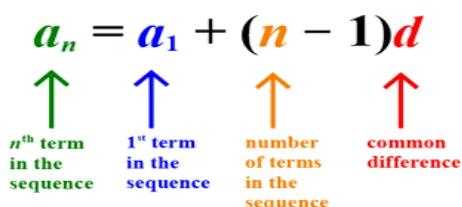
Arithmetic Series

The arithmetic series is the sum of all the terms of the arithmetic

sequence. The arithmetic series is in the form of

{a + (a + d) + (a + 2d) + (a + 3d) +...........}

Let there be an A.P with first term 'a' and common difference d. if there are m terms in the AP, then nth term from the end = $(m-n+1)^{th}$

term from the beginning =a+(m−n)d

Also, nth term from the end = Last term + (n−1)(−d)

= L−(n−1)d, where Ldenotes the last term.

The sum to n terms of an A.P with first term 'a' and common difference 'd' is given by

S_n= n/2{2a + (n-1)d}

S_n = n/2{a_n +a}

MCQ

1. Find 15th terms of an AP 15, 10 ,5, 0 -5 -------------

    (a) -55   (b) -60   (c) -65   (d) none of these

2. If 18 , a, b, -3 are in AP , then find $a +$ b

    (a) 15   (b) 10   (c) 25   (d) - 15

3. If the nth term of an AP is $(2n + 1)$then find the sum of its first three terms.

    (a) 15   (b) 10   (c) 25   (d) - 15

4. If the common difference of an A.P. is 3, then find $a_{20} - a_{15}$

    (a) 15   (b) 13   (c) 25   (d) 35

5. If 7th term of an AP is 34 and 13th term is 64 then 18th term is

    (a) 89   (b) 87   (c) 90   (d) 88

6. The next term of an AP √7 , √28 , √63 , ………..

    (a) √84   (b) √70   (c) √97   (d) √112

7. If an A.P. if a= 4 n= 7 , d= 4 then a$_n$ is

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

8. What is common difference of an AP . in which a$_{18 – }$a$_{14}$ = 32

    (a) 8   (b) -8   (c) -4   (d) 4

9. The sum of first 20 even natural number is

    (a) 420   (b) 100   (c) 220   (d) 400

10. In an A.P. if a = -7.2 d=3.6 a$_n$ = 7.2 then n is

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

11. Write next terms of an AP $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32}$ ….

    (a) √40   (b) √50   (c) √64   (d) √112

12. How many natural numbers are there between 200 and 500, which are divisible by 7?

(a) 42 (b) 43 (c) 63 (d) 53

13. The common difference of an AP is 8. Find the difference of its 20th and 15th term

(a) 42 (b) 40 (c) 63 (d) 53

14. The sum of first five multiple of 3 is

(a) 35 (b) 45 (c) 63 (d) 53

15. The sum first n odd natural number is

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

16 The 21st term of an AP . whose first two terms are – 3 and 4 is

(a) 17 (b) 143 (c) 137 (d) 153

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

(a) 117 (b) 143 (c) 128 (d) 158

18. The 4th term from the end of an AP , -11 , -8 , -5 , ……..49

(a) 17 (b) 25 (c) 40 (d) - 40

19. For the A.P. 3/2 , 1/2 , -1/2 , -3/2 write common difference

(a) 1 (b) 14 (c) -1 (d) 3/2

20. If 6/5, a , 4 are in AP then value of a is

(a) 13/3 (b) 13/6 (c) 13/5 (d) 13/7

Answer key :- 1.(a) 2.(a) 3.(a)4.(a)5.(a)6.(a)7.(a)8.(a)9.(a)10.(a)

11.(b)12.(b)13.(b)14.(b)15.(b)16.(c) 17.(c)18.(c)19.(c)20.(c)

Assertion Reasoning Questions Arithmetic Progression

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.

Q.1. Assertion : Let the positive numbers a, b, c be in A.P., then 1/bc, 1/ac, 1/ab are also in A.P.
Reason : If each term of an A.P. is divided by abc, then the resulting sequence is also in A.P.

Ans(a)

Q2. Assertion : If S$_n$ is the sum of the first n terms of an A.P., then its nth term an is given by a$_n$ = S$_n$ − S$_{n-1}$.
Reason : The 10th term of the A.P. 5, 8, 11, 14, ………………. is 35.

Answer: (c)

Q 3. Assertion : The sum of the series with the nth term, $t_n = (9 - 5n)$ is (465), when no. of terms n = 15.
Reason : Given series is in A.P. and sum of n terms of an A.P. is

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

Answer (d)

Q4. Assertion: Sum of fist n terms in an A.P. is given by the formula:

Sn = n/2×[2a+(n−1)d]

Reason: Sum of first 15 terms of 2+5+8——- is 345.

Answer :- (a)

Q5. Assertion: The constant difference between any two terms of an AP is commonly known as common difference

Reason: the common difference of 2,4,6,8 this A.P. sequence is 2

Answer :- (a)

Q.6. Assertion: If numbers a,b,c are in A.P then b-a=c-b

reason: given three numbers are in AP, then the common difference will be same.

Answer (a)

Q 7. Assertion: the value of n, if a = 10, d = 5, an = 95.

Reason: the formula of general term an is an= a+(n-1)d.

Answer (a)

Q8. Assertion: The 11 th term of an AP is 7,9,11,13_____is 67

Reason: if S_n is the sum of first n terms of an AP then its nth term an is given by $a_n = S_n + S_n - 1$

Answer :-(d)

Q9. Assertion: arithmetic mean between 5 and 90 is 47.5

Reason: arithmetic mean between two given number a,b is (a+b)/2

Answer:- (a)

Q10. Assertion: Sum of natural number from 1 to 100 is 5050

 reason: Sum of n natural number is n(n+1)/2

Answer (a)

SA TYPE questions(2 MARKS)

1.Write first four terms of the AP when first term is -2 and common difference is 0 Ans -2.-2,-2,-2

2. How many two digit numbers are divisible by 3? Ans 30

3. In a flower bed there are 23 rose plants in the first row 21 in the second 19 in the third and so on. There are 5 rose plants in the last row. How many rows are there in the flower bed ? Ans n = 10

4. Subba Rao stared work in 1995 at an annual salary of Rs 5000 and received an increament of Rs 200 each year . in Which year did his income reach Rs. 7000. Ans:- 11th years

5 Which terms of an AP : 3,8,13,18,….is 78 Ans:- 16th term

6. If 9th term of an AP is zero, prove that its 29th term is double the 19th term.   Ans:-

7. If $a_n = 9 - 5n$ find sum of 15th terms of an AP   Ans:- - 66

8.The taxi fare after each km when the fare is Rs 15 for the first km and Rs 8 each additional   km find fare after 4 km.   Ans :- 39

9. A man saves Rs. 10 on the first day of the month Rs 20 on the second day Rs. 30 on the third day and so on What will be saving in 30 days   Ans :- Rs 4500

10. Find the number of all two-digit natural numbers which are divisible by 6. Ans: 15

SA TYPE- II 3marks questions

1. Which term of the AP: 23, 21, 19,…..is first negative term? Also, find this term.Ans: 13th , -1

2. How many natural numbers are there between 200 and 500, which are divisible by 7?Ans: 43

3. Ragav buys a shop for Rs. 120000. He pays the amount in case and agree to pay the balance in 12 annual installment of Rs. 5000 each if the rate of interest is 12 % and he pays with the installment the interest due on the unpaid amount . find the total cost of shop. Ans Rs. 166800.

4. A thief after committing a theft runs a uniform speed of 50m/minute. After 2 minute, a policeman runs to catch him. He goes 60m in first minute and increases his speed by 5m/minute   every succeeding minute. After how many minutes, the police will catch the thief.   Ans:- 7 minutes

5. The sum of the first seven terms of an AP is 182. If its 4th and the 17th terms are in the ratio 1: 5, find the AP.   Ans:2,10,18,...

6. A man is in the habit of drinking daily. Amounts spent on drinking are as follows:
   Rs. 25, Rs. 40, Rs 55, Rs 70 . . . in successive days.What will be total amount spent by   him in 30 successive days? Write any two disadvantages of drinking.Ans: Rs.7275

7. The sum of first m terms of an AP is $4m^2 - m$. If its nth term is 107, find the value of n. Also find the 21st term of this of this AP.   Ans: n =14 , 163

8. If k, 2k−1 and 2k+1 are three consecutive terms of an A. P. , then find the value of k.   Ans: 3

9. In an AP, the sum of its first ten terms is −80 and the sum its next ten terms is −280.Find the AP.Ans: 1, −1, −3, −5, …

10. Three numbers are in AP. If the sum of these numbers be 27 and the product 648, find the numbers.
                                          Ans: 6, 9, 12 or 12,9,6

11. The pih, 9th and rth terms of an A.P. are   a, b and c respectively. Show that a(q − r) + b(r-p) + c(p − q) = 0

12. Find the number of three-digit natural numbers which are divisible by 11.
       Ans :- 81

13. The 5th term of an AP exceeds its 12th term by 14. If its 7th term is 4, find the AP.
       Ans:- 16, 14, 12, 10……

15. Determine the AP whose5th term is 19 and the difference of the 8th term from the 13th term

is 20.   (Ans. 3,7,11,15)

Long Answer type questions
 1.200 logs are stacked in following manner . 20 logs in the bottom row , 19 in the next row 18 in the row next to it and so on . how many rows are the 200 logs placed and how many logs are in the top row ? Ans:-total rows 16 and 5 logs placed in top row

2.Ramkali saves Rs 5 in the first week, of a year and increased her weekly savings by Rs 1.75. If in the nth week her weekly savings became Rs 20.75, find n.   (Ans. 10)

3.The digits of a positive number of three digits are in A.P. and their sum is 15. The number obtained by reversing the digits is 594 less than the original number. Find the number.   (Ans. 852)

4.In a school, students decided to plant trees in and around the school to reduce air pollution. It was decided that the number of trees, that each section of each class will plant, will be double of the class in which they are studying. If there are 1 to 12 classes in the school and each class has two sections, find how many trees were planted by the students.   (Ans.312

5.If the sum of the first n terms of an AP is $4n - n^2$, what is the first term (that is S_1)? What is the sum of first two terms? What is the second term? Similarly find the 3rd, the 10th and the nth terms.

              (Ans. The second term is 1, The 3rd, 10th, and nth terms are −1, −15, and 5 − 2n respectively
6.A sum of Rs 1600 is to be used to give ten cash prizes to students of a school for their overall academic performance. If each prize is Rs 20 less than its preceding prize, find the value of each of the prizes.
                              (Ans. 250,230,210,190,170,150,130,110,90,70)

7.A thief, after committing a theft, runs at a uniform speed of 50 m/minute. After 2 minutes, a policeman runs to catch him. He goes 60 m in first minute and increases his speed by 5 m/minute every succeeding minute. After how many minutes, the policeman will catch the thief? Ans :- police man catch the thief after 5 minutes

8.Reshma wanted to save at least ? 6,500 for sending her daughter to school next year (after 12 months). She saved Rs 450 in the first month and raised her savings by ? 20 every next month. How much will she be able to save in next 12 months? Will she be able to send her daughter to the school next year? Ans :- Rs 6720

9.The sum of the third and seventh terms of an A.P. is 40 and the sum of its sixth and 14th terms is 70. Find the sum of the first ten terms of the A.P.   Ans :-215

10. If sum of first n terms of an AP is $4n - n^2$ What is the first term What is the sum first two terms ?

Find 10th term , 3rd term and nth term .   Ans S1 = 3 S2 = 4 $a_{10} = -15$ $a_3 = -1$ and n^{th} term =5-2n

CASE STUDY QUESTIONS (4 marks)

1. India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year.

1. Find the production during first year.

2. Find the production during 8th year.

3. Find the production during first 3 years.

4. In which year, the production is Rs 29,200.

Answer :- 1. Rs 5000

2. Production during 8th year is (a+7d) = 5000 + 2(2200) = 20400

3. Production during first 3 year = 5000 + 7200 + 9400 = 21600

4.   N = 12 5.

    Difference = 18200 - 11600 = 6600

Q,2. Your friend Veer wants to participate in a 200m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less. He wants to do in 31 seconds.
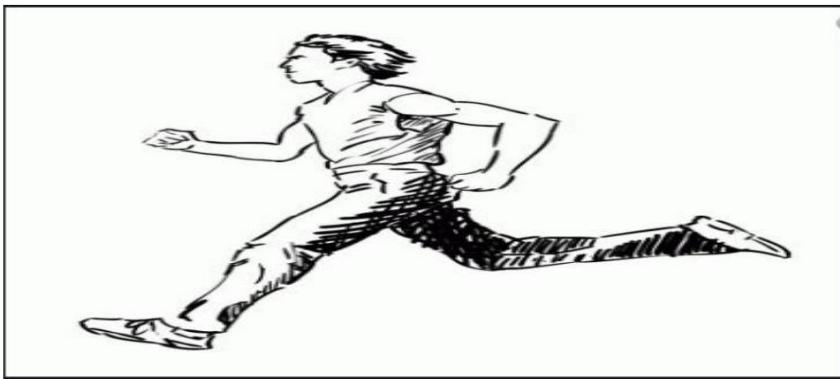
1. Write first four terms are in AP for the given situation.   Ans:- 51,49, 47, 45.....

2. What is the minimum number of days he needs to practice till his goal is achieved. Ans:- 11

3. How many second takes after 5th days . Answer :- 43 seconds

Q. 3. Your elder brother wants to buy a car and plans to take loan from a bank for his car. He repays his total loan of Rs 1,18,000 by paying every month starting with the first instalment of Rs 1000. If he increases the instalment by Rs 100 every month , answer the following:

1   Find the amount paid by him in 30th installment . Ans:- 3900

2   Find the amount paid by him in the 30 installments . Ans:- 73500

3   If total instalments are 40 then amount paid in the last installment?   Ans:-490

Q4. Students of a school thought of planting trees in and around the school to reduce air pollution. It was decided that the number of trees, that each section of each class will plant, will be the same as the class, in which they are plant 1 tree, a on till class XII. studying, e.g., a section of class I will section of class II will plant 2 trees and so There are three sections of each class.

Find the total number of trees planted by the students of the school.? Ans:- 324

1. Find total number of trees planted by primary 1 to 5 class students? Ans:- 45

2. Find total number of classes ? Ans :- 12

Q. 5. In a potato race, a bucket is placed at the starting point, which is 5 m from the first potato, and the other potatoes are placed 3 m apart in a straight line. There are ten potatoes in the line

A competitor starts from the bucket, picks up the nearest potato, runs back with it, drops it in the bucket, runs back to pick up the next potato, runs to the bucket to drop it in, and she continues in the same way until all the potatoes are in the bucket. What is the total distance the competitor has to run?

1. Find terms of AP formed in above situation

2. What is the total distance the competitor has to run?

3. Find   distance cover after 4 potato drop In the bucket?

Answer 1.   10, 16 , 22……..   2   Total distance 370   3 . 152 m

Chapter 6 TRIANGLES

MCQs

Q.1   In the given figure, $DE \parallel BC$. The value of EC is
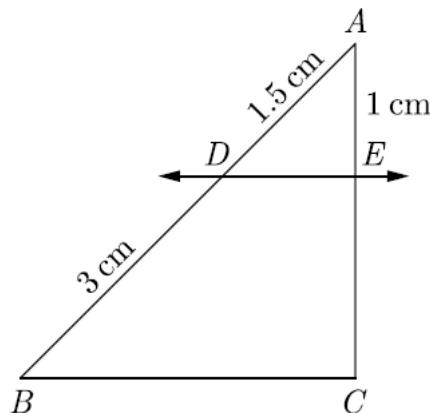
(A) 1.5cm   (B) 3cm   (C) 2cm   (D) 1cm

Q.2   In the given figure, x is
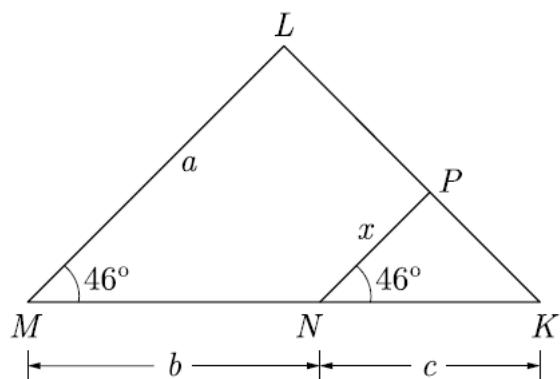
(A) $\dfrac{ab}{a+b}$ (B) $\dfrac{ac}{b+c}$ (C) $\dfrac{bc}{b+c}$ (D) $\dfrac{ac}{a+c}$

Q.3   Two poles of height 6 m and 11 m stand vertically upright on a plane ground. If the length of shadow of smaller pole is 12 m, then length of shadow of bigger pole.
(A) 22 m   (B) 14 m   (C) 13 m   (D) 11 m

Q.4   It is given that, $\Delta ABC \sim \Delta EDF$ such that AB = 5 cm, AC = 7 cm, DF = 15 cm and DE = 12 cm then the sum of the remaining sides of the triangles is
(A) 23.05 cm   (B) 16.8 cm   (C) 6.25 cm   (D) 24 cm

Q.5   The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of the first triangle is 9 cm, then the corresponding side of second triangle is .
(A) 5.4 cm   (B) 6.8 cm   (C) 2.5 cm   (D) 4 cm

Q.6   If $\Delta ABC \sim \Delta EDF$ and ΔABC is not similar to ΔDEF, then which of the following is not true?
(A) $BC \times EF = AC \times FD$ (B) $AB \times EF = AC \times DE$
(C) $BC \times DE = AB \times EF$ (D) $BC \times DE = AB \times FD$

Q.7 D and E are respectively the points on sides AB and AC of triangle ABC such that AB=3cm, BD = 1.5cm, BC = 7.5cm and $DE \parallel BC$. Then length of DE is
(A) 2cm   (B) 2.5 cm   (C) 3.75 cm   (D) 3cm

Q.8 If ΔABC and ΔDEF are similar triangles such that ∠A = 57° and ∠E = 83°.
Find ∠C.
(A) 33°   (B) 30°   (C) 40°   (D) 83°

Q.9 In ΔABC, DE || BC and AD = 4cm, AB = 9cm. AC = 13.5 cm then the value of EC is
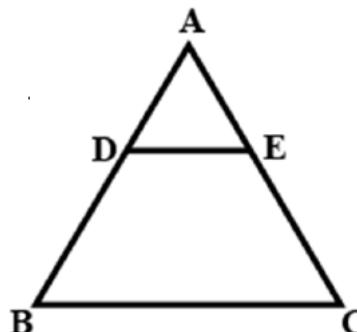
(A) 6 cm   (B) 7.5 cm   (C) 9 cm   (D) none of these

Q.10 D and E are points on the sides AB and AC respectively of a ΔABC such that DE ∥ BC. Find the value of x when AD = x cm, DB = (x − 2) cm, AE = (x + 2) cm and EC = (x − 1) cm.
(A) 2 cm   (B) 3 cm   (C) 4 cm   (D) none of the above

Q.11 In the adjoining figure, ABCD is a trapezium in which CD ∥ AB and its diagonals intersect at O. If AO = (2x + 1) cm, OC = (5x − 7) cm, DO = (7x − 5) cm and OB = (7x + 1) cm, find the value of x.
(A) 2 cm   (B) 3 cm   (C) 4 cm   (D) none of the above

Q.12 ΔABC is such that AB = 3 cm, BC = 2 cm and CA = 2.5 cm. If ΔDEF ∼ ΔABC and FE = 4 cm, then find the perimeter of ΔDEF.
(A) 12 cm   (B) 13 cm   (C) 14 cm   (D) 15 cm

Q.13 A street light bulb is fixed on a pole 6 m above the level of the street. If a woman of height 1.5 m casts a shadow of 3 m, find how far she is away from the base of the pole.
(A) 12 m   (B) 10 m   (C) 9 m   (D) 11 m

Q.14 A 15 metres high tower casts a shadow 24 meters long at a certain time and at the same time, a telephone pole casts a shadow 16 meters long. Find the height of the telephone pole.
(A) 12 m   (B) 10 m   (C) 9 m   (D) 11 m

Q.15 ABCD is a trapezium in which $AB \parallel DC$ and P and Q are points on AD and BC, respectively such that $PQ \parallel DC$. If PD = 18 cm, BQ = 35 cm and QC = 15 cm, find AD.
(A) 20 cm   (B) 40 cm   (C) 60 cm   (D) 80 cm

Q.16 If ΔABC ∼ ΔDEF, AB = 4 cm, DE = 6 cm. EF = 9 cm and FD =12 cm, find the perimeter of ΔABC.
(A) 12 cm   (B) 14 cm   (C) 16 cm   (D) 18 cm

Q.17 In the given figure, if ∠ADE = ∠B, AD = 3.8 cm, AE = 3.6 cm, BE = 2.1 cm and BC = 4.2 cm, find DE.
(A) 2 cm   (B) 2.5 cm   (C) 2.8 cm   (D) 3 cm

Q.18 The perimeters of two similar triangles ABC and PQR are 32 cm and 24 cm respectively. If PQ = 12 cm. find AB.
(A) 12 cm   (B) 14 cm   (C) 16 cm   (D) 18 cm

Q.19 In the given figure, ∠CAB = 90°, AD ⊥ BC, AC = 75 cm, AB = 1 m and BC = 1.25 m, find AD.
(A) 20 cm   (B) 40 cm   (C) 60 cm   (D) 80 cm

Q.20 A vertical stick of length 7.5 m casts a shadow 5 m long on the ground and at the same time a tower casts a shadow 24 m long. Find the height of the tower.
(A) 20 m   (B) 40 m   (C) 60 m   (D) none of these

Q.1 **A: Assertion**: A line drawn parallel to any one side of a triangle intersects the other two sides proportionally.

R: Reason: Parallel lines cannot be drawn to any one side of a triangle.

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

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

(c) A is true but R is false.

(d) A is false but R is true.

Q.2   E and F are the points on the sides PQ and PR respectively of a triangle PQR. PE = 4 cm, QE = 4.5 cm, PF = 8 cm and RF = 9 cm.

A: Assertion: EF is not parallel to QR

R: Reason: In a triangle if two sides are divided proportionally by a line then the line is parallel to the third side.

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

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

(c) A is true but R is false.

(d) A is false but R is true.

Q.3   **A: Assertion**: If two angles of any triangle are equal to the corresponding two angles of another triangle then the third angles are not necessarily equal.

R: Reason: The sum of three angles of any triangle is equal to 180°

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

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

(c) A is true but R is false.

(d) A is false but R is true.

Q.4   **A: Assertion**: If any two sides of a triangle are proportional to corresponding two sides of another triangle and the included angles are equal then the triangles are similar by SAS similarity criterion.

R: Reason: If the equal angles are not included between the proportional sides, then SAS criterion will be void.

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

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

(c) A is true but R is false.

(d) A is false but R is true.

SA TYPE – I (2 Marks)

Q.1   In Figure, $DE \parallel BC$. Find the length of side AD, given that AE = 1.8 cm, BD = 7.2 cm and CE = 5.4 cm.
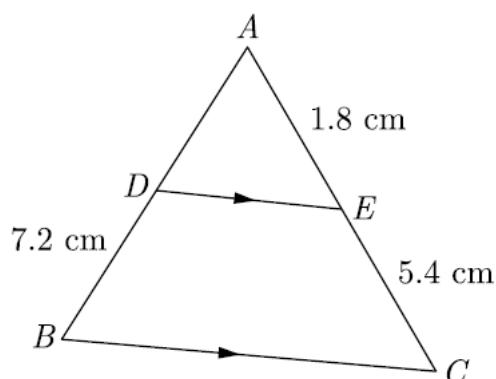
Q.2   In the given figure, $DE \parallel BC$. What is the value of EC?
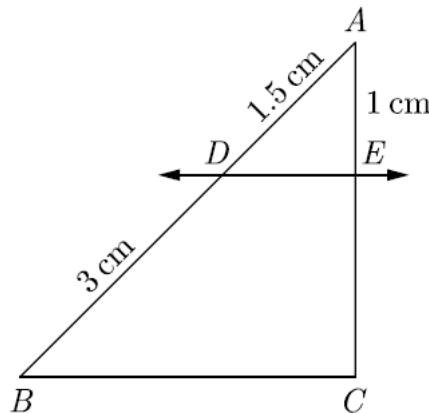
Q.3 What is the value of x in given figure?
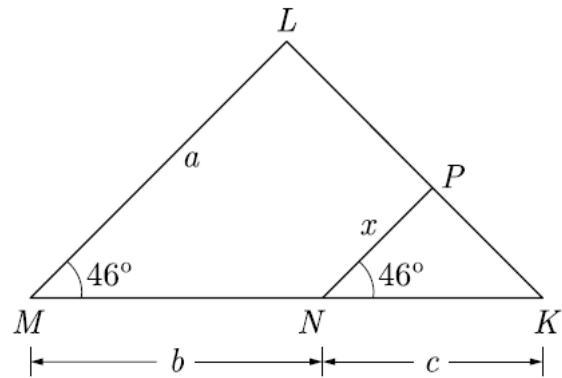
Q.4 Two triangles are similar if their corresponding sides are_____

Q.5 In $\triangle ABC, DE \parallel BC$, find the value of x.
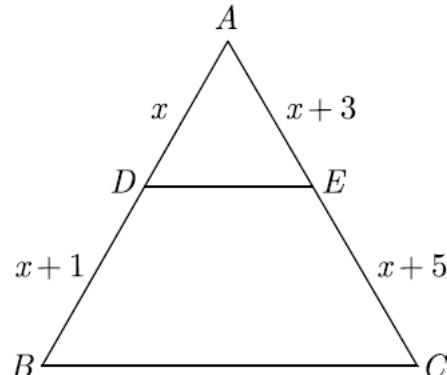
Q.6 In the given figure, if $\angle A = 90^0$, $\angle B = 90^0$, OB = 4.5cm OA = 6 cm and AP = 4 cm then find QB.
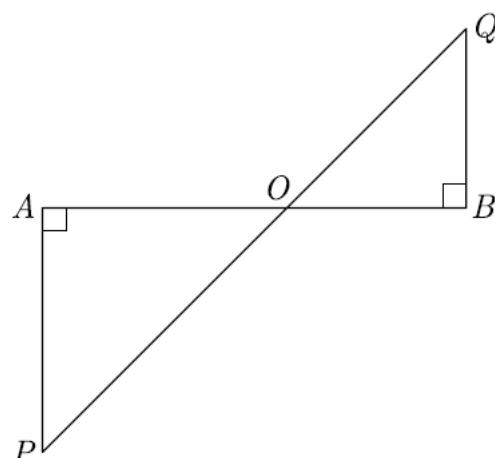
Q.7 In $\triangle ABC$, if X and Y are points on AB and AC respectively such that , $\dfrac{AX}{XB} = \dfrac{3}{4}$
AY = 5 and YC = 9, then state whether XY and BC parallel or not.

Q.8 Are two triangles with equal corresponding sides always similar?

Q.9 If $\Delta ABC \sim \Delta DEF$ such that 2AB = DE and BC = 8 cm then find EF.

Q.10 In the figure, PQ is parallel to MN. If $\frac{KP}{PM} = \frac{4}{13}$ and KN = 20.4 cm then find KQ.
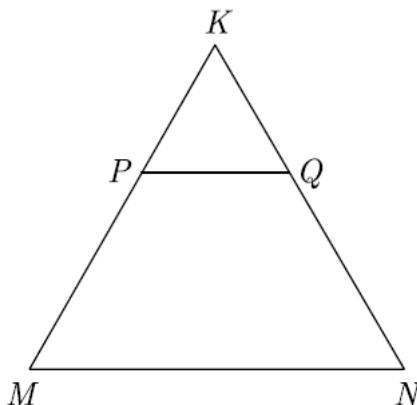
Q.11 If a line intersects sides AB and AC of a ΔABC at D and E respectively and is parallel to BC, prove that $\frac{AD}{AB} = \frac{AE}{AC}$
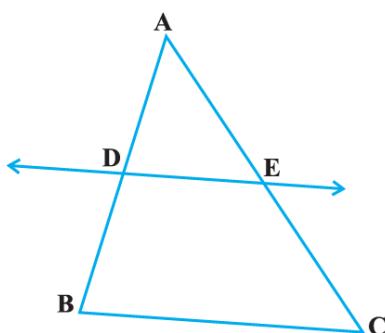
Q.12 If a line intersects sides AB and AC of a ΔABC at D and E respectively and is parallel to BC, prove that $\frac{BD}{AB} = \frac{CE}{AC}$
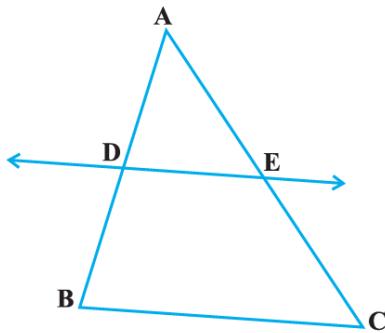
Q.13 In Figure, DE || BC. Find EC.
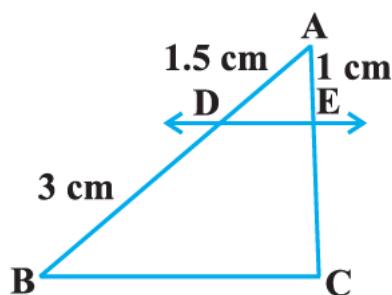
Q.14 In Figure, DE || BC. Find AD.
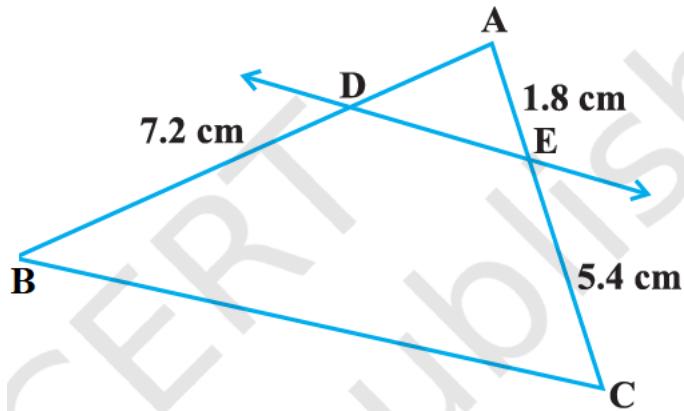
Q.15   E and F are points on the sides PQ and PR respectively of a ΔPQR. If PE = 3.9 cm, EQ = 3 cm, PF = 3.6 cm and FR = 2.4 cm. State whether EF || QR.

Q.16   E and F are points on the sides PQ and PR respectively of a ΔPQR. If PE = 4 cm, QE = 4.5 cm, PF = 8 cm and RF = 9 cm. State whether EF || QR.

Q.17   E and F are points on the sides PQ and PR respectively of a ΔPQR. If PQ = 1.28 cm, PR = 2.56 cm, PE = 0.18 cm and PF = 0.36 cm. State whether EF || QR.

Q.18   In Figure, if $PQ \parallel RS$, prove that $\Delta POQ \sim \Delta SOR$.
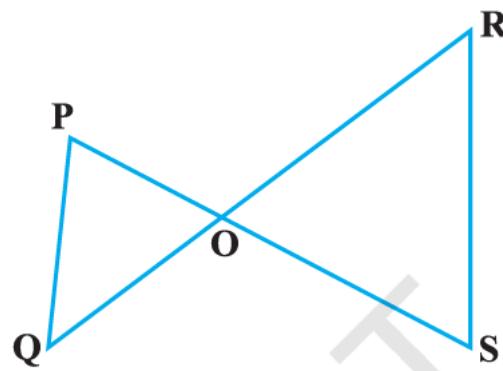
Q.19   Observe Figure and then find $\angle P$.
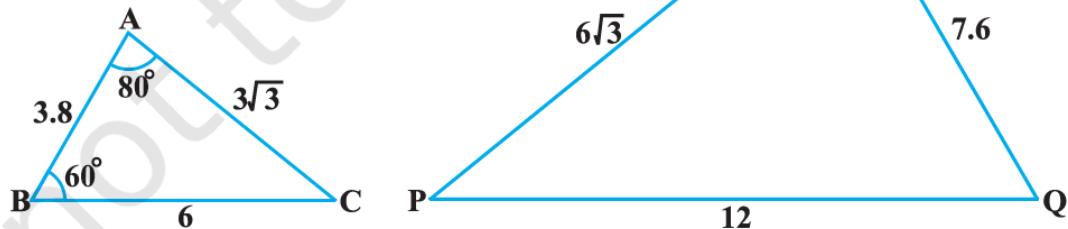
Q.20   Check the similarity of triangles. Write the similarity statement and criterion used.
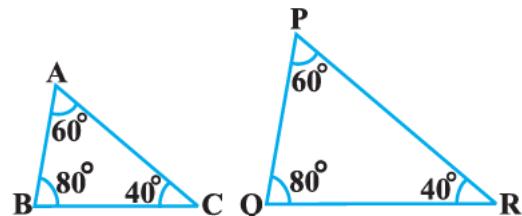
Q.21   Check the similarity of triangles. Write the similarity statement and criterion used.
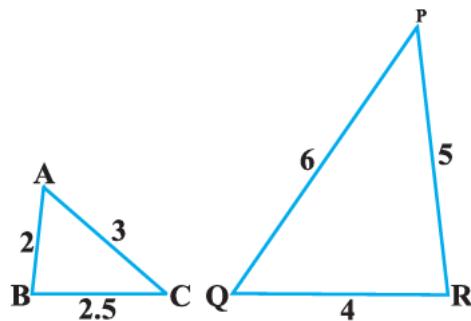
Q.22 Check the similarity of triangles. Write the similarity statement and criterion used.
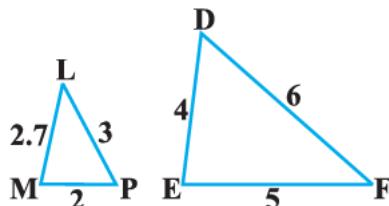
Q.23 Check the similarity of triangles. Write the similarity statement and criterion used.
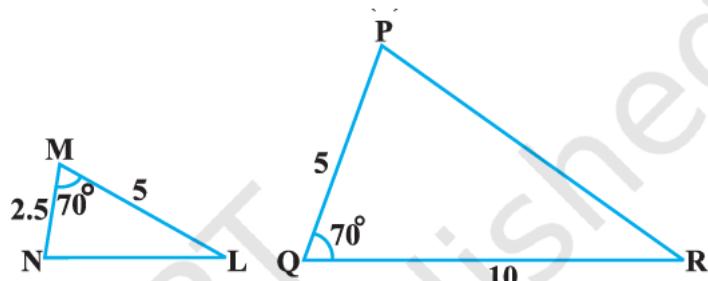
Q.24 Check the similarity of triangles. Write the similarity statement and criterion used.
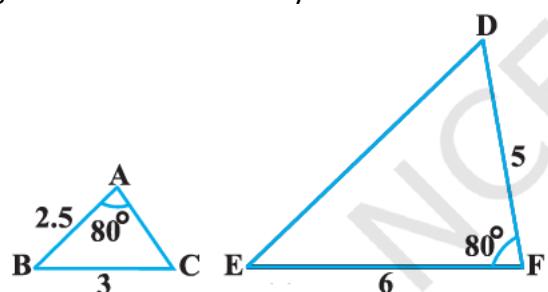
Q.25 Check the similarity of triangles. Write the similarity statement and criterion used.
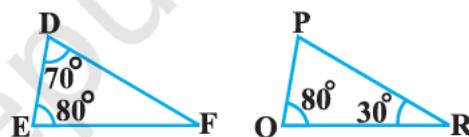
Q.26 In Figure, $\triangle ODC \sim OBA, \angle BOC = 125^0$ and $\angle CDO = 70^0$. Find $\angle DOC, \angle DCO$ and $\angle OAB$.
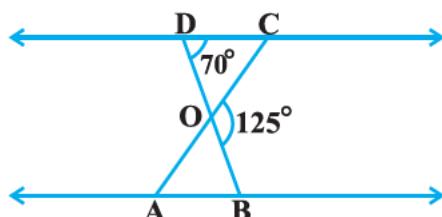
Q.27 Diagonals AC and BD of a trapezium ABCD with $AB \parallel DC$ intersect each other at the point O. Using a similarity criterion for two triangles, show that $\frac{OA}{OC} = \frac{OB}{OD}$.

Q.28 S and T are points on sides PR and QR of $\triangle PQR$ such that $\angle P = \angle RTS$. Show that $\triangle RPQ \sim \triangle RTS$.

Q.29 E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\triangle ABE \sim CFB$.

Q.30 In Figure, E is a point on side CB produced of an isosceles triangle ABC with AB = AC. If $AD \perp BC$ and $EF \perp AC$, prove that $\triangle ABD \sim ECF$.
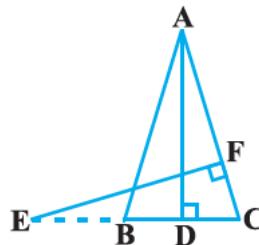
Q.31 In Figure, ABC and AMP are two right triangles, right angled at B and M respectively. Prove that:

(i) $\triangle ABC \sim \triangle AMP$
(ii) $\dfrac{CA}{PA} = \dfrac{BC}{MP}$
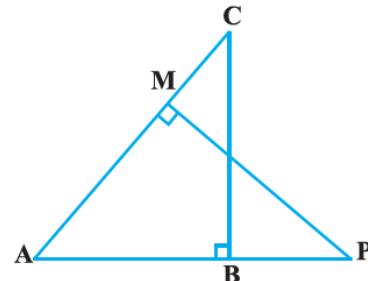
SA TYPE – II (3 Marks)

Q.1 ABCD is a trapezium with $AB \parallel CD$. E and F are points on non-parallel sides AD and BC respectively such that EF is parallel to AB . Show that $\dfrac{AE}{ED} = \dfrac{BF}{CF}$
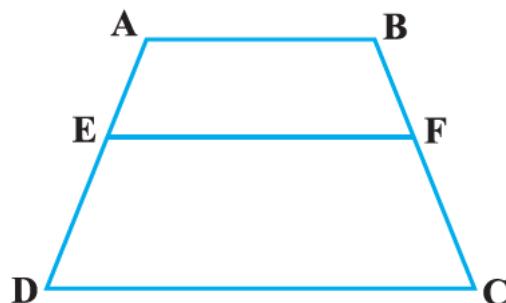
Q.2 In Figure $\dfrac{PS}{SQ} = \dfrac{PT}{TR}$ and $\angle PST = \angle PRQ$. Prove that PQR is an isosceles triangle.
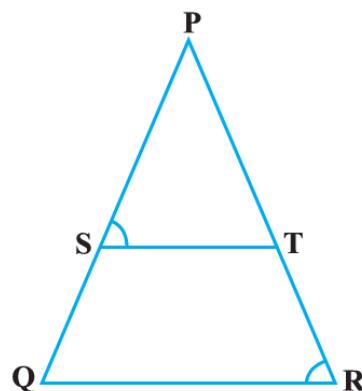
Q.3 In Figure, if $LM \parallel BC$ and $LN \parallel CD$, prove that $\dfrac{AM}{AB} = \dfrac{AN}{AD}$.
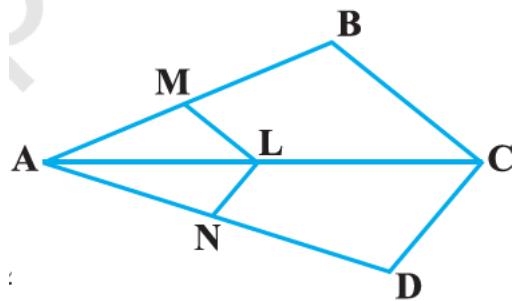
Q.4   In Figure, if $DE \parallel AC$ and $DF \parallel AE$. Prove that $\dfrac{BF}{FE} = \dfrac{BE}{EC}$
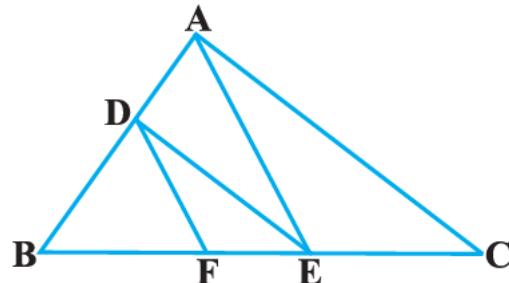
Q.5   In Figure, if $DE \parallel OQ$ and $DF \parallel OR$. Show that $EF \parallel QR$.
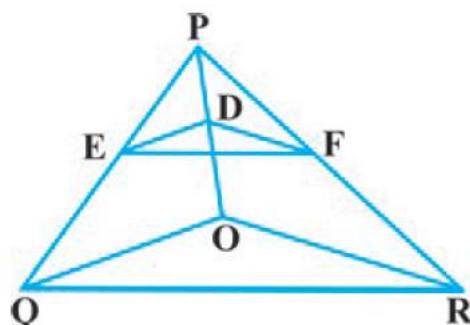
Q.6   In Figure, A, B and C are points on OP, OQ and OR respectively such that $AB \parallel PQ$ and $AC \parallel PR$. Show that $BC \parallel QR$.
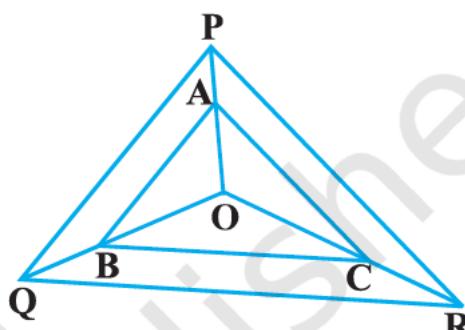

Q.7   In Figure, OA . OB = OC . OD. Show that $\angle A = \angle C \text{ and } \angle B = \angle D$.
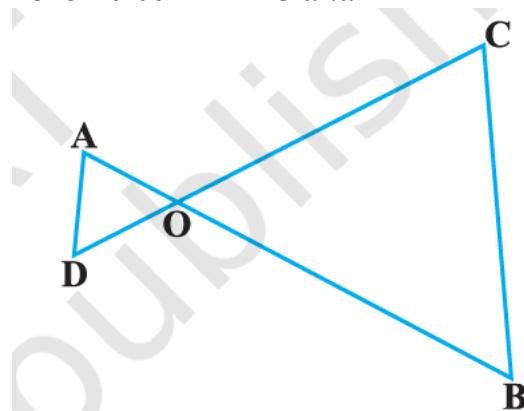
Q.8   In Figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Show that $\Delta PQS \sim \Delta TQR$.
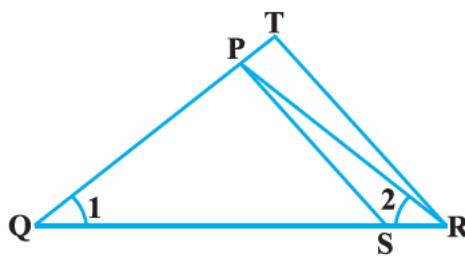
Q.9   In Figure, if $\Delta ABE \cong \Delta ACD$ show that $\Delta ADE \sim \Delta ABC$.
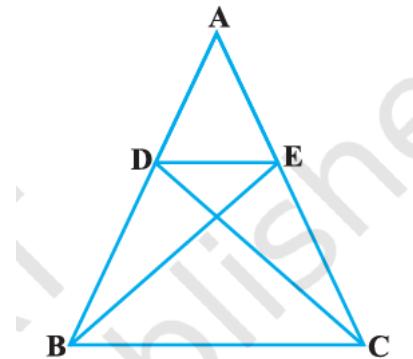
Q.10   CD and GH are respectively the bisectors of $\angle ACB$ and $\angle EGF$ such that D and H lie
       on sides AB and FE of ΔABC and ΔEFG respectively. If $\Delta ABC \sim FEG$, show that:
       (i) $\Delta DCA \sim \Delta HGF$
       (ii) $\frac{CD}{GH} = \frac{AC}{FG}$
       (iii) $\Delta DCB \sim \Delta HGE$

Q.11   Sides AB and BC and median AD of a triangle ABC are respectively proportional
       to sides PQ and QR and median PM of ΔPQR . Show that $\Delta ABC \sim PQR$.
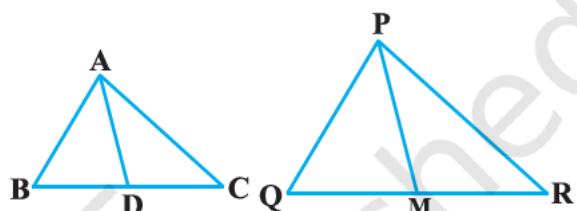
Q.12   D is a point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$. Show that $CA^2 = CB.CD$

LA TYPE (5 Marks)

Q.1   Using Basic Proportionality theorem, prove that a line drawn through the mid-point of one side
       of a triangle parallel to another side bisects the third side.
Q.2   Using Basic Proportionality theorem, prove that the line joining the mid-points of any two sides
       of a triangle is parallel to the third side.
Q.3   ABCD is a trapezium in which $AB \parallel DC$ and its diagonals intersect each other at the point O. Show
       that $\frac{AO}{BO} = \frac{CO}{DO}$
Q.4   The diagonals of a quadrilateral ABCD intersect each other at the point O such that
       $\frac{AO}{BO} = \frac{CO}{DO}$. Show that ABCD is a trapezium.
Q.5   A girl of height 90 cm is walking away from the base of a lamp-post at a speed of 1.2 m/s. If the
       lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.
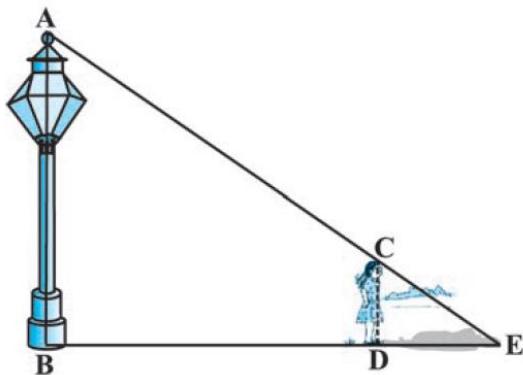
Q.6 In Figure, CM and RN are respectively the medians of ΔABC and ΔPQR. If$\Delta ABC \sim \Delta PQR$, prove that :

(i) $\Delta AMC \sim \Delta PNR$
(ii) $\frac{CM}{RN} = \frac{AB}{PQ}$
(iii) $\Delta CMB \sim \Delta RNQ$
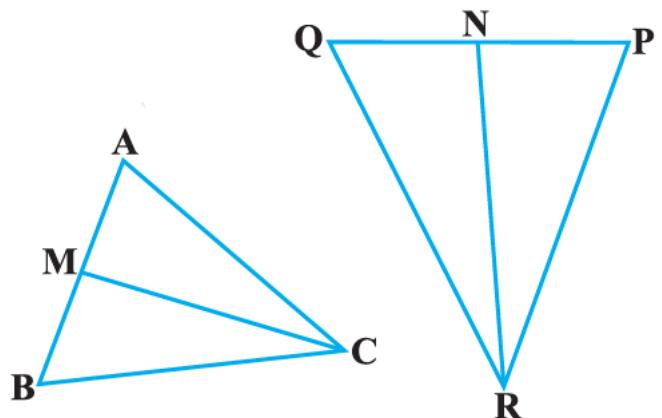
Q.7 In Figure, altitudes AD and CE of ΔABC intersect each other at the point P. Show that:

(i) $\Delta AEP \sim \Delta CDP$
(ii) $\Delta ABD \sim \Delta CBE$
(iii) $\Delta AEP \sim \Delta ADB$
(iv) $\Delta PDC \sim \Delta BEC$
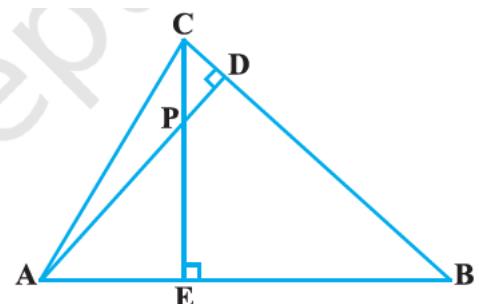
Q.8 A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.

Q.9 Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that $\Delta ABC \sim PQR$.

Q.10 If AD and PM are medians of triangles ABC and PQR, respectively where $\Delta ABC \sim \Delta PQR$, prove that $\frac{AB}{PQ} = \frac{AD}{PM}$

Q.12 Prove that, 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.

Case Study Based Questions

Q.1 Two poles, 30 feet and 50 feet tall, are 40 feet apart and perpendicular to the ground. The poles are supported by wires attached from the top of each pole to the bottom of the other, as in the figure. A coupling is placed at *C* where the two wires cross.
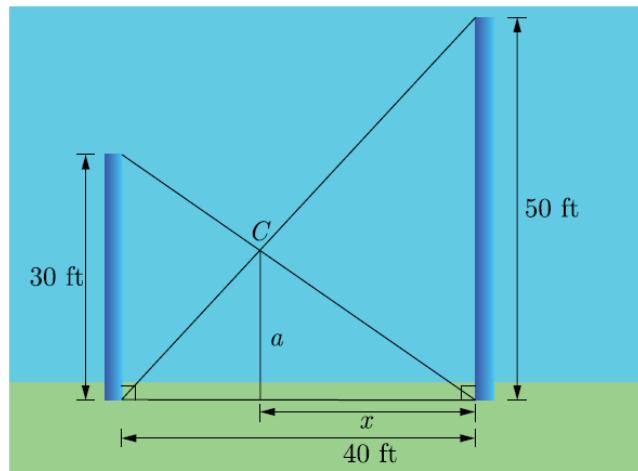
(a) What is the horizontal distance from C to the taller pole?
(b) How high above the ground is the coupling?
(c) How far down the wire from the smaller pole is the coupling ?

Q.2   Aakesh wanted to determine the height of a tree on the corner of his block. He knew that a certain fence by the tree was 4 feet tall. At 3 PM, he measured the shadow of the fence to be 2.5 feet tall. Then he measured the tree's shadow to be 11.3 feet.
(i)What is the height of the tree?
(ii) What will be length of shadow of tree at 12:00 pm
(iii) Write the name triangle formed for this situation.
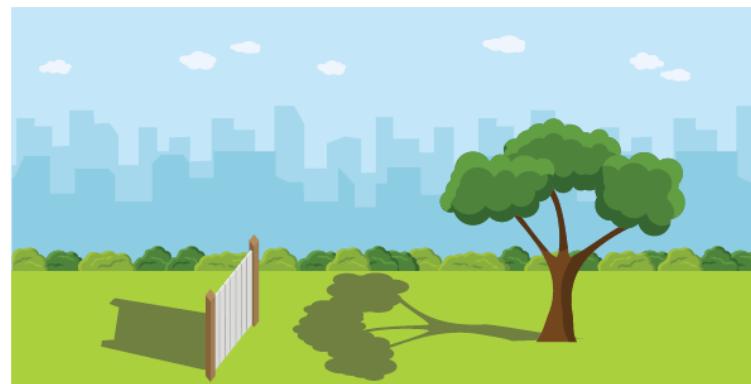
Q.3   **Helicopter Patrolling:** A helicopter is hovering over a crowd of people watching a police standoff in a parking garage across the street. Stewart notices the shadow of the helicopter is lagging approximately 57 m behind a point directly below the helicopter. If he is 160 cm tall and casts a shadow of 38 cm at this time,

(i) what is the altitude of the helicopter?
(ii) What will be length of shadow of Stewart at 12:00 pm
(iii) Write the name of triangles formed for this situation.

Q.4   **Swimmer in Distress :** A lifeguard located 20 metre from the water spots a swimmer in distress. The swimmer is 30 metre from shore and 100 metre east of the lifeguard. Suppose the lifeguard runs and then swims to the swimmer in a direct line, as shown in the figure.
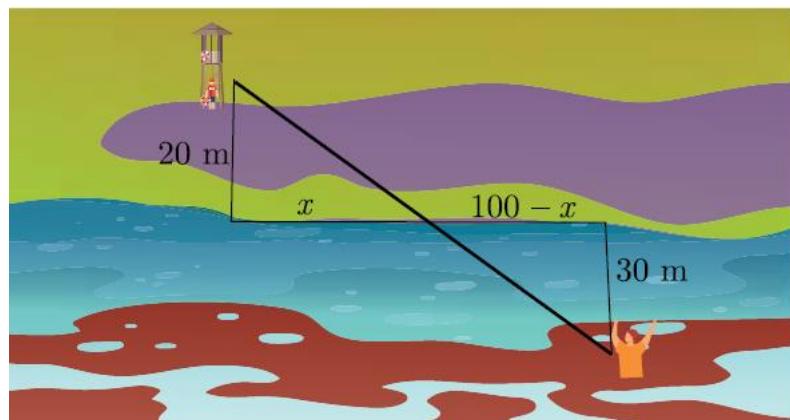

(i) How far east from his original position will he enter the water? (Hint: Find the value of x in the sketch.)
(ii) Which similarity criterion of triangle is used?
(iii) What is the distance of swimmer from the shore?

Q.5   **Statue of a Pineapple:** The Big Pineapple is a heritage-listed tourist attraction at Nambour Connection Road, Woombye, Sunshine Coast Region, Queensland, Australia. It was designed by Peddle Thorp and Harvey, Paul Luff, and Gary Smallcombe and Associates. It is also known as Sunshine Plantation. It was added to the Queensland Heritage Register on 6 March 2009.


Ishita last year visited Nambour and wanted to find the height of a statue of a pineapple. She measured the pineapple's shadow and her own shadow. Her height is 156 cm and casts a shadow of 39 cm. The length of shadow of pineapple is 4 m.
(i)What is the height of the pineapple?
(ii) What is the height Ishita in metres?
(iii) Write the type of triangles used to solve this problem.
(iv) Which similarity criterion of triangle is used?

Q.6   Rohan is very intelligent in maths. He always try to relate the concept of maths in daily life. One day he is walking away from the base of a lamp post at a speed of 1 m/s. Lamp is 4.5 m above the ground.
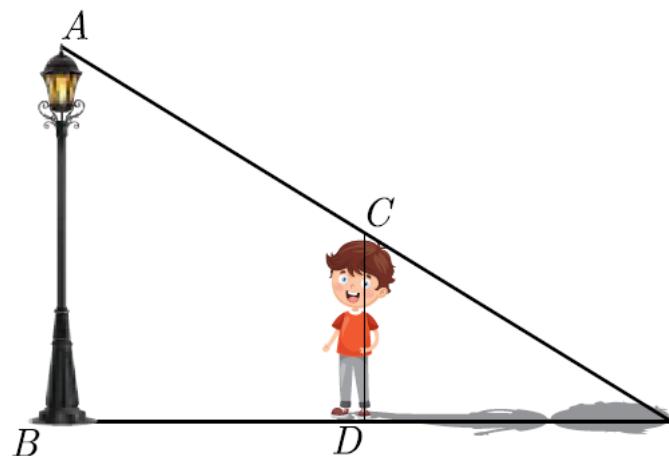
(i) If after 2 second, length of shadow is 1 meter, what is the height of Rohan ?

(ii) What is the minimum time after which his shadow will become larger than his original height?

(iii) What is the distance of Rohan from pole at this point ?

(iv) What will be the length of his shadow after 4 seconds?

(v) Which similarity criterion is used in solving the above problem

Q.7   The law of reflection states that when a ray of light reflects off a surface, the angle of incidence is equal to the angle of reflection.
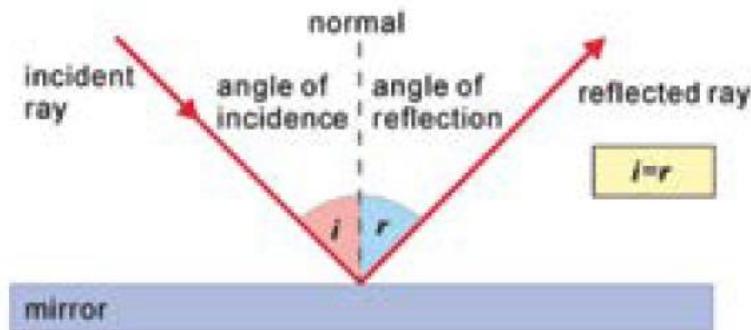

Ramesh places a mirror on level ground to determine the height of a pole (with traffic light fired on it). He stands at a certain distance so that he can see the top of the pole reflected from the mirror. Ramesh's eye level is 1.5 m above the ground. The distance of Ramesh and the pole from the mirror are 1.8 m and 6 m respectively.
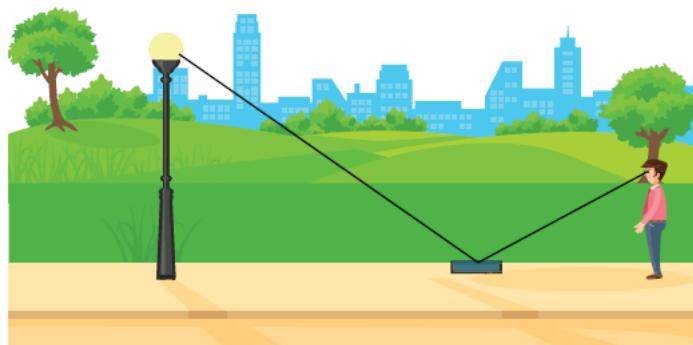
(i) Which criterion of similarity is applicable to similar triangles?

(ii) What is the height of the pole?

(iii) If angle of incidence is i , find tan i .

(iv) Now Ramesh move behind such that distance between pole and Ramesh is 13 meters. He place mirror between him and pole to see the reflection of light in right position. What is the distance between mirror and Ramesh ?

(v) What is the distance between mirror and pole?

Q.8 Tania is very intelligent in maths. She always try to relate the concept of maths in daily life. One day she plans to cross a river and want to know how far it is to the other side. She takes measurements on her side of the river and make the drawing as shown below.
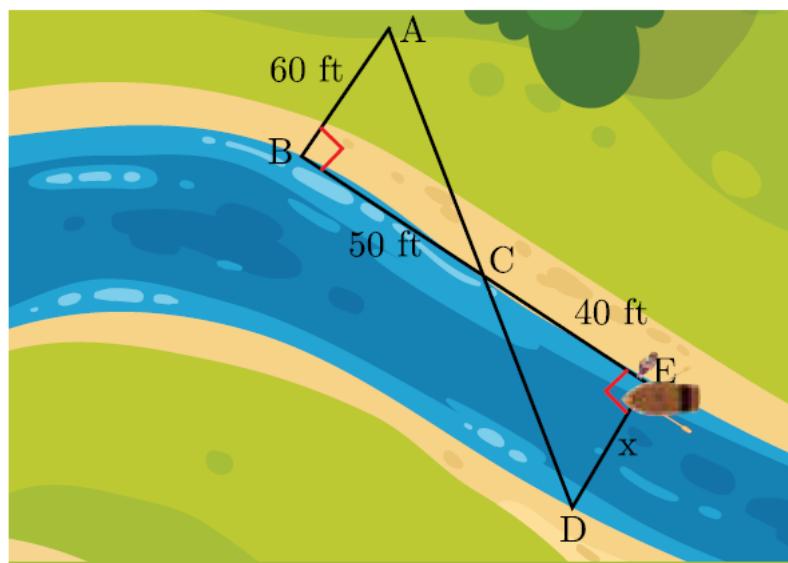
(i) Which similarity criterion is used in solving the above problem ?

(ii) Consider the following statement:

S_1: $\angle ACB = \angle DCE$

S_2: $\angle BAC = \angle CDE$

Which of the above statement is/are correct.

(a) S_1 and S_2 both   (b) S_1

(c) S_2 (d) None

(iii) Consider the following statement:

$$S_3: \quad \frac{AB}{DE} = \frac{CA}{CD}$$

$$S_4: \quad \frac{BC}{CE} = \frac{AB}{DE}$$

$$S_5: \quad \frac{CA}{CD} = \frac{DE}{AB}$$

Which of the above statements are correct ?

(a) S_3 and S_5 (b) S_4 and S_5

(c) S_3 and S_4 (d) All three

(iv) What is the distance x across the river?

(v) What is the approximate length of AD shown in the figure?

Q.9 Rani wants to make the curtains for her window as shown in the figure. The window is in the shape of a rectangle, whose width and height are in the ratio 2 : 3 . The area of the window is 9600 square cm.
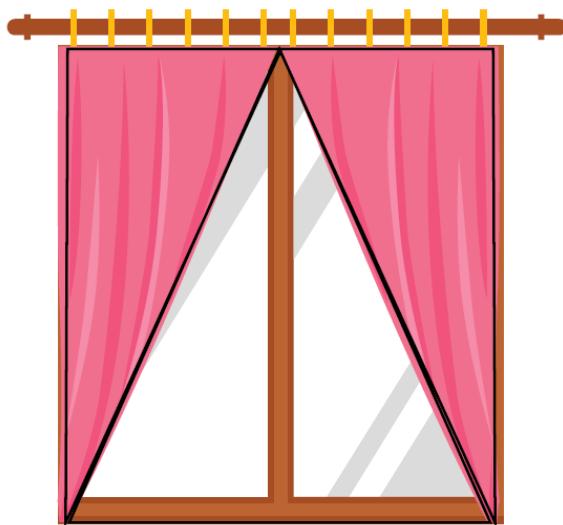
(i) What is the shape of the window that is uncovered?
(ii) What will be the ratio of two sides of each curtain (other than hypotenuse)?
(iii) What are the dimensions of the window?
(iv) What will be the perimeter of the window?
(v) How much window area is covered by the curtains?

Q.10   The centroid is the centre point of the object. It is also defined as the point of intersection of all the three medians. The median is a line that joins the midpoint of a side and the opposite vertex of the triangle. The centroid of the triangle separates the median in the ratio of 2 : 1. It can be found by taking the average of x- coordinate points and y-coordinate points of all the vertices of the triangle. See the figure given below
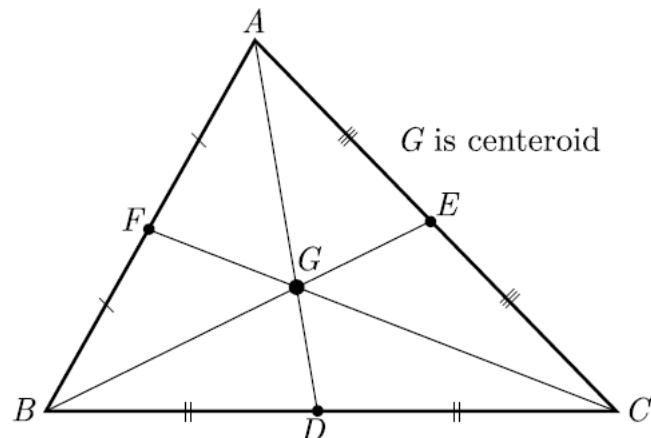
Here D,E and F are mid points of sides BC , AC and AB in same order. G is centroid, the centroid divides the median in the ratio 2 : 1 with the larger part towards the vertex.
Thus AG :GD = 2 :1
On the basis of above information read the question below. If G is Centroid of ΔABC with height h and J is centroid of ΔADE . Line DE parallel to BC, cuts the ΔABC at a height $\frac{h}{4}$ from BC. $HF = \frac{h}{4}$
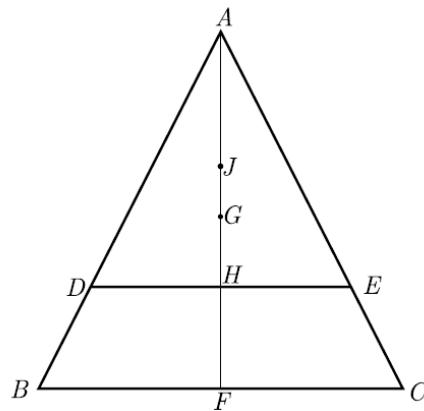
(i) What is the length of AH?
(ii) What is the distance of point A from point G?
(iii) What is the distance of point A from point J?
(iv) What is the distance GJ?

Q.11   Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Vijay's house if 20m when Vijay's house casts a shadow 10m long on the ground. At the same time, the tower casts a shadow 50m long on the ground and the house of Ajay casts 20m shadow on the ground.

Vijay's House   Tower   Ajay's House
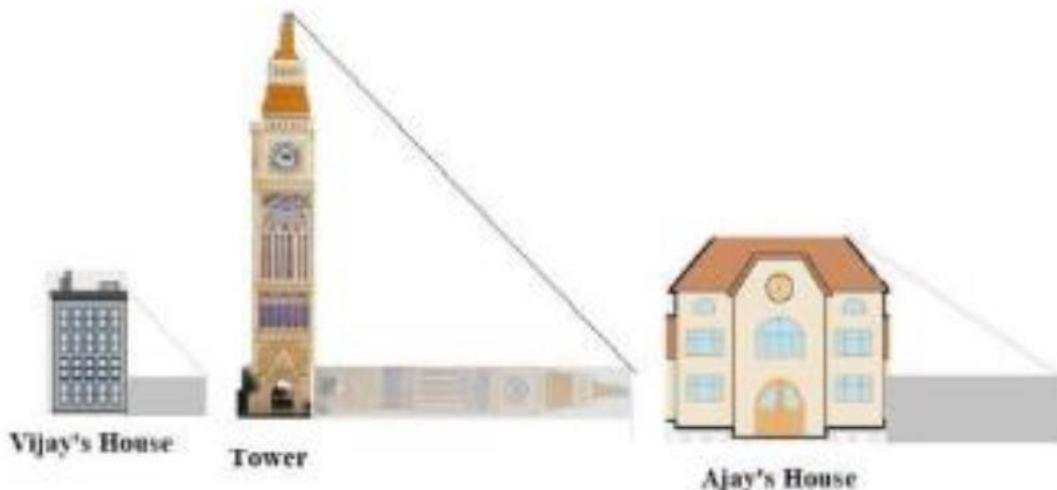
1. What is the height of the tower?

2. What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12m?

3. What is the height of Ajay's house?

4. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Ajay's house?

5. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Vijay's house?

Q.12   A scale drawing of an object is the same shape at the object but a different size. The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio. The ratio of two corresponding sides in similar figures is called the scale factor

Scale factor= length in image / corresponding length in object

If one shape can become another using revising, then the shapes are similar. Hence, two shapes are similar when one can become the other after a resize, flip, slide or turn. In the photograph below showing the side view of a train engine. Scale factor is 1:200

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

1. If the length of the model is 11cm, then the overall length of the engine in the photograph above, including the couplings(mechanism used to connect) is:

2. What will affect the similarity of any two polygons?

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

4. If two similar triangles have a scale factor 5:3 which statement regarding the two triangles is true?

5. The length of AB in the given figure:
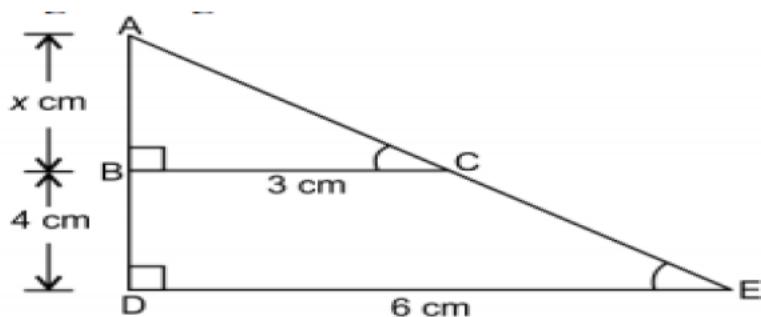
Answer Keys

Section-A (MCQs)

Q.1   (C) 2cm   Q.2   (B) $\frac{ac}{b+c}$ Q.3   (A) 22m   Q.4   (A) 23.05

Q.5   (A) 5.4cm   Q.6   (A) $BC \times EF = AC \times FD$ Q7. (B) 3.75 cm   Q.8   C) 40⁰

(Q.9 (B) 7.5 cm   Q.10 (C) 4 cm   Q.11   (A) 2 cm

Q.12   (D) 15 cm   Q.13 (C) 9 m   Q.14 (B) 10 cm   Q.15 (C) 60cm

Q.16   (D) 18cm   Q.17 (C) 2.8cm   Q.18 (C) 16cm   Q.19 (C) 60cm

Q.20   (D) 36m

Assertion and reasoning Type

Q.1   C   Q.2 d   Q3. d   Q4. b

Section-B (2 Marks)

Q.1   2.4 cm   Q.2 2cm   Q.3   Q.4 Same proportion

$$\frac{ac}{b+c}$$

Q.5   3   Q.6 3cm   Q.7 XY is not parallel to BC   Q8. Yes

Q.9   16cm   Q.10 15.6cm   Q.13 2cm   Q.14 2.4cm

Q.15   No, EF is not parallel to QR   Q.16 Yes, EF is parallel to QR

       Yes, EF is parallel to QR   Q.19 40⁰   Q.20   AAA criterion, $\Delta ABC \sim \Delta PQR$

Q.21   SSS criterion, $\Delta ABC \sim \Delta QRP$ Q.22 Not similar   Q.23 SAS criterion, $\Delta MNL \sim \Delta QPR$

Q.24   Not similar   Q.25 Yes, similar by AAA Q.26 $\angle DOC = 55^0, \angle DCO = 55^0$ and $\angle OAB = 55^0$.

Section-D (5 Marks)

Q.5   1.6m

Q.8   42m

Section-E (Case Study)

Q.1   (a) 25 feet   (b) 18.75   (c) 18.75 feet   Q.2 (i) 18.08 feet   (ii) 0   (iii) Right triangle

Q.3   240 metres   Q.4 (i) 40 metres   (ii) AA   (iii) 60 metres

Q.5   (i) 16 metres   (ii) 5.1 ft   (iii) right triangle   (iv) AA

Q.6   (i) 150 metres   (ii) 3 sec   (iii) 3 metres (iv) 2 metres (v) AA criterion

Q.7   (i) AA criterion   (ii) 5 metres (iii) $\frac{6}{5}$ (iv) 3 metres   (v) 10 metres

Q.8   (i) AA criterion   (ii) option (a)   (iii) option (c)   (iv) 48 feet (v) 140 feet

Q.9   (i) Isosceles Triangle   (ii) $\frac{1}{3}$ (iii) 80cm, 120cm   (iv) 400cm   (v) 50%

Q.10   (i) $\frac{3h}{4}$ (ii) $\frac{2}{3}AF$ (iii) $\frac{3}{4}AG$ (iv) $\frac{1}{4}AG$

Q.11   1. c)100m   2. d)60m   3. b)40m   4. a)16m   5. d) 8m

Q.12   a) 8cm   b) 6cm   c) 4cm d) 10cm

IMPORTANT FORMULAS & CONCEPTS

Points to remember

☞ The distance of a point from the *y*-axis is called its **x-coordinate**, or **abscissa**.
☞ The distance of a point from the *x*-axis is called its **y-coordinate**, or **ordinate**.
☞ The coordinates of a point on the *x*-axis are of the form $(x, 0)$.
☞ The coordinates of a point on the *y*-axis are of the form $(0, y)$.

Distance Formula

The distance between any two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given by

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

$$or \quad AB = \sqrt{(\text{difference of abscissae})^2 + (\text{difference of ordinates})^2}$$

Distance of a point from origin

The distance of a point $P(x, y)$ from origin O is given by $OP = \sqrt{x^2 + y^2}$

Problems based on geometrical figure

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 satisfies Pythagoras theorem.

Section formula

The coordinates of the point $P(x, y)$ which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$, internally, in the ratio $m_1 : m_2$ are

$$\left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$$

This is known as the **section formula**.

Mid-point formula

The coordinates of the point $P(x, y)$ which is the midpoint of the line segment joining the points

$A(x_1, y_1)$ and $B(x_2, y_2)$, are $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

(1 MARK QUESTIONS)

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

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

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

    (a) 4   (b) 5   (c) 6   (d) $3\sqrt{3}$

Q.3. The points (-5, 1), (1, p) and (4, -2) are collinear if the value of p is

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

Q.4. The line $3x + y – 9 = 0$ divides the line joining the points (1, 3) and (2, 7) internally in the ratio

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

Q.5. 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) -4

Q.6. If the distance between the points (x, -1) and (3, 2) is 5, then the value of x is

    (a) -7 or -1   (b) -7 or 1   (c) 7 or 1   (d) 7 or -1

Q.7. If the points P(1, 2), B(0, 0) and C(a, b) are collinear, then

    (a) 2a = b   (b) a = -b   (c) a = 2b   (d) a = b

Q.8. The points (1,1), (-2, 7) and (3, -3) are

    (a) vertices of an equilateral triangle   (b) collinear

    (c) vertices of an isosceles triangle   (d) none of these

Q.9. If the points A(4,3) and B (x,5) are on the circle with centre O(2,3), then the value of x is :

    (a) 5   (b)6   (c)2   (d) 0

Q.10.Which of the points A(1,3), B(-3,2), C(3,4) and D(4,1) is nearest to the origin:

    (a) A   (b)B   (c) C   (d) D

Q.11.If the point (x,y) is equidistant from the point(2,1) and(1,-2), then:

    (a) x+3y=0   (b)3x+y=0   (c) x+2y=0   (d) 3x+2y=0

Q.12. If points A(5,p), B(1,5), C(2,1) and D(6,2) form a square ABCD , then p=

    (a) 7   (b)3   (c)6   (d)8

Q.13.The perimeter of the Triangle formed by the points (0,0), (2,0) and (0,2) is:

    (a) 1- $2\sqrt{2}$ (b)$2\sqrt{2} + 1$ (c) 4+ $\sqrt{2}$ (d) 4 +$2\sqrt{2}$

Q.14. The x – Coordinate of a point P is twice its Y- Coordinate. If P is equidistant from Q (2,-5) and R(-3,6), Then the Coordinates of P are:

    (a) (16,8)   (b) (14,7)   (c)(18,9)   (d) (10,5)

Q.15.The distance between the points P(a sin Ø, 0) and Q (0, -a cosØ) is:

    (a) a^2 (b)1   (c) 2a   (d) a

Q.16.The Coordinates of the image of the point (-4,5) in Y-axis is:

    (a) (4,5)   (b) (4, -5)   (c) (-4,-5)   (d) (0,5)

Q.17. If four vertices of a parallelogram taken in order are (-3,-1), (a,b), (3,3) and (4,3), then a:b=

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

Q.18.If A and B are the points (-3,4) and (2,1) respectively , then the coordinates of the point C on AB produced such that AC=2BC are:

    (a)(2,4)   (b) (3,7)   (c) (7,-2)   (d) (7,-9)

Q.19. P (5,-3) and Q (3,y) are the points of trisection of the line segment joining A (7,-2) and B(1,-5) , then y equals:

    (a) 2   (b) 4   (c) -4   (d) -5/2

Q.20.The point which divides the line segment joining the points (7,-6) and (3,4) in ratio 1:2 internally lies in the:

(a) I quadrant (b) II quadrant   (c) III quadrant   (d) IV quadrant

ASSERTION REASONING 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) 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 point which divides the line joining the points A(1, 2) and B(- 1, 1) internally in the ratio 1: 2 is $(\frac{-1}{2},\frac{5}{3})$

   Reason: The coordinates of the point P(x, y) which divides the line segment joining the points A (x_1, y_1) and B(x_2, y_2) in the ratio $m_1 : m_2$ is $\left(\frac{m_1 x_2 + m_2 x_1}{m1+m2}, \frac{m_1 y_2 + m_2 y_1}{m1+m2}\right)$

2. Assertion : The point on the X -axis which if equidistant from the points A(- 2, 3) and B(5, 4) is (2, 0)

   Reason: The coordinates of the point P(x, y) which divides the line segment joining the points A (x_1, y_1) and B(x_2, y_2) in the ratio $m_1 : m_2$ is $\left(\frac{m_1 x_2 + m_2 x_1}{m1+m2}, \frac{m_1 y_2 + m_2 y_1}{m1+m2}\right)$

3. . Assertion : Ratio in which the line 3x + 4y = 7 divides the line segment joining the points (1, 2) and (- 2, 1) is 3 : 5

   Reason : The coordinates of the point P(x, y) which divides the line segment joining the points A(x_1, y_1) and B(x_2, y_2) in the ratio $m_1 : m_2$ is $\left(\frac{m_1 x_2 + m_2 x_1}{m1+m2}, \frac{m_1 y_2 + m_2 y_1}{m1+m2}\right)$

4. Assertion : C is the mid-point of PQ, if P is (4, x), C is (y,- 1) and Q is (- 2, 4), then x and y respectively are -6 and 1.

   Reason : The mid-point of the line segment joining the points P(x_1, y_1) and Q(x_2, y_2) is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

5. Assertion : The point (0, 4) lies on y -axis.

   Reason : The x co-ordinate on the point on y -axis is zero

6. Assertion : The value of y is 6, for which the distance between the points P(2,- 3) and Q(10, y) is 10.

   Reason : Distance between two given points A(x_1, y_1) and B(x_2, y_2) is given by, $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

7. Assertion : The point (-1, 6) divides the line segment joining the points (-3, 10) and (6, -8) in the ratio 2 : 7 internally.

   Reason : Three points A,B and C are collinear if AB + BC = AC

8. . Assertion : The possible values of x for which the distance between the points A(x, - 1) and   B(5, 3) is 5 units are 2 and 8.

   Reason : Distance between two given points A(x1 , y1) and B(x2 , y2) is given by, AB $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

9. Assertion : If the points A(4, 3) and B(x, 5) lies on a circle with the centre O(2,3) then the value of x is 2.

   Reason : The mid-point of the line segment joining the points P(x_1, y_1) and   Q(x_2, y_2) is$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

10. Assertion: The co-ordinates of the point which divides the join of A(-5, 11) and B(4,-7) in the ratio 7 : 2 is (2, -3)

    Reason : The coordinates of the point P(x, y) which divides the line segment joining the points A(x_1, y_1) and B(x_2, y_2) in the ratio m1 : m2 is $\left(\frac{m_1 x_2 + m_2 x_1}{m1+m2}, \frac{m_1 y_2 + m_2 y_1}{m1+m2}\right)$

(2 MARKS QUESTIONS)

1. What is the distance of the point P(2,3) from the X – axis?
2. A point a lies on the X axis, What is the coordinate of this point ?
3. Find the distance between P(7,5) and Q(2,5)
4. If the distance between the points (4,p) and (1,0) is 5, then find the value of p
5. Find the ratio in which the y -axis divides the segment joining (-3,6) and (12,-3)
6. If the points A(x, 2), B(-3, 4) and C(7, -5) are collinear, then find the value of x
7. In which quadrant the point P that divides the line segment joining the points A(2, -5) and B(5,2) in the ratio 2 : 3 lies?
8. What is the mid-point of the line segment joining the points A (−2, 8) and B (− 6, − 4)?
9. Find a relation between x and y such that the point (x, y) is equidistant from the point (3, 6) and (− 3, 4).
10. If (1, 2), (4, y), (x, 6) and (3, 5) are the vertices of a parallelogram taken in order, find x and y
11. 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, find the value of p.
12. Find the values of y for which the distance between the points P(2, − 3) and Q(10, y) is 10 units
13. Find the distance of the point P $(−3, \ 4)$ from the origin.
14. If A and B are the points $(−6, \ 7)$ and $(−1, −5)$respectively, then find the distance 2AB.
15. If P and Q are the points having coordinates $(8, \ 3)$ and $(5, −1)$ respectively, then find the distance 3PQ
16. If C $(a, \ 3)$ is the mid-point of the line segment joining the points A$(5, \ 4)$ and B$(−3, \ 2)$,then find the value of a
17. If P $\left(\frac{a}{2}, 4\right)$ is the mid-point of the line-segment joining the points A$(−6, \ 5)$ and B$(−2, \ 3)$, then find the value of a.
18. Find the point on the x-axis which is equidistant from points $(−1, 0)$ and $(5, \ 0)$
19. ABCD is a rectangle whose three vertices are B $(4, \ 0)$, C $(4, \ 3)$and D $(0, \ 3)$.Find the length of one of its diagonals.
20. Find a relation between x and y such that the point (x, y) is equidistant from the points A$(\mathbf{3}, \mathbf{6})$ and B $(−\mathbf{3}, \mathbf{4})$

(3 MARKS QUSETIONS)

21. P $(x, −3)$ and Q$(3, y)$ are points of trisections the line segment joining A$(7, −2)$ and B $(1, −5)$, then find the values of x and y
22. Find the ratio in which the line segment joining A(1, − 5) and B(− 4, 5) is divided by the x-axis. Also find the coordinates of the point of division.
23. Find the third vertex of a triangle, if its two vertices are(-3,1) and (0,-2) and the centroid of this triangle is at origin.
24. If P and Q are 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
25. If Q(0, 1) is equidistant from P(5, –3) and R(x, 6), find the values of x. Also find the distances QR and PR.
26. Determine, whether each of the given points (-2,1), (2,-2) and (5,3) are vertices right angles.
27. Let A (4, 2), B(6, 5) and C(1, 4) be the vertices of Δ ABC. (i) The median from A meets BC at D. Find the coordinates of the point D. (ii) Find the coordinates of the point P on AD such that AP: PD = 2: 1

28. Show that the points (a,a) ,(-a,a) and $(-\sqrt{3}\,a, \sqrt{3}\,a)$ are vertices of an equilateral triangle.

29. Find the coordinates of a point A, where AB is a diameter of the circle with centre (3,-1) and the point B is (2,6)

30. Determine the ratio in which the line 2x + y − 4 = 0 divides the line segment joining the points A(2, − 2) and B(3, 7).

31. If A and B are (− 2, − 2) and (2, − 4), respectively, find the coordinates of P such that AP = $\frac{3}{7}$ AB and P lies on the line segment AB.

32. Name the type of quadrilateral formed, if any, by the following points, and give reasons for your answer: (− 1, − 2), (1, 0), (− 1, 2), (− 3, 0)

33. Find the area of a rhombus if its vertices are (3, 0), (4, 5), (− 1, 4) and (− 2, − 1) taken in order. Also find the perimeter.

34. A point $P(1 , a)$ is at a distance of 3 units from the point $Q(1, 2)$ Find the value of 'a'

35. Find the value of y for which the distance between the points A $(3, -1)$ and B $(11, \ y)$ is 10 units.

36. The length of a line segment is 10. If it's one end is at $(2, -3)$ and other end is at $(10, y)$ then find the value(s) of y.

37. Show that the points $(-2, 5)$, $(3, -4)$ and $(7, \ 10)$ are the vertices of a right triangle.

38. The length of a line segment is 10. If one end is at $(2, - 3)$ and the abscissa of the second end is 10. Find its ordinate.

39. The point A$(3, \ y)$ is equidistant from the points P$(6, \ 5)$ and Q$(0, - 3)$. Find the value of y.

40. Find the area of the quadrilateral ABCD, whose vertices are A$(-3, -1)$, B $(-2, -4)$, C$(4, -1)$ and D $(3, 4)$.

41. Find the ratio in which point P$(-1, y)$ lying on the line segment joining points A$(-3, 10)$ and B $(6, \ -8)$ divides it. Also find the value of y.

42. Prove that the points A$(2, -1)$, B$(3, 4)$, C$(-2, 3)$ and D$(-3, -2)$ are the vertices of a rhombus ABCD. Is ABCD a square?

43. Find the value of p, so that the point (p, 2) divides the line- segment joining the points (2, 5) and (4, 7).

44. Find the ratio in which the line segment joining the points A $(3, -3)$ and B$(-2, 7)$ is divided by x-axis. Also find the coordinates of the point of division.

45. Find a point P on the y- axis which is equidistant from the points A$(4, 8)$ and B$(-6, 6)$. Also find the distance AP.

(5 MARKS QUESTIONS)

46. If $(1, 2)$, $(4, y)$, $(x, 6)$ and $(3, 5)$ taken in order, are the vertices of a parallelogram, then find the values of x and y .

47. If A $(-2, -1)$, B $(a, 0)$, C$(4, b)$ and D$(1, 2)$ are the vertices of a parallelogram ABCD, find values of 'a' and ' b' .

48. If A and B are $(4, -3)$, and $(8, 5)$, respectively the coordinates of a line segment AB, find the coordinates of a point P such that AP = $\frac{3}{7}$ AB, where P lies on AB.

49. In what ratio, does the point $(1, p)$ divides the line segment joining the points $(-5, 1)$ and $(4, -2)$? Also find the value of 'p´'

50. Point P divides the line segment joining the points A $(2, 1)$ and B $(5, -8)$ such that $\frac{AP}{AB} = \frac{1}{3}$. If P lies on the line $2x - y + k = 0$, find the value of k

51. The points A$(4, 7)$, B$(p, 3)$ and C$(7, 3)$ are the vertices of a right triangle, right-angled at B. Find the value of p.

52. Find the coordinates of a point P on the line segment joining A $(1, 2)$ and B$(6, 7)$ is such that AP $= \frac{2}{5}$ AB.

CASE STUDY -1

Class X students of a secondary school in Krishnagar have been allotted a rectangular plot of a land for gardening activity. Saplings of Gulmohar are planted on the boundary at a distance of 1m from each other. There is a triangular grassy lawn in the plot as shown in the fig. The students are to sow seeds of flowering plants on the remaining area of the plot.
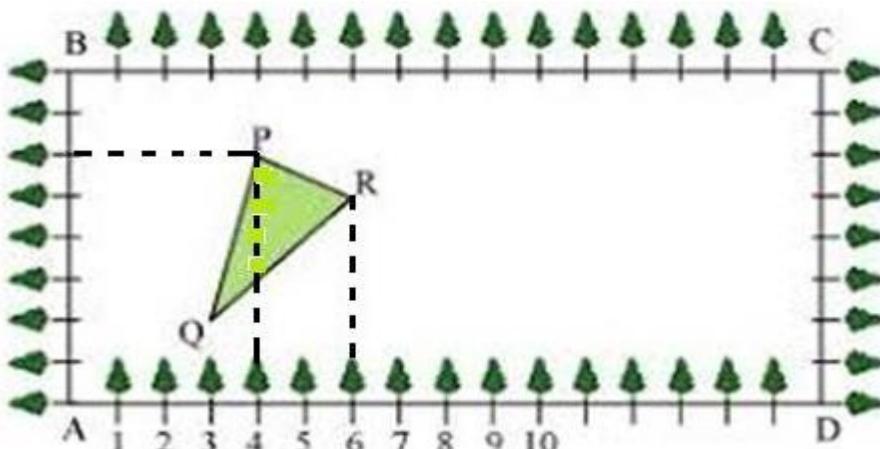
(i) What are the coordinates of P?

(ii) What are the coordinates of D?

(iii) Find the coordinates of P if D is taken as origin

CASE STUDY 2

To conduct Sports Day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1m from each other along AD, as shown in Fig. Niharika runs the distance AD on the 2nd line and posts a green flag. Preet runs the distance AD on the eighth line and posts a red flag. (take the position of feet for calculation)
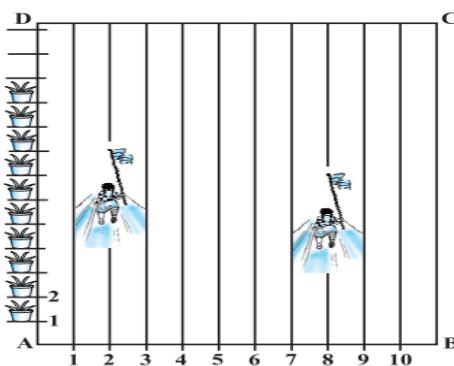
(i) What co-ordinates you will use for Green Flag?

(ii)What is the distance between the green flag and the red flag?

(iii) If Rashmi wants to post a blue flag adjacently in between these two flags. Where she will post a blue flag?

CASE STUDY-3

Using Cartesian Coordinates we mark a point on a graph by **how far along** and **how far up** it is.

The left-right (**horizontal**) direction is commonly called X-axis.

The up-down (**vertical**) direction is commonly called Y-axis.

When we include negative values, the x and y axes divide the space up into 4 pieces.

Read the information given above and below and answer the questions that follow:

Two friends Seema and Aditya work in the same office in Delhi. In the Christmas vacations, both decided to go their hometowns represented by Town A and Town B respectively in the figure given below. Town A and Town B are connected by trains from the same station C (in the given figure) in Delhi.
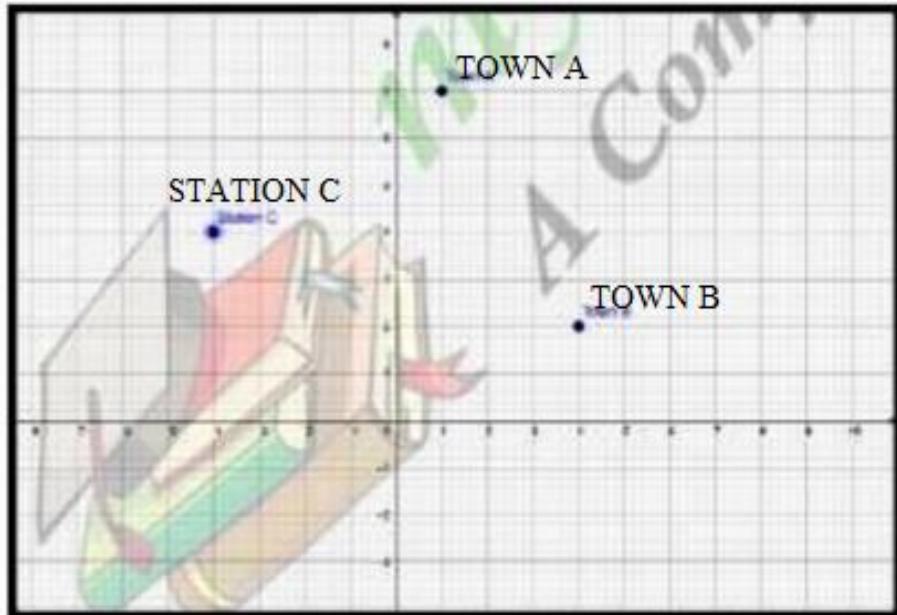
(i) Who will travel more distance to reach their home?

(ii) Find the location of the station

(iii) Find in which ratio Y-axis divide Town B and Station.

CASE STUDY-4

CASE STUDY: CARTESIAN- PLANE

Using Cartesian Coordinates we mark a point on a graph by **how far along** and **how far up** it is.

The *left-right* (**horizontal**) direction is commonly called X-axis.

The *up-down* (**vertical**) direction is commonly called Y-axis.

In Green Park, New Delhi Ramesh is having a rectangular plot ABCD as shown in the following figure. Sapling of Gulmohar is planted on the boundary at a distance of 1m from each other. In the plot, Ramesh builds his house in the rectangular area PQRS. In the remaining part of plot, Ramesh wants to plant grass.
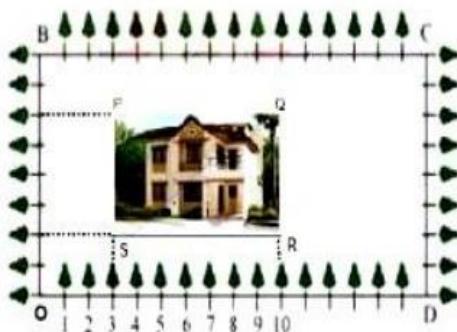
1. Find the coordinates of the midpoints of the diagonal QS
2. Find the length and breadth of rectangle PQRS
3. Find Area of rectangle PQRS.

CASE STUDY-5

There is a function in the school. Ashima, Bharti and Camella are standing in a rectangular ground at points A, B and C respectively as shown in the figure. They are ready to perform an aerobic dance. –
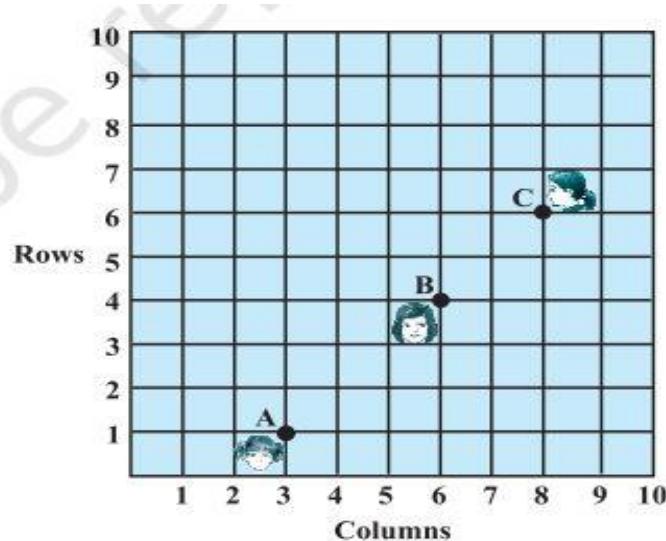
(i) How far is Camella from y – axis?
(ii) Find distance between Ashima and Bharti.
(iii) Check whether AB + BC = AC?

CASE STUDY-6

Seema has a 10 m × 10 m kitchen garden attached to her kitchen. She divides it into a 10 ×10 grid and wants to grow some vegetables and herbs used in the kitchen. She puts some soil and manure in that and sow a green chilly plant at A, a coriander plant at B and a tomato plant at C. Her friend Kusum visited the garden and praised the plants grown there. She pointed out that they seem to be in a straight line. See the below diagram carefully and answer the following questions:
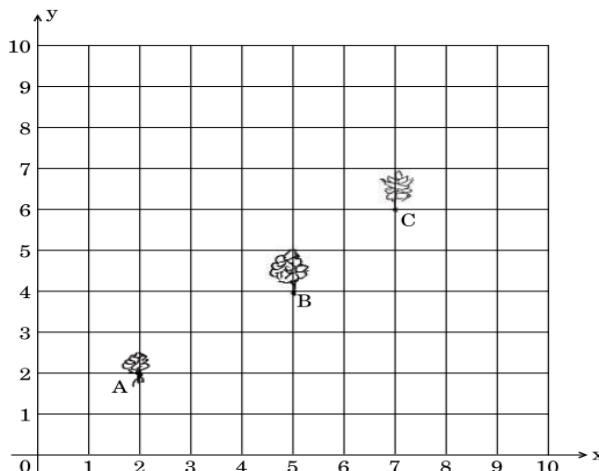
(i) Find the distance between A and B is

(ii) Find the mid- point of the distance AB

(iii) Find the distance between B and C

CASE STUDY-7

Karan went to the Lab near to his home for COVID 19 test along with his family members.
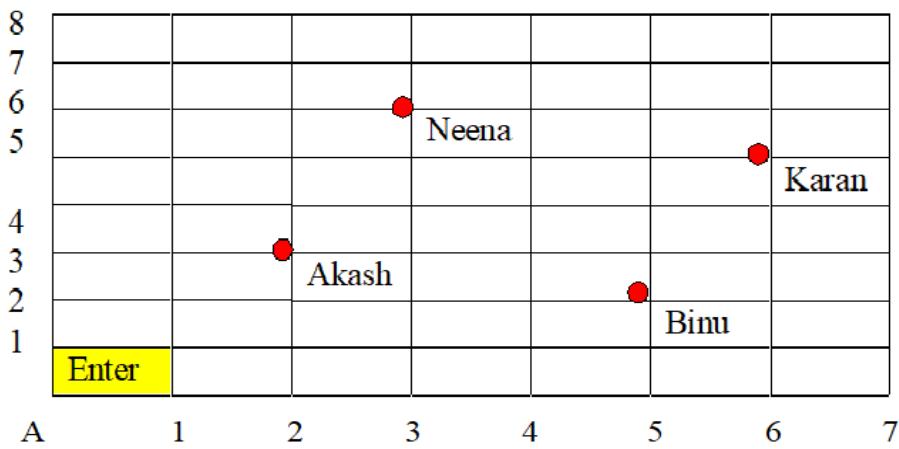
The seats in the waiting area were as per the norms of distancing during this pandemic (as shown in the above figure). His family member took their seats surrounded by red circular area.

(i) What is the distance between Neena and Karan?

(ii) What are the coordinates of seat of Akash?

(iii) What will be the coordinates of a point exactly between Akash and Binu where a person can be

seated?

<div align="center">

ANSWER KEY

Q. NO.	ANSWERS	Q. NO.	ANSWERS
MCQs (1 MARK)			
1	(b)	11	(a)
2	(b)	12	(c)
3	(d)	13	(d)
4	(a)	14	(a)
5	(c)	15	(d)
6	(d)	16	(a)
7	(a)	17	(b)
8	(b)	18	(c)
9	(d)	19	(c)
10	(a)	20	(d)
ASSERSION REASONING (1 MARK)			
1	d	6	d
2	b	7	a
3	d	8	a
4	a	9	d
5	a	10	a
2 MARKS			
1	3 units	11	p= 7
2	$(a, 0)$	12	y = 3, y = -9
3	5	13	5
4	± 4	14	26
5	¼	15	15
6	$x = -63$	16	1
7	4 th Quadrant	17	-8
8	(-4,2)	18	(2, 0)
9	3x + y − 5 = 0	19	$5 units$
10	x = 6, y = 3	20	$3x + y = 5$
3 MARKS			
21	$x = 5, y = -4$	34	$a = 5 \, or - 1$
22	Ratio is 1:1 and Coordinates: $(\frac{-3}{2}, 0)$	35	$y = 5 \, or - 7$
23	(3,-1)	36	$y = 3 or - 9$
24	P(-1,0) and Q(-4,2)	37	Do yourself
25	± 4 , $QR = \sqrt{41}$, $PR = \sqrt{82}, 9\sqrt{2}$	38	$y = 3 or - 9$
26	Do yourself	39	1
27	D $(\frac{7}{2}, \frac{9}{9})$, P $(\frac{11}{3}, \frac{11}{3})$	40	$28 \, sq \, units$
28	Do yourself	41	$2:1, y = 6$

</div>

29	$(4, -8)$	42	Do yourself
30	Do yourself	43	$p = -\dfrac{5}{3}$
31	$(\dfrac{-2}{7}, \dfrac{20}{7})$	44	$7:3, \left(-\dfrac{1}{2}, 0\right)$
32	Square	45	$(0.2); 2\sqrt{13}$
33	24 sq units		

5 MARKS			
46	$x = 6, y = 3$	50	-8
47	$a = 1, b = 3$	51	$p = 7 \text{ or } 4$
48	$\left(\dfrac{40}{7}, \dfrac{3}{7}\right)$	52	$(3, 4)$
49	$2:1, p = -1$		

CCT 1		**CCT 5**	
1	(4, 6)	1	8
2	(16, 0)	2	$3\sqrt{2}$
3	(-12, 6)	3	Yes
CCT 2		**CCT 6**	
1	(2, 25)	1	$\sqrt{13}$
2	$\sqrt{61}$	2	(3.5, 3)
3	(6, 22.5)	3	$2\sqrt{2}$
CCT 3		**CCT 7**	
1	Aditya	1	$\sqrt{10}$
2	(-4, 4)	2	(2, 3)
3	1: 1	3	(3.5, 2.5)
CCT 4			
1	(6.5, 4)		
2	7cm & 4 cm		
3	28 cm^2		

CHAPTER 8 INTRODUCTION TO TRIGONOMETRY

MCQ

1 The two legs AB & AC of right angled Δ ABC are in the ratio 1:3, what will be the value of sin C ?

    (a) $\sqrt{10}$ (b) $\frac{1}{\sqrt{10}}$ (c) $\frac{3}{\sqrt{10}}$ (d) $\frac{1}{2}$

2. If $\sin A + \sin^2 A = 1$, then find the value of $\cos^2 A + \cos^4 A$

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

3. The value of $\frac{4-\sin^2 45^0}{cotA\ tan60^0}$ is 3.5 , what is the value of A

    (a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0

4. The value of $\frac{2tan30^0}{1-tan^2 30^0}$

    (a) $\cos 60^0$ (b) $\sin 60^0$ (c) $\tan 60^0$ (d) $\sin 30^0$

5. If **cos A** $= \frac{4}{5}$, then the value of **tan A** is

    (a) $\frac{3}{5}$ (b) $\frac{3}{4}$ (c) $\frac{4}{3}$ (d) $\frac{5}{3}$

6. If **sinA** $= \frac{1}{2}$, then the value of **cotA** is

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

7. If **sinΘ** $= \frac{a}{b}$, then **cosΘ** is equal to

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

8. Given that **sin a** $= \frac{\sqrt{3}}{2}$ and **cosb = 0**, then the value of **b - a** is

    (a) 0^0 (b) 90^0 (c) 60^0 (d) 30^0

9. If Δ ABC is right angled at C , then the value of **sec(A + B)** is

    (a) 0   (b) 1   (c) $\frac{2}{\sqrt{3}}$ (d) not defined

10. If **sinΘ + cos Θ** $= \sqrt{2}$**cos Θ**,   ($\Theta \neq 90^0$) then the value of **tan Θ** is

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

11. If ΔABC is right angled at C , then the value of **cos(A + B)** is

(a) 0   (b) 1   (c)$\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$

12. If **sin α=$\frac{1}{2}$** and **cos β=$\frac{1}{2}$**, then the value of **(α + β)** is

   (a) 0^0 (b) 30^0 (c) 60^0 (d) 90^0

13. If **4 tan Θ = 3** , then $\left(\dfrac{4\sin\Theta - \cos\Theta}{4\sin\Theta + \cos\Theta}\right)$ is equal to

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

14. If **sin Θ - cos θ = 0**, then the value of **sin⁴θ + cos⁴θ** is

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

15. In the adjoining figure, the length of *BC* is
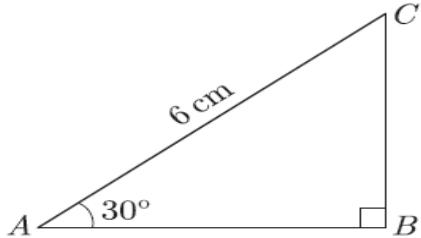
   (a) 2 $\sqrt{3}$ cm   (b) $3\sqrt{3}$ cm   (c) 4 $\sqrt{3}$ cm   (d) 3 cm

16. If **x = p sec** and **y = q tan** , then

   (a) $x^2 - y^2 = p^2q^2$ (b) $x^2q^2 - y^2p^2 = pq$ (c) $x^2q^2 - y^2p^2 = \frac{1}{pq}$ (d) $x^2q^2 - y^2p^2 = p^2q^2$

17. **(cos⁴A - sin⁴A)** is equal to

   (a) $1 - 2\cos^2A$ (b) $2\sin^2A - 1$ (c) $\sin^2A - \cos^2A$ (d) $2\cos^2A - 1$

18. If **tan θ + sin θ = m** and **tan θ - sin θ = n**, then **m² - n²** is equal to

   (a) $\sqrt{mn}$ (b) $\sqrt{\dfrac{m}{n}}$ (c) $4\sqrt{mn}$ (d) None of these

19. If **sin θ = $\frac{5}{13}$** , then the value of **tan θ** is ....

   (a) $\frac{5}{13}$ (b) $\frac{5}{12}$ (c) $\frac{12}{13}$ (d) $\frac{8}{13}$

20. The value of the **(tan²60⁰ + sin²45⁰)** is ....

   (a) $\frac{1}{2}$ (b) $\frac{3}{2}$ (c) 1   (d) $\frac{7}{2}$

21. **sin²60⁰ - 2 tan 45⁰ - cos²30⁰** = ?

    (a) 2   **(b) −2**   (c) 1   (d) −1

22. What happens to value of cos θ when increases from 0º to 90º.

    (a) cos θ decreases from 1 to 0.   (b) cos θ increases from 0 to 1.

    (c) cos θ increases from $\frac{1}{2}$ to 1   (d) cos θ decreases from 1 to $\frac{1}{2}$

23. **tan⁴ θ + tan² θ** = ?

    (a) $\sec^2 \theta - 2\sec^4 \theta$ (b) $2\sec^2 \theta - \sec^4 \theta$

    (c) $\sec^2 \theta - \sec^4 \theta$ **(d) $\sec^4 \theta - \sec^2 \theta$**

24. $\sqrt{\dfrac{1-Sin\theta}{1+\sin\theta}}$ = **?**

    (a) $\sin \theta - \cos \theta$ **(b) $\sec \theta - \tan \theta$**

    (c) $\sec \theta + \tan \theta$ (d) $\sin \theta + \cos \theta$

25. $\dfrac{1-tan^2\theta}{1+tan^2\theta}$ = **?**

    (a) 1   **(b) $\cos^2 \theta - \sin^2 \theta$**   (c) $\sin^2 \theta$ (d) $\cos^2 \theta$

26. In the given figure, *AOB* is a diameter of a circle with centre *O*, The value of **tanA.tanB** will be

    (a) 1   (b) 2   (c) $\sqrt{3}$ (d) 3

27. If **tan5 θ = 1** then θ is equal to

    (a) 9º   (b) 90º   (c) 45º   (d) 30º
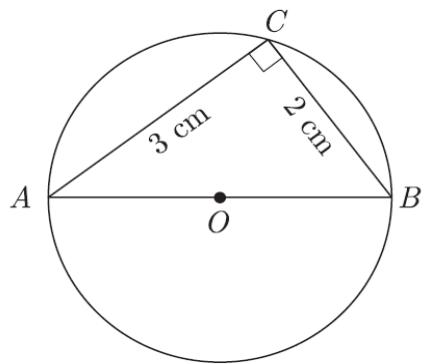
28. If **tan(A + B) = $\sqrt{3}$** and **tan(A- B) = $\frac{1}{\sqrt{3}}$** , A > B , then the value of **A** is ....

    (a) 45°   (b) 60°   (c) 90°   (d) 30°

29. The value of **(1 + tan² θ) (1 - sin θ) (1 + sin θ)** =

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

30. If **tanA = cotB**, then the value of **(A + B)** is

<mark>(a) 90°</mark>　　　(b) 120°　　　(c) 60°　　　(d) 180°

Q.NO.	Ans.	Q.NO.	Ans.	Q.NO.	Ans.
1	B	11	A	21	B
2	A	12	D	22	A
3	C	13	C	23	D
4	C	14	C	24	B
5	B	15	D	25	B
6	A	16	D	26	A
7	C	17	D	27	A
8	D	18	C	28	A
9	D	19	B	29	B
10	A	20	D	30	A

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.

ANSWER OF THE QUESTIONS :-

Q.31. Assertion: If $cosA+cos^2A=1$ then $sin^2A+sin^4A=1$.
　　Reason: $sin^2A+cos^2A=1$, for any value of A
　　Answer-b
Q.32. Assertion: The value of $2tan^245^0+cos^230^0-sin^260^0$ is 2.
　　Reason: value of $tan45^0=1$, $cos30^0=\sqrt{3}/2$ and $sin60^0=\sqrt{3}/2$.
　　Answer-a

Q.33. Assertion: If x=2 sin²θ and y=2cos²θ+1 then the value of x+y=3.
Reason: For any value of θ, sin²θ+cos²θ=1
Answer-a

Q.34. Assertion: sinA is the product of sin & A.
Reason: The value of sinθ increases as θ increases.
Answer-d

Q.35. Assertion: In a right ΔABC, right angled at B, if tanA=1, then 2sinA.cosA=1
Reason: cosecA is the abbreviation used for cosecant of angle A.
Answer- b

SHORT ANSWER QUESTIONS (TYPE I)

Q 36. If $tan\alpha = \frac{5}{12}$, find the value of $sec\alpha$. (Hint :using identity sec² α = tan² α +1)

   Secα = 13/12

Q 37. If $sec^2\theta(1+sin\theta)$ (1-$sin\theta$)=k , find the value of k

 Solution :- $sec^2\theta(1+sin\theta)$ (1-$sin\theta$) = $sec^2\theta(1-sin^2\theta)$= $sec^2\theta$ $cos^2\theta$ =1

Q 38 . If $sin\theta=\frac{1}{3}$, then find the value of 2 $cot^2\theta$+2.

 Solution :- 2$cot^2\theta$ +2 = 2($cot^2\theta$+1) =2 $cosec^2\theta$ = 2 .3² =18

Q 39. What is the value of θ ,if $\sqrt{3}$ $sin\theta = cos\theta$

 Ans- θ =30⁰

Q 40. If tanA = $\frac{3}{4}$,find the value of $\frac{1}{sinA} + \frac{1}{cosA}$.

SHORT ANSWER QUESTIONS (TYPE- II)

Q 41. If $sin \theta$+cos $\theta = \sqrt{3}$, then prove that $tan \theta + cot\theta = 1$

Q 42. Prove that $\sqrt{\frac{sec\theta-1}{sec\theta+1}} + \sqrt{\frac{sec\theta+1}{sec\theta-1}}$ = 2cosecθ

Q 43. If 1+ sin² θ=3sinθcosθ, then prove that $tan\theta = 1 \, or \, \frac{1}{2}$

.Q 44. Prove that $\frac{sin\theta-cos\theta+1}{cos\theta+sin\theta-1} = \frac{1}{sec\theta-tan\theta}$

Q 45. If sinθ+cosθ $= p$ and $sec\theta + cosec\theta = q$, show that $q(p^2 - 1) = 2p$

LONG ANSWER QUESTIONS

Q.46. Prove that $\frac{tan^3\theta}{1+tan^2\theta} + \frac{cot^3\theta}{1+cot^2\theta}$ = $sec\theta cosec\theta - 2sin\theta cos\theta$

Q 47. Prove that (sin θ + sec θ)² + (cos θ + cosec θ)² = (1 + $sec\theta cosec\theta$)²

Q 48 If $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, prove that $x^2+y^2=1$

Q 49. If x= a $\sec\theta$ +b $\tan\theta$ and y= a $\tan\theta$ +b $\sec\theta$, prove that $x^2-y^2 = a^2-b^2$

Q 50. Prove that $2\sec^2\theta - \sec^4\theta - 2\csc^2\theta + \csc^4\theta = \cot^4\theta - \tan^4\theta$

CASE STUDY QUESTIONS
Case Study -1

Golf is a game played in an open field where the golfer plays his golf ball into a hole by using different types of clubs (golf instruments). In golf, a golfer plays a number of holes in a given order. 18 holes played in an order controlled by the golf course design, normally make up a game.

On your approach shot to the ninth green, the Global Positioning System (GPS) your cart is equipped with tells you the pin is 120 meter away.

Q 1.The distance plate states the straight line distance to the hole is 60 meter. Relative to a straight line between the plate and the hole, at what acute angle should you hit the shot?
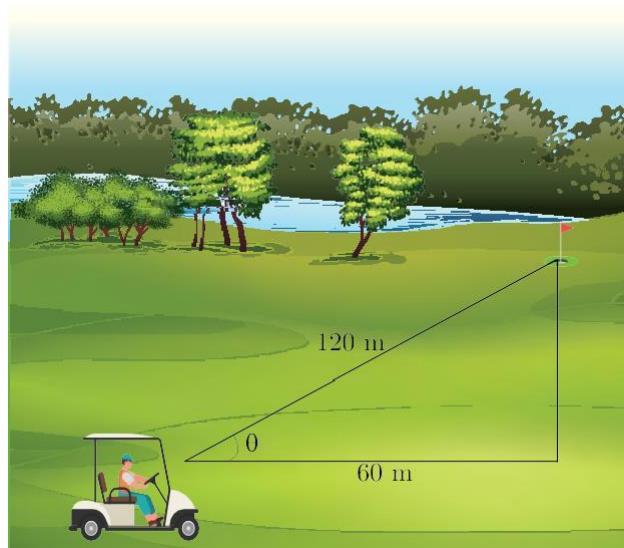
Q 2. What is the value of the tangent of the above angle?

Ans $\sqrt{3}$

Q 3. What is the length of the side opposite to the angle θ in the given picture ?

Case Study-II

A heavy-duty ramp is used to winch heavy appliances from street level up to a warehouse loading dock. If the ramp is 2 meter high and the incline is 4 meter long.

(Use $\sqrt{3}$ = 1.73)

Q 1 . What angle does the dock make with the street?

Ans- 30°

Q 2. How long is the base of the ramp? **(In round figure)**

Ans - 3.5 m

Q 3. If the ramp is inclined at the angle of 45° , what is the height of the ramp ? **Use $\sqrt{2}$ = 1.41**

Ans- 2.82 m

Case Study-III

A truss is a structure that consists of members organized into connected triangles so that the overall assembly behaves as a single object. Trusses are most commonly used in bridges, roofs and towers.

Consider the line diagram of truss shown below and find the following length

(Use $\sqrt{3}$ = 1.732)
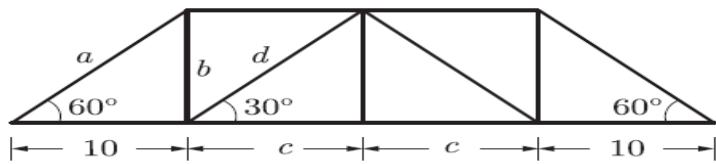
Q 1. What is the length *a*?

Ans- 20 m

Q 2. What is the length *b* ?

Ans - 17.32 m

Q 3. What is the length *d* ?

Ans- 34.64 m

Case Study-IV

Tower cranes are a common fixture at any major construction site. They're pretty hard to miss – they often rise hundreds of feet into the air, and can reach out just as far. The construction crew uses the tower crane to lift steel, concrete, large tools like acetylene torches and generators, and a wide variety of other building materials

A crane stands on a level ground. It is represented by a tower *AB*, of height 24 m and a jib *BR*. The jib is of length 16 m and can rotate in a vertical plane about *B*. A vertical cable, *RS* , carries a load *S* . The diagram shows current position of the jib, cable and load.
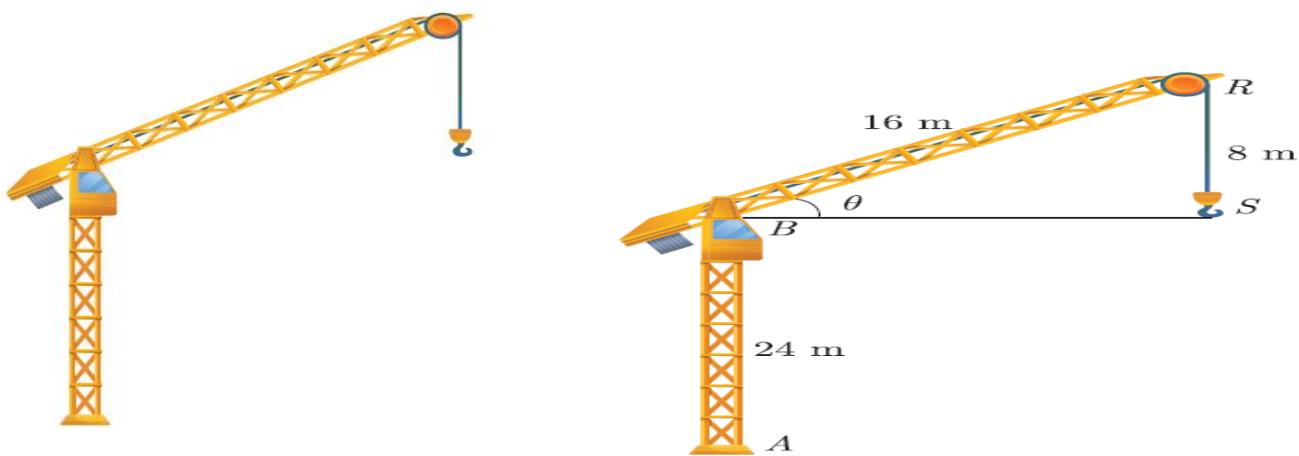
Q 1. What is the distance *BS* ?

Ans- $8\sqrt{3}$ m

Q 2. What is the angle that the jib, *BR*, makes with the horizontal ?

Ans- 30°

Q 3. What is the distance between the points A and S ?

Ans - 27.71 m

Case Study - V

Water Slide Design : Slide shown in the figure is part of a design for a water slide.

(Use $\sqrt{2}$ = 1.41 and $\sqrt{3}$ = 1.73)
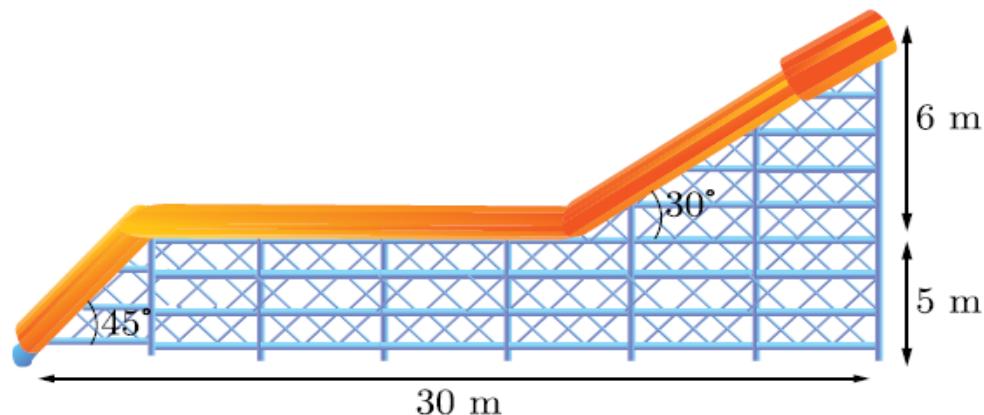
Q 1. What is the length of flat part of slide.

Ans- 14.62 m

Q 2. Which inclined part is more comfortable for small children ? Upper inclination or lower inclination ?

Ans – upper inclination

Q 3 . What is the total length of the slide?

(a) 5.4 m   (b) 21.6 m   (c) 33.69 m   (d) 42.2 m

CHAPTER 9 : APPLICATION OF TRIGONOMETRY

MCQ

Q1. From the top of a 7m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. The height of the tower in metre is

(a) 7(√3 +1) (b) 7(√3 -1) (c) 7√3 +1 (d) 7 +√3

Q2 The height of tower is-
(a) 50√3 (b) 50/√3
(c) 50 + √3 (d) 50 - √3
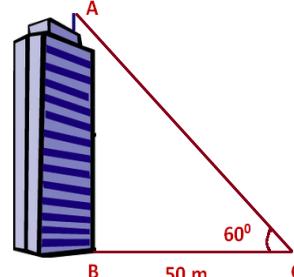
Q3 (a)Angle of depression measures same as angle of elevation
(b)Angle of depression measures greater then as angle of
(c)Angle of depression measures less than as angle of
(d)Not defined
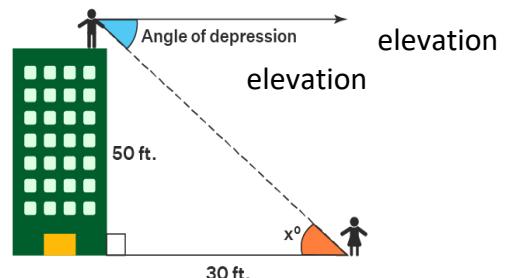
Q4 A plane is observed to be approaching the airport. It is at a distance of 12 km from the point of observation and makes an angle of elevation of 60°. The height above the ground of the plane is
(a) 6√3 m (b) 4√3 m (c) 3√3 m (d) 2√3 m

Q5 Two poles are 25 m and 15 m high and the line joining their tops makes an angle of 45° with the horizontal. The distance between these poles is
(a) 5 m (b) 8 m (c) 9 m (d) 10 m

Q6 In the figure, BC represents the pole and AB its shadow. The angle of elevation of the sun at this point of time is 60°.
Which is true -
(a) $\sqrt{3}l$ = h (b) $\sqrt{3}h$ = l
(c) $\sqrt{3}l$ + h = 0 (d) $\sqrt{3}h$ + l = 0
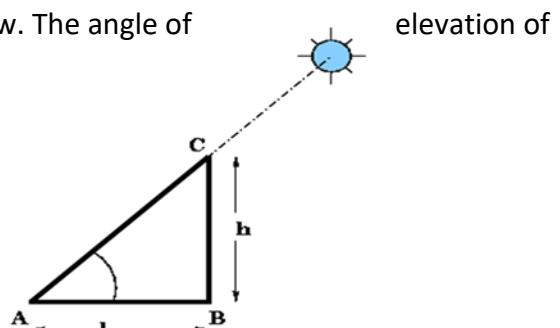
Q7. Let BC represent the tower with height h = 40 m, and A represent the point where the man is standing. AB = d denotes the distance of the man from tower. The angle subtended by the tower is A = 60°. so 'd' is defined as

a) $\frac{40}{\sqrt{3}}$ b) 40 $\sqrt{3}$
b) $\sqrt{3}$ + 40 d) $\sqrt{3}$ -40
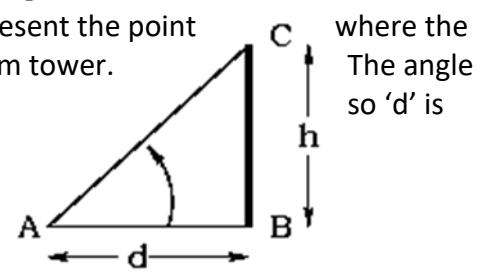
Q8.   The shadow of a tower is equal to its height at 10:45 a.m. The sun's altitude is
       (a) 30°   (b) 45°   (c) 60°   (d) 90°

Q9.   In given figure, the length of AP is

(a) $\dfrac{8\sqrt{3}}{3}$ cm

(b) $\dfrac{80\sqrt{3}}{3}$ cm

(c) $8\sqrt{3}$ cm

(d) $80\sqrt{3}$ cm
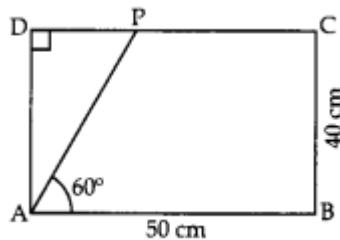
Q10   When the length of shadow of a vertical pole is equal to √3 times of its height, the angle of
       elevation of the Sun's altitude is
       (a) 30°   (b) 45°   (c) 60°   (d) 15°

Assertion and Reasoning questions Q11 to Q 15

DIRECTION: In the following questions (Q1-10), 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)if both assertion (A) and reason (R) are true but reason (R) is not the correct   explanation of assertion
(A).

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

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

Q11.   Two poles of equal heights are standing opposite to each other, on either side of the road,
        which is 80m wide. From a point between them on the road, the angles of elevation of top of
        the poles are 60° and 30° respectively. Find the height of the poles.

        A : First pole is nearer.

        R: Either one of angle of elevation is required

Q12.   An Aeroplan is flying horizontally 4000 m above the ground and is going away from an
        observer on the level ground. At a certain instant the observer finds that the angle of
        elevation of the plane is 45°. After 15 seconds, its elevation from the same point changes to
        30°. Find the speed of the areophane in km/h.

        A.   Distance between the plane and observer is required.
        B.   Time 15 second is sufficient to calculate

Q13.
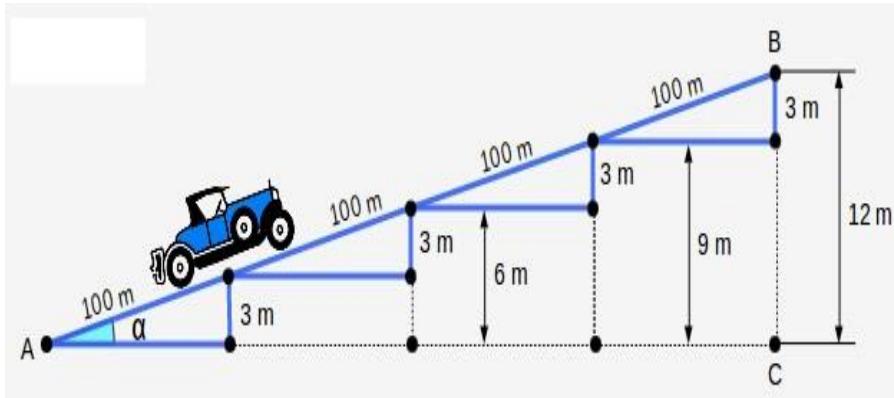
As per this Trigonometry inclined plane

    A. The angle of elevation is different at all steps of inclination.
    B. The height of plane can be measured.

Q14.   A man is standing on the deck of a ship which is 8 m above water level. He observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of the hill as 30°.
    A. The height of hill from the ship can be measured.
    B. .When the ship is in move

Q15.   The Leaning Tower of Pisa currently "leans" at a 4∘ angle and has a vertical height of 55.86 meters. How tall was the tower when it was originally built ?

    A. The value of $\cos 4^0$ is sufficient.
    B. The value of $\tan 4^0$ is sufficient.
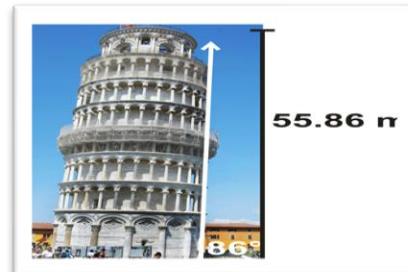
Short Answer Type – I (2 marks)

Q1.   A 25-foot-tall flagpole casts a 25-foot shadow. What is the angle that the sun hits the flagpole?

Q2.   Mark is flying a kite and realizes that 300 feet of string are out. The angle of the string with the ground is 45∘. How high is Mark's kite above the ground?

Q3.   The angle of elevation of the top of the building from the foot of the tower is 30^0 and the angle of the top of the tower from the foot of the building is 60^0. If the tower is 50 m high, find the height of the building.

Q4.   The shadow of a tower standing on a level ground is found to be 40 m longer when Suns altitude is 30^0 than when it was 60^0. Find the height of the tower.

Short Answer Type – II (3 marks)

Q20. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle of 30o with the ground. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree

Q21. A man on the top of the vertical tower observes a car moving at a uniform speed coming directly towards it. If it takes 12 minutes for the angle of depression to change its measure from 30 ^{0} to 45 ^{0}, how soon after this, will the car reach the tower?

Q22. The ratio of the height of a tower and the length of its shadow on the ground is √3 1. What is the angle of elevation of the sun?

Q23. A vertical tower stands on horizontal plane and is surmounted by a vertical flagstaff of height *h* m. At a point on the plane, the angle of elevation of the bottom of the flagstaff is α and that of the top of the flagstaff is β. Prove that the height of the tower is $\frac{h\ tan\alpha}{tan\beta - tan\alpha}$

Q24. From a point on a bridge across a river the angle of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at the height of 30 m from the banks, Find the width of the river.

Long Answer Type (5 marks)

Q1. Two poles of equal heights are standing opposite to each other, on either side of the road, which is 80m wide. From a point between them on the road, the angles of elevation of top of the poles are 60º and 30º respectively. Find the height of the poles.

Q2. At the foot of a mountain, the elevation of its summit is 45°. After ascending 1000 m towards the mountain up a slope of 30° inclination, the elevation is found to be 60°. Find the height of the mountain

Q3.

The angles of depression of the top and bottom of 8 m tall building from the top of a multi-storeyed building are 30^0 and 45^0 respectively. Find the height of the multi-storeyed building and the distance between the two buildings**.**

Q4. The horizontal distance between two buildings is 140 m. The angle of depression of the top of the first building when seen from the top of the second building is 30°. If the height of the first building is 60 m, find the height of the second building

Q5. The shadow of a tower at a time is three times as long as its shadow when the angle of elevation of the sun is 60°. Find the angle of elevation of the sun at the time of the longer shadow

CASE STUDY BASED QUESTIONS

Q1. A flag pole 'h' metres is on the top of the hemispherical dome of radius 'r' metres. A man is standing 7 m away from the dome. Seeing the top of the pole at an angle 45° and moving 5 m away from the dome and seeing the bottom of the pole at an angle 30°.


Find
   (i)   the height of the pole
   (ii)   radius(height) of the dome
   (iii)   Is it possible to see the pole at the angle of 60 ^{0}
   (iv)   If the height of pole is increased, the angle elevation will .....
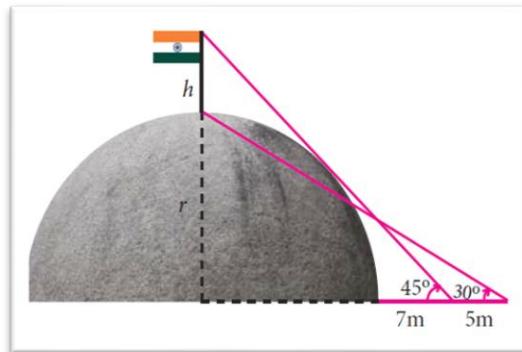
Q2. A man is watching a boat speeding away from the top of a tower. The boat makes an angle of depression of 60° with the man's eye when at a distance of 200 m from the tower. After 10 seconds, the angle of depression becomes 45°.
   i.   What is the approximate speed of the boat (in km / hr), assuming that it is sailing in still water?
   ii.   How far is the boat when the angle is 45 ^{0}
   iii. What is the height of tower is
   iv.   As the boat moves away from the tower, angle of elevation will decrease/ increase?
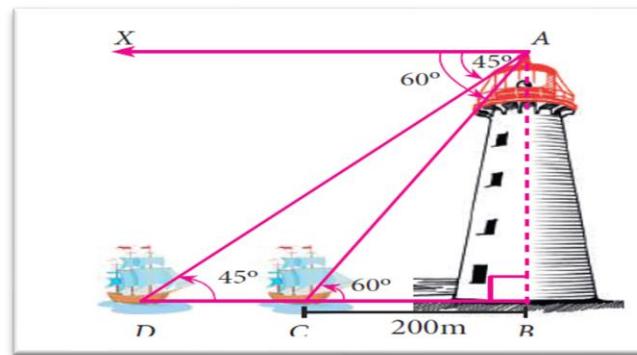
Q3. Two trees are standing on flat ground. The angle of elevation of the top of Both the trees from a point X on the ground is 60°. If the horizontal distance between X and the smaller tree is 8 m and the distance of the top of the two trees is 20 m, calculate –
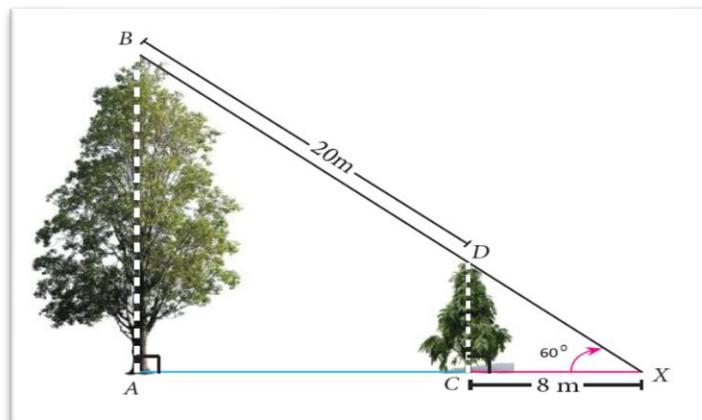
   i.   the distance between the point X and the top of the smaller tree.
   ii.   the horizontal distance between the two trees.
   iii. Height of big tree ………….
   iv.   Height of small tree is ……….

Q4. Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure, including microwave dishes. They are among the

tallest human made structures. There are 2 main types: guyed and   Self-supporting structures.

On a similar concept, a radio station tower was built in two sections *A* and *B*. Tower is supported by wires from a point *O* .

Distance between the base of the tower and point *O* is 36 m. From   point *O* , the angle of elevation of the top of section *B* is 30^c and the   angle of elevation of the top of section *A* is 45^c.
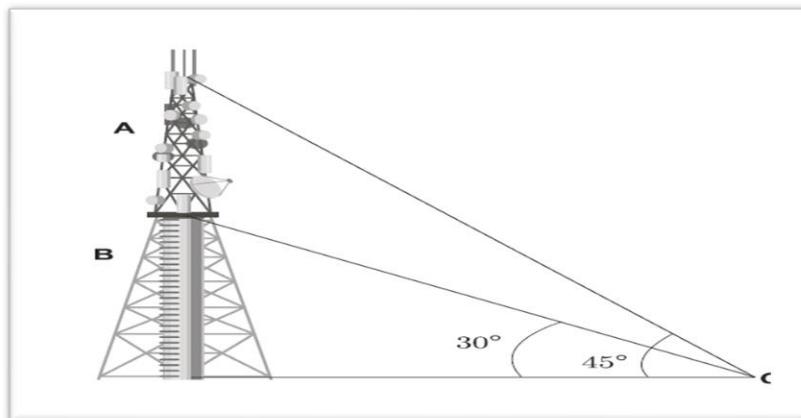
    i.   What is the height of the section *B?*
    ii.   What is the height of the section *A?*
    iii.   What is the length of the wire structure from the point *O* to the top of section *A?*
    iv.   What is the angle of depression from top of tower to point *O* ?

Q5.   Navy officer Mr. Colin is tasked with planning a coup on the enemy at a certain date. Currently he is inspecting the area standing on top of the cliff. Agent Dev is on a chopper in the sky. When Mr. Colin looks down below the cliff towards the sea, he has Bhawani and Amar in boats. is behind the Amar boat.
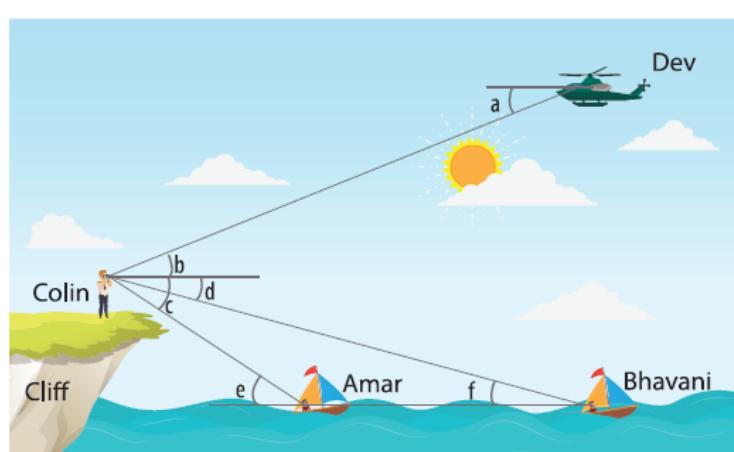
Following angle have been measured :
From Colin to Bhawani : 30c
From Dev to Colin : 60c
    (i) Which of the following is a pair of angle of elevation?

(a) (∠a, ∠e)   (b) (∠b, ∠e)
(c) (∠c, ∠d)   (d) ∠a, ∠f)

(ii) Which of the following is a pair of angle of depression?
   (a) (∠a, ∠e)   (b) (∠b, ∠e)
   (c) (∠c, ∠d)   (d) (∠a, ∠f)

(iii) If angle of depression of Colin to Bhawani is 30c, what is the distance of Amar boat from the Bhawani boat?

   (a) $\frac{\sqrt{3}}{2}$h   (b) $\frac{h}{\sqrt{3}}$

   (c) $\frac{2h}{\sqrt{3}}$ (d) $\sqrt{3}$ h

(iv) If angle of depression of Dev to Colin is 60c , what is the height of Dev from base of hill ?
   (a) h (b) $2h$
   (c) $3h$ (d) $4h$

<u>Answer key</u>

MCQ

Q1. a   Q2. b   Q3. a   Q4. a   Q5. d   Q6. a   Q7. a   Q8. b   Q9. b   Q10. a

ASSERTION AND REASONING   Q11. d   Q12. d   Q13. d   Q14. c   Q15. c

Short Answer Type – I (2 marks)   Q1. 45^0 Q2. 150 √2   Q3. 50/3 m   Q4. 20√3 m

Short Answer Type – II (3 marks) Q1. 20/√3 m Q2. (18 +6 √3) min Q3. 60 ^{0}Q4. NA

Q5. 30 ($\sqrt{3}+1$) m

Long Answer Type (5 marks) Q1. 20√3 m   Q2. 1000/ (√3 – 1) m   Q3. (12 + 4√3) m

Q4. 12($\sqrt{3}+1$), 4√3($\sqrt{3}+1$)   Q5. 30 ^{0}

CASE STUDY BASED QUESTIONS

Q1. 7 , 6 ($\sqrt{3}+1$) NO, Decrease   Q2. 53 km/hr approx, 147m approx. 200√3 m, decrease

Q3. 16 m , 10m, 18√3 m,8√3 m   Q4. a, c, d, b   Q5. b, c , b , d

CHAPTER-10 (CIRCLES)

MCQ BASED QUESTIONS (1 MARK)

Q.1 The common point of a tangent to a circle with the circle is called _____

   (a) Centre   (b) point of contact   (c) end point   (d) none of these.

Q.2 If radii of two concentric circles are 4 cm and 5 cm, then the length of each chord of one circle

which is tangent to the other circle is -----
(a) 3cm   (b) 1cm   (c) 6cm   (d) 9cm

Q.3 If angle between two radii of a circle is 130º, the angle between the tangents at the ends of the

radii is :

(a) 90º   (b) 50º   (c) 70º   (d) 40º

Q.4 In Fig., if ∠AOB = 125°, then ∠COD is equal to
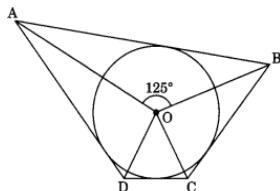
(a) 62.5°   (c) 35°   (b) 45°   (d) 55°

Q.5 A tangent PQ at a point P of a circle of radius 5 cm meets a line through the Centre O at a point Q

so that OQ = 12 cm. Length PQ is -----

(a) 12 cm   (b) 13 cm   (c) 8.5 cm   (d) $\sqrt{119}$ cm.

Q.6 In Fig., if O is the centre of a circle PQ is a chord and the tangent PR at P makes an angle of 50°

with PQ, then ∠POQ is equal to ------
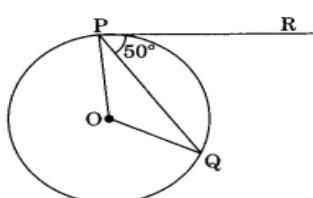
(a) 100°   (b) 80°   (c) 90°   (d) 75°

Q.6 In Fig., if PA and PB are tangents to the circle with centre O such that ∠APB = 50°,

then ∠OAB is equal
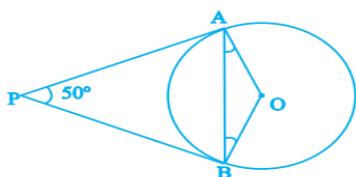
(a) 25°   (b) 30°   (c) 40°   (d) 50°

Q.7 A circle can have _____parallel tangents at a single time.

(a) One   (b) Two   (c) Three   (d) Four

Q.8   A line intersecting a circle in two points is called a _____.

(a) Secant (b) Chord   (c) Diameter (d) Tangent

Q.9 In Fig., AT is a tangent to the circle with centre O such that OT = 4 cm and ∠OTA =   30°. Then AT is equal to
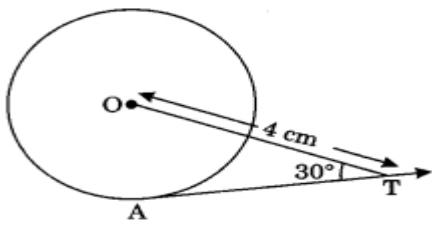
(a) 4 cm   (b) 2 cm   (c) 2√3 cm   (d) 4√3 cm

Q.10 In the given Fig., AB is a chord of the circle and AOC is its diameter such that ∠ACB = 50°. If   AT is

the tangent to the circle at the point A, the ∠BAT is equal to
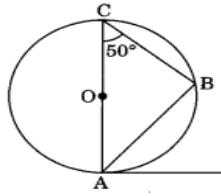
(a) 65°   (b) 60°   (c) 40°   (d) 50°

Q.11 The area of the circle that can be inscribed in a square of each 6cm is

(a) 36π sq.cm   (b) 18π sq.cm   (c) 12 π sq.cm   (d) 9π sq.cm

Q12 If two tangents inclined at an angle of 60° are drawn to a circle of radius 3cm, then the length of

each tangent is equal to

(a) 3√3/ 2 cm   (b) 3cm   (c) 6cm   (d) 3√3cm

Q.13 The number of tangents drawn from a point lies inside the circle is --------

(i) Two tangents   (ii) only one tangent   (iii) No tangents (iv) Infinite tangents

Q.14 The number of tangents drawn from a point lies on the circle is --------

(i) Two tangents   (ii) only one tangent   (iii) No tangents (iv) Infinite tangents

Q.15 The number of tangents drawn from a point lies outside the circle is --------

(i) Two tangents   (ii) only one tangent   (iii) No tangents (iv) Infinite tangents

ANSWER KEY MCQ: 1- (b) point of contact 2-(d) 9cm   3- (b) 50º   4- (d) 55°

5-(d) √119 cm.   6- (a) 100°   7-(b) Two   8-(a) Secant   9-(c) 2√3 cm 10-(d) 50°

11-(d) 9π sq.cm   12-(d) 3√3cm 13-(iii) No tangents 14- (ii) only one tangent 15- (i) Two tangents

ASSERTION AND REASONING BASED QUESTION

Q.1.Assertion (A):   If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.

**Reason (R):** (hypotenuse) ^{2} = (base) ^{2} + (height) ^{2}

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

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

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

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

Q.2.Assertion (A):   The two tangents are drawn to a circle from an external point, then they subtend equal angles at the centre.

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

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

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

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

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

Q-3 .Assertion (A): PA and PB are two tangents to a circle with centre O. Such that $\angle AOB = 110^0$, then $\angle APB = 90^0$.

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

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

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

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

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

Q-4.Assertion (A): The length of the tangent drawn from a point 8cm away from the centre of circle of radius 6cm is $2\sqrt{7}$ cm.

Reason (R): If the angle between two radii of a circle is 130^0, then the angle between the tangents at the end points of radii at their point of intersection is 50^0.

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

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

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

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

Q.5. Assertion (A): If a chord AB subtends an angle of 60^0 at the centre of a circle, then the angle between the tangents at A and B is also 60^0.

Reason (R): The length of the tangent from an external points P on a circle with centre O is always less than OP.

(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.

ANSWER KEY:

   1(a) , 2(b) , 3 (d) , 4(b) , 5(d)

SHORT ANSWER TYPE-1 (2MARKS)

Q.1 In the given figure, O is the centre of circle. Find $\angle AQB$, given that PA and PB are tangents to the circle and $\angle APB= 75°$
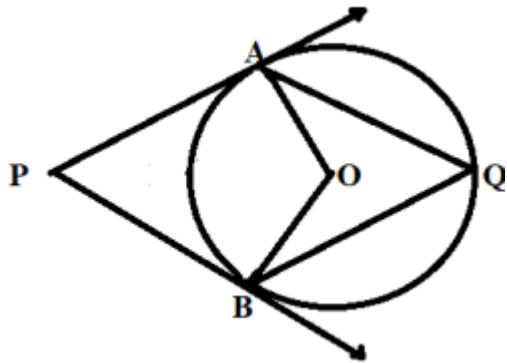
(ANSWER: 52.5⁰)

Q.2 Find the diameter of a circle whose area is equal to the sum of the areas of the two circles of radii 24 cm and 7 cm. **(ANSWER: 50cm)**

Q.3 Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

**Q.4** In Fig., AB and CD are common tangents to two circles of unequal radii. Prove that AB = CD.
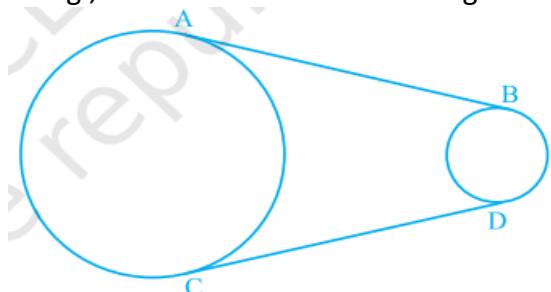
**Q.5** In Fig., common tangents AB and CD to two circles intersect at E. Prove that AB = CD.
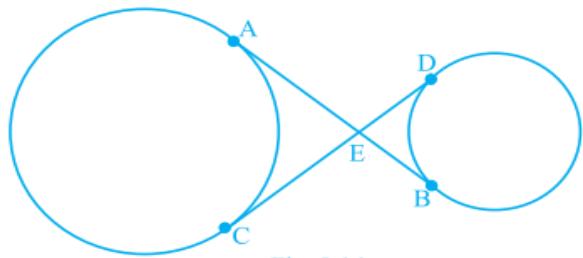
Q.6 If from an external point B of a circle with centre O, two tangents BC and BD are drawn such that ∠DBC = 120°, prove that BC + BD = BO, i.e., BO = 2BC.

Q.7 In figure, AP and BP are tangents to a circle with centre O , such that AP = 5 cm and ∠APB = 60° . Find the length of chord AB.
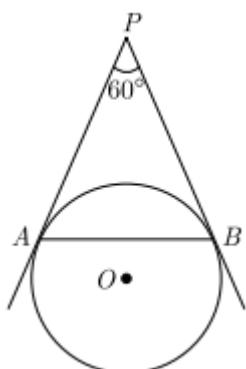
(ANSWER: 5CM)

Q.8 In the given figure, AOB is a diameter of the circle with centre O and AC is a tangent to the circle at A. If ∠BOC = 130° , the find ∠ACO.
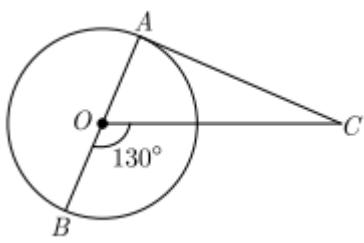
Q.9 A quadrilateral ABCD is drawn to circumscribe a circle (see Fig.). Prove that AB + CD = AD + BC
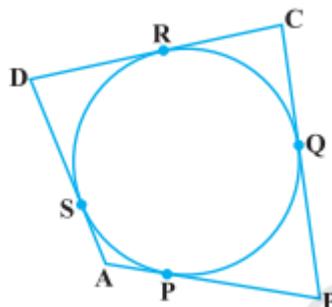
Q.10 In the given figure, a circle touches all the four sides of quadrilateral ABCD with AB = 6 cm, BC = 7 cm and CD = 4 cm, then length of AD is
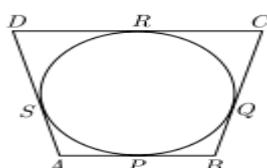
(ANSWER: 3cm)

SHORT ANSWER TYPE-2 (3MARKS)

Q.1 Prove that a parallelogram circumscribing a circle is a rhombus.

Q.2 In the figure XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB

with point of contact C interesting XY at A and X'Y' at B, what is the measure of ∠AOB.
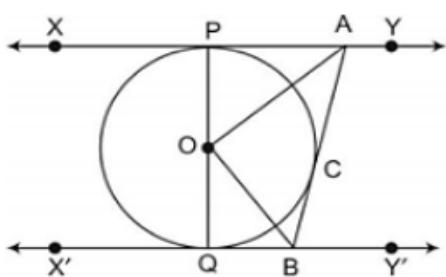
(ANSWER: 90⁰)

Q.3 In the figure, PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect

at a point T. Find the length TP.
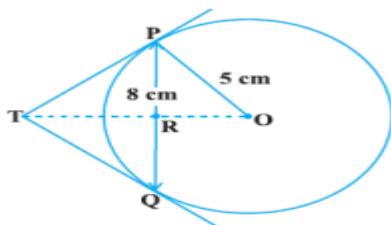
(ANSWER: 20/3cm)

Q.4 Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠ PTQ = 2 ∠ OPQ.

Q.5 If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that AQ = 1/ 2 (BC + CA + AB)
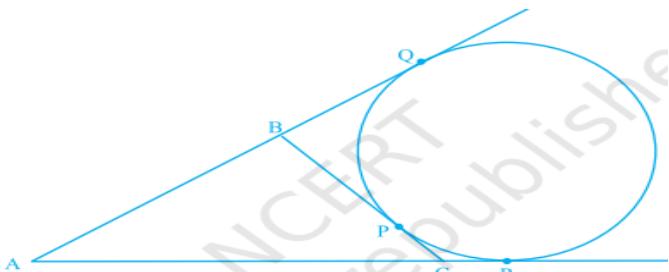
Q.6 In figure, AP, AQ and BC are tangents of the circle with centre O. If AB = 5 cm, AC = 6 cm and BC = 4 cm, then the length of AP (in cm) is
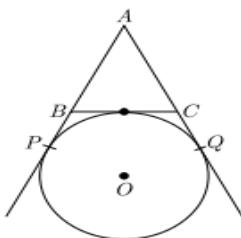
(ANSWER: 7.5cm)

Q.7 Two tangents PQ and PR are drawn from an external point to a circle with centre O. Prove that QORP is a cyclic quadrilateral.

Q.8 Prove that the centre of a circle touching two intersecting lines lies on the angle bisector of the lines.

Q.9 PA and PB are the tangents drawn to a circle with centre O. If PA= 6 cm and ∠ APB=60° , then find the length of the chord AB.
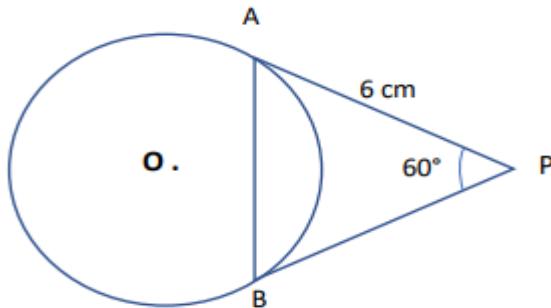
(ANSWER: 6cm)

Q.10 Prove that the lengths of tangents drawn from an external point to a circle are equal.

LONG ANSWER TYPE (5 MARKS)

Q.1 A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 8 cm and 6 cm respectively (see Fig.). Find the sides AB and AC.
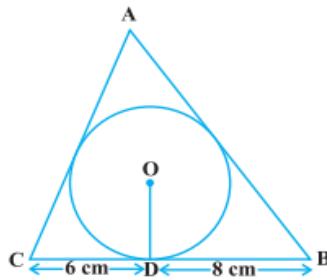
Q.2 In the given figure, a circle is inscribed in a triangle PQR. If PQ = 10 cm, QR = 8 cm and PR = 12 cm, find the lengths of QM, RN and PL
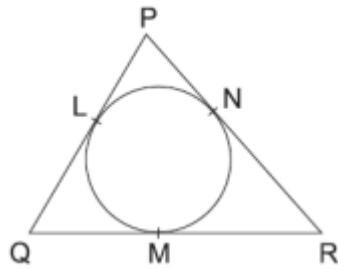
(**ANSWER: QM=3cm, RN=5cm, PL=7cm**)

Q.3 If a hexagon ABCDEF circumscribe a circle, prove that AB + CD + EF = BC + DE + FA.

Q.4 If AB is a chord of a circle with centre O, AOC is a diameter and AT is the tangent at A .

Prove that ∠BAT = ∠ACB

Q.5 Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary

angles at the centre of the circle.

Q.6 In Fig., tangents PQ and PR are drawn to a circle such that ∠RPQ = 30°. A chord RS is drawn parallel

to the tangent PQ. Find the ∠RQS.

[**Hint:** Draw a line through Q and perpendicular to QP.]
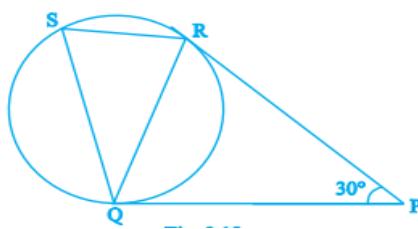
(**ANSWER: ∠RQS=30⁰**)

Q.7 If an isosceles triangle ABC, in which AB = AC = 6 cm, is inscribed in a circle of radius 9 cm, find the area of the triangle. (**ANSWER: $8\sqrt{2}$cm**)

Q.8 The tangent at a point C of a circle and a diameter AB when extended intersect at P. If ∠PCA=110º , find ∠CBA [see Fig.]. **ANSWER: 70⁰**
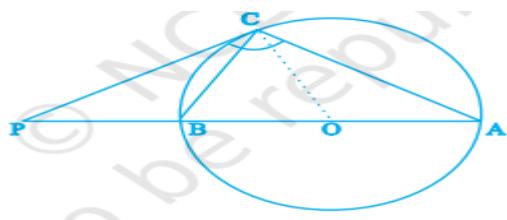
Q.9 Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.

Q.10 a, b and c are the sides of a right triangle, where c is the hypotenuse. A circle, of radius r, touches the sides of the triangle. Prove that r = (a+b – c)/ 2.

CASE STUDY QUESTIONS (4 MARKS)

Q.1

▢ In a park, four poles are standing at positions A, B, C and D around the fountain such that the cloth joining the poles AB, BC, CD and DA touches the fountain at P, Q, R and S respectively as shown in the figure.
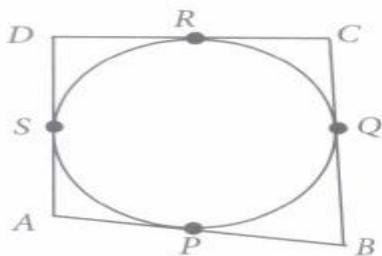
Based on the above information, answer the following questions.
(i) If O is the centre of the circular fountain, then Find ∠OSA.
(ii) If DR = 7 cm and AD = 11 cm, then Find AP.
(iii) If O is the centre of the fountain, with ∠QCR = 60°, then Find ∠QOR
ANSWER KEY: (i) 90°   (ii) AP= 4cm   (iii) 120°

Q.2. In a maths class, the teacher draws two circles that touch each other externally at point K with centres A and B and radii 5 em and 4 em respectively as shown in the figure.
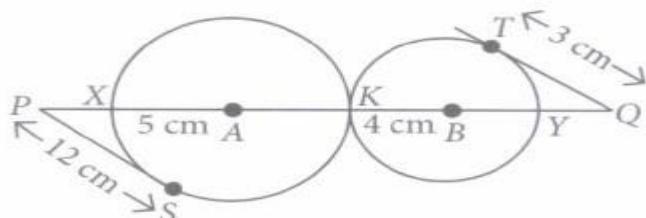
Based on the above information, answer the following questions.
(i) Find the value of PA .
(ii) Find the value of BQ.
(iii) Find the value of QY.
**ANSWER KEY:** (i) 13cm   (ii) 5cm   (iii) 1cm

Q.3. In an online test, Ishita comes across the statement - If a tangent is drawn to a circle from an external point, then the square of length of tangent drawn is equal to difference of squares of distance of the tangent from the centre of circle and radius of the circle.

Help Ishita, in answering the following questions based on the above statement.

(i) If AB is a tangent to a circle with centre O at B such that AB = 10 cm and OB = 5 cm, then Find OA.

(ii) In the adjoining figure, Find the radius of the circle.
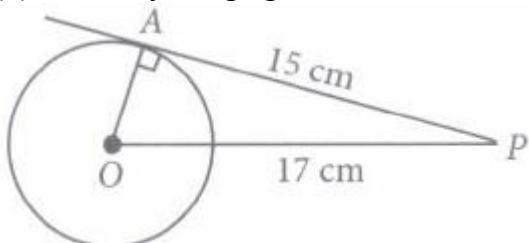
(iii) In the adjoining figure, Find the length of the tangent
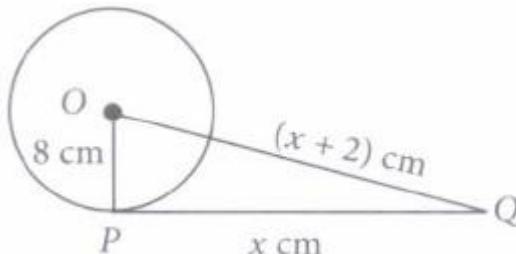
ANSWER KEY: (i) 5√5 cm   (ii) OA= 8cm   (iii) PQ= 15 cm

CASE STUDY QUESTIONS-4

A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms the figure as given below
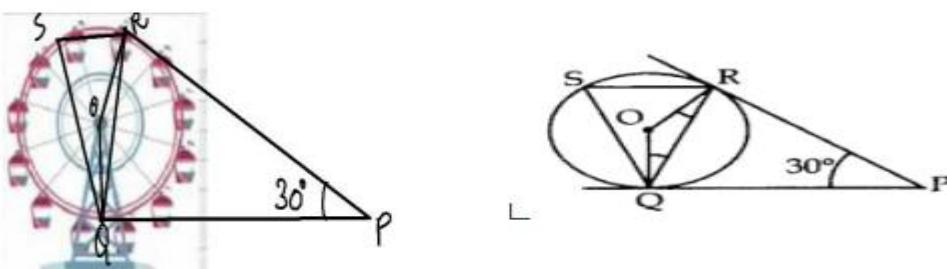
In the given figure
1. find ROQ.
2. Find RQP.
3. Find RSQ
4. Find ORP

ANSWER KEY: 1. 150 °   **2.** 75 °   **3.** 75 °   **4.** 90 °

**CASE STUDY QUESTIONS-5**

In an international school in Hyderabad organised an Interschool Throwball Tournament for girls just after the pre-board exam. The throw ball team was very excited. The team captain Anjali directed the team to assemble in the ground for practices. Only three girls Priyanshi, Swetha and Aditi showed up. The rest did not come on the pretext of preparing for pre-board exam. Anjali drew a circle of radius 5m on the ground. The centre A was the position of Priyanshi. Anjali marked a point N, 13 m away from centre A as her own position. From the point N, she drew two tangential lines NS and NR and gave positions S and R to Swetha and Aditi. Anjali throws the ball to Priyanshi, Priyanshi throws it to Swetha, Swetha throws it to Anjali, Anjali throws it to Aditi, Aditi throws it to Priyanshi, Priyanshi throws it to Swetha and so on.
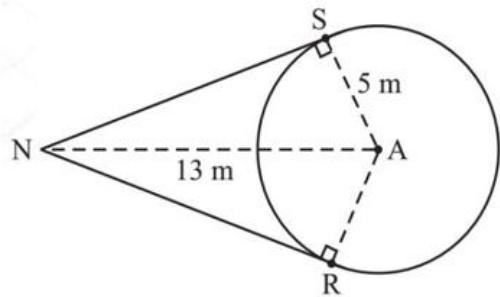
1. Find the measure of ∠NSA.
2. Find the distance between Swetha and Anjali.
3. If ∠SNR is equal to θ, then Find ∠NAS .

ANSWER KEY: 1. 90°   **2.** 12m   **3.** $90^0 - \frac{\theta}{2}$

CHAPTER 12.AREAS RELATED TO CIRCLE

MCQ (1 MARK)

Q1.The area of a circular ring formed by two concentric circles whose radii are 5.7 cm and

4.3 cm respectively is (Take $\pi = 3.14$)

(a) 44 sq. cm.   (b) 66 sq. cm.   (c) 22 sq. cm.   (d) 33 sq. cm

Q2.The diameter of a wheel is 1.26 metres. How long will it travel in 500 revolutions?

A. 1492   B. 2530   C. 1980   D. 2880

Q3.Area of a sector of a circle of radius R, whose central angle is P (in degrees) is given by:

A. $\frac{P}{180}$x 2πR   B. $\frac{P}{180}$x πR²   C. $\frac{P}{180}$x 2πR²   D. $\frac{P}{360}$x 2πR

Q4.The area of a circle is 154 cm, then its diameter is

    A . $7cm$ B. $21cm$ C. $40cm$ D. $28cm$

Q5.The area of the circle that can be inscribed in the square of side 6cm is

    A . $18\pi cm$ B. $12\pi cm$ C. $9\pi cm$ D. $14\pi cm$

Q6 The perimeter of circular field is 242 cm. The area of the field is :-

    a)9317 cm^2 b)18634 cm^2 c) 4658.5 cm^2 d)None of these

Q7. The difference between the circumference and radius of a circle is 37 cm. The area of the circle is:-

    a) 111cm^2 b) 184 cm^2 c) 154 cm^2 d) 259 cm^2

Q8..The area of the square is the same as the area of the circle. Their perimeter are in the ratio:-

    a) 1:1   b)π:2   c) 2:π d) none of these

Q9. In making 1000 revolutions, a wheel covers 88 Km. The diameter of the wheel is:-

    a) 14 m   b) 24 m   c) 28 md) 40 m

Q10. The diameter of a wheel is 40 cm. How many revolutions will it make on covering 176 m ?

    a) 140   b) 150   c) 160   d) 166

Q11. A wire is looped in the form of a circle of radius 28 cm. It is re-bent into a square form.

    Determine the length of the side of the square:-

    a) 42 cm   b) 44 cm   c) 46 cm   d) 48 cm

Q12. A road which is 7 m wide surrounds a circular park whose circumference is 352 m.

    Find the area of the road.

    a) 2618 m^2 b) 2518 m^2 c) 1618 m^2 d) none of these

Q13. A square is inscribed in a circle of radius r. Find the area of the square in sq.units

    a) 3r^2 b) 2r^2 c) 4r^2 d) none of these

Q14. Find the area of a right angled triangle, if the radius of its circumscribed circle is 2.5 cm and the

    altitude drawn to the hypotenuse is 2 cm long.

    a) 5 cm^2 b) 6 cm^2 c) 7 cm^2 d) none of these

15. The perimeter of a sector of a circle of radius 5.6 cm is 27.2 cm. Find the area of the sector.

    a) 44 cm^2 b) 44.6 cm^2 c) 44.8 cm^2 d) none of these

<div align="center">**ANSWERS:**</div>

<div align="center">**MCQ**</div>

1 (a)	2(c)	3(c)	4 (c)	5(c)	MM6 (c)	7(c)	8(d)

9(c) 10(a) 11(b) 12(a) 13. (b) 14. (a) 15.(c)

<div align="center">**ASSERTION AND REASONING**</div>

1.Assertion : In a circle of radius 6 cm, the angle of a sector is 60° Then the area of the sector is $18\frac{6}{7}$ cm² .

Reason : Area of the circle with radius r is πr^2 .

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

 (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.

2.Assertion : If the outer and inner diameter of a circular path is 10 m and 6 m then area of the path is 16π m^2 .

Reason : If R and r be the radius of outer and inner circular path, then area of path is $\pi(R^2 - r^2)$

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

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

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

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

3.Assertion : If a wire of length 22 cm is bent in the shape of a circle, then area of the circle so formed is 40 cm^2 .

Reason : Circumference of the circle = length of the wire.

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

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

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

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

4.Assertion : If the circumference of a circle is 176 cm, then its radius is 28 cm.

Reason : Circumference= $2 \times \pi \times radius$

(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.

5.Assertion : The area of circular playground is 22176 m^2 the cost of fencing this ground at the rate Rs. 50 per metre is Rs. 26400

Reason : If R and r be the radius of outer and inner circular path ,then the area of the ring will be π(R^2– r^2)

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

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

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

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

<div align="center">

Answers

</div>

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

The correct formula for area of the sector is $\frac{\theta}{360} \times \pi r^2$

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

Formula given is correct . If R and r be the radius of outer and inner circular path, then area of path is $\pi(R^2 - r^2)$

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

The assertion is wrong as the area calculated is wrong (Area = $\frac{77}{2} cm^2$)

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

 Circumference= $2 \times \pi \times radius$

176=$2 \times \pi \times radius$

$\frac{176}{2\pi} = radius$ ∴ **8**=$radius$

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

<div align="center">

Short Answer Type -1 (2 MARKS)

</div>

1. The sum of the areas of two circle, which touch each other externally, is 153 . If the sum of their radii is 15, then find the ratio of the larger to the smaller radius .   (Ans 4:1)
2. If the radius of a circle is diminished by 10%, then find how much area will diminished ? (Ans 36%)
3. The circumference of two circles are in the ratio 2:3. Then find ratio of their areas.(Ans 4: 9)

4. On increasing the diameter of circle by 40%,find how much its area will be   increased?(Ans 96%)

5 The radii of two circles are 8 cm and 6 cm respectively. Find the radius of the circle having its area equal to the sum of the areas of the two circles.(10 cm)

6. The minute hand of a clock is 12 cm long ,find the area swept by minute hand in 35 minutes. . (Ans.264 cm^2)

7. The sum of radii of two circles is 140 cm and the difference of their circumferences is 88 cm. Find the diameters of the circles.(d1 = 154 cm, d2 = 126 cm)

8. An arc of a circle is of length 5 π cm and the sector it bounds has an area of 25 sq cm .Find radius of circle. (Ans.8 cm).

9. Find the area of sector of central angle x° of a circle with radius 4r. (Ans. $\frac{2\pi x r 2}{45°}$cm^2).

10. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find length of the arc. (Ans.22 cm).

Short Answer Type 2 (3 MARKS)

1 The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?   (Ans: 4375)

2. A field is in the form of a circle. A fence is to be erected around the field. The cost of fencing would be ₹2640 at the rate of ₹12 per metre. Then, the field is to be thoroughly ploughed at the cost of ₹0.50 per m^2. What is the amount required to plough the field?   (Ans: Rs. 1925)

3. A car travels 1 kilometre distance in which each wheel makes 450 complete revolutions. Find the radius of the its wheels. (Ans 35.35)

4. The area of enclosed between the concentric circles is 770 cm^2. If the radius of the outer circle is 21 cm, find the radius of the inner circle.   (Ans.14 cm).

5. A circular park is surrounded by a rod 21 m wide. If the radius of the park is 105 m, find the area of the road .   (Ans. 15246 cm^2)

6. A road which is 7 m wide surrounds a circular park whose circumference is 352 m. Find the area of the road.   (Ans.2618 m^2)

7. Find the radius of a circle whose circumference is equal to the sum of the circumferences of two circles of radii 15 cm and 18 cm.   (Ans.33 cm).

8. A pendulum swings through an angle 60° and describes an arc 8.8 cm in length ,then find the legth of pendulum (Ans.8.4 cm).

9. Find the area of sector of a circle with radius 6 cm and sector angle is 60° .   (Ans.$\frac{132}{7}$ cm^2)

10. The circumference of a circle exceeds the diameter by 16.8 cm. Find the circumference of the circle   (Ans.24.64 cm).

LA TYPE (5 MARKS)

1. An archery target has three regions formed by the concentric circles as shown in the figure. If the diameters of the concentric circles are in the ratio 1:2:3, then find the ratio of the areas of three regions

(Ans. 1:3:5)

2. Prove that the area of a circular path of uniform width h surrounding a circular region of radius r is

πh (2r + h).

3. The cost of fencing a circular field at the rate of Rs 36 per m is 11880.The field is to be ploughed at the rate of Rs. 0.60 per m². Then find the cost of ploughing the field.   (Ans Rs. 5197.5)

4. Find the area of the shaded region in the given figure, ¡f radii of the two concentric circles with centre O are 7 cm and 14 cm respectively and ∠AOC = 40°.   (Ans. $\frac{153}{4}$ cm²)
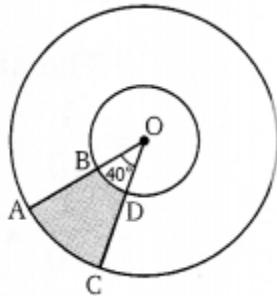
5. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut as shown in the figure. Find the area of the remaining portion of the square.

(Ans. $\frac{68}{7}$ cm²)
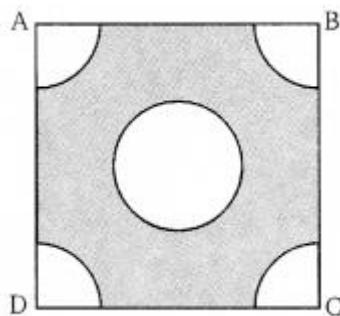
CASE STUDY QUESTION (4Marks)

Q1.John had a farm with many animals like cows, dogs, horses etc. He had sufficient grass land for the cows and horses to graze, One day Three of his horses were tied with 7metre long ropes at the three corners of a triangular lawn having sides 20m, 34m and 42m.

(a)   Find the a rea of the triangular lawn .   (Ans. 336 m²)

(b) Find the area of the field that can be grazed by the horses.   (Ans) 77m²

(c)   The area that cannot be grazed by the horses.   (Ans) 259m²

Q2.Raksha Bandhan, is a popular annual rite, or ceremony, which is celebrated in South Asia, and in other parts of the world significantly influenced by Hindu culture. On this day, sisters of all ages tie a talisman, or amulet, called the *rakhi*, around the wrists of their brothers, symbolically protecting them, receiving a gift in return, and traditionally investing the brothers with a share of the responsibility of their potential care..
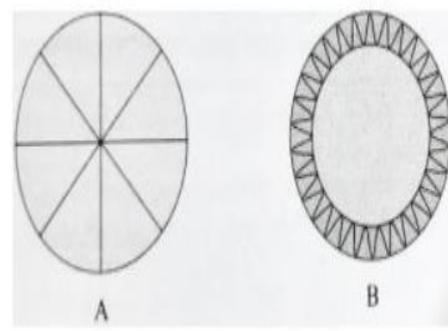
Observe the 2 designs of Rakhi
Design A: Rakhi A is made with silver wire in the form of a circle with diameter 28mm. The wire used for making 4 diameters which divide the circle into 8 equal parts.
Design B: Rakhi B is made of two colours - Gold and silver. Outer part is made with Gold. The circumference of silver part is 44mm and the gold part is 3mm wide everywhere.
Refer to Design A
(a). Find the total length of silver wire required   Ans) 200 mm
 (b) Find the area of each sector of the Rakhi   Ans) 77 mm²
Refer to Design B
(c) Find the circumference of outer part (golden)   Ans) 62.86 mm

Q3.Pookalam is the flower bed or flower pattern designed during Onam in Kerala. It is similar as Rangoli in North India and Kolam in Tamil Nadu. During the festival of Onam, your school is planning to conduct a Pookalam competition. Your friend who is a partner in competition, suggests two designs given below.

Observe these carefully.
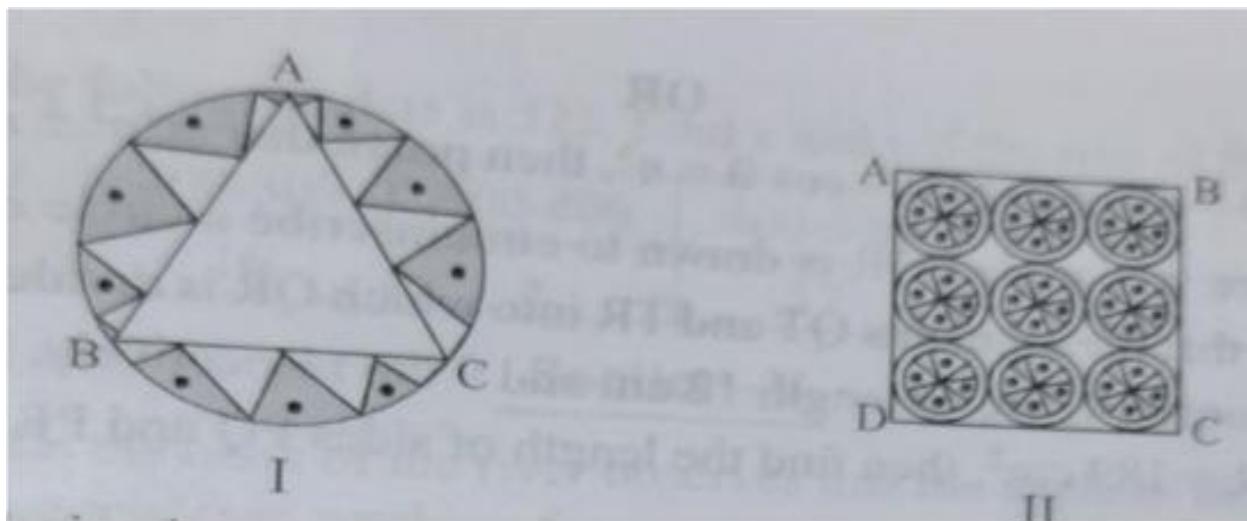
Design I: This design is made with a circle of radius 32cm leaving equilateral triangle ABC in the middle as shown in the given figure.

Design II: This Pookalam is made with 9 circular design each of radius 7cm.

Refer Design I:

1. Find the side of equilateral triangle is 　　　　　　　　　　　　　　　**Answer:** 32√3 cm

2. Find the altitude of the equilateral triangle is 　　　　　　　　　　　　　**Answer:** 48cm

Refer Design II:

3. Find the area of square is 　　　　　　　　　　　　　　　　　　　　　**Answer:** 1764 cm^2

Q4.A brooch is a small piece of jewellery which has a pin at the back so it can be fastened on a dress, blouse or coat. Designs of some brooch are shown below. Observe them carefully.
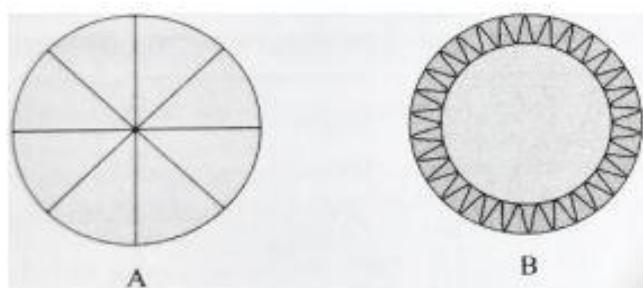
Design A: Brooch A is made with silver wire in the form of a circle with diameter 28mm. The wire used for making 4 diameters which divide the circle into 8 equal parts.

Design B: Brooch b is made two colours - Gold and silver. Outer part is made with Gold. The circumference of silver part is 44mm and the gold part is 3mm wide everywhere.

Refer to Design A

1. Find the total length of silver wire required . 　　　　　　　　　　　**Answer:** 200 mm

2. Find the area of each sector of the brooch is 　　　　　　　　　　　**Answer** 77 mm^2

Refer to Design B

3. Find the circumference of outer part (golden) is 　　　　　　　　　　**Answer:** 62.86 mm

Q5. In figure, O is the centre of a circle such that diameter AB = 13 cm and AC = 12 cm. BC is joined. Find the area of the shaded region.
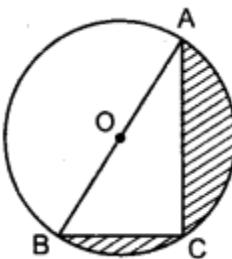
Q.1 Find the perimeter of circle. (Ans.40.85 cm)

Q.2 Find the area of triangle. (Ans.30 cm²)

Q.3 Find the area of shaded portion. (Ans.36.33 cm²)

CHAPTER 13 SURFACE AREAS AND VOLUMES
MCQ (1 Mark)

1. A cylindrical pencil sharpened at one edge is the combination of
(a) two cylinders
(b) a hemisphere and a cylinder
(c) a cone and a cylinder
(d) frustum of a cone and a cylinder

2. A shuttlecock used for playing badminton has the shape of the combination of
(a) a cylinder and a sphere
(b) a sphere and a cone
(c) a cylinder and a hemisphere
(d) frustum of a cone and a hemisphere

3. The slant height of the frustum of a cone having radii of two ends as 5 cm and 2 cm respectively and height 4 cm is
(a) √26 cm   (b) 5 cm   (c) √65 cm   (d) 25 cm

4. The total surface area of a hemispherical solid having radius 7 cm is
(a) 462 cm²   (b) 294 cm²   (c) 588 cm²   (d) 154 cm²

5. A solid formed on revolving a right angled triangle about its height is
(a) cylinder   (b) sphere   (c) right circular cone   (d) two cones
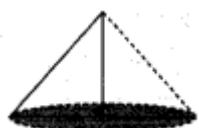
6. The surface area of a sphere is 616 cm2. Its radius is
(a) 7 cm   (b) 14 cm   (c) 21 cm   (d) 28 cm

7. A cylinder and a cone are of same base radius and of same height. The ratio of the volume of the cylinder to that of the cone is
(a) 2 : 1   (b) 3 : 1   (c) 2 : 3   (d) 3 : 2

8. The volume of a sphere is 4851 cm³. Its diameter is
(a) 3.5 cm   (b) 7 cm   (c) 14 cm   (d) 21 cm

9. A piece of paper is in the shape of a semi¬circular region of radius 10 cm. It is rolled to form a right circular cone. The slant height is

(a) 5 cm   (b) 10 cm   (c) 15 cm   (d) 20 cm

10. The base radii of two circular cones of the same height are in the ratio 3 : 5. The ratio of their volumes are

(a) 9 : 25   (b) 5 : 3   (c) 9 : 5   (d) 3 : 25

11. The curved surface area of glass having radii 3 cm and 4 cm respectively and slant height 10 cm is

(a) 55 cm²   (b) 110 cm²   (c) 220 cm²   (d) 440 cm²

12. If two solid hemispheres of same base radius are joined together along their bases, then curved surface area of this new solid is

(a) $3\pi r^2$ (b) $4\pi r^2$ (c) $5\pi r^2$ (d) 6π

13. The radii of the top and bottom of a bucket of slant height 13 cm are 9 cm and 4 cm respectively. The height of the bucket is

(a) 10 cm   (b) 12 cm   (c) 15 cm   (d) 16 cm

14. The shape of an ice-cream cone is a combination of:

(a) Sphere + cylinder   (b) Sphere + cone

(c) Hemisphere + cylinder   (d) Hemisphere + cone

15. If a cone is cut parallel to the base of it by a plane in two parts, then the shape of the top of the cone will be a:

(a) Sphere   (b) Cube   (c) Cone itself   (d) Cylinder

Ans : 1 (C)   **2(D)**   **3(B)**   **4 (A)**   **5(C)**   **6(A)**   **7 (B**   **8(D)21 cm**

9(B)   **10 (A) 9:25**   **11(C)**   **12(B)**   **13 (B)**   **14**(d) Hemisphere + cone **15** (c) Cone itself

ASSERTION REASONING (1 Mark)

1). **Assertion:** a cylinder and right circular cone are having the same base and same height the volume of cylinder is three times the volume of cone

Reason: if the radius of cylinder is doubled and height is halved the volume will be doubled

a) both Assertion and reason are correct and reason is correct explanation for Assertion

b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is correct but reason is false

d) both Assertions and reason are false

2). **Assertion**: the lateral surface area of a right cone is 62.82 if the radius is 4 cm and the slant height is 5 cm.

Reason: lateral surface area of cone = πrl

a) both Assertion and reason are correct and reason is correct explanation for Assertion

b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is correct but reason is false

d) both Assertions and reason are false

3). **Assertion**: the perpendicular distance between two bases is the height of cylinder

Reason: the line segment joining the centre of two bases is the axis of cylinder

a) both Assertion and reason are correct and reason is correct explanation for Assertion

b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is correct but reason is false

d) both Assertions and reason are false

4) Assertion: volume of cuboid is defined as the amount of space occupied by the walls of cuboid in three dimensional space

Reason: volume of cuboid is the product of length ,width ,height

a) both Assertion and reason are correct and reason is correct explanation for Assertion

b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is correct but reason is false

d) both Assertions and reason are false

5).Assertion: a sphere is a symmetrical object

Reason: a sphere had an only a curved surface no flat surface no edge and no vertices

a) both Assertion and reason are correct and reason is correct explanation for Assertion

b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is correct but reason is false

d) both Assertions and reason are false

Ans:1(b) both Assertion and reason are correct but reason is not correct explanation for Assertion

Ans:2(a) both Assertion and reason are correct and reason is correct explanation for Assertion

Ans:3(b) both Assertion and reason are correct but reason is not correct explanation for Assertion

Ans: 4(b) both Assertion and reason are correct but reason is not correct explanation for assertion

Ans:5(b) both Assertion and reason are correct but reason is not correct explanation for Assertion

Short Answer Type -1 (2MARKS EACH)

1. A tent is in the form of a cylinder surmounted by a conical top. If the height and radius of cylindrical part are 2.8 m and 2 m and slant height of the top is 3.2 m, find the area of canvas used for the tent.

2.A cylindrical reservoir is 21 m in diameter. Water is passed into it at 420 litres per minute. Find the rise of water level is the reservoir per hour.

3. A sphere of radius 5 cm is dropped into a cylindrical vessel partly filled with water. The diameter of the base of vessel is 20 cm. If the sphere is completely submerged, find the rise of level of water.

4. A toy is in the form of cone on a hemisphere of diameter 7 cm. The total height of toy is 14.5 cm. Find the volume of the toy.

5. 168 cones each of diameter 7 cm and height 6 cm are melted to form a metallic hemisphere. Find the radius of hemisphere and the total surface area.

6. From solid right circular cylinder with height 12 cm and radius of base 5 cm, a right circular cone of the same height & same base is cut. Find the volume of the remaining solid.

7. Find the total surface area of a top (lattice) as shown is the figure.

(Use π = 3.14)
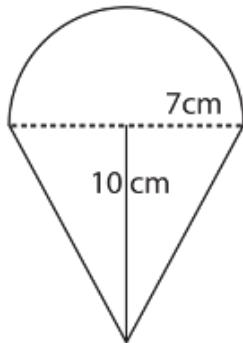
8. A solid is composed of a cylinder with hemispherical ends. The whole length of solid is 120 cm with diameter of hemispherical ends as 32 cm. Find the cost of polishing the surface of the solid at the rate of Rs. 50 per sq m.

9. A well (cylindrical in shape) of diameter 10 m is 21 m deep is dug out and the earth from it is evenly spreaded to form a platform 20 m by 16 m. Find the height of plat form.

10. If the total surface area of a solid hemisphere is 462 cm², find its volume. [Take π = 22/7]

Short Answer Type - 2 (3 MARKS EACH)

1. 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.
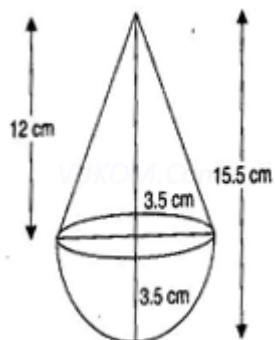
2. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy.

3. 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.

4. 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

5. Rachel, an engineering student, was asked to make a model shaped like a cylinder with two cones attached at its two ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model that Rachel made. (Assume the outer and inner dimensions of the model to be nearly the same.)
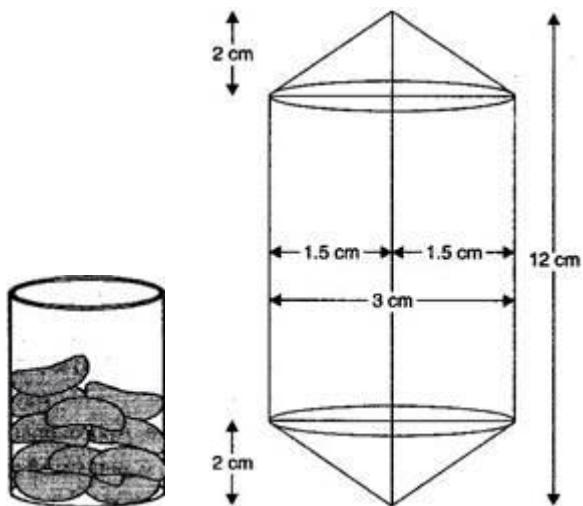
6. A *gulabjamun*, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 *gulab jamuns*, each shaped like a cylinder with two hemispherical ends, with length 5 cm and diameter 2.8 cm (see figure).
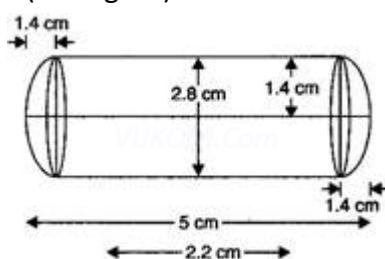
7. A vessel is in the form of inverted cone. Its height is 8 cm and the radius of the top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.
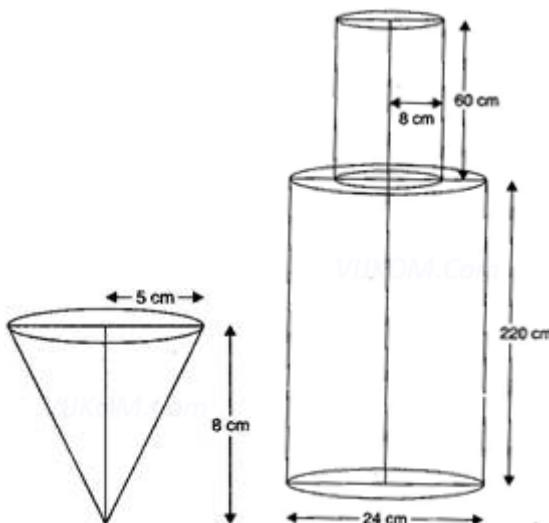
8. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 g mass. $(\text{Use } \pi = 3.14)$

9. A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a hemisphere of radius 60 cm is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder, if the radius of the cylinder is 60 cm and its height is 180 cm.
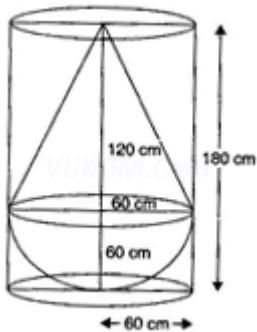
10. A spherical glass vessel has a cylindrical neck 8 cm long, 2 cm in diameter; the diameter of the spherical part is 8.5 cm. By measuring the amount of water it holds, a child finds its volume to be 345 cm³. Check whether she is correct, taking the above as the insidE measurements and π = 3.14.
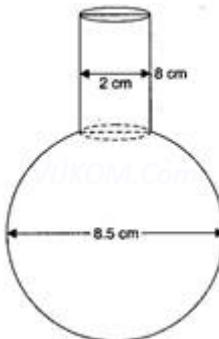
ANSWERS

Ans1. 572 cm²   2. 214.5 cm²   3. 332.5 cm²   4. $\frac{1}{4}l^2(\pi+24)$ 5. 66 cm³

6. ∴ Volume of 45 gulabjamuns = 1127.28 cm³

∴ Volume of syrup = 338 cm³ (approx.)

7. ⇒ n = 100

8. 111532.8 cm³

9. 1.131 m³ (approx.)

10. Hence, she is not correct. The correct volume is 346.51 cm³.

Long Answer (5 MARKS EACH)

1.

A juice seller was serving his customers using glasses as shown in Fig. The inner diameter of the cylindrical glass was 5 cm, but the bottom of the glass had a hemispherical raised portion which reduced the capacity of the glass. If the height of a glass was 10 cm, find the apparent capacity of the glass and its actual capacity. (Use π = 3.14.)   (Ans: 163.54 cm²)
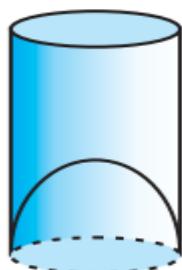
2. A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. If a right circular cylinder

circumscribes the toy, find the difference of the volumes of the cylinder and the toy. (Take π = 3.14) (Ans: 25.12 cm³. 25.12 cm³)

3. A copper wire, 3 mm in diameter, is wound about a cylinder whose length is 12 cm, and diameter 10 cm, so as to cover the curved surface of the cylinder. Find the length and mass of the wire, assuming the density of copper to be 8.88 g per cm3 . (Ans: 1256 cm; 788g app)

4. A right triangle, whose sides are 3 cm and 4 cm (other than hypotenuse) is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. (Choose value of π as found appropriate.)   (Ans: 30.14 cm3 ; 52.75 cm²)

5. The height of a cone is 42 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume is 1/64 of the volume of the given cone, find the height at which the section is made.   (Ans: 10.5 cm)

6. A sector of circle of radius 15 cm has the angle 120°. It is rolled up so that two boundary radii are joined together to form a cone. Find the volume of cone. (Ans: $\frac{250\sqrt{2}}{3}\pi\ cm^3$)

7. A tent is in the shape of a right circular cylinder surmounted by a cone. The total height and the diameter of the base are 13.5 m and 28 m. If the height of the cylindrical portion is 3 m, find the total surface area of the tent.   (Ans : 287 π cm²)

8. A cistern, internally measuring 150 cm × 120 cm × 110 cm, has 129600 cm3 of water in it. Porous bricks are placed in the water until the cistern is full to the brim. Each brick absorbs one-seventeenth of its own volume of water. How many bricks can be put in without overflowing the water, each brick being 22.5 cm × 7.5 cm × 6.5 cm?.   (Ans: 1792)

CASE STUDY BASED
Case Study: 1

Arun a 10th standard student makes a project on corona virus in science for an exhibition in his school. In this project, he picks a sphere which has volume 38808 cm³ and 11 cylindrical shapes, each of volume 1540 cm³ with length 10 cm.
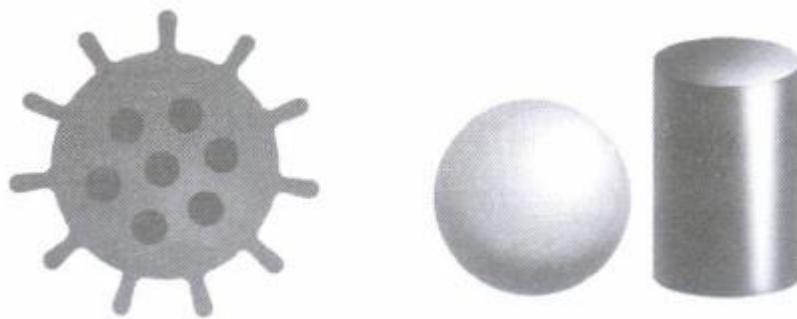
Based on the above information, answer the following questions.
(i) Diameter of the base of the cylinder is

(ii) Diameter of the sphere is   (Ans : 42cm)

(iii) Total volume of the shape formed is   (Ans: 55748cm^3)

(iv) Curved surface area of the one cylindrical shape is   (Ans : 440 cm^2)

(v) Total area covered by cylindrical shapes on the surface of sphere is (Ans: 539 π cm^2)

Case Study : 2

Ajay is a Class X student. His class teacher Mrs Kiran arranged a historical trip to great Stupa of Sanchi. She explained that Stupa of Sanchi is great example of architecture in India. Its base part is cylindrical in shape. The dome of this stupa is hemispherical in shape, known as Anda. It also contains a cubical shape part called Hermika at the top. Path around Anda is known as Pradakshina Path.
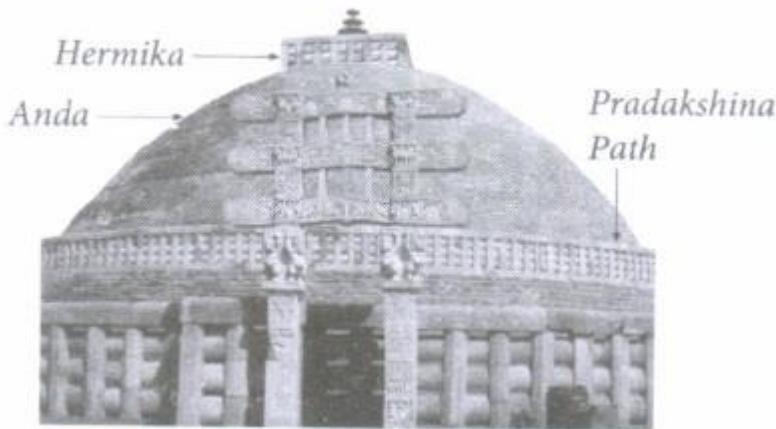
Based on the above information, answer the following questions.
(i) Find the lateral surface area of the Hermika, if the side of cubical part is 8 m. (Ans:256 m^2)
(ii) The diameter and height of the cylindrical base part are respectively 42 m and 12 m. If the volume of each brick used is 0.01 m^3, then find the number of bricks used to make the cylindrical base.
(Ans: 16,63,200 bricks)
(iii) Find the Curverd surface area of Anda if its radius is 21m. (Ans:882 π cm^2)

CASE STUDY : 3

One day Rinku was going home from school, saw a carpenter working on wood. He found that he is carving out a cone of same height and same diameter from a cylinder. The height of the cylinder is 24 ern and base radius is 7 cm. While watching this, some questions came into Rinkus mind. Help Rinku to find the answer of the following questions.
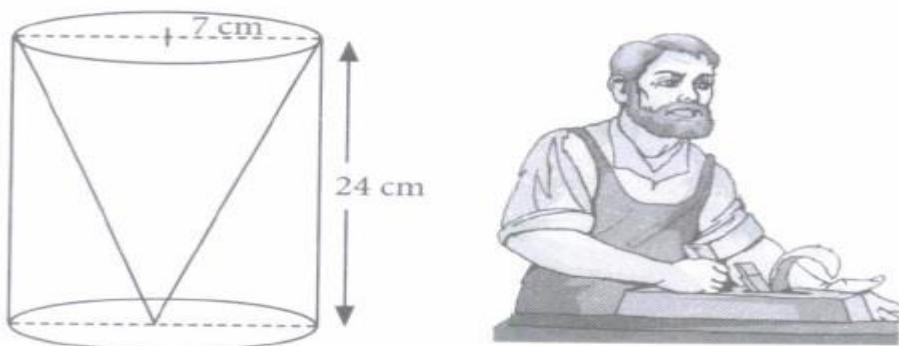
(i) After carving out cone from the cylinder,
     (a) Volume of the cylindrical wood will decrease.

(b) Height of the cylindrical wood will increase.

(c) Volume of cylindrical wood will increase.

(d) Radius of the cylindrical wood will decrease.

(ii) Find the slant height of the conical cavity so formed.

(iii) The curved surface area of the conical cavity so formed is ----------------------

(iv) External curved surface area of the cylinder is_____.

(v) Volume of conical cavity is -----------------------

Ans : (i) - (a) ,(ii)- 25cm   (iii) 175 π cm^2 (iv) 336 π cm^2 (v) 392cm^3

CASE STUDY : 4

To make the learning process more interesting, creative and innovative, Amayras class teacher brings clay in the classroom, to teach the topic - Surface Areas and Volumes. With clay, she forms a cylinder of radius 6cm and height 8 cm. Then she moulds the cylinder into a sphere and asks some questions to students.
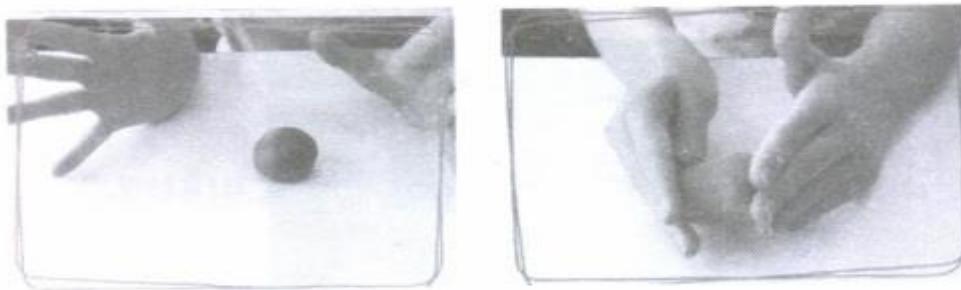
(i) The radius of the sphere so formed is -------------------------------   (Ans: 6cm)

(ii) The volume of the sphere so formed is ----------------------------   (Ans : 288 π cm^3)

(iii) Find the ratio of the volume of sphere to the volume of cylinder.   (Ans:1:1)

(iv) Total surface area of the cylinder is ----------------------------   (Ans: 28 π cm^2)

(v) During the conversion of a solid from one shape to another the volume of new shape will --------------------------------------   (Ans : Same)

CASE STUDY : 5

A carpenter used to make and sell different kinds of wooden pen stands like rectangular, cuboidal, cylindrical, conical. Aanav went to his shop and asked him to make a pen stand as explained below. Pen stand must be of the cuboidal shape with three conical depressions, which can hold 3 pens. The dimensions of the cuboidal part must be 20 cm x 15 cm x 5 cm and the radius and depth of each conical depression must be 0.6 cm and 2.1cm respectively.
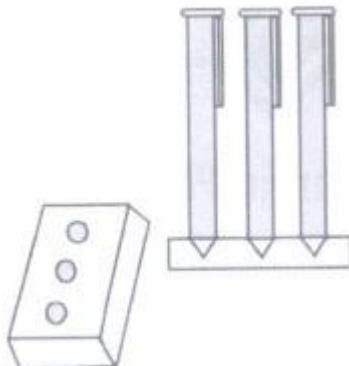
Based on the above information, answer the following questions.

(i) The volume of the cuboidal part is ------------------------------ (Ans: 1500cm^3)

(ii) Total volume of conical depressions is -------------------------- (Ans: 2.376 cm^3)

(iii) Volume of the wood used in the entire stand is -------------------- (Ans:1497.624 cm^3)

(iv) If the cost of wood used is Rs 0.05 per cm^3, then the total cost of making the
   pen stand is --- (Ans : Rs 748.80 approx)

CHAPTER 14 STATISTICS
MCQ (1MARKS QUESTIONS)

1) If the value of mean and mode are respectively 30 and 15, then Median =
(a) 22.5   (b) 24.5   (c) 25   (d) 26

2) While computing mean of grouped data, we assume that the frequencies are
(a) evenly distributed over all the class
(b) centered at the class marks of the class
(c) centered the upper limits of the class
(d) centered the lower limits of the class

3) The wickets taken by a bowler in 10 cricket matches are as follows
   2, 6, 4, 5, 0, 2, 1, 3, 2, 3. Find the mode of the data.
(a) 2   (b) 4   (c) 3   (d) 1

4) If mean of the distribution is 7.5, then p=

X	3	5	7	9	11	13
F	6	8	15	P	8	4

(a) 2   (b) 4   (c) 3   (d) 6

5) 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

6) If the sum of frequencies is 24, then the value of x in the observation: x, 5,6,1,2, will be
(a) 4   (b) 6   (c) 8   (d) 10

7) In the formula x = a + h(fiui/fi), for finding the mean of grouped frequency distribution, ui =
(a) (xi+a)/h   (b) h (xi – a)   (c) (xi –a)/h   (d) (a – xi)/h

8) Consider the following frequency distribution:

0 − 5	6 − 11	12-17	18-23	24-29
13	10	15	8	11

The upper limit of the median class is
(a) 17   (b) 17.5   (c) 18   (d) 18.5

9) The algebraic sum of the deviations of a frequency distribution from its mean is always,
(a) greater than zero   (b) less than zero   (c) zero   (d) a non-zero number

10) The empirical relationship between the three measures of central tendency is
(a) 3 Median = Mode + 2 Mean   (b) 2 Median = Mode + 2 Mean
(c) 3 Median = Mode + Mean   (d) 3 Median = Mode – 2 Mean

11) The median of the data 13, 15, 16, 17, 19, 20 is:
(a) 30/2   (b) 31/2   (c) 33/2   (d) 35/2

12) Mode and mean of a data are 12k and 15A. Median of the data is
(a) 12k   (b) 14k   (c) 15k   (d) 16k

13) Mean of 100 items is 49. It was discovered that three items which should have been 60, 70, and 80 were wrongly read as 40, 20, and 50 respectively. The correct mean is
(a) 48   (b) 49   (c) 50   (d) 60

14) Mode is the

(a) middle most frequent value (b) least frequent value

(c) maximum frequent value (d) none of these

15) **If the mean of frequency distribution is 7.5 and $\sum f_i x_i = 120 + 3k$, $\sum f_i = 30$, then k is equal to:**

(a) 40 (b) 35 (c) 50 (d) 45

Assertion and Reason Questions (Q16 to 20)

DIRECTION: In the following questions (Q16-20), 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)if both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

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

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

16) **Statement A (Assertion): The mode of the call received on 7 consecutive day**

11,13,13,17,19,23,25 is 13.

Statement R(Reason): Mode is the value that appears most frequent;

17) Statement A (Assertion): The runs scored by a batsman in 5 ODIs are 31, 97,112, 63, and 12. The standard deviation is 25.79.

Statement R(Reason) : mean = total sum of number in data sets. / Total number in data sets**.**

18) **Statement A (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.

Statement R(Reason): When the number of observations (n) is odd the median is the value of the (n+1/2) th observation.

 19)   Statement A (Assertion)Median of 51, 70, 65, 82, 60, 68, 62, 95, 55, 64, 58, 75, 80, 85, and 90 is 68.

Statement R(Reason): When n observations are arranged in an ascending order and n is odd, then median=value of 1/2(n+1) th observation.

20) **Statement A (Assertion) If mean & median of an asymmetrical distribution are 58 & 61 respectively,**

   then Mode =67.

Statement R(Reason): For an asymmetrical distribution Mode =3 Median −2 Mean.

SHORT ANSWER TYPE QUESTIONS (2 marks)

1) If the mean of 4 numbers, 2, 6, 7 and a is 15 and also the mean of other 5 numbers, 6, 18, 1, a, b is 50. What is the value of b?

2) A student scored the following marks in 6 subjects: 30, 19, 25, 30, 27, 30 . Find his modal score.

3) The modal class of the grouped size frequency table given below is

5-5.2	5.2-5.4	5.4-5.6	5.6-5.8	5.8-6.0
20	5	5	12	8

4) The points scored by a basketball team in a series of matches are as follows:

    17, 2, 7, 27, 25, 5, 14, 18, 10. Find the median.

5) Find the mean of the following distribution:

5	10	15	20	25
4	12	20	28	6

6) Find the mean of first five Prime numbers.

7) If the mode of a distribution is 18 and its mean is 12, then find its median.

8) Write the empirical relationship between the three measures of central tendency.

9. A data has 15 observations arranged in descending order. Which observation represents the Median of the data?

10) Find the class size of the given class intervals.

Class Interval	$0-6$	$6-12$	$12-18$	$18-24$	$24-30$	$30-46$
Frequency	3	5	7	4	9	2

SHORT ANSWER TYPE QUESTIONS (3 marks)

1) The mean of the following data is 18.75. Find the value of P

Class Mark	Frequency
10	5
5	10
P	7
25	8
30	2

2) Following table shows sale of shoes in a store during one month

Size of shoes	Pairs of shoes sold
3	4
4	18
5	25
6	12
7	5
8	1

Find the model size of the shoes sold.

3) Find the median.

Marks	Frequency
0-10	8
10-20	10
20-30	12
30-40	22
40-50	30
50-60	18

4). The mean of the following frequency distribution is 4.84. Find the value of f.

Class Interval	Frequency
0 – 2	5
2 – 4	f
4 – 6	25
6 – 8	4
8 – 10	6

5) The distribution below gives the weight of 50 students of class X. Find the Modal weight of the students.

Weight (in kg)	35 – 45	45 – 55	55 – 65	65 – 75	75 – 85
Number of students	5	10	20	12	3

6) Find the mode of the following frequency distribution.

Class Interval	Frequency
0 – 10	8
10 – 20	12
20 – 30	10
30 – 40	11
40 – 50	9

7) From the following frequency distribution, find the median class.

Monthly wages	Number of workers
18000 – 24000	18
24000 – 30000	25
30000 – 36000	30
36000 – 42000	28
42000 – 48000	35
48000 – 54000	32
54000 – 60000	32

8) While finding the mean of 18 observation, an observation 43 was wrongly noted as 34 and then the mean was 30. Find the correct mean.

9) Find the missing frequency from the following data, when mode is 27.

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	5	x	15	12	7

10) Apples are supplied to a retail market from a garden. Different number of apples are

Packed in the boxes as per their size. The following are the distribution of apples according to the number of boxes:

Number of apples	100 - 105	105 – 110	110 – 115	115 – 120	120 – 125
Number of boxes	25	100	130	125	20

Find the average number of apples kept in a packing box

Long answer question (5 marks questions)

1) The following data gives the distribution of the total monthly household expenditure of 200 families of a village. Find the modal monthly expenditure of the families. Also, find the mean monthly expenditure

Expenditure	Number of families
1000-1500	24
1500-2000	40
2000-2500	33
2500-3000	28
3000-3500	30
3500-4000	22
4000-4500	16
4500-5000	7

2) The median of the following frequency distribution is 35. Find the value of x.

C.I.	frequency
0-10	2
10-20	3
20-30	X
30-40	6
40-50	5
50-60	3
60-70	2

3) Find the missing frequencies when the mean of dats is 53.

Age	0-20	20-40	40-60	60-80	Total
Number of people	15	F1	21	F2	17

4) **An aircraft has 120 passenger seats. The number of seats occupied during 100 flights are given in the following table:**

Number of seats	100-104	104-108	108-112	112-116	116-120
Frequency	15	20	32	18	15

Determine the mean number of seats occupied over the flights.

5) Data of average annual rainfall (in cm) of different states and union territories of our country is recorded by the students of class X B. It is represented by the following table.

Average annual rainfall (in cm)	Number of states or union territories
50 – 74	3
75 – 99	5
100 – 124	4
125 – 149	10
150 – 174	8
175 – 199	4
200 – 225	1

Find the median and mean rainfall of the cities.

Case study question (1+1+2 Marks)

Q 1) **COVID-19** Pandemic The COVID-19 pandemic, also known as coronavirus pandemic, is an ongoing pandemic of coronavirus disease caused by the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) among humans.

The following tables shows the age distribution of case admitted during a day in two different hospitals

Table 1

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of cases	6	11	21	23	14	5

Table 2

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of cases	8	16	10	42	24	12

Refer to table 1

a) Find the average age for which maximum cases occurred .

b) Find the upper limit of modal class.

Refer to table 2

c) Find the median of the given data .

Q2) Childhood obesity is the new emerging epidemic in India. In last 15 years the prevalence of overweight and obesity has increased 4 times. India has the second highest number of obese children in the world. According to the new statistics 5 to 8.8% of school children are obese in India. Observe the graph and answer the questions.

AGE	BOYS	GIRLS
5	6	15
6	17	20
7	27	26
8	32	21
9	27	22
10	30	33
11	36	24
12	34	31
13	25	32
14	40	31
15	36	29

a) Among 8-year-old children, are boys or girls more obese and by what percentage?
b) On an average, what percentage of children in the given age group is obese?
c) If a program is introduced to mitigate child obesity, what age group should the program focus on?

Q3) On a particular day, National Highway Authority of India (NHAI) checked the toll tax collection of a particular toll plaza in Rajasthan

The following table shows the toll tax paid by drivers and the number of vehicles on that particular day.

Toll tax (in ₹)	30-40	40-50	50-60	60-70	70-80
Number of vehicles	80	110	120	70	40

a)If A is taken as assumed mean, then find the possible value of A

b)Find the average toll tax received by NHAI in a day, from that particular toll plaza.

c) Find the **mean of toll tax received by NHAI by assumed mean method is**

Q4) Under the physical and health education a medical check up program was conducted in a Vidyalaya to improve the health and fitness conditions of the students. Reading of the heights of 50 students was obtained as given in the table below:

Height (in cm)	Number of students
135 – 140	2
140 – 145	8
145 – 150	10
150 – 155	15
155 – 160	6
160 – 165	5
165 – 170	4

a) Find the lower class limit of the modal class

b) Find the median class

c) Find the assumed mean of the data

Answers of MCQ

1) C) 25   2) (b) centered at the class marks of the class   3) a) 2   4) c) 3   5) D) 4   6) d) 10   7) (c) (xi –a)/h   8) (b) 17.5   9) c) zero   10) a) 3 Median = Mode + 2 Mean   11) (c) 33/2   12) b) 14k   13) c) 50   14)(c) maximum frequent value   15) b) 35

16) a)Both Assertion and Reason are correct and reason is correct explanation for the asseration

17) b)) Both Assertion and Reason are false but reason is not correct explanation for assertion .

18) Both Assertion and Reason are correct and reason is correct explanation for the asseration.

19) a) Both Assertion and Reason are correct and reason is correct explanation for the asseration.

20) a) Both Assertion and Reason are correct and reason is correct explanation for the asseration.

Answers of Short Answers(2Marks) 1) 180   2) 30   3) 5-5.2   4) 14   5) 15.1   6)5.6   7)9   8) Mode = 3 Median – 2 Mean   9) 7 th term   10) 6.

Answers of Short Answers Questions(3 Marks)

1)20   2)5   3) 27.22   4)50   5)60.56   6)16.6   7)36000-42000   8)30.5   9) 10   10) 113(112.69)

Answers of Long Answers Questions(4 Marks)

1)Mode: 1847.83 Mean: 2662.5   2)x = 5   3)F1=18 and F2= 29   4)109   5)Median: 138.25 and Mean: 134.14

Answers of Case Study Questions (5 Marks)

1) a) 36.5   b) 45   c) 40.23   2) a)Boys 11 percent b)27 percent c)14 years age.   3)a)35, 45,55,65,75 b)21898.80   c)52.14   4) a)150   b)150-155   c)190.13
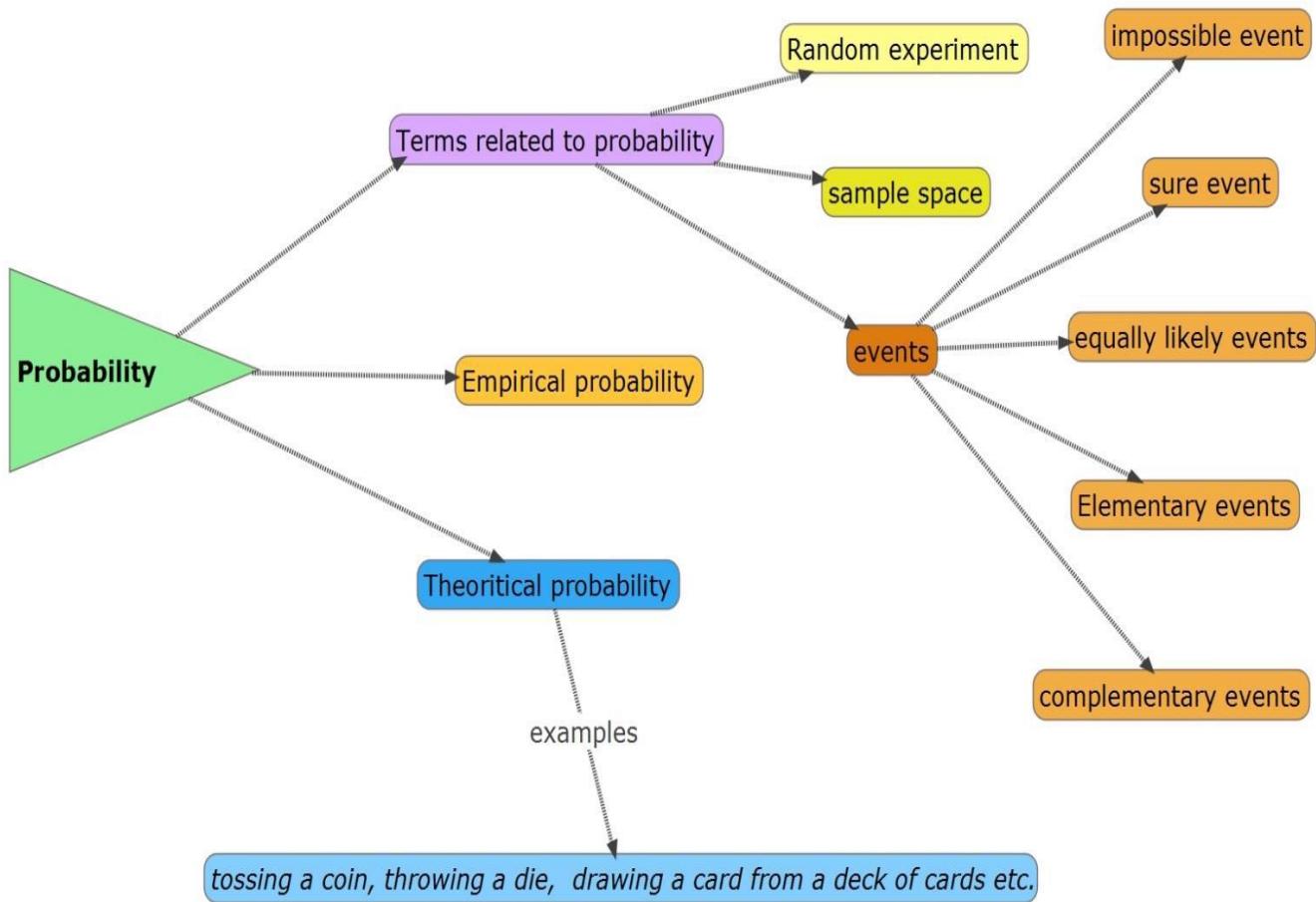
The theoretical probability (also called classical probability) of an event A, written as P(A), is defined as

P(E) = Number of favorable out come / Total number of out comes

COMPLIMENTARY EVENTS AND PROBABILITY

We denote the event 'not E' by E . This is called the **complement** event of event E.

P(E) + P(not E)

P(E) + P(not E) = 1, which gives us P(not E) = 1 − P(E).

impossible event:-The probability of an event which is impossible to occur is 0. Such an event is called an impossible event.

Sure event : The probability of an event which is sure (or certain) to occur is 1. Such an event is called a sure event or a certain event.

. The probability of an event E is always between 0 and 1 number P(E) such that

$0 ≤ P(E) ≤ 1$

.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.

Playing cards problems and their probability

A deck of playing cards = 52 cards

which are divided into 4 suits of 13 cards each.

black spades (♠) =13   red hearts (♥) = 13

red diamonds (♦) = 13   black clubs (♣) =13

The cards in each suit are Ace, King, Queen, Jack, 10, 9, 8, 7, 6, 5, 4, 3 and 2.

Face cards: - Kings, Queens and Jacks are called face cards (Total 12 face cards).

Numbered Cards: Ace,10, 9, 8, 7, 6, 5, 4, 3 and 2 (Total 40 cards)

Honours cards: Kings, Queens, Jacks and Ace

Example set of 52 poker playing cards

Suit	Ace	2	3	4	5	6	7	8	9	10	Jack	Queen	King
Clubs	♣												
Diamonds	♦												
Hearts	♥												
Spades	♠												

TOSSING OF COINS:

One coin tossed the outcomes = { H, T }=2^1=2
Two coins tossed then total outcome = (H,H),(H,T),(T,H),(T,T)=2^2=4
Three coins tossed then total outcome= (HHH),(HHT),(HTH),(THH),(TTT),(TTH),(THT),(HTT)= 2^3=8

Throwing dice
One dice thrown total number of outcomes = (1,2,3,4,5,6) = 6
Two dice throwing or one dice twice the total number of out comes
(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6)
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6)
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6)
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6)
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)
So, the total number of outcomes = 6 × 6 = 36

Some important questions
M C Q QUESTIONS(1 Mark each)

Q1 When a die is thrown, the probability of getting an odd number less than 3 is

    (a) 1/6   (b) 1/3   (c) ½   (d) 0

Q2. A card is drawn from a deck of 52 cards. The event E is that card is not an ace of hearts. The number of outcomes favourable to E is

    (a) 4   (b) 13   (c) 48   (d) 51

Q3. The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is

    (a) 7   (b) 14   (c) 21   (d) 28

Q4. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought?

    (a) 40   (b) 240   (C) 480   (D) 750

Q5. A bag has 4 red balls and 2 yellow balls. A ball is drawn from the bag without looking into the bag. What is probability of getting a red ball?

    (a) 1/6   (b) 2/3   (c) 1/3   (d) 1

Q6. A coin is flipped to decide which team starts the game. What is the probability of your team will start?

    (a) ¼   (b) ½   (c) 1   (d) 0

Q 7. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting a king of red colour

    (a) 1/26   (b) 2/13   (c) 1/13   (d) 3/26

Q8. There are 6 marbles in a box with number 1 to6 marked on each of them . What is the probability of drawing a marble with number 2 ?

    (a) 1/6   (b) 1/5   (c) 1/3   (d) 1

Q 9. Find the probability that the month of April has exactly 5 Monday is

    (a) 4/7   (b) 5/7   (c) 3/7   (d) 2/7

Q10. Which of the following never be the probability of an event of any random experiment.

    (a) 112%   (b) 7/5   (c) -0.3%   (d) all of these

Q11.Two dice are thrown at the same time, what is the probability that the sum appearing on the two top 8 is -------

    (a) 5/8   (b) 5/36   (c) 5/12   (d) None

Q12. The probability of a sure event is -------

    (a) ½   (b) 2/3   (c) 1   (d) 0

Q13. A bag contains 40 balls out of which some are red, some are blue and remaining are black. If the probability of drawing a red ball is 11/20 and that of blue ball is 1/5 , then what is the no. of black ball.

    (a) 5   (b) 10   (c) 15   (d) 20

Q14. A card is drawn from a well shuffled deck of 52 cards. Find the probability of getting an ace.

    (a) 1/13   (b)4/13   (c) 1/52   (d) 4/13

Q15. In a lottery, there are 10 prizes and 25 blanks. Find the probability of getting a prize.

    (a) 2/7   (b) 5/7   (c) 3/7   (d) None

Q16. **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 (Not E) () = 1 - P (E) , where E is any event.

(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

Q17. **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

(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

Answer :- 1(a),2(d),3(b), 4(c),5(b),6(b),7(a),8(a),9(d),10(d),11(b).12(c), 13(b),14(a),15(a),16(d) and 17(a)

SHORT ANSWER TYPE -1 (2 Marks)

Q 1. A bag contains a red ball, a blue ball and a yellow ball, all the balls being of the same size. Kritika takes out a ball from the bag without looking into it. What is the probability that she takes out the

  (i) yellow ball?   **(ii) red ball?**

Q2. An integer is chosen between 0 and 100. What is the probability that it is

   (i) divisible by 7?   **(ii) not divisible by 7?**

Q3. : If P(E) = 0.05, what is the probability of 'not E'?

Q 4. 12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not it is defective. One pen is taken out at random from this lot. Determine the probability that the pen is taken out is a good one.

Q 5. There are 100 cards in a bag on which numbers from 1 to 100 are written. A card is taken out from the bag at random. Find the probability that the number on the selected card:

is divisible by 9 and is a perfect square.

is a prime number greater than 80.

Q 6. A game of chance consists of spinning an arrow on a circular board, divided into 8 equal parts, which comes to rest pointing at one of the numbers 1,2,3,…, 8 which are equally likely outcomes. What is the probability that the arrow will point at (1) an odd number (2) a number more than 3

1. a number greater than 3
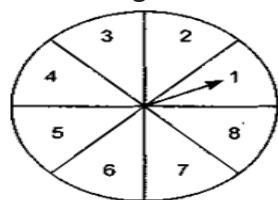
Q7. From a pack of 52 playing cards, Jacks, Queens and Kings of red colour are removed. From the remaining, a card is drawn at random. Find the probability that drawn card is:

1.a black king.   2.a card of red colour.

Q8. **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.**

Q9. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

   (i) red colour ace card (ii) a face card or a spade card

Q10. Two dice are thrown at the same time. Find the probability of getting

(i) the same number on both dice.

(ii) different numbers on both dice.

Q11. A die is thrown twice. What is the probability that

(i) 5 will not come up either time? (ii) 5 will come up at least once?

Q12. A coin is tossed two times. Find the probability of getting at most one head.

Solution:

SHORT ANSWER TYPE-2 (3 MARKS)

Q1. Three different coins are tossed together. Find the probability of getting

          (a) exactly two heads   (b) at least two heads   (c) at least two tails.

Q2**. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting**

    (i) a king of red colour   (ii) a face card   (iii) a red face card

Answer :- (i). 2/52   (ii) 12/52   (iii) 6/52

Q3. Five cards—the ten, jack, queen, king and ace of diamonds, are removed. One card is then picked up at random.

(i) What is the probability that the card is the queen?

(ii) If the queen is drawn and put aside, what is the probability that the second card
     picked up is an ace?

(iii) If the ace is drawn and put aside, what is the probability that the third card picked up is ten?

Answer :- (i) 3/47 (ii) 3/46 (iii) 3/45

Q4. A box contains 12 balls out of which x are white. (i) If one ball is drawn at random, what is the probability that it will be a white ball? (ii) If 6 more white balls are put in the bag, the probability of drawing a white ball will be double than that in . Find x.

Answer :-   (i) x/12 (ii) x= 3

Q5. A bag contains 5 red balls and some blue balls. If the probability of drawing blue ball is double that of a red ball, find the number of blue balls in the bag. Hence find the probability of red balls also.

Answer :- 10 and 1/3

Q6. Find the probability that a non-leap year selected at random will contain 53 Sundays. (**Answer:** 1/7)

Q7. Find the probability that a leap year selected at random will contain 53 Tuesdays.   (**Answer** : 2/7)

Q8: Cards with numbers 2 to 101 are placed in a box. A card selected at random from the box.
Find the probability that

 (i) The card which is selected has a number which is a perfect square.   **[Ans.9/100]**

(ii) The card which is selected has a digit 1 at tens place.   **[Ans.1/10]**

(iii) The card which is selected has a number divisible by 7.   **[Ans.14/100**]

 Q9. Cards bearing numbers 4,5,6……………,35 are kept in a bag. A card is drawn at random from the
      bag. Find the probability of getting a card bearing

 (a) a prime number less than 15

 (b)a number divisible by 3 and 5.

 (c) a number whose sum of digit is divisible by 2   (**Ans: 1/8,1/16,17/32**)

CASE STUDY (4 Marks)

Q1.Piggy bank or Money box(a coin container) is normally used by children. Piggy bank serves as a pedagogical device to teach about saving money to children. Generally, piggy banks have openings besides the slot for inserting coins but some do not have openings. We have to smash the piggy bank with a hammer or by other means, to get the money inside it.

A child Shreya has a Piggybank. She saves her money in her Piggybank. One day she found that her Piggybank contains hundred 50 paisa coins, fifty 1 rupees coin, twenty 2 rupees coin, and ten 5 rupees coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down.

Based on the above information, answer the following questions.

(a) The probability that the fallen coin will be 50 paisa coin, is -------   (Ans : 5/9)

(b) The probability that the fallen coin will be 5 rupees coin, is---------   (Ans : 1/18)

(c) The probability that the fallen coin will be 2 rupees coin, is---------   (Ans : 1/9)

(d) The probability that the fallen coin will be 2 rupees coin or 5 rupees coin, is-------- (Ans : 1/6)

Q2.A lottery involves the drawing of numbers at random for a prize. It is a form of gambling. Some governments have banned Lottery in their countries while some governments endorse it in their countries. there are many formats of the Lottery. In one format, the prize can be a fixed amount of cash or goods while in another format, the prize will be 50 per cent of the revenue.

In a Lottery system, a box contains cards numbers between 11 to 122. A card is drawn at random from the box.

Based on the above information, answer the following questions.

(a) The probability that the number on the drawn card is a square number, is: (Ans : 4/55)

(b) The probability that the number on the drawn card is a multiple of 7, is: (Ans : 8 /55)

(c) The probability that the number on the drawn card is divisible by 3, is: (Ans : 5/9)

(d) The probability that the number on the drawn card is a multiple of 11, is: (Ans : 37/110)

Q3.Most People use playing card decks just for fun and to spend time. However, there are many benefits of playing cards. It improves patience, concentration and boosts memory skills. All these help everyone in their daily life. It helps to make people socialized and help to connect with people of all mindset.
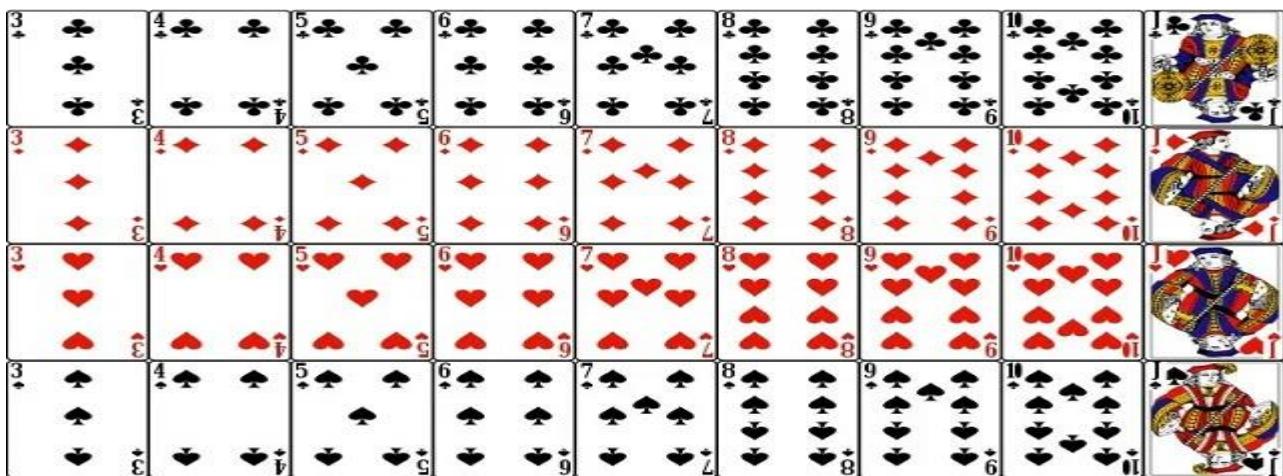
Three friends play a game with playing cards. They remove Red and black colour of king , queen and ace from a pack of 52 playing cards.

Based on the above information, answer the following questions.

(i) Find the probability of red colour card from the pack.   (Ans : 1/2)

(ii) Find the probability of getting a spade.   (Ans : 1/4)

(iii) Find the probability of getting jack of red colour.   (Ans : 1/20)

Q4.During the admission procedure in a school, the number of students seeking admission is more than that of the seats available in the class so that school administration decides to organize a draw so that each student has equal possibility of getting admission in the school. The following category of students applied for admission.

Service/ Social Category.	GEN	SC	OBC	ST	EWS
1	60	40	25	12	00
2	45	15	18	10	00
3	20	17	12	8	12
4	18	13	10	15	10
5	72	50	45	25	18
TOTAL	215	135	110	70	40

Question 1.   If all the admission forms are shuffled and one form is drawn randomly, what is the probability that an OBC student belonging to either of the categories 1,2,3 or 4 will get admission?   (Ans : 13/22)

Question 2: If General, SC, OBC and ST category's admission forms are shuffled and one form is drawn randomly, what is the probability that a student of EWS category will get admission? (Ans : 0)

Question 3: . If EWS, SC and ST category's admission forms are shuffled and one form is drawn randomly, what is the probability that student either SC or EWS student from category-3 will get admission? (Ans : 41/49)

Question4 : If SC and ST category's admission forms are shuffled and one form is drawn randomly, what is the probability that student from service category 1 either SC or ST will get admission?   (Ans : 52/ 205)

Q5.   **FREE TICKETS FOR WORLD CUP**

Geeta wanted to watch football world cup final match. She saw an advertisement that a radio station has 25 free tickets to football world cup final match to give away. Radio announced that one participant can send only one SMS for free ticket. SMS`s are received from 20000 listeners out of which 12000 are female. SMS`s are then selected at random one at a time until all free tickets are given away.

shutterstock.com • 1065011564

Q1.The first 24 tickets have been given away to the participants and Gita's SMS`s has
    yet not been selected. What is Geeta's chance of winning the last ticket, based on above said
information.
        (a) 1/25   (b)1/20000   (c) 1/19976   (d) none of these
Q2. Out of first 24 tickets 14 males have already won the ticket and remaining are won by females.
     Chances that last ticket is won by Geeta is.
     (a) 24/25   (b) 11990/20000   (c) 1/19976   (d) 11990/19976
Q3.How many more males should have sent SMS`s so that the chances of winning a ticket is
     equal for both male/female
     (a) 4000   (b) 2000   (c) 12000   (d) cannot be determined
Q4 In the same condition, the number of winner tickets is doubled and one ticket is left for male
    while rest are won by female. Find the probability of winning last ticket by any male.
  (a) 1/19951   (b) 1/8000   (c) 8000/19951   (d) cannot be determined
                                                                            Ans: 1(b), 2(c) ,3(a) ,4(c)

Case Study 6:

TERM INSURANCE PLAN

A particular term insurance company has two options in the application form before issuing the policy – Smoker or Non-smoker. As a smoker has more chance of getting lung disease and death chance is comparatively higher. So premium payment is more for a smoking person. Company gives a rider plan (i.e. for some critical diseases) along with normal term plan by paying some extra premium money. In a certain time period, company issues 100 policies of which 30% are for smokers and rest for non-smoker customers. Also, half the smokers and 2/5 th of non – smoking customers have purchased a rider plan along with a normal plan.

On the basis of above information give the answers of the following questions:
Q1) Find the probability that company issues policy for a smoker with rider plan.   (Ans: 15/100)
Q2) Find the probability that company issues policy for a non- smoker without a rider plan.   (Ans: 21/50)
Q3) Find the probability that company issues policy for a smoker without a rider plan.   (Ans: 15/100)
Q4) Find the probability that company issues policy for a non-smoker with rider plan.   (Ans: 7/25)

Case Study 7:

Playing cards

Four persons are playing a bridge game forming teams each of two players. A deck of 52 playing cards is distributed around the table clockwise in such a way that each person gets 13 cards.

(i) Find the probability of the card drawn by each player with number 5 or 6.
(a) 2/13   (b) 11/13   (c) 1/13   (d) 12/13
(ii) Find the probability of the card drawn by each player with number less than 8.
(a) 6/13   (b) 5/13   (c)7/13   (d) None of these
(iii)Find the probability of the card drawn by each player with number between 2 and 9.
 (a) 7/13   (b) 5/13   (c) 6/13   (d) 3/13
(iv) What is the probability that any one person gets queen of spade?
(a) 1/3   (b) 1/4   (c) 1/2   (d) 1
Ans : i(a) , ii(c) , iii(c) , iv(b)

Class - X Session 2022-23

Subject - Mathematics (Basic) Sample Question Paper

Time Allowed: 3 Hours   Maximum 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 Case 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

SECTION A consist of 20 questions of 1 marks each

Q1 If two positive integers A and B can be expressed as XY^3 and B = X^4Y^2Z x, y , z being a prime numbers then LCM (A,B)

(a) X^4Y^2Z (b) X^4YZ (c) X^4Y^2 (d) XY^2Z

Q2. LCM of smallest prime number and smallest composite number is

(a)   4 (b) 2 (c)   1(d)   8

Q3. If 1 is zero of polynomial p(x) = x^2 – x + k then value of k

(a)   0 (b) -2 (c)   1(d)   4

Q4. Pair of linear equation 2x= 3y-5 and 2y = 3x – 4y

(a) Intersecting line   (b) parallel line   (c)   coinciding line (d)   line parallel to coordinate axis.

Q5. Find the Discriminate of x^2 +5x +5 =0 .

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

Q6. The distance between the points A(0,6) and B(0,-2) is

(a) 4 (b) 8 (c)   3(d)   -8

Q7. If ΔABC and ΔDEF are similar such that 2AB = DE and BC= 8cm then EF Equal to

(a)   16 (b) 12 (c) 1 1(d) 1 8

Q.8 Find the co ordinate point Which of the points divides the line segments joining the points (4,-3) and (8,5) in the Ratio 3:1 internally.

(a) (7, 4) (b) (7,2) (c) (7, 1)(d) (7,8)

Q9. How many tangents can a circle have?

(a)   1 (b) Infinitely many   (c) 2(d) 3

Q10. If cos A = √3/2 then the value of sec A

(a)   √3/2 (b) 2/√3 (c) 1 /2(d) 1 /3

Q 11. $4 \sin^2 A + 4 \cos^2 A$ equal to

(a)   16 (b) 4 (c) 1 1(d) 1 8

Q12. $\sin 60^0 \cos 30^0 + \sin 30^0 \cos 60^0$ equal to

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

Q13. The area of two circles are equal then their circumference are

(a)   Not equal (b) equal (c) ratio 1:2(d) non of these

Q14. Circumference of circle is 22 cm Area of its quadrant is

(a)   77/2 cm^2 (b) 77/8 cm^2 (c) 77/4 cm^2 (d) 77/6 cm^2

Q15. If the ratio of volume of two spheres is 1:8 then ratio of their circumference is

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

Q16. Find the mean of first five whole numbers.

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

Q17. A data has 9 observations arranged in descending order. Which observation represents the median of the data?

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

Q18. The probability of getting a multiple of 2 in a single throw of die is

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

Q19. Assertion (A) √7 is irrational number

Reason (R) 7 is prime number

(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.

Q20 assertion (A) points A(1,2) , B(4,1) ,C (-2,3) are collinear

Reason (R) three lines A,B,C are collinear if AB+BC = AC or CA+AB = BC or AC+BC = AB

(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.

Section B

Section B consist of 5 question of 2 marks each

Q21. Determine the value of k for the pair of linear equation 2x+3y = 5 and kx − 6y = 8 has a unique solution.

Q22. Out of the two concentric circles, the radius of the outer circle is 10 cm and the chord AC of length 16 cm is a tangent to the inner circle. Find the radius of the inner circle.
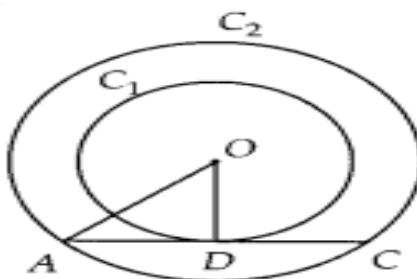
Q23.If tan A = 4/3 find the value of (sinA +cosA)/(sinA − cosA)

Q24. In the following figure LM is parallel to BC and LN is parallel to CD then prove that AM/AB = AN/ND
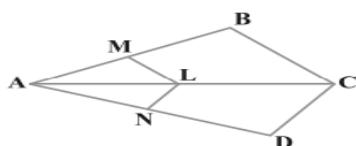
Q25. Find area of a circular ring formed by two concentric circles whose radii are 5.7 cm and

4.3 cm respectively is (Take $\pi = 3.14$) OR

The area of a circle is 154 cm, Find its diameter ?

Section C

Section C consist of 6 question of 3 marks each

Q26.prove that √3 irrational number.

Q27. Find zeros of polynomial $x^2 − 15$ and verify the relationship between the zeroes and coefficient.

Q28.The sum of a two digit number and number obtained by reversing the digits is 66 . If the digit of the number differ by 2 find the number ?

OR

Five years hence the age of Jacob will be three times that of his son . Five year ago Jacob age was seven time that of his son. What are their present ages.

Q29. Prove The lengths of tangents drawn from an external point to a circle are equal.

Q30 prove that tanA /(1+sec A) - tanA/(1-secA)

Or

If sinA + cosA =√3 then prove that tanA + cotA = 1

Q31. If two coins are tossed simultaneously, then find the probability of getting at least one head

Section D

Section D consist of 4question of 5 marks each

Q32. A passenger train takes 3 Hour less for a journey of 360 km. If its speed is increased by 10km/ h from its usual speed. Find its usual speed.
OR
The sum of the reciprocals of Anjali's age 3 years ago and 5 years from now is 1/3.
        Find the present age of Anjali.

Q33. State basic proportional theorem and prove it.
Q34. A toy is in the form of a hemisphere surrmounted by a right circular cone of the same base radius as that of the hemisphere. If the radius of the base of the cone is 21cm and its volume is 2/3 of the volume of the hemisphere , calculate the height of the cone and the surface area of the toy.   OR

A solid is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 4cm and the diameter of the base is 8cm. Determine the volume of the toy. If a cube circumscribes the toy, then the difference of the volumes of cube and toy. Also, find the total surface area of the toy

Q35 . The distribution below gives the weight of 50 students of class X. Find the median and modal weight of the students.

Weight (in kg)	35 − 45	45 − 55	55 − 65	65 − 75	75 − 85
Number of students	5	10	20	12	3

SECTION E

Case study based questions are compulsory

Q.36.Case study 1.

In a potato race, a bucket is placed at the starting point, which is 5 m from the first potato, and the other potatoes are placed 3 m apart in a straight line. There are ten potatoes in the line A competitor starts from the bucket, picks up the nearest potato, runs back with it, drops it in the bucket, runs back to pick up the next potato, runs to the bucket to drop it in, and she continues in the same way until all the potatoes are in the bucket. What is the total distance the competitor has to run?

5m   3m   3m

1. Find terms of AP formed in above situation

2. What is the total distance the competitor has to run?

3. Find distance cover after dropped 4 potatoes in bucket ?

Q37 . Case Study 2

The class X students of a school in Rajinder Nagar have been alloted a rectangular plot of land for their gardening activity . Sapling of Mango are planted on the boundary at the distance of 1m from each other. There is a triangular grassy lawn in the plot as shown in the figure.
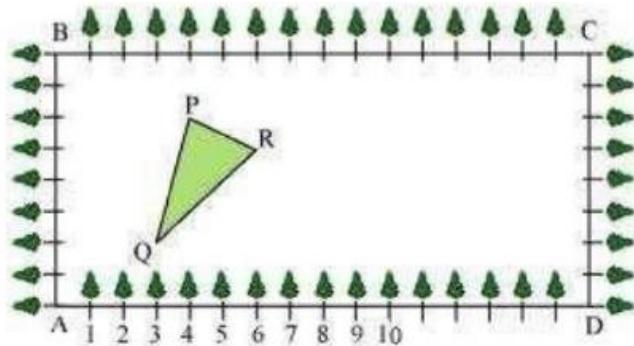

1. Taking A as origin Find the coordinates of vertices of the triangle .

2. Find Perimeter of ΔPQR

3. Find the coordinates of the point M on QR is such that QM:QR = 2:1

Q38. Case Study 3.

An asana is a body posture, originally and still a general term for a sitting meditation pose, and later extended in hatha yoga and modern yoga as exercise, to any type of pose or position, adding reclining, standing, inverted, twisting, and balancing poses. In the figure, one can observe that poses can be related to representation of quadratic polynomial
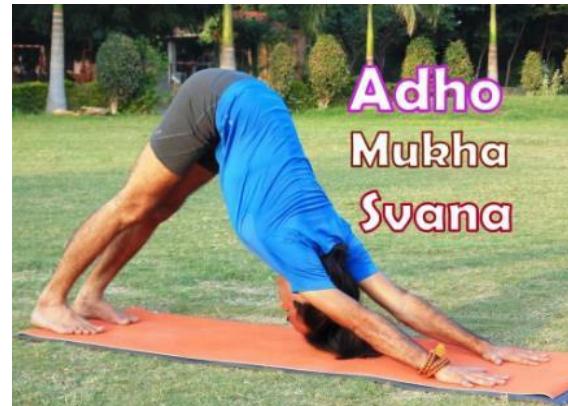
1.Find the shape of the poses shown in picture.

2.In the graph, how many zeroes are there for the polynomial?

3.Find the two zeroes in the above shown graph are.

Class- X Session- 2022-23

Subject- Mathematics (Standard)
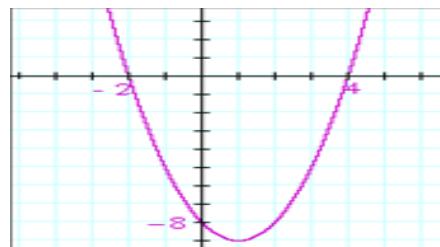
Sample Question Paper

**Time Allowed: 3 Hrs.**   **Maximum Marks : 80**

General Instructions:
1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of
1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 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.

SN	Section A
1.	The least number which is a perfect square and is divisible by each of 16, 20 and 24 is (a) 240 (b) 1600 (c) 2400 (d) 3600
2.	Which of the following equations has 2 as a root? (a) $X^2-4X+5=0$ (b) $X^2+3X+5=0$ (c) $X^2-4X+4=0$ (d) $X^2+4X+5=0$
3	The graph of a polynomial x = P(y) is shown in Figure, then the number of its zeroes is (A) 1 (B) 2 (C) 3 (D) 4
4	For which value(s) of p, will the lines represented by the following pair of linear equations be parallel 3x - y - 5 = 0 , 6x - 2 y - p = 0 (a) all real values except 10 (b) 10 (c) 5/2 (d) 1/2
5	If the vertices of a parallelogram PQRS taken in order are P(4,3), Q(-2,3) and R(-3,-2), then the coordinates of its fourth vertex S are (a) (-2,-1) (b) (-2,-3) (c) (2,-1) (d) (1,3)
6	In the given figure, x is (a) $\frac{ab}{a+b}$ (b) $\frac{ac}{b+c}$ (c) $\frac{bc}{b+c}$ (d) $\frac{ac}{a+c}$
7.	If cosA = 4/5 , then the value of tanA is --- (a) 3/5 (b) 2/5 (c) 1/5 (d) 9/5
8.	If tan θ + Sin θ = m and tan θ - Sin θ = n then $m^2 - n^2$ =--- (a) $\sqrt{mn}$ (b) $\sqrt{m}/n$ (c) $4\sqrt{mn}$ (d) None of these
9.	Two poles of height 6 m and 11 m stand vertically upright on a plane ground. If the distance between their foot is 12 m, then distance between their tops is (a) 12 m (b) 14 m (c) 13 m (d) 11 m
10	Which of the following statement is false? (a) All isosceles triangles are similar. (b) All quadrilateral are similar. (c) All circles are similar. (d) None of the above
11.	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
12.	If the perimeter of a semi-circular protractor is 36 cm, then its diameter is (a) 10 cm (b) 14 cm (c) 12 cm (d) 16 cm
13.	Volumes of two spheres are in the ratio 64 : 27. The the ratio of their surface areas is (a) 3 : 4 (b) 4 : 3 (c) 9 : 16 (d) 16 : 9
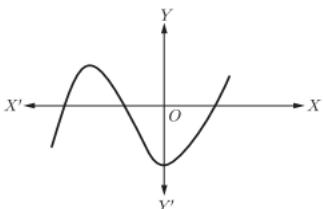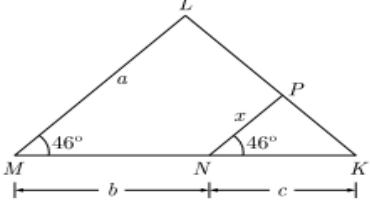
14.	The median and mode respectively of a frequency distribution are 26 and 29, Then its mean is (a) 27.5 (b) 24.5 (c) 28.4 (d) 25.8
15.	In the adjoining figure, OABC is a square of side 7 cm. OAC is a quadrant of a circle with O as centre. The area of the shaded region is (a) 10. 5 cm^2 (b) 38.5 cm^2 (c) 49 cm^2 (d) 11.5 cm^2
16.	The mean weight of 9 students is 25 kg. If one more student is joined in the group the mean is unaltered, then the weight of the 10th student is (a) 25 kg (b) 24 kg (c) 26 kg (d) 23 kg
17.	A single letter is selected at random from the word PROBABILITY. The probability that the selected letter is a vowel is ---- (a) 2/11 (b) 3/11 (c) 4/11 (d) 11/4
18	Given that sin α = $\frac{\sqrt{3}}{2}$ and cos β = 0, then the value of β - α is (a) 0^0 (b) 90^0 (c) 60^0 (d) 30^0
19	Assertion : The HCF of two numbers is 5 and their product is 150, then their LCM is 30 Reason : For any two positive integers a and b, HCF (a, b) +LCM (a,b), = a +b . (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 : The value of y is 6, for which the distance between the points P(2,3) and Q (10,y) is 10. Reason : Distance between two given points A (x$_2$, y$_2$) and B (x$_1$, y$_1$) is given, AB = $\sqrt{(x2 - x1)^2 + (y2-y1)^2}$ (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A). (c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.
	SECTION B.
	Section B consists of 5 questions of 2 marks each.
21.	Find the value of "c" if the system of equations cx +3y+(3-c)=0; 12x+cy-c=0 has infinitely many solutions?
22.	In the figure, PQ is parallel to MN. If $\frac{KP}{PM}=\frac{4}{13}$ and KN = 20 4. cm then find KQ.
23.	In figure, AP, AQ and BC are tangents of the circle with centre O. If AB = 5 cm, AC = 6 cm and BC = 4 cm, then what is the length of AP?
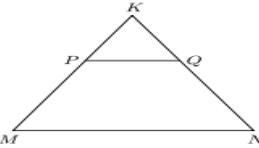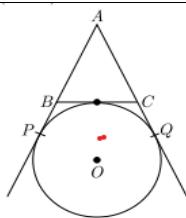
24.	In the figure OABC is a quadrant of a circle of radius 7 cm. If OD = 4 cm, find the area of shaded region.
	Or
	In the given figure, two concentric circle with centre O have radii 21 cm and 42 cm. If +AOB = 60c, find the area of the shaded region. Use π=22/7
25	*Prove that* $\frac{tanA}{1-cotA} + \frac{cotA}{1-tanA} = 1 + secA.cosecA$ Or, If Sin(A-B) =1/2 , Cos(A+B) = 1/2 where 0< A + B≤90⁰,A> B. Find A and B
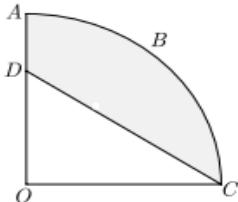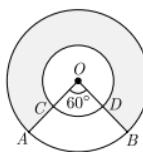
SECTION C	
S.N.	Section C consists of 6 questions of 3 marks each.
26.	Given that √5 is irrational. Prove that 7-√5 is irrational.
27.	If α and β are the zeros of the polynomial p(x) = x² -5x +4 , Find the value of (i) $\frac{1}{\alpha} + \frac{1}{\beta}$ - 2 $\alpha\beta$ (ii) $\alpha - \beta$
28.	Seven times a two-digit number is equal to four times the number obtained by reversing the order of its digits. If the difference of the digits is 3, determine the number. Or, Draw the graphs of the equations 5x – y = 5 and 3x – y = 3. Determine the co-ordinates of the vertices of the triangle formed by these lines and the y axis.
29.	Prove that:$\frac{sinA-cosA+1}{sinA+cosA-1} = \frac{1}{secA- tanA}$
30.	Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle. Or, PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at a point T in the given fig. Find the length TP.
31.	A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random
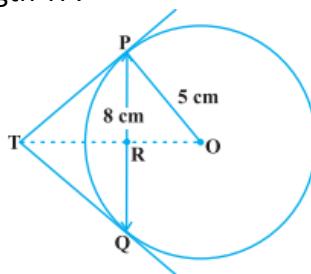
from the box, find the probability that it bears
  (i)   a two-digit number
  (ii) a perfect square number
  (iii) a number divisible by both 2 and 3.

	SECTION D
	Section D consists of 4 questions of 5 marks each.
32.	A train travels at a certain average speed for a distance of 63km and then travel at a distance of 72km at an average speed of 6km/hr more than its original speed. If it takes 3 hour to complete total journey, what is the original average speed? OR, Two water taps together can fill a tank in 75/8 hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.
33.	State and Prove Basic Proportionality Theorem. Or, A girl of height 90 cm is walking away from the base of a lamp-post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds
34.	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 a cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm Or, A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form an embankment. Find the height of the embankment
35.	The arithmetic mean of the following frequency distribution is 62.8.Determine the value of f_1&f_2.

C.I	0-20	20-40	40-60	60-80	80-100	100-120	Total
Frequency	5	F1	10	F2	7	8	50

|	**SECTION E**
	Case Study Questions (Each question 4 marks)

36.	A garden is in the shape of rectangle. Gardener grew sapling of Ashoka tree on the boundary of garden at the distance of 1 meter from each other. He want to decorate the garden with rose plants. He choose triangular region inside the park to grow rose plants. On the above situation, gardener took help from the students of class 10th. They made a chart for it which looks as the above figure.
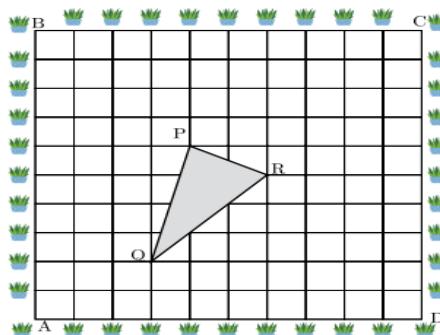	
	  (i) If A is taken as origin, What are the coordinates of triangle PQR ?
	    (ii) What is distance between P and Q if origin is taken A?
	    (iii) What is distance between P and Q if origin is taken B ?
	Or,(iv) Find the coordinate of centroid taking A as centre.

37.	Contest Prizes: A contest offers 15 prizes. The 1st prize is Rs 5000, and each successive prize is Rs 250 less than the preceding prize.

(i) What is the value of the 15th prize?
(ii) What is the total amount of money distributed in prizes?
Or, Find the amount of the last prize.
(iii) If Suresh got 5th prize then find Suresh got how much?

| 38. | Truss : A truss is a structure that consists of members organised into connected triangles so that the overall assembly behaves as a single object. Trusses are most commonly used in bridges, roofs and towers. |

Consider the line diagram of truss shown below.
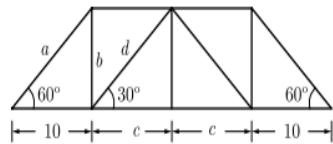
(i) Find the length a .
(ii) Find the length b .
(iii) Find the length c .
Or,
(iv) Find the length d .