

MBD Model Question Papers

MODEL QUESTION PAPER – 1

Time Allowed: 3 Hours

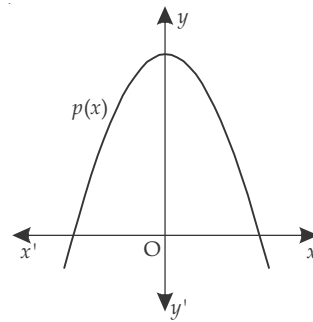
Maximum Marks: 80

General Instructions:

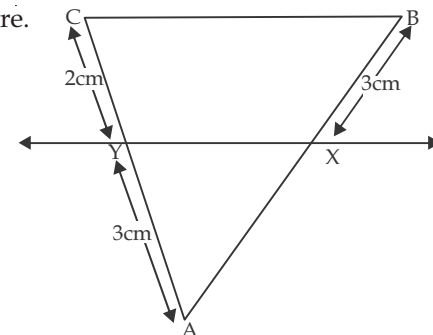
- (i) All questions are compulsory.
- (ii) The question paper consists of 30 questions divided into four sections A, B, C and D.
- (iii) Section-A comprises of 6 questions of 1 mark each. Section-B comprises of 6 questions of 2 marks each. Section-C comprises of 10 questions of 3 marks each and Section-D comprises of 8 questions of 4 marks each.
- (iv) There is no overall choice. However, an internal choice has been provided in four questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
- (v) Use of calculators is not permitted.

SECTION – A

1. Find the 11th term of the A.P.: $-5, -\frac{5}{2}, 0, \frac{5}{2}, \dots$
2. In Fig. graph of $p(x)$ is shown. Find the number of zeroes of $p(x)$.



3. The surface area of a sphere is 616 cm^2 . Find the radius of the sphere.



4. In Fig. If $XY \parallel BC$. Find the length of AX.
5. Find a quadratic polynomial whose zeros are -5 and -6 .
6. Write the formula for total surface area of a hemisphere of radius r .

SECTION – B

7. Has the rational number $\frac{441}{257}$ terminating or a non-terminating decimal expansion?
8. Find roots of $2x^2 + x + 4 = 0$ by quadratic formula.
9. Give example of $p(x)$, $g(x)$, $q(x)$ and $r(x)$ which satisfy division algorithm and $\deg p(x) = \deg q(x)$.
10. Three cubes of each of sides 5 cm are joined end to end. Find the TSA of the resulting cuboid.
11. If n^{th} term of an A.P., is $(2n + 1)$, find the sum of first n terms of the A.P.

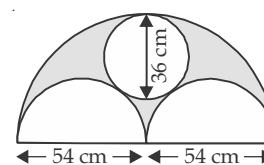
12. The following cumulative frequency distribution gives ages of 100 policy holders.

Age (in years)	No. of policy holder
Below 20	2
Below 25	6
Below 30	24
Below 35	45
Below 40	78
Below 45	89
Below 50	92
Below 55	98
Below 60	100

Write the above distribution as grouped frequency distribution.

SECTION – C

13. If 3 is a factor of p^2 , prove that 3 is a factor of p .
14. In the fig., given alongside find the area of the shaded region if 54 cm is radius of the biggest semicircle and 18 cm is the radius of the smallest circle.



15. Two customers are visiting a particular shop in the same week (Monday to Saturday). Each is equally likely to visit the shop on any one day as on another. What is the probability that both will visit the shop on
- the same day?
 - different days?

Or

A bag contains 10 red, 5 blue and 7 green balls. A ball is drawn at random. Find the probability of this ball being a (i) red ball (ii) green ball (iii) not a blue ball.

16. The ages of Ram and Shyam are in the ratio 9:4. Seven years hence, the ratio of their ages will be 5:3, find their present ages.
17. $\frac{\operatorname{cosec}^2 \theta}{\operatorname{cosec} \theta - 1} - \frac{\operatorname{cosec}^2 \theta}{\operatorname{cosec} \theta + 1}$ to a single trigonometric function.

Or

Prove that: $\sin A(1 + \tan A) + \cos A(1 + \cot A) = \sec A + \operatorname{cosec} A$.

18. If S_n denotes the sum of n terms of an A.P., whose common difference is d , show that:
- $$d = S_n - 2S_{n-1} + S_{n-2}$$

Or

The sum of the 5th and the 7th terms of an AP is 52 and the 10th term is 46. Find the AP.

19. The vertices of $\triangle ABC$ are A (4, 6), B (1, 5) and C (7, 2). A line is drawn to intersect sides AB and AC at D and E respectively, such that $\frac{AD}{BD} = \frac{AE}{CE} = \frac{1}{4}$.

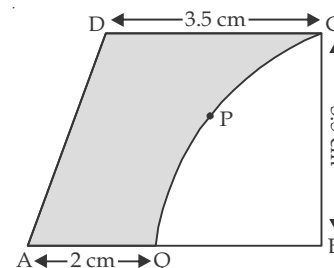
Prove that the ratio of the areas of triangles $\triangle ADE$ and $\triangle ABC$ is 1:25.

20. Find the area of shaded region of trapezium ABCD with $AB \parallel DC$ and BCPQ as a quadrant of a circle.
21. Show that $\sqrt{2} + \frac{3}{7}$ is irrational number.

Or

Prove that $\sqrt{3} + \sqrt{5}$ is irrational.

22. An equilateral triangle has one vertex at the point (0, 0) and another at $(3, \sqrt{3})$. Find the coordinates of third vertex.



SECTION – D

23. A peacock is sitting on the top of a tree 10 m high. A rat's burrow lies exactly at the bottom of the tree. A snake is coming from a distance of 26 m horizontally from the burrow towards rat. Seeing the snake, the peacock pounces upon it, if their speeds are equal, at what distance from the hole the snake is caught? Do you think it is right for animals to eat each other for their survival? Why or why not?

24. If all sides of a parallelogram touches a circle, prove that the parallelogram is a rhombus.

Or

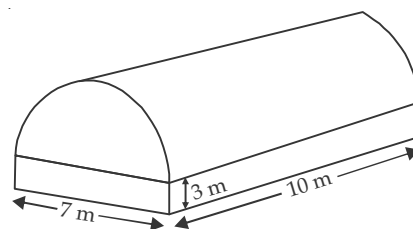
Prove that the tangent drawn at the mid-point of an arc of a circle is parallel to the chord joining the end points of the arc.

25. A cable tied to the top of an electric pole affixed at a point on the ground a metres away from the pole to keep the pole upright. If the cable makes an angle θ with the ground, prove that the height of the pole is $a \tan \theta$ and length of the cable is $a \sec \theta$.
26. A train travel a distance of 480 km at uniform speed. If the speed had been 8 km/h, then it would have taken 3 hours more to cover the same distance. Find the speed of the train.

Or

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

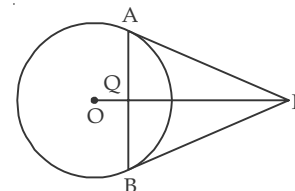
27. A godown building is in the form as shown in figure. The vertical cross-section parallel to the width side of the building is a rectangle of size 7 m \times 3 m mounted by a semicircle of radius 3.5 m. The inner measurements of the cuboidal portion are 10 m \times 7 m \times 3 m. Find the (i) volume of the godown, and (ii) the total internal surface area excluding the floor.



Or

A bucket open at the top is in the form of a frustum of a cone with a capacity of 12308.8 cm³. The radii of the top and bottom circular ends are 20 cm and 12 cm respectively. Find the height of the bucket and the area of metal sheet used in making the bucket. [Use $\pi = 3.14$]

28. Prove that the lengths of tangents drawn from an external point to a circle are equal. Making use of above, prove the following. From an external point P, two tangents PA and PB are drawn to a circle with centre O as shown in fig. Show that OP is the perpendicular bisector of AB

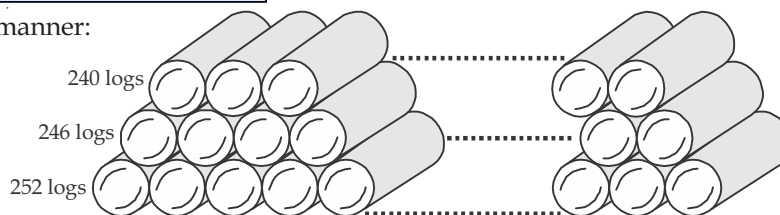


29. For the following distribution median is 525, find missing frequencies f_1 and f_2 if total number of frequencies is 100.

C.I.	Frequency
0-100	2
100-200	5
200-300	f_1
300-400	12
400-500	17
500-600	20
600-700	f_2
700-800	9
800-900	7
900-1000	4

30. 5412 logs are stacked in the following manner:

252 logs in the bottom row,
246 logs in the row next to it,
240 logs in the next row and so on



In how many rows the 5412 logs are placed and how many logs are in top row?

MODEL QUESTION PAPER – 2

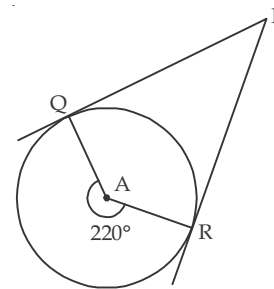
Time Allowed: 3 Hours

Maximum Marks: 80

General Instructions – Same as in Model Question Paper – 1.

SECTION – A

1. The value of k so that $x^2 + 5kx + 16 = 0$ has no real root.
2. If $\alpha^2 + 5\alpha + 4 = 0 = \beta^2 + 5\beta + 4$, then write the polynomial whose zeroes are α and β .
3. In fig., if PQ and PR are two tangents drawn from point P to the circle with centre A. If $\angle QAR = 220^\circ$, then find the $\angle QPR$.
4. A man goes 15 m due east and 8 m due north. How far is he from the starting point?
5. In which quadrant of the cartesian plane the equation $x + y = 10$ has no solution?
6. What is the minimum value of $\sin \theta$, if $0^\circ \leq \theta \leq 90^\circ$?



SECTION – B

7. Check, is there any natural number n for which 21^n ends with zero.
8. Find k , if quadratic equation $(k - 5)x^2 + 2(k - 5)x + 2 = 0$ has equal roots.
9. Can two numbers have 18 as their HCF and 279 as LCM? Explain.
10. Find CSA of hemisphere if its volume is $2425 \frac{1}{2} \text{ m}^3$.
11. If the sequence $\{a_n\}$ is an A.P., show that $a_{m+n} + a_{m-n} = 2a_m$.
12. The wickets taken by a bowler in his first 25 one day International are as follows:
1, 0, 5, 4, 2, 4, 3, 5, 0, 0, 2, 3, 7, 6, 5, 4, 3, 5, 1, 1, 5, 6, 3, 5, 2.
Find the modal number of wickets for the bowler.

SECTION – C

13. Show that the equation: $x^2 (a^2 + b^2) + 2x (ac + bd) + (c^2 + d^2) = 0$ has no real root.
Or
Find the values of a and b for which the following pair of linear equations have infinitely many solutions.
 $2x + 3y = 7; (a + b)x + (2a - b)y = 21$
14. Prove that: $\frac{\sec^2 \theta \sin^2 \theta - \operatorname{cosec}^2 \theta + \operatorname{cosec}^2 \theta \cos^2 \theta}{\sec^2 \theta \sin^2 \theta - \operatorname{cosec}^2 \theta \cos^2 \theta} = \sin^2 \theta$
15. Prove that the points $(2, -2)$, $(-2, 1)$ and $(5, 1)$ are the vertices of a right angled triangle. Also, find the area of the triangle.
16. If the sum of first 13 terms of an A.P., is 21 and sum of first 21 terms is 13. Show that sum of first 34 terms is -34 .

Or

If the p^{th} term of an A.P. is q and q^{th} term, is p , prove that its n^{th} term is $(p + q - n)$.

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17. Determine all the zeroes of $x^4 - x^3 - 8x^2 + 2x + 12$ if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

Or

Find the value of b for which the polynomial $2x^3 + 9x^2 - x - b$ is divisible by $2x + 3$.

18. If $A + B = 90^\circ$. Prove that: $\sqrt{\frac{\tan A \tan B + \tan A \cot B}{\sin A \sec B}} - \frac{\sin^2 B}{\cos^2 A} = \tan A$.

19. During Van Mahotsav a group of students, planted a number of plants in 20 houses of a locality.

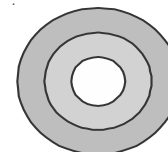
No. of Plants	0-2	2-4	4-6	6-8	8-10	10-12	12-14
No. of Houses	$x + 2$	$2x$	$x - 1$	$2x + 2$	$6x$	$2x$	$2x + 1$

What is the probability of houses who has plants ≤ 10 ?

Or

Tony speaks the truth only 3 out of 7 times. He was asked to narrate an incident of which he was the only witness. What is the probability that he will lie in narrating it? What values Tony is lacking?

20. Solve: $8x + 9y = 6xy$, $10x + 6y = 19xy$.
21. An archery target has three regions formed by three concentric circles as shown in fig. If diameters of concentric circles are in the ratio $1 : 2 : 3$, then find the ratio of the areas of the three regions.
22. Find median for the following data:



Wages (in ₹)	No of Workers
More than 150	0
More than 140	12
More than 130	27
More than 120	60
More than 110	105
More than 100	124
More than 90	141
More than 80	150

SECTION – D

23. Show that square of any positive integer is of the form $5q$, $5q + 1$, $5q + 4$ for some integer.

Or

If p and q are two odd prime numbers, show that $p^2 - q^2$ is composite.

24. An aeroplane flying at certain height declines at an angle of 30° and went straight towards ground and to land at an airport. The average speed of aeroplane is 200 km/hr. It takes 54 seconds to reach the ground. How high was the aeroplane before it started to descend.
25. The room of a village school is not sufficient to cater to the needs of village students. The *Sarpanch* of village decided to increase the floor area of room. He works out on two planes. If it were made 2 m longer and 3 m

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broader then its area would increase by 75 sq. m. But if it is made 1 m shorter in length and 2 m broader in width then its floor area would increase by 16 sq.m. Find the original length and breadth of the room. If *Sarpanch* opts for first plan to renovate the room then what values are shown by *Sarpanch*?

26. At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is $\frac{5}{12}$. On walking 192 metres towards the tower, the tangent of the angle is found to be $\frac{3}{4}$. Find the height of the tower.
27. The speed of a boat in still water is 11 km/hour. It can go 12 km upstream and return downstream to the original point in 2 hours 45 minutes. Find the speed of the stream.

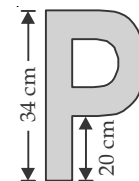
Or

A thief runs with a uniform speed of 100 m/minute. After one minute, a policeman runs after the thief to catch him. He goes with a speed of 100 m/minute in the first minute and increases his speed by 10 m/minute every succeeding minute. After how many minutes the policeman will catch the thief?

28. The following table gives the height of trees.

Height	No of trees
Less than 7	26
Less than 14	57
Less than 21	92
Less than 28	134
Less than 35	216
Less than 42	287
Less than 49	341
Less than 56	360

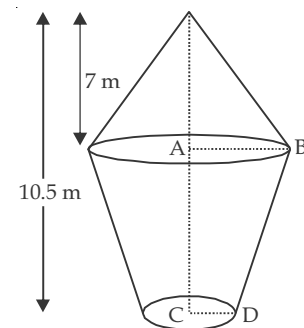
29. In adjoining fig., a letter block of letter 'P' is shown which is uniformly broad throughout. The column is rectangular and curved portion is semicircular. Find area of shaded portion.



Or

Three circles each of radius 3.5 cm are drawn in such a way that each of them touches the other two. Find the area enclosed between these circles.

30. The lower portion of a haystack is an inverted cone frustum and upper part is a cone [see fig.]. Find the total volume of the haystack. $AB = 3$ m and $CD = 2$ m.



MODEL QUESTION PAPER – 3

Time Allowed: 3 Hours

Maximum Marks: 80

General Instructions – Same as in Model Question Paper – 1.

SECTION – A

1. Find the value of k for which the system $7x + 3y = 0$, $kx + 9y = 0$ has unique solution $x = 0 = y$.
2. If $x = 1 + 2 + 3 + \dots + 2000$, find the value of x .
3. Find the value of θ for $\frac{\cos^2 \theta}{\cot^2 \theta - \cos^2 \theta} = 3$, $0^\circ < \theta < 90^\circ$.
4. Find the coordinates of point A, where AB is diameter of a circle whose centre is $(2, -3)$ and B is $(1, 4)$.
5. Find the distance between two parallel tangents of a circle of radius 3 cm.
6. Write the area of a sector of a circle of radius r and central angle θ .

SECTION – B

7. If α and β are the zeroes of the polynomial $p(x) = 9x^2 + 22x + 8$ then find the value of α^4 and β^4 .
8. Find the ratio of volume of a cone and a cylinder of equal diameter and equal height.
9. Express $\frac{68}{2^4 \times 5^3}$ in decimal form.
10. Can any number of the form 3^n , $n \in \mathbb{N}$ end with digit 0? Explain your answer.
11. Find roots of $2x^2 - 7x + 3 = 0$ by completing square method.
12. ΔABC is right angled at B. A circle with centre O has been inscribed in the triangle. If $AB = 12$ cm, $BC = 5$ cm, find the radius of the circle.

SECTION – C

13. Find HCF and LCM of 24, 15 and 36 by applying Euclid's division lemma and check whether $\text{HCF} \times \text{LCM}$ equals the product $24 \times 15 \times 36$ or not.

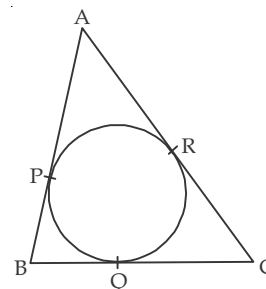
Or

Show that any positive odd integer is of the form $4q + 1$ or $4q + 3$ where q is a positive integer.

14. A takes 3 hours more than B to walk 30 km. But, if A doubles his pace, he is ahead of B by 1 hour 30 min. Find their speeds of walking.
15. Prove that the lengths of tangents drawn from an external point to a circle are equal. Use the above result in the following:
A circle is inscribed in a ΔABC , touching AB, BC and AC at P, Q and R respectively, as shown in figure. If $AB = 10$ cm, $AR = 7$ cm and $RC = 5$ cm, then find the length of BC.

Or

Prove that the centre of a circle touching two intersecting lines lies on the angle bisector of the lines.

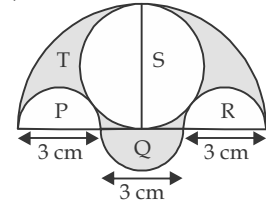


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16. In fig., given alongside, there are three semicircles P, Q and R having diameter 3 cm each, and another semicircle T having a circle with radius 4.5 cm. Find the area of shaded region.

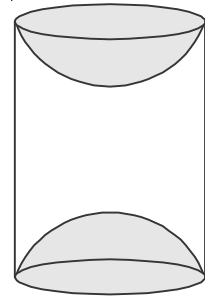


17. Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} + \sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = 2 \operatorname{cosec} \theta$.

Or

Prove $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$.

18. Prove that the three times the sum of the squares of the sides of triangles is equal to the four times the sum of squares of the medians of the triangle.
19. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in fig. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article.



Or

A wall 24 m long, 0.4 m thick and 6 m high is constructed with the bricks each of dimensions 25 cm \times 16 cm \times 10 cm. If mortar occupies $\frac{1}{10}$ th of the volume of the wall, then find the number of bricks used in constructing the wall.

20. The median of the following data is 35, and the sum of all the frequencies is 170.

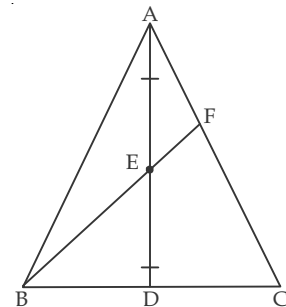
C.I.	Frequency
0-10	10
10-20	20
20-30	f_1
30-40	40
40-50	f_2
50-60	25
60-70	15

Find f_1 and f_2 the missing frequencies.

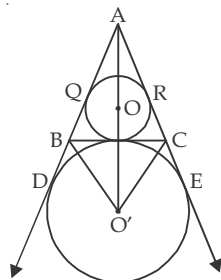
21. Solve the following system of equation by drawing their graph: $x + 4y = 3$, $2x + 8y = 6$. Determine whether these are consistent, inconsistent or dependent.
22. Show that for any two odd positive integers 'a' and 'b', the expression $a^2 + b^2$ is even but not divisible by 4.

SECTION - D

23. Find the value of $\sqrt{2 + \sqrt{2 + \sqrt{2 + \dots \infty}}}$.
24. A remainder $r(x) = 2x - b$ is obtained when the polynomial $f(x) = 2x^3 - 3x^2 + 6x - 8$ is divided by the polynomial $g(x) = x^2 - 2x + a$ find the values of a and b .
25. In $\triangle ABC$, AD is a median and E is mid-point of AD as shown in fig. If BE is produced it meets AC at F. Show that $AF = \frac{1}{3} AC$.



26. AQ, AR, BC are tangents for the circle with centre O and BC, AD, AE are tangents to the circle with centre O' . Prove that $ABO'C$ is parallelogram. [see fig.]



Or

$OABC$ is a rhombus whose three vertices A, B and C lie on a circle with centre O . If the radius of the circle is 10 cm, find the area of the rhombus.

27. Angle of elevation of a cloud from a point 200 m above a lake is 30° and the angle of depression of its reflection in the lake is 60° . Find the height of the cloud.
28. A hollow cone is cut by a plane parallel to the base and the upper portion is removed. If the curved surface of the remainder is $\frac{8}{9}$ of the curved surface of the whole cone, find the ratio of the line segment into which the cone's altitude is divided by the plane.
29. A farmer wants to dig a well in his field. He was given two options on shape of well by the contractor. Either the well can be cuboidal in shape having dimensions $1\text{ m} \times 1\text{ m} \times 140\text{ m}$ or a cylindrical well of diameter 1 m and depth 140 m. The rate at which contractor charges for digging the well is $\text{₹}250/\text{m}^3$. Find the cost to dig both the wells. The farmer opted for cylindrical well. What values are depicted by the farmer for opting for cylindrical well?

Or

A vessel in shape of an inverted cone is surmounted by a cylinder has a common radius of 7 cm. It was filled with liquid till it covered one third the height of the cylinder. If the height of each part is 9 cm and the vessel is turned upside down. Find the volume of the liquid and to what height will it reach in the cylindrical part.

30. The following table gives production yield per hectare of wheat of 100 farms of a village.

Production yield (in kg/ha)	Number of farms
50-55	4
55-60	8
60-65	12
65-70	24
70-75	38
75-80	16

Change the distribution to a more than type distribution and draw its ogive.

Or

The annual rainfall record of a city for 66 days is given in the following table:

Rainfall (in cm)	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	22	10	8	15	5	6

Calculate median rainfall using ogives type (of more than type and of less than type).

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ANSWERS

MODEL QUESTION PAPER—1

1. 20 2. Two 3. 7 cm 4. 4.5 cm 5. $x^2 + 11x + 30$ 6. $3\pi r^2$ 7. Terminating
 8. no real roots 9. $p(x) = 2x^2 - 2x + 14$; $g(x) = 2$, Then $q(x) = x^2 - x + 7$ and $r(x) = 0$ 10. 360 cm^2 11. $n(n+2)$

Age	0-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
No. of Policy holder	2	4	18	21	33	11	3	6	2

12. 14. $405 \pi \text{ cm}^2$ 15. (i) $\frac{1}{6}$ (ii) $\frac{5}{6}$ Or (i) $\frac{5}{11}$ (ii) $\frac{7}{22}$ (iii) $\frac{17}{22}$
 16. Ram: 18 years 17. $2 \sec^2 \theta$ 18. Or 1, 6, 11 16 20. 66.5 cm^2
 22. $(0, 2\sqrt{3})$ or $(\sqrt{3}, -\sqrt{3})$
 23. Snake is caught at a distance of 11.08 m from the hole. Yes, it is nature's law to maintain balance among various animals. This 'food-chain' is in place for millions of years and it is must for maintaining ecological balance.
 26. 40 km/h Or 8 km/h 27. (i) 402.5 m^3 (ii) 250.5 m^2 Or 15 cm , 2160.32 cm^2 29. $f_1 = 9, f_2 = 15$
 30. 41 rows, 12 logs.

MODEL QUESTION PAPER—2

1. lies between $\frac{-8}{5}$ and $\frac{8}{5}$ 2. $x^2 + 5x + 4$ 3. 40° 4. 17m 5. III quadrant 6. 0
 8. $k = 7$ 9. No 10. 693 m^2 12. 5 13. Or $a = 5, b = 1$ 17. $+\sqrt{2}, -\sqrt{2}, 3, -2$ Or 15
 19. $\frac{3}{4}$ Or $\frac{4}{7}$ 20. $x = \frac{3}{2}, y = \frac{2}{3}$ 21. 1 : 3 : 5 22. 116.67 24. 1.5 km
 25. 15 m, 12 m; Sarpanch has Leadership qualities and is concerned for others.
 26. 180 m 27. 5 km/h Or 5 minutes 29. 234.5 cm^2 Or 1.967 cm^2 (approx.) 30. 135.66 m^3 .

MODEL QUESTION PAPER—3

1. Any real value other than 21 2. 2001000 3. 60° 4. $(3, -10)$ 5. 6 cm 6. $\frac{\pi r^2 \theta}{360^\circ}$
 7. $\frac{105232}{6561}$ 8. 1 : 3 9. 0.034 10. No 11. $3, \frac{1}{2}$ 12. 2 cm
 13. HCF = 3, LCM=360; No 14. $3\frac{1}{3} \text{ km/hr}$, 5 m/hr 16. 12.375 cm^2 19. 374 cm^2 Or 12960 bricks
 20. $f_1 = 35, f_2 = 25$ 21. Dependent equation 23. $x = 2$ 24. $a = 3, b = 11$ 26. Or $50\sqrt{3} \text{ cm}^2$
 27. 400 m 28. 1 : 2
 29. ₹35000 for cuboidal and ₹27500 for cylindrical well. Farmer is economical and gives importance to time saving.
 Or 6 cm.