

Time : 3 Hours
Maximum Marks : 80

MATHEMATICS (Standard)

CBSE
Sample Question Papers

3

Sample Question Paper

Solved

General Instructions :

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

Part – A :

1. It consists two sections- I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4 questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B :

1. Section III, Question No 21 to 26 are Very short answer Type questions of 2 marks each,
2. Section IV, Question No 27 to 33 are Short Answer Type questions of 3 marks each
3. Section V, Question No 34 to 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

PART-A

Section-I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

1. Calculate the largest number which divides 70 and 125, leaves remainders 5 and 8, respectively.

OR

If p is a prime number, then find LCM of p , p^2 and p^3 .

2. Explain why 13233343563715 is a composite number ?

OR

A number is chosen at random from the numbers $-3, -2, -1, 0, 1, 2, 3$. What will be the probability that square of this number is less than or equal to 1.

3. How many polynomials can be formed with -2 and 5 as zeroes?

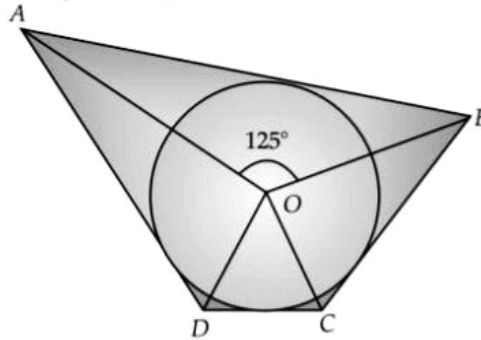
4. Graphically, the pair of equations :

$$6x - 3y + 10 = 0$$

$$2x - y + 9 = 0$$

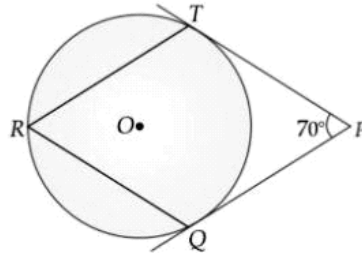
Represents what kind of lines.

5. Is the equation $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$ quadratic? Justify.
6. Find the 30th term of the A.P. : 10, 7, 4
7. Find the distance of the point $(-3, -4)$ from the x -axis (in units).
8. In the given figure, if $\angle AOB = 125^\circ$, then find $\angle COD$.



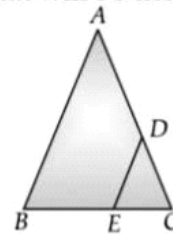
OR

In figure, O is the centre of a circle. PT and PQ are tangents to the circle from an external point P . If $\angle TPQ = 70^\circ$, then find $\angle TRQ$.



9. If the circumference of a circle and the perimeter of a square are equal, then find the relation between area of circle and area of square.
10. During conversion of a solid from one shape to another, what will be the volume of new shape?

- AI** 11. In the figure of $\triangle ABC$, the points D and E are on the sides CA , CB respectively such that $DE \parallel AB$, $AD = 2x$, $DC = x + 3$, $BE = 2x - 1$ and $CE = x$. Then, the value of x is



12. Find the value of $\sin^2 60^\circ + 2 \tan 45^\circ - \cos^2 30^\circ$.

OR

If $\sin A = \frac{3}{4}$, then find value of $\sec A$.

13. Find the area (in cm^2) of the circle that can be inscribed in a square of side 8 cm.
14. The curved surface area of a cylinder is 264 m^2 and its volume is 924 m^3 . Find the ratio of its height to its diameter.
15. If the distance between the points $(4, k)$ and $(1, 0)$ is 5, then what can be the possible values of k ?

OR

Write the co-ordinates of a point P on x -axis which is equidistant from the points $A(-2, 0)$ and $B(6, 0)$.

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

Find the sum of lower limits of median class and modal class.

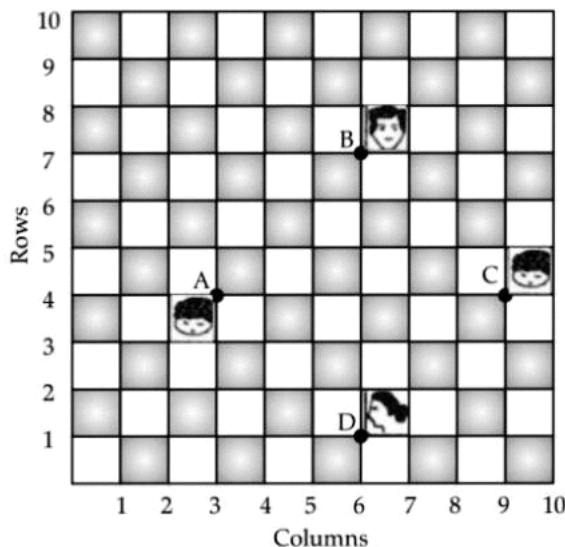
Section-II

Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

AI 17. Case Study based-1 :

In a room, 4 friends are seated at the points A, B, C and D as shown in figure. Reeta and Meeta walk into the room and after observing for a few minutes Reeta asks Meeta.

Asks Meeta



(a) What is the position of A ?

- (i) (4, 3) (ii) (3, 3) (iii) (3, 4) (iv) None of these

(b) What is the middle position of B and C ?

- (i) $\left(\frac{15}{2}, \frac{11}{2}\right)$ (ii) $\left(\frac{2}{15}, \frac{11}{2}\right)$ (iii) $\left(\frac{1}{2}, \frac{1}{2}\right)$ (iv) None of these

(c) What is the position of D ?

- (i) (6, 0) (ii) (0, 6) (iii) (6, 1) (iv) (1, 6)

(d) What is the distance between A and B ?

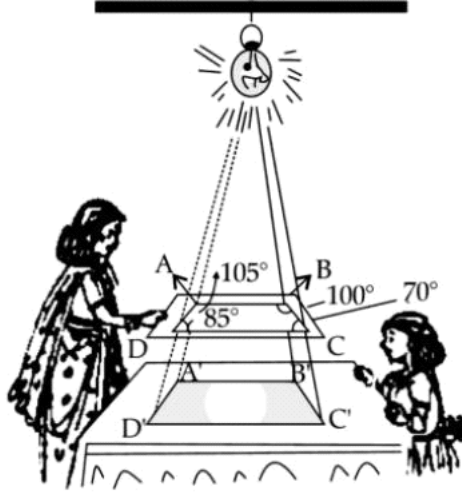
- (i) $3\sqrt{2}$ (ii) $2\sqrt{3}$ (iii) $2\sqrt{2}$ (iv) $3\sqrt{3}$

(e) What is the equation of line CD ?

- (i) $x - y - 5 = 0$ (ii) $x + y - 5 = 0$ (iii) $x + y + 5 = 0$ (iv) $x - y + 5 = 0$

AI 18. Case Study based-2 :

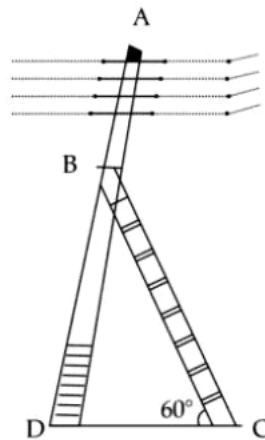
Seema placed a lightedbulb at point O on the ceiling and directly below it placed a table. Now, she put a cardboard of shape ABCD between table and lighted bulb. Then a shadow of ABCD is casted on the table as A'B'C'D' (see figure). Quadrilateral A'B'C'D' is an enlargement of ABCD with scale factor 1 : 2, Also, $AB = 1.5$ cm, $BC = 25$ cm, $CD = 2.4$ cm and $AD = 2.1$ cm; $\angle A = 105^\circ$, $\angle B = 100^\circ$, $\angle C = 70^\circ$ and $\angle D = 85^\circ$.



- (a) What is the measurement of angle A' ?
 (i) 105° (ii) 100° (iii) 70° (iv) 80°
- (b) What is the length of $A'B'$?
 (i) 1.5 cm (ii) 3 cm (iii) 5 cm (iv) 2.5 cm
- (c) What is the sum of angles of quadrilateral $A'B'C'D'$?
 (i) 180° (ii) 360° (iii) 270° (iv) None of these
- (d) What is the ratio of sides $A'B'$ and $A'D'$?
 (i) 5 : 7 (ii) 7 : 5 (iii) 1 : 1 (iv) 1 : 2
- (e) What is the sum of angles of C' and D' ?
 (i) 105° (ii) 100° (iii) 155° (iv) 140°

AI 19. Case Study based-3 :

An electrician has to repaired and electric fault on the pole of height 5 cm. She needs to reach a point 1.3 m below the top of the pole to undertake the repair work (see figure)



- (a) What is the length of BD ?
 (i) 1.3 m (ii) 5 m (iii) 3.7 m (iv) None of these
- (b) What should be the length of Ladder, when inclined at an angle of 60° to the horizontal ?
 (i) 4.28 m (ii) $\frac{3.7}{\sqrt{3}}$ m (iii) 3.7 m (iv) 7.4 m
- (c) How far from the foot of pole should she place the foot of the ladder ?
 (i) 3.7 (ii) 2.14 (iii) $\frac{1}{\sqrt{3}}$ (iv) None of these
- (d) If the horizontal angle is changed to 30° , then what should be the length of the ladder ?
 (i) 7.4 m (ii) 3.7 m (iii) 1.3 m (iv) 5 m

(e) What is the value of $\angle B$?

(i) 60°

(ii) 90°

(iii) 30°

(iv) 180°

AI 20. Case Study based-4 :

The weights (in kg) of 50 wrestlers are recorded in the following table :

Weight (in kg)	100 – 110	110 – 120	120 – 130	130 – 140	140 – 150
No. of Wrestless	4	14	21	8	3



(a) What is the upper limit of modal class.

(i) 120

(ii) 130

(iii) 100

(iv) 150

(b) What is the mode of the given data

(i) 21

(ii) 50

(iii) 25

(iv) 80

(c) How many wrestlers weights have more than 120 kg weight ?

(i) 32

(ii) 50

(iii) 16

(iv) 21

(d) What is the class mark for class 130 – 140 ?

(i) 105

(ii) 125

(iii) 135

(iv) 145

(e) Which method is more suitable to find the mean of the above data ?

(i) Direct method

(ii) Assumed mean method

(iii) Step-Deviation method

(iv) None of these

PART-B

Section-III

All questions are compulsory. In case of internal choices, attempt any one.

21. Write the denominator of the rational number $\frac{257}{500}$ in the form $2^m \times 5^n$, where m and n are non-negative integers. Hence write its decimal expansion without actual division.

22. In a rectangle $ABCD$, E is a point on AB such that $AE = \frac{2}{3} AB$. If $AB = 6$ km and $AD = 3$ km, then find DE .

AI 23. If $\sin(A + B) = 1$ and $\sin(A - B) = \frac{1}{2}$, $0 \leq A + B = 90^\circ$ and $A > B$, then find A and B .

OR

Express : $\sin A$ and $\tan A$ in terms of $\sec A$.

24. An observer 1.5 m tall is 28.5 m away from a tower 30 m high. Find the angle of elevation of the top of the tower from his eye.

25. A child prepares a poster on "save water" on a square sheet whose each side measures 50 cm. At each corner of the sheet, she draws a quadrant of radius 15 cm in which she shows the ways to save water. At the centre, she draws a circle of diameter 21 cm and writes a slogan save water in it. Find the area of the remaining sheet.

26. A teacher took a surprise test of maths. He observes the marks of five students of class. He observes the median is 45.5 and mode is 50.5. So find the mean of the marks of five students using an empirical formula.

OR

Find the mode of the following frequency distribution

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	8	10	10	16	12	6	7

Section-IV

All questions are compulsory. In case of internal choices, attempt any one.

27. Sum of the ages of a father and the son is 40 years. If father's age is three times that of his son, then find their respective ages.

OR

28. A part of monthly hostel charge is fixed and the remaining depends on the number of days one has taken food in the mess. When Swati takes food for 20 days, she has to pay ₹ 3,000 as hostel charges whereas Mansi who takes food for 25 days has to pay ₹ 3,500 as hostel charges. Find the fixed charges and the cost of food per day.

29. The ninth term of an A.P. is equal to seven times the second term and twelfth term exceeds five times the third term by 2. Find the first term and the common difference.

OR

The sum of first n terms of three arithmetic progressions are S_1 , S_2 and S_3 respectively. The first term of each A.P. is 1 and common differences are 1, 2 and 3 respectively. Prove that $S_1 + S_3 = 2S_2$.

30. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant of 60° . After sometime, the angle of elevation reduces to 30° .

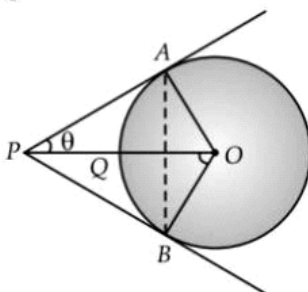
- (i) Find the distance travelled by the balloon during the interval.
 (ii) Which mathematical concept is used in the above problem ?

31. If $(x^2 + y^2)(a^2 + b^2) = (ax + by)^2$. Prove that $\frac{x}{a} + \frac{y}{b}$

32. A bag contains 18 balls out of which x balls are red.

- (i) If one ball is drawn at random from the bag, what is the probability that it is not red ?
 (ii) If 2 more red balls are put in the bag, the probability of drawing a red ball will be $\frac{9}{8}$ times the probability of drawing a red ball in the first case. Find the value of x .

33. In the given figure, OP is equal to the diameter of a circle with centre O and PA and PB are tangents. Prove that ABP is an equilateral triangle.



34. If $b \cos \theta = a$, then prove that $\operatorname{cosec} \theta + \cot \theta = \sqrt{\frac{b+a}{b-a}}$.

Section-V

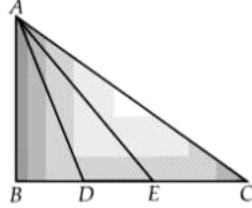
All questions are compulsory. In case of internal choices, attempt any one.

AI 34. Solve $\frac{1}{(a+b+x)} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$, where $a + b \neq 0$.

OR

Check whether the equation $5x^2 - 6x - 2 = 0$ has real roots and if it has, find them by the method of completing the square. Also, verify that roots obtained satisfy the given equation.

AI 35. In the given figure, D and E trisect BC . Prove that $8AE^2 = 3AC^2 + 5AD^2$.



AI 36. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 20 cm and the diameter of the cylinder is 7 cm. Find the total volume of the solid. (Use $\pi = \frac{22}{7}$)

■■■

Self Assessment Paper

2

General Instructions :

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

Part – A :

1. It consists two sections- I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4 questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B :

1. Section III, Question No 21 to 26 are Very short answer Type questions of 2 marks each,
2. Section IV, Question No 27 to 33 are Short Answer Type questions of 3 marks each
3. Section V, Question No 34 to 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

PART-A

Section-I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

1. What is the HCF of 3000 and 525 ?

OR

On a morning walk, three persons step off together and their steps measure 40 cm, 42 cm and 45 cm respectively. At what minimum distance each should walk, so that each can cover the same distance in complete steps.

2. For what value of k , the roots of the equation $3x^2 - 10x + k = 0$ are reciprocal of each other ?

OR

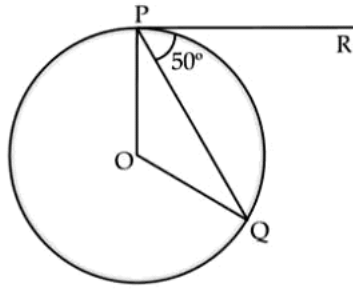
For which value (s) of p , will the lines represented by the following pair of linear equations be parallel.

$$3x - y - 5 = 0$$

$$6x - 2y - p = 0$$

3. If A $\left(\frac{m}{3}, 5\right)$ is the mid-point of the line segment joining the points Q $(-6, 7)$ and R $(-2, 3)$, then find the value of m .

- Q4.** In the given figure, 'O' is the centre of circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, then find $\angle POQ$.



5. If $\sin\theta + \cos\theta = \sqrt{2} \cos\theta$, ($\theta \neq 90^\circ$) then find the value of $\tan\theta$.
6. What is area of the largest triangle that can be inscribed in a semi-circle of radius 'r' units.

OR

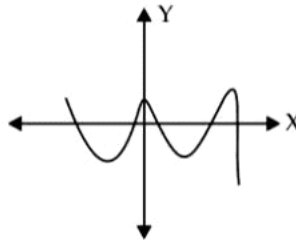
Find the radius of a circle whose circumference is equal to the sum of the circumferences of the two circles of diameters 36 cm and 20 cm.

7. What is the sum or difference of a rational and an irrational number.
8. For what value of p for which $3x^2 - 5x + p = 0$ has equal roots.
9. If the n^{th} term of A.P. 12, 15, 18,..... 99 is 99. Then find value of n .

OR

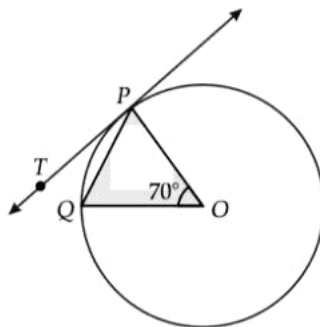
If S_n , the sum of first n terms of an A.P. is given by $S_n = 3n^2 - 4n$, the find its n^{th} term.

- Q10.** The graph of $y = p(x)$, where $p(x)$ is a polynomial in variable x , is as follows :

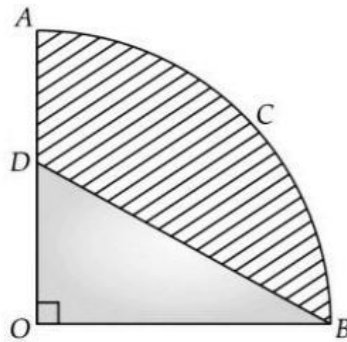


Find the number of zeroes of $p(x)$.

11. Find the co-ordinates of a point A, where AB is the diameter of the circle with centre $(-2, 2)$ and B is the point with coordinates $(3, 4)$.
12. In given figure, O is the centre of the circle, PQ is a chord and PT is tangent to the circle at P. Find $\angle TPQ$.



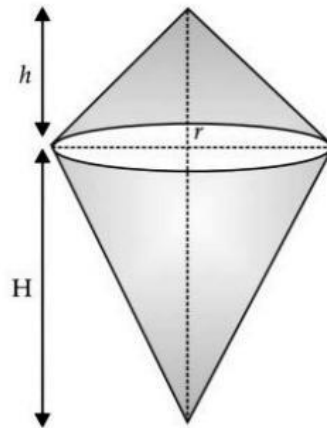
13. In the given figure, OACB is a quadrant of a circle with centre O and radius 3.5 cm. If $OD = 2$ cm, find the area of the shaded region.



14. Two cubes each of volume 8 cm^3 are joined end to end, then what is the surface area of resulting cuboid.

OR

A solid metallic object is shaped like a double cone as shown in figure. Radius of base of both cones is same but their heights are different. If this cone is immersed in water, find the quantity of water it will displace.



15. A number is chosen at random from the numbers $-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5$. Then find the probability that square of this number is less than or equal to 1 is _____.

16. Convert the following data into 'more than type' distribution :

Class	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75	75 – 80
Frequency	2	8	12	24	38	16

Section-II

Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

17. Case Study based-1 :

In a game, the entry fee is 5. The game consists of a tossing a coin 3 times. If one or two heads show, Sweta gets her entry fee back. If she throws 3 heads, she receives double entry fees. Otherwise she will lose. For tossing a coin three times, find the following :



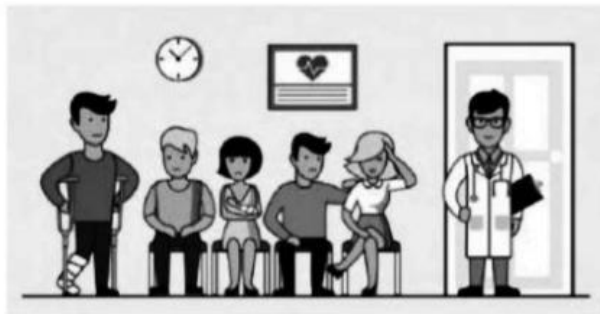
Tossing of Coin

- (a) What is the total number of outcomes for this game?
 (i) 8 (ii) 2 (iii) 6 (iv) none of these
- (b) Probability that she loses the entry fee :
 (i) 1 (ii) $\frac{1}{8}$ (iii) $\frac{3}{4}$ (iv) none of these
- (c) Probability that she gets double entry fee:
 (i) 1 (ii) $\frac{1}{8}$ (iii) $\frac{3}{4}$ (iv) none of these
- (d) Probability that she just gets her entry fee:
 (i) 1 (ii) $\frac{1}{8}$ (iii) $\frac{3}{4}$ (iv) none of these
- (e) Sum of probability in all the above three cases:
 (i) 1 (ii) $\frac{1}{8}$ (iii) $\frac{3}{4}$ (iv) none of these

AI 18. Case Study based-2 :

The following table shows the ages of the patients admitted in a hospital during a year :

Age (in years)	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Number of patients	6	11	21	23	14	5



- (a) What is the modal class of the given data?
 (i) 5-15 (ii) 15-25 (iii) 25-35 (iv) 35-45
- (b) What is the value of class mark for 45-55?
 (i) 10 (ii) 50 (iii) 100 (iv) 20
- (c) What is the median class of the given data?
 (i) 5-15 (ii) 15-25 (iii) 55-65 (iv) 35-45
- (d) What is the width of the class?
 (i) 10 (ii) 5 (iii) 2.5 (iv) 15
- (e) What is the sum of upper limit of modal class and lower limit of median class?
 (i) 100 (ii) 70 (iii) 90 (iv) 80

AI 19. Case Study based-3 :

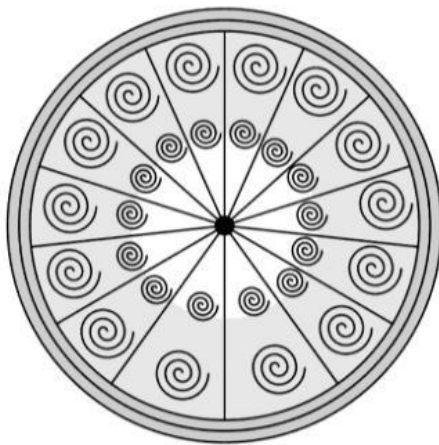
Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour.



- (a) Assuming that the speed of first car and second car be v km/h respectively.
What is the relative speed of both cars while they are travelling in the same direction?
- (i) $u+v$ km/hr (ii) $u - v$ km/hr
(iii) u/v km/hr (iv) uv km/hr
- (b) What is the relative speed of both cars while they are travelling towards each other?
- (i) $u+v$ km/hr (ii) $u-v$ km/hr
(iii) u/v km/hr (iv) uv km/hr
- (c) What is the actual speed of one car?
- (i) 60 km/hr (ii) 40 km/hr
(iii) 100 km/hr (iv) 20 km/hr
- (d) What is the actual speed of other car?
- (i) 60 km/hr (ii) 40 km/hr
(iii) 100 km/hr (iv) 20 km/hr
- (e) The given problem is based on which mathematical concept
- (i) Pair of linear equations (ii) Quadratic equations
(iii) Polynomials (iv) none of these

AI 20. Case Study based-4 :

In a workshop brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in the given figure.



- (a) What is the radius of the circle?
- (i) $\frac{35}{2}$ (ii) $\frac{5}{2}$ (iii) 35 (iv) 10
- (b) What is the circumference of the brooch?
- (i) 100 mm (ii) 110 mm (iii) 50 mm (iv) 10 mm
- (c) What is the total length of silver wire required?
- (i) 528 mm (ii) 825 mm (iii) 285 mm (iv) 852 mm
- (d) What is the area of the each sector of the brooch?
- (i) $\frac{385}{2}$ mm² (ii) $\frac{358}{4}$ mm² (iii) $\frac{585}{4}$ mm² (iv) $\frac{385}{4}$ mm²
- (e) The given problem is based on which mathematical concept
- (i) Areas Related to circles (ii) Circles
(iii) Construction (iv) none of these

Section-III

All questions are compulsory. In case of internal choices, attempt any one.

Q1. Prove that $\sqrt{2}$ is an irrational number.

OR

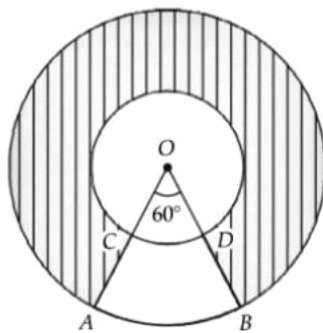
If HCF (336, 54) = 6, find LCM (336, 54)

Q2. If $\left(1, \frac{p}{3}\right)$ is the mid point of the line segment joining the points (2, 0) and $\left(0, \frac{2}{9}\right)$, then show that the line $5x + 3y + 2 = 0$ passes through the point $(-1, 3p)$.

Q3. If $\sin A = \frac{\sqrt{3}}{2}$, then find the value of $2\cot^2 A - 1$.

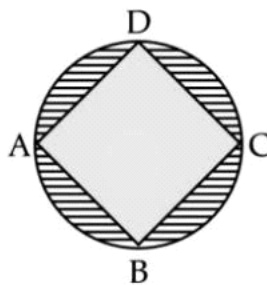
24. From the top of a 7 m high building the angle of elevation of the top of a tower is 60° and the angle of depression of its foot is 45° . Find the height of the tower.

25. In the given figure, two concentric circles with centre O have radii 21 cm and 42 cm. If $\angle AOB = 60^\circ$, find the area of the shaded region. (Use $\pi = \frac{22}{7}$)



OR

In figure, $ABCD$ is a square with side $2\sqrt{2}$ cm and inscribed in a circle. Find the area of the shaded region. (Use $\pi = 3.14$)



26. Find the sum of the lower limit of the median class and the upper limit of the modal class :

Classes	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	1	3	5	9	7	3

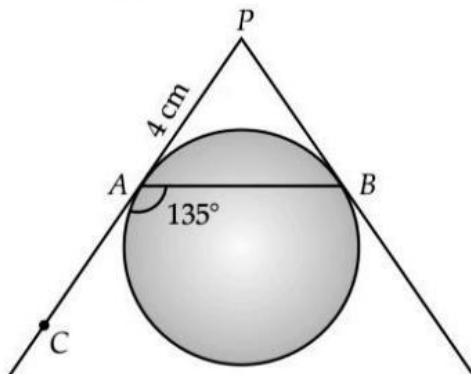
Section-IV

All questions are compulsory. In case of internal choices, attempt any one.

27. Show that $\frac{1}{2}$ and $\frac{-3}{2}$ are the zeroes of the polynomial $4x^2 + 4x - 3$ and verify the relationship between zeroes and coefficients of the polynomial.

How many terms of an A.P. 9, 17, 25, must be taken to give a sum of 636 ?

31. [AI] $\triangle ABC$ is a right angled at C . If p is the length of the perpendicular from C to AB and a, b, c are the lengths of the sides opposite $\angle A, \angle B$ and $\angle C$ respectively, then prove that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.
32. In the given figure, PA and PB are tangents to a circle from an external point P such that $PA = 4$ cm and $\angle BAC = 135^\circ$. Find the length of chord AB .



33. Three different coins are tossed together. Find the probability of getting
 (i) exactly two heads. (ii) at least two heads (iii) at least two tails.

Section-V

All questions are compulsory. In case of internal choices, attempt any one.

34. If the roots of the quadratic equation $(x - a)(x - b) + (x - b)(x - c) + (x - c)(x - a) = 0$ are equal. Then, show that $a = b = c$.

OR

The denominator of a fraction is one more than twice its numerator. If the sum of the fraction and its reciprocal is $2\frac{16}{21}$, find the fraction.

35. The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60° . From a point Y 40 m vertically above X , the angle of elevation of the top Q of tower is 45° . Find the height of the tower PQ and the distance PX . (Use $\sqrt{3} = 1.73$)

- [AI] 36. Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/hour. How much area will it irrigate in 30 minutes; if 8 cm standing water is needed ?

Finished Solving the Paper ?
Time to evaluate yourself !
<https://qrqo.page.link/euZVt>

OR

SCAN THE CODE



For elaborate Solutions

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Self Assessment Paper

3

General Instructions :

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

Part – A :

1. It consists two sections- I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4 questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B :

1. Section III, Question No 21 to 26 are Very short answer Type questions of 2 marks each,
2. Section IV, Question No 27 to 33 are Short Answer Type questions of 3 marks each
3. Section V, Question No 34 to 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

PART-A

Section-I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

1. Find the LCM of 6, 72 and 120.

OR

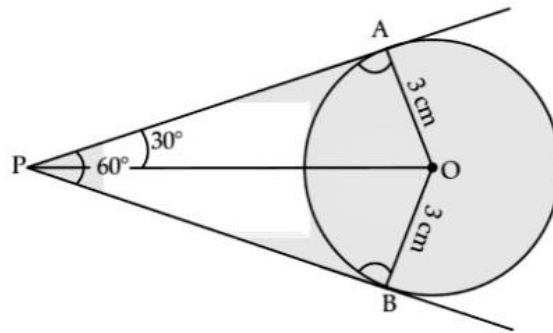
After how many decimal places will the decimal expansion of $\frac{23}{2^4 \times 5^3}$ terminate ?

AI Q. 2. Find the values (s) of k for which the quadratic equation $x^2 + 2\sqrt{2} kx + 18 = 0$ has equal roots.

3. Find the distance of the point $P(-6, 8)$ from the origin.

4. If in two triangles CAB and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$ then these two triangles are similar or not.

AI 5. If two tangents inclined at an angle 60° are drawn to a circle of radius 3 cm, then find the length of each tangent.



OR

Find the area of the square that can be inscribed in a circle of radius 8 cm.

6. The surface areas of two spheres are in the ratio 16 : 9. Then find the ratio of their volumes.
7. If a card is selected from a deck of 52 cards, then find the probability of its being a red face card.
8. If zeroes of the polynomial $x^2 + 4x + 2a$ are α and $\frac{2}{\alpha}$, then find the value of a .
9. HCF of two number is 18 and their product is 12960, the find LCM of the two numbers.
10. A quadratic equation $x^2 - 6x - 16 = 0$ has sum of roots equal to 6, then find product of roots.

OR

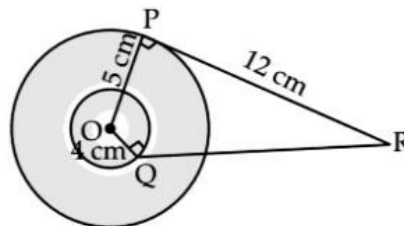
Find the positive root of the following equation $\sqrt{3x^2 + 6} = 9$.

11. Find the common difference of the given A.P. $\frac{1}{3q}, \frac{1-6q}{3q}, \frac{1-12q}{3q}, \dots$

OR

11. Find the ratio in which the line segment joining the points (6, 4) and (1, -7) is divided by the x-axis.

12. In the given figure if $PR = 12$ cm, $OP = 5$ cm and $OQ = 4$ cm find RQ .



13. Express the trigonometric ratio of $\sec A$ and $\tan A$ in terms of $\sin A$.

OR

If $\sin \theta = \cos \theta$, then find the value of $2\tan \theta + \cos^2 \theta$.

14. What is the area of the largest square that can be inscribed in a circle of radius 12 cm. ?

15. The radius of sphere is r cm. It is divided into two equal parts. Find the whole surface area of two parts.

16. The times, in seconds, taken by 62 athletes to run 110 m hurdle race is tabulated below :

Class	13.8 - 14	14 - 14.2	14.2 - 14.4	14.4 - 14.6	14.6 - 14.8	14.8 - 15
Frequency	8	10	10	16	12	6

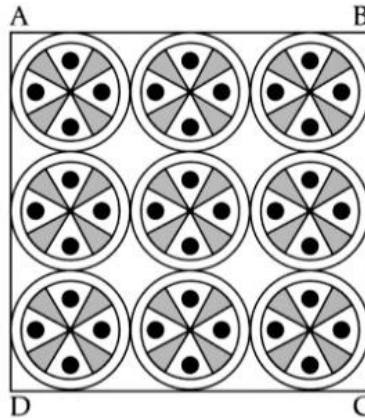
Find the number of athletes who completed the race in less than 14.6 seconds.

Section-II

Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

AI 17. Case Study based-1 : Painting Activity :

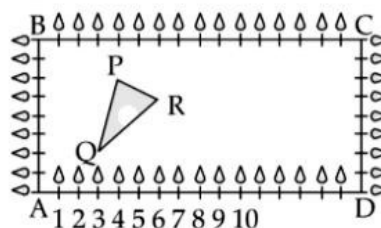
In a class activity Sheena done a block painting on a square handkerchief as shown in figure. She made nine designer circles each of radius 7 cm.



- (a) What is the area of nine circles?
 (i) 154 cm^2 (ii) 145 cm^2
 (iii) 1386 cm^2 (iv) 1836 cm^2
- (b) What is the side of the square?
 (i) 22 cm (ii) 44 cm
 (iii) 24 cm (iv) 42 cm
- (c) What is the area of square?
 (i) 1764 cm^2 (ii) 1674 cm^2
 (iii) 1476 cm^2 (iv) 1746 cm^2
- (d) What is the area of remaining portion of square?
 (i) 837 cm^2 (ii) 378 cm^2
 (iii) 738 cm^2 (iv) 383 cm^2
- (e) The given problem is based on which mathematical concept
 (i) Areas Related to circles (ii) Circles
 (iii) Construction (iv) none of these

AI 18. Case Study based-2 :

The Class X students of a secondary school in have been allotted a rectangular plot of land for their gardening activity. Sapling of Gulmohar is planted on the boundary at a distance of 1 m from each other. There is a triangular grassy lawn in the plot as shown in the figure. The students are to sow seeds of flowering plants on the remaining area of the plot.



- (a) Taking A as origin, find the coordinates of the vertices of the triangle.
 (i) P (4, 6), Q(3, 2), R(6, 5)
 (ii) P (3, 2), Q(4,6), R(6,5)
 (iii) P (4, 6), Q(3, 2), R(5, 6)
 (iv) P (4, 6), Q(2, 3), R(6, 5)

(b) What is the midpoint of side PQ, when A is the origin?

- (i) $\left(\frac{7}{2}, \frac{9}{2}\right) \text{ cm}^2$ (ii) $\left(\frac{7}{2}, 4\right) \text{ cm}^2$ (iii) $\left(\frac{23}{2}, \frac{9}{2}\right) \text{ cm}^2$ (iv) none of these

(c) What will be the coordinates of the vertices of ΔPQR if C is the origin ?

- (i) P (10, 6), Q(13, 2), R(12, 5) (ii) P (12, 2), Q(10, 6), R(13, 5)
 (iii) P (12, 6), Q(13, 2), R(10, 6) (iv) P (12, 2), Q(13, 6), R(10, 3)

(d) What is the mid point of side QR, when C is the origin?

- (i) $\left(\frac{7}{2}, \frac{9}{2}\right) \text{ cm}^2$ (ii) $\left(\frac{7}{2}, 4\right) \text{ cm}^2$ (iii) $\left(\frac{23}{2}, \frac{9}{2}\right) \text{ cm}^2$ (iv) none of these

(e) The given problem is based on which mathematical concept

- (i) Lines in two dimension (ii) triangles
 (iii) Similarity (iv) none of these

AI 19. Case Study based-3 :

Two customers Shyam and Ekta are visiting a particular shop in the same week (Tuesday to Saturday). Each is equally likely to visit the shop on any day as on another day.



(a) What are the total numbers of favorable outcomes?

- (i) 5 (ii) 10 (iii) 25 (iv) 20

(b) What is the probability that both will visit the shop on same day?

- (i) $\frac{1}{5}$ (ii) $\frac{4}{5}$ (iii) $\frac{2}{5}$ (iv) $\frac{8}{25}$

(c) What are the total numbers of favorable outcomes if both will visit the shop on consecutive day?

- (i) 5 (ii) 10 (iii) 8 (iv) 25

(d) What is the probability that both will visit the shop on consecutive day?

- (i) $\frac{1}{5}$ (ii) $\frac{1}{10}$ (iii) $\frac{2}{5}$ (iv) $\frac{8}{25}$

(e) What is the probability that both will visit the shop on different day?

- (i) $\frac{1}{5}$ (ii) $\frac{3}{5}$ (iii) $\frac{4}{5}$ (iv) $\frac{8}{25}$

AI 20. Case Study based-4 :

Electricity Consumption problem



The following frequency distribution gives the monthly consumers of a locality.

Monthly consumption (in units)	65 – 85	85 – 105	105 – 125	125 – 145	145 – 165	165 – 185	185 – 205
Number of consumers	4	5	13	20	14	8	4

- (a) What is the lower limit of median class?
 (i) 125 (ii) 145 (iii) 165 (iv) 185
- (b) What is the lower limit of modal class?
 (i) 125 (ii) 145 (iii) 165 (iv) 185
- (c) What is the mean of upper limits of median and modal class?
 (i) 125 (ii) 145 (iii) 165 (iv) 185
- (d) What is the width of the class?
 (i) 10 (ii) 15 (iii) 20 (iv) 25
- (e) The median is :
 (i) 137 (ii) 135 (iii) 125 (iv) 135.7

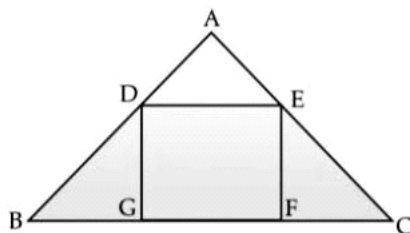
PART-B

Section-III

All questions are compulsory. In case of internal choices, attempt any one.

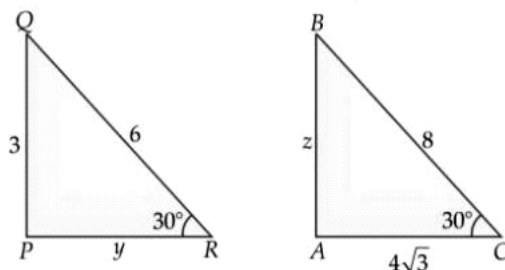
21. Show that $7 - \sqrt{5}$ is irrational, given that $\sqrt{5}$ is irrational.

22. In the given figure, $DEFG$ is a square and $\angle BAC = 90^\circ$. Show that $FG^2 = BG \times FC$



OR

In the given figure, $\triangle ABC \sim \triangle PQR$. Find the value of $y + z$.



23. If $4 \cos \theta = 11 \sin \theta$, find the value of $\frac{11 \cos \theta - 7 \sin \theta}{11 \cos \theta + 7 \sin \theta}$.

24. The angle of elevation of the top of a chimney from the foot of a tower is 60° and the angle of depression of the foot of the chimney from the top of the tower is 30° . If the height of tower is 40 m, find the height of smoke emitting chimney. According to pollution control norms, the minimum height of a smoke emitting chimney should be 100 m.

25. A solid metallic cylinder of radius 3.5 cm and height 14 cm is melted and recast into a number of small solid metallic balls, each of radius $\frac{7}{12}$ cm. Find the number of balls so formed.

OR

Sides of a right triangular field are 25m, 24m and 7m. At the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of 3.5 m each to graze in the field. Find the area of the field that cannot be grazed by these animals.

26. The mean of the following frequency distribution is 25. Find the value of p .

Class interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	4	6	10	6	p

Section-IV

All questions are compulsory. In case of internal choices, attempt any one.

27. Express the number $0.\overline{3178}$ in the form of rational number $\frac{a}{b}$.

OR

A part of monthly hostel charge is fixed and the remaining depends on the number of days one has taken food in the mess. When Swati takes food for 20 days, she has to pay ₹ 3,000 as hostel charges whereas Mansi who takes food for 25 days has to pay ₹ 3,500 as hostel charges. Find the fixed charges and the cost of food per day.

28. Places A and B are 80 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in same direction they meet in 8 hours and if they move towards each other they meet in 1 hour 20 minutes. Find the speed of cars.
29. If S_n denotes, the sum of the first n terms of an A.P. prove that $S_{12} = 3(S_8 - S_4)$.

OR

The p^{th} , q^{th} and r^{th} terms of an A.P. are a , b and c respectively. Show that $a(q - r) + b(r - p) + c(p - q) = 0$.

30. If $\sec \theta = x + \frac{1}{4x}$, prove that $\sec \theta + \tan \theta = 2x$ or $\frac{1}{2x}$.
31. Two tangents TP and TQ are drawn to a circle with centre O from an external point T . Prove that $\angle PTO = 2\angle OPQ$.
32. From an airport, two aeroplanes start at the same time. If speed of first aeroplane due North is 500 km/h and that of other due East is 650 km/h then find the distance between the two aeroplanes after 2 hours.
33. Two different dice are thrown together. Find the probability of :
- getting a number greater than 3 on each die.
 - getting a total of 6 or 7 of the numbers on two dice.

Section-V

All questions are compulsory. In case of internal choices, attempt any one.

34. The line segment joining the points $A(2, 1)$ and $B(5, -8)$ is trisected at the points P and Q such that P is nearer to A . If P also lies on the line given by $2x - y + k = 0$, find the value of k .

35. From a point P on the ground, the angle of elevation of the top of a tower is 30° and that of the top of the flag-staff fixed on the top of the tower is 45° . If the length of the flag-staff is 5 m, find the height of the tower. (Use $\sqrt{3} = 1.732$)

OR

From the top of a building 60 m high the angles of depression of the top and the bottom of a tower are observed to be 30° and 60° . Find the height of the tower.

36. 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 volume of the cylinder and toy. (Take $\pi = 3.14$)

Finished Solving the Paper ?
Time to evaluate yourself !
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OR

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The advertisement features a central illustration of a student reading a book, surrounded by various educational icons such as a pencil, a ruler, a protractor, a compass, and a plus sign. To the left, there is a QR code and a smartphone displaying the QR code. The background is a grid pattern.



Self Assessment Paper

4

General Instructions :

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

Part – A :

1. It consists two sections- I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4 questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B :

1. Section III, Question No 21 to 26 are Very short answer Type questions of 2 marks each,
2. Section IV, Question No 27 to 33 are Short Answer Type questions of 3 marks each
3. Section V, Question No 34 to 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

PART-A

Section-I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

1. Find the HCF of 96 and 404.

OR

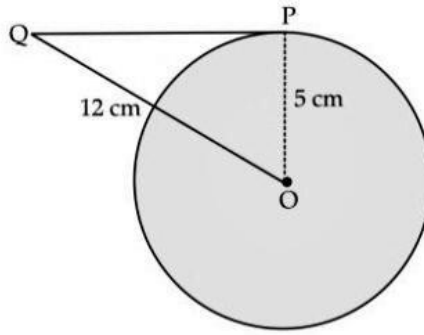
What is the relation between HCF and LCM of two numbers ?

2. Show that equation $2x^2 - 7x + 6$ has 2 as a root.
3. Find the fourth vertex D of a parallelogram $ABCD$ whose three vertices are $A(-2, 3)$, $B(6, 7)$ and $C(8, 3)$ respectively.

OR

Find the distance of a point (x, y) from origin.

4. 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. Find length of PQ .



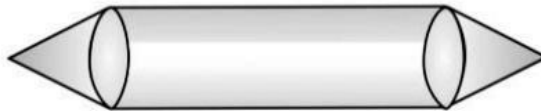
5. Evaluate $9 \sec^2 A - 9 \tan^2 A$

OR

If $\operatorname{cosec} \theta - \cot \theta = \frac{1}{3}$, then find the value of $\operatorname{cosec} \theta + \cot \theta$.

6. Find the area of the circle that can be inscribed in a square of side 6 cm.

7. The shape of a gilli, in the gilli-danda game (see in Figure) is a combination of which geometrical figures?



8. Consider the following frequency distribution of the heights of 60 students of a class.

Heights (in cm)	No. of students
150-155	15
155-160	13
160-165	10
165-170	8
170-175	9
175-180	5

Find the upper limit of the median class.

9. If LCM and HCF of two rational numbers are same, then what can you say of these numbers.

10. The pair of equations $x = a$ and $y = b$ graphically represents which type of lines.

11. Find the sum of first 8 multiples of 3.

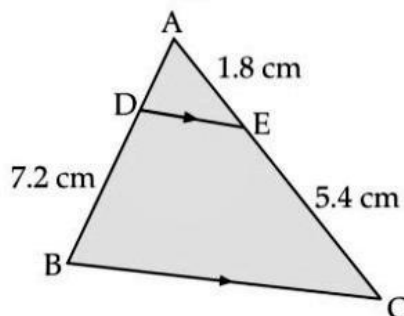
OR

Find the 21st term of the A.P. $-4\frac{1}{2}, -3, -1\frac{1}{2}, \dots$

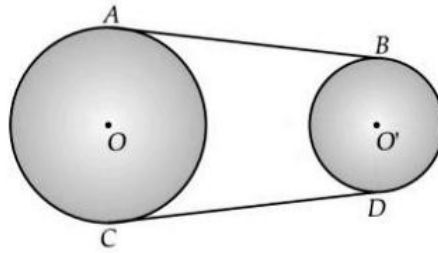
12. Are two triangles having corresponding sides equal are similar.

OR

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.



13. In the fig, AB and CD are common tangents to two circles of unequal radii. Prove that $AB = CD$.



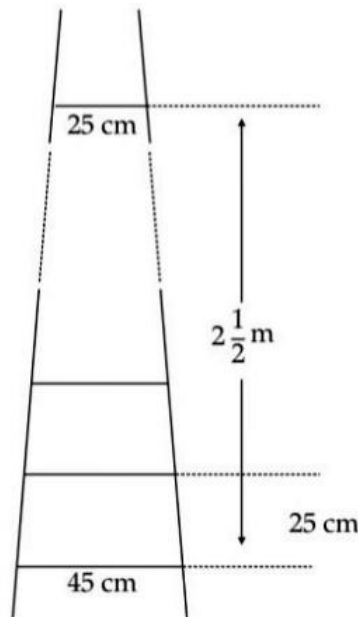
14. The diameters of two circles with centre A and B are 16 cm and 30 cm respectively. If area of another circle with centre C is equal to the sum of areas of these two circles, then find the circumference of the circle with centre C .
15. Three cubes of iron whose edges are 3 cm, 4 cm and 5 cm respectively are melted and formed into a single cube, what will be the edge of the new cube formed?
16. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap?

Section-II

Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

17. Case Study based-1 :

A ladder has rungs 25 cm apart. (see the figure below). The rungs decrease uniformly in length from 45 cm at the bottom to 25 cm at the top. The top and the bottom rungs are $2\frac{1}{2}$ m apart.

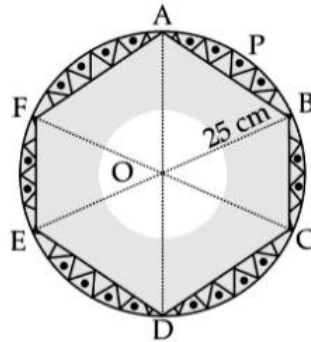


- (a) The top and bottom rungs are apart at a distance:
- | | | | |
|------------|-------------|--------------|-------------|
| (i) 200 cm | (ii) 250 cm | (iii) 300 cm | (iv) 150 cm |
|------------|-------------|--------------|-------------|
- (b) Total number of the rungs is:
- | | | | |
|--------|---------|----------|---------|
| (i) 20 | (ii) 25 | (iii) 11 | (iv) 15 |
|--------|---------|----------|---------|
- (c) The given problem is based on AP, find its first term.
- | | | | |
|--------|---------|----------|---------|
| (i) 25 | (ii) 45 | (iii) 11 | (iv) 13 |
|--------|---------|----------|---------|
- (d) What is the last term of AP?
- | | | | |
|--------|---------|----------|---------|
| (i) 25 | (ii) 45 | (iii) 11 | (iv) 13 |
|--------|---------|----------|---------|
- (e) What is the length of the wood required for the rungs?
- | | | | |
|---------|----------|-----------|----------|
| (i) 385 | (ii) 538 | (iii) 532 | (iv) 382 |
|---------|----------|-----------|----------|

AI 18. Case Study based-2 :

Reema mother's is making a table cover for a round table. Reema painted a designe on it.

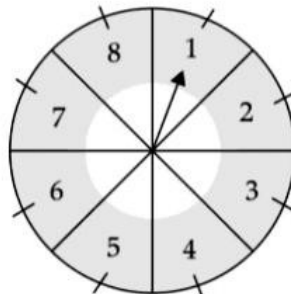
It has six equal designs as shown in the given figure. The radius of the cover is 28 cm. (us $\sqrt{3} = 1.73$)



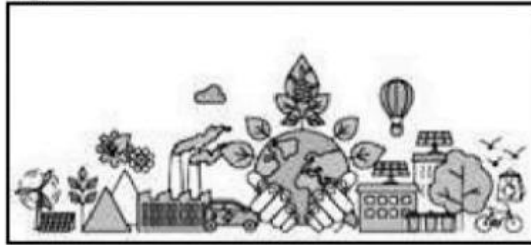
- (a) Find $\angle AOB$.
- (i) 60° (ii) 70° (iii) 30° (iv) 65°
- (b) Find area of $\triangle AOB$.
- (i) 332 cm^2 (ii) 322 cm^2 (iii) 333 cm^2 (iv) none of these
- (c) Find area of sector OAPB.
- (i) $\frac{1232}{3} \text{ cm}^2$ (ii) $\frac{1232}{3} \text{ cm}^2$ (iii) $\frac{1223}{3} \text{ cm}^2$ (iv) $\frac{1223}{5} \text{ cm}^2$
- (d) Find area of a design APBA.
- (i) 411 cm^2 (ii) 414 cm^2 (iii) 465 cm^2 (iv) 455 cm^2
- (e) Find the cost of making the designs at the rate of ₹ 0.35 per cm^2 .
- (i) 160 (ii) 163 (iii) 164 (iv) 161

AI 19. Case Study based-3 :

A game of chance consists of spinning an arrow which comes of rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 (see figure) and these are equally likely outcomes.



- (a) What are the total possible outcomes?
- (i) 8 (ii) 1 (iii) 36 (iv) 4
- (b) What is the probability that spinning arrow will point at 8?
- (i) $\frac{1}{8}$ (ii) $\frac{1}{2}$ (iii) $\frac{3}{4}$ (iv) 1
- (c) What is the probability that spinning arrow will point at a number greater than 2?
- (i) $\frac{1}{8}$ (ii) $\frac{1}{2}$ (iii) $\frac{3}{4}$ (iv) 1
- (d) What is the probability that spinning arrow will point at an odd number?
- (i) $\frac{1}{8}$ (ii) $\frac{1}{2}$ (iii) $\frac{3}{4}$ (iv) 1
- (e) What is the probability that spinning arrow will point at a number less than 9?
- (i) $\frac{1}{8}$ (ii) $\frac{1}{2}$ (iii) $\frac{3}{4}$ (iv) 1

AI 20. Case Study based-4 :**Environmental awareness program**

A survey was conducted by a group of students as a part of their environmental awareness programme, in which they collected the following data regarding the number of plants in 20 houses in a locality.

- (a) Estimate the mean number of plants per house.
 (i) 8.1 (ii) 8.2 (iii) 8 (iv) none of these
- (b) What is the upper limit of modal class?
 (i) 8 (ii) 10 (iii) 12 (iv) 14
- (c) Which method did you find best for finding the mean?
 (i) Assumed Mean Method (ii) Step Deviation Method
 (iii) Direct Method (iv) none of these
- (d) Sum of lower limits of median and modal class is
 (i) 10 (ii) 12 (iii) 20 (iv) 16
- (e) Mean of upper limits of median and modal class is
 (i) 10 (ii) 12 (iii) 20 (iv) 16

PART-B**Section-III**

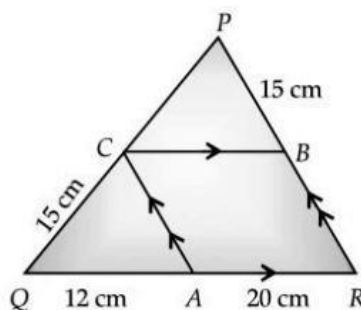
All questions are compulsory. In case of internal choices, attempt any one.

21. The length, breadth and height of a room are 8 m 50 cm, 6 m 25 cm and 4 m 75 cm respectively. Find the length of the longest rod that can measure the dimensions of the room exactly.
22. Two different dice are thrown together. Find the probability that the product of the number appeared is less than 18.

OR

AI A game consists of tossing a coin 3 times and noting the outcome each time, if getting the same result in all the tosses is a success, find the probability of losing the game.

AI 23. In the given figure, $CB \parallel QR$ and $CA \parallel PR$. If $AQ = 12$ cm, $AR = 20$ cm, $PB = CQ = 15$ cm, calculate PC and BR .



AI 24. If $\sqrt{3} \sin \theta - \cos \theta = 0$ and $0^\circ < \theta < 90^\circ$, find the value of θ .

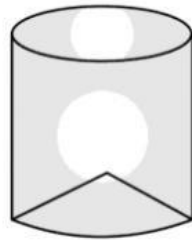
25. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap ?

Q 26. Isha is 10 years old girl. On the result day, Isha and her father Suresh were very happy as she got first position in the class. While coming back to their home, Isha asked for a treat from her father as a reward for her success. They went to a juice shop and asked for two glasses of juice.

Aisha, a juice seller, was serving juice to her customers in two types of glasses. Both the glasses had inner radius 3 cm. The height of both the glasses was 120 cm.



First type : A Glass with hemispherical raised bottom.



Second type : A glass with conical raised bottom of height 1.5 cm.

Isha insisted to have the juice in first type of glass and her father decided to have the juice in second type of glass. Out of the two, Isha or her father Suresh, who got more quantity of juice to drink and by how much ?

OR

A sphere of diameter 6 cm is dropped in a right circular cylindrical vessel partly filled with water. The diameter of the cylindrical vessel is 12 cm. If the sphere is completely submerged in water, by how much will the level of water rise in the cylindrical vessel ?

Section-IV

All questions are compulsory. In case of internal choices, attempt any one.

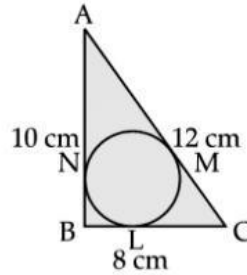
27. If α and β are the zeroes of polynomial $P(x) = 3x^2 + 2x + 1$, find the polynomial whose zeroes are $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$.

OR

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

28. A fraction becomes $\frac{1}{3}$ when 2 is subtracted from the numerator and it becomes $\frac{1}{2}$ when 1 is subtracted from the denominator. Find the fraction.
29. Solve for x : $x^2 + 5x - (a^2 + a - 6) = 0$
30. Divide 56 in four parts in A.P. such that the ratio of the product of their extremes (1st and 4th) to the product of middle (2nd and 3rd) is 5 : 6.

- AI 31.** In the given figure a circle is inscribed in a $\triangle ABC$ having sides $BC = 8$ cm, $AB = 10$ cm and $AC = 12$ cm. Find the length BL , CM and AN .



OR

The radii of two concentric circles are 13 cm and 8 cm. AB is a diameter of the bigger circle and BD is a tangent to the smaller circle touching it at D and intersecting the larger circle at P on producing. Find the length of AP .

- 32.** The co-ordinates of the vertices of $\triangle ABC$ are $A(7, 2)$, $B(9, 10)$ and $C(1, 4)$. If E and F are the mid-points of AB and AC respectively, prove that $EF = \frac{1}{2} BC$.

- AI 33.** Prove that $\frac{\cos^3 \theta + \sin^3 \theta}{\cos \theta + \sin \theta} + \frac{\cos^3 \theta - \sin^3 \theta}{\cos \theta - \sin \theta} = 2$.

Section-V

All questions are compulsory. In case of internal choices, attempt any one.

- 24.** The sum of squares of two consecutive even numbers is 340. Find the numbers.

OR

- AI** A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km downstream. Determine the speed of the stream and that of the boat in still water.
- 35 AI** The angle of elevation of an airplane from a point on the ground is 60° . After a flight of 30 seconds the angle of elevation becomes 30° . If the airplane is flying at a constant height of $3000\sqrt{3}$ m, find the speed of the aeroplane.
- 36.** Water is flowing at the rate of 5 km/hour through a pipe of diameter 14 cm into a rectangular tank of dimensions $50 \text{ m} \times 44 \text{ m}$. Find the time in which the level of water in the tank will rise by 7 cm.

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OR

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