Thiruvananthapuram Region

(Kerala and the union territory of Lakshadweep)

ALL THE SETS ARE ALMOST SIMILAR

ANSWERS ARE HIGHLIGHTED IN GREEN OR MRAKED IN RED

(vii) *In* **Section E,** *Questions no.* **36** *to* **38** *are case study based questions carrying* **4** *marks each. Internal choice is provided in* **2** *marks questions in each case study.*

(viii) *There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.*

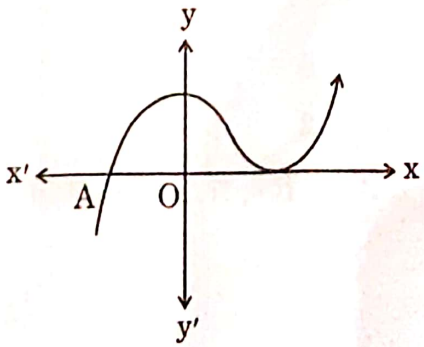
(ix) *Draw neat diagrams wherever required. Take* $\pi = \frac{22}{7}$ *wherever required, if not stated.*

(x) *Use of calculator is* ***not*** *allowed.*

SECTION A

This section has **20** *Multiple Choice Questions (MCQs) carrying* **1** *mark each.* $20 \times 1 = 20$

1. The graph of y = f(x) is given. The number of distinct zeroes of y = f(x) is :



(A) 0 (B) 1

(C) 2 (D) 3

2. There are two sections A and B of Grade X. There are 28 students in Section A and 30 students in Section B. What is the minimum number of books you will acquire for the class library so that they can be distributed equally among students of Section A or Section B ?

(A) 144 (B) 2

(C) 420 (D) 272

3. The pair of linear equations $\frac{3x}{2} + \frac{5y}{3} = 7$ and $9x + 10y = 14$, is :

(A) consistent

(B) inconsistent

(C) consistent with one solution

(D) consistent with many solutions

4. The natural number 1 is :

(A) a prime number.

(B) a composite number.

(C) prime as well as composite.

(D) neither prime nor composite.

5. The value of x for which $2x$, $(x + 10)$ and $(3x + 2)$ are the three consecutive terms of an A.P. is :

(A) 6 (B) -6

(C) 18 (D) -18

6. For any natural number n, 5^n ends with the digit :

(A) 0 (B) 5

(C) 3 (D) 2

7. In triangles ABC and PQR, $\angle A = \angle Q$ and $\angle B = \angle R$, then AB : AC is equal to :

(A) PQ : PR

(B) PQ : QR

(C) QR : QP

(D) PR : QR

8. If α and β are two zeroes of a polynomial $f(x) = px^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$, then value of p is :

(A) $-\frac{2}{3}$

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

(C) $\frac{1}{3}$

(D) $-\frac{1}{3}$

9. The mean and median of a frequency distribution are 43 and 43·4 respectively. The mode of the distribution is :

(A) 43·4

(B) 42·4

(C) 44·2

(D) 49·3

10. If the distance between the points (4, p) and (1, 0) is 5, then p is equal to :

(A) ± 4

(B) 4

(C) -4

(D) 0

11. A hemispherical bowl is made of steel of thickness 1 cm. The outer radius of the bowl is 6 cm. The volume of steel used (in cm^3) is :

(A) 182π

(B) $\frac{182}{3}\pi$

(C) $\frac{682}{3}\pi$

(D) $\frac{364}{3}\pi$

12. 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) $\frac{5}{3}$

13. Area of a segment of a circle of radius 'r' and central angle 60° is :

(A) $\frac{\pi r^2}{2} - \frac{1}{2}r^2$

(B) $\frac{2\pi r}{4} - \frac{\sqrt{3}}{4}r^2$

(C) $\frac{\pi r^2}{6} - \frac{\sqrt{3}}{4}r^2$

(D) $\frac{2\pi r}{4} - r^2 \sin 60°$

14. If $2 \sin A = 1$, then the value of $\tan A + \cot A$ is :

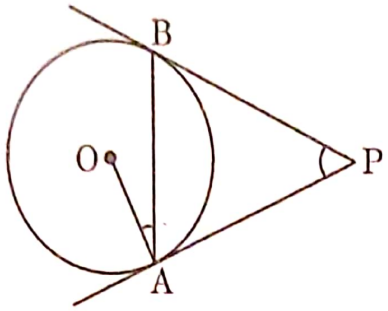
(A) $\sqrt{3}$

(B) $\frac{4}{\sqrt{3}}$

(C) $\frac{\sqrt{3}}{2}$

(D) 1

15. In the given figure, PA and PB are tangents to a circle centred at O. If $\angle OAB = 15°$, then $\angle APB$ equals :



(A) 30°

(B) 15°

(C) 45°

(D) 10°

16. From a point on the ground, which is 60 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is found to be 45°. The height (in metres) of the tower is :

(A) $10\sqrt{3}$

(B) $30\sqrt{3}$

(C) 60

(D) 30

17. The probability for a randomly selected number out of 1, 2, 3, 4, ..., 25 to be a composite number is :

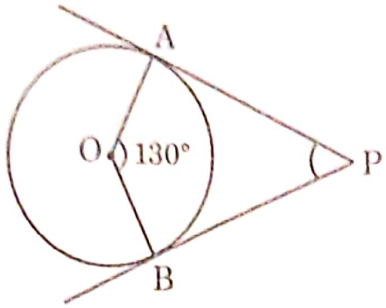
(A) $\frac{15}{25}$

(B) $\frac{10}{25}$

(C) $\frac{11}{25}$

(D) $\frac{9}{25}$

18. In the given figure, PA and PB are tangents to a circle centred at O. If $\angle AOB = 130°$, then $\angle APB$ is equal to :



(A) 130° (B) 50°

(C) 120° (D) 90°

*Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the options (A), (B), (C) and (D) as given below.*

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

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

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

19. *Assertion (A) :* The mean of first 'n' natural numbers is $\frac{n-1}{2}$.

Reason (R): The sum of first 'n' natural numbers is $\frac{n(n+1)}{2}$.

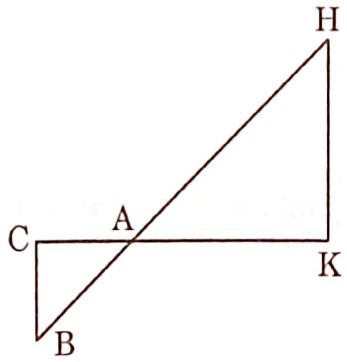
20. *Assertion (A) :* The surface area of the cuboid formed by joining two cubes of sides 4 cm each, end-to-end, is 160 cm^2.

Reason (R): The surface area of a cuboid of dimensions $l \times b \times h$ is $(lb + bh + hl)$.

SECTION B

This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each. 5×2=10

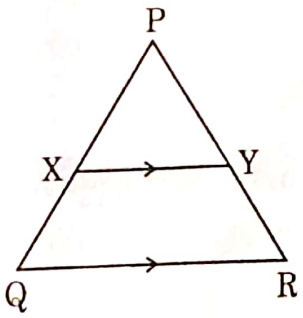
21. (a) In the given figure, Δ AHK ~ Δ ABC. If AK = 10 cm, BC = 3·5 cm and HK = 7 cm, find the length of AC. 2.7cm



ANS: 5 CM

OR

(b) In the given figure, XY || QR, $\frac{PQ}{XQ} = \frac{7}{3}$ and PR = 6·3 cm. Find the length of YR.



22. (a) Evaluate :

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

6 1/2

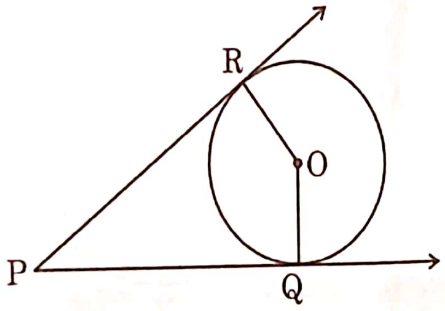
OR

(b) Prove that :

CONVERT cot2 to identity

$$1 + \frac{\cot^2 \alpha}{1 + \operatorname{cosec} \alpha} = \operatorname{cosec} \alpha$$

23. In the given figure, O is the centre of the circle. PQ and PR are tangents. Show that the quadrilateral PQOR is cyclic.



Proof

24. Find the value of p, for which one zero of the quadratic polynomial $px^2 - 14x + 8$ is 6 times the other. 3 p =3

25. If the points A(4, 5), B(m, 6), C(4, 3) and D(1, n) taken in this order are the vertices of a parallelogram ABCD, then find the values of m and n.

m=7 , n=2

SECTION C

This section has 6 Short Answer (SA) type questions carrying 3 marks each. 6×3=18

26. (a) Prove that :

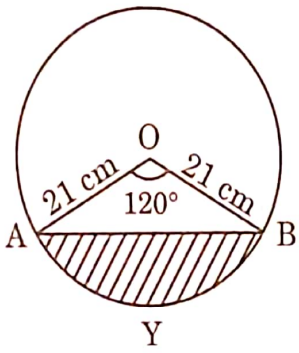
Poof : LHS = RHS

$$\frac{\sec^3 \theta}{\sec^2 \theta - 1} + \frac{\operatorname{cosec}^3 \theta}{\operatorname{cosec}^2 \theta - 1} = \sec \theta \cdot \operatorname{cosec} \theta (\sec \theta + \operatorname{cosec} \theta)$$

OR

(b) If $\frac{\sec \alpha}{\operatorname{cosec} \beta} = p$ and $\frac{\tan \alpha}{\operatorname{cosec} \beta} = q$, then prove that $(p^2 - q^2) \sec^2 \alpha = p^2$.

27. Find the area of the segment AYB shown in the figure, if the radius of the circle is 21 cm and $\angle AOB = 120°$. [Use $\pi = \frac{22}{7}$]



40.354 cm²
231 − 110.23 cm²

Ans= 40.4 cm2

28. Two dice are thrown at the same time. Determine the probability that the (i) sum of the numbers on the two dice is 5, and (ii) difference of the numbers on the two dice is 3. 1/9 1/6

1/9 and 1/6

29. Prove that $\sqrt{5}$ is an irrational number. Proof

30. Find the coordinates of the points of trisection of the line segment joining the points A(– 1, 4) and B(– 3, – 2). $\left(\frac{-5}{3}, 2\right)$ $\left(\frac{-7}{3}, 0\right)$

31. (a) Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact. NCERT Proof

OR

(b) If a regular hexagon ABCDEF circumscribes a circle, then prove that AB + CD + EF = BC + DE + FA.

SECTION D

This section has 4 Long Answer (LA) type questions carrying 5 marks each. 4×5=20

32. If the median of the following distribution is 32·5, then find the values of x and y.

Class	*Frequency*
0 – 10	x
10 – 20	5
20 – 30	9
30 – 40	12
40 – 50	y
50 – 60	3
60 – 70	2
Total	40

5 5

4 4

33. Aarush bought 2 pencils and 3 chocolates for ₹ 11 and Tanish bought 1 pencil and 2 chocolates for ₹ 7 from the same shop. Represent this situation in the form of a pair of linear equations. Find the price of 1 pencil and 1 chocolate, graphically. (1, 3)

34. (a) In a flight of 600 km, an aircraft slowed down its speed due to bad weather. Its average speed for the trip reduced by 200 km/h from its usual speed and time of flight increased by 30 minutes. Find the scheduled duration of the flight. 1 hr 600km/hr , 1 hr

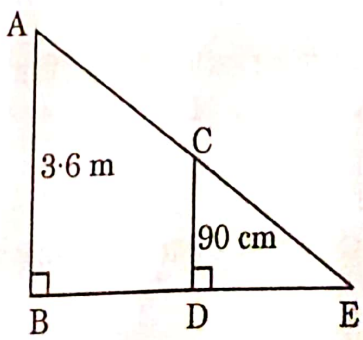
OR

(b) Two pipes are used to fill a swimming pool. If the pipe of the larger diameter is used for 4 hours and the pipe of the smaller diameter for 9 hours, only half of the pool can be filled. Find how long it would take for each pipe to fill the pool, separately, if the pipe of smaller diameter takes 10 hours more than the pipe of larger diameter to fill the pool.

35. (a) Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio. BPT

OR

(b) As shown in the given figure, 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.

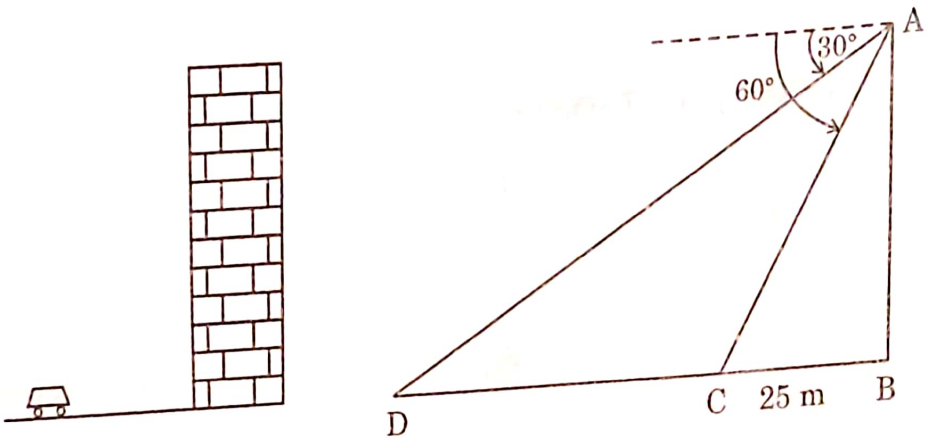


SECTION E

This section has 3 case study based questions carrying 4 marks each. 3×4=12

Case Study – 1

36. Tejas is standing at the top of a building and observes a car at an angle of depression of 30° as it approaches the base of the building at a uniform speed. 6 seconds later, the angle of depression increases to 60°, and at that moment, the car is 25 m away from the building.



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

(i) What is the height of the building ? $25\sqrt{3}$ m 1

(ii) What is the distance between the two positions of the car ? 50 m 1

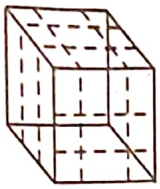
(iii) (a) What would be the total time taken by the car to reach the foot of the building from the starting point ? 2

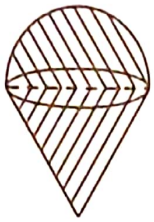
OR

(iii) (b) What is the distance of the observer from the car when it makes an angle of 60° ? 50 m 2

Case Study – 2

37. On a Sunday your parents took you to a fair. You could see lot of toys displayed and you wanted them to buy a Rubik's cube and a strawberry ice-cream for you.





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

(i) Find the length of the diagonal of Rubik's cube if each edge measures 6 cm. 1

Ans: 6 root 3

(ii) Find the volume of Rubik's cube if the length of the edge is 7 cm. 1

343 cm^3

(iii) (a) What is the curved surface area of hemisphere (ice-cream) if the base radius is 7 cm ? 2

308 cm^2

OR

(iii) (b) If two cubes of edges 4 cm are joined end-to-end, then find the surface area of the resulting cuboid. 2

Case Study – 3

38. Your elder brother wants to buy a car and plans to take a loan from a bank for his car. He repays his total loan of ₹ 1,18,000 by paying every month, starting with the first instalment of ₹ 1,000 and he increases the instalment by ₹ 100 every month.

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

(i) Find the amount paid by him in the 30th instalment. 1

3900

(ii) If the total number of instalments is 40, what is the amount paid in the last instalment ? 1

4900

(iii) (a) What amount does he still have to pay after the 30th instalment ? 2

OR

(iii) (b) Find the ratio of the tenth instalment to the last instalment. 2

10 : 49

(v) *In Section–**C**, questions number **26** to **31** are Short Answer (SA) type questions, carrying **3** marks each.*

(vi) *In Section–**D**, questions number **32** to **35** are Long Answer (LA) type questions, carrying **5** marks each.*

(vii) *In Section–**E**, questions number **36** to **38** are Case Study based questions carrying **4** marks each. Internal choice is provided in **2** marks questions in each case-study.*

(viii) *There is no overall choice. However, an internal choice has been provided in **2** questions in Section–**B**, **2** questions in Section–**C**, **2** questions in Section–**D** and **3** questions of **2** marks in Section–**E**.*

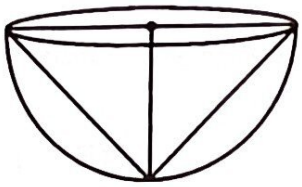
(ix) *Draw neat diagrams wherever required. Take* $\pi = \frac{22}{7}$ *wherever required, if not stated.*

(x) *Use of calculator is **NOT** allowed.*

SECTION – A

Q. Number 1 to 20 are multiple choice questions of 1 mark each.

1. A conical cavity of maximum volume is carved out from a wooden solid hemisphere of radius 10 cm. Curved surface area of the cavity carved out is (use $\pi = 3.14$)



(A) $314\sqrt{2}\ cm^2$ (B) $314\ cm^2$

(C) $\frac{3140}{3}\ cm^2$ (D) $3140\sqrt{2}\ cm^2$

2. If a_n represents n^{th} term of the A.P. $-\frac{15}{4}, -\frac{10}{4}, -\frac{5}{4}, \ldots\ldots$ then value of $a_{16} - a_{12}$ is

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

(C) 5 (D) $\frac{25}{4}$

3. Meena calculates that the probability of her winning the first prize in a lottery is 0.08. If total 800 tickets were sold, the number of tickets bought by her, is

(A) 64 (B) 640

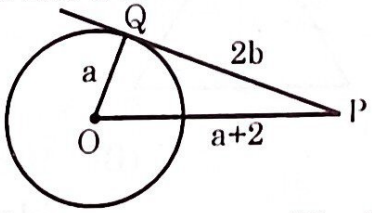
(C) 100 (D) 10

4. A camping tent in hemispherical shape of radius 1.4 m, has a door opening of area 0.50 m^2. Outer surface area of the tent is

(A) 11.78 m^2 (B) 12.32 m^2

(C) 11.82 m^2 (D) 12.86 m^2

5. PQ is tangent to a circle with centre O. If OQ = a, OP = a + 2 and PQ = 2b, then relation between a and b is



(A) $a^2 + (a + 2)^2 = (2b)^2$ (B) $b^2 = a + 4$

(C) $2a^2 + 1 = b^2$ (D) $b^2 = a + 1$

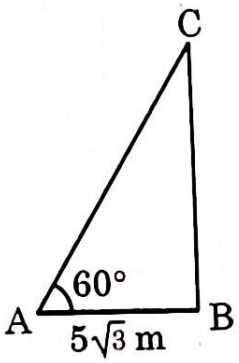
6. Simplest form of $\frac{\sec A}{\sqrt{\sec^2 A - 1}}$ is

(A) sin A
(B) tan A
(C) cosec A
(D) cos A

7. The line segment joining the points P(–4, –2) and Q(10, 4) is divided by y-axis in the ratio

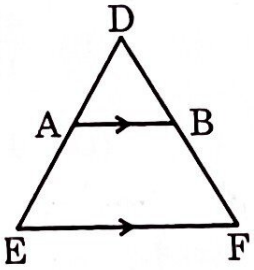
(A) 2 : 5
(B) 1 : 2
(C) 2 : 1
(D) 5 : 2

8. A wire is attached from a point A on the ground to the top of a pole BC, making an angle of elevation as 60°. If AB = $5\sqrt{3}$ m, then length of the wire is



(A) 10 m
(B) $10\sqrt{3}$ m
(C) 15 m
(D) $\frac{5}{2}\sqrt{3}$ m

9. In the given figure, AB || EF. If AB = 24 cm, EF = 36 cm and DA = 7 cm, then AE equals



(A) 2.5 cm
(B) 10.5 cm
(C) 3.5 cm
(D) $\frac{14}{3}$ cm

10. Devansh proved that $\Delta ABC \sim \Delta PQR$ using SAS similarity criteria. If he found $\angle C = \angle R$, then which of the following was proved true ?

(A) $\frac{AC}{AB} = \frac{PR}{PQ}$ (B) $\frac{BC}{AC} = \frac{PR}{QR}$

(C) $\frac{AC}{BC} = \frac{PR}{PQ}$ (D) $\frac{AC}{BC} = \frac{PR}{QR}$

11. While calculating mean of a grouped frequency distribution, step deviation method was used $\left(\frac{x-a}{h} = u\right)$. It was found that $\bar{x} = 64$, $h = 5$ and $a = 62.5$. The value of $\bar{u}$ is

(A) 0.5 (B) 1.5

(C) 0.3 (D) 7.5

12. For an acute angle θ, if $\sin\theta = \frac{1}{9}$, then value of $\frac{9\ \text{cosec}\ \theta + 1}{9\ \text{cosec}\ \theta - 1}$ is

(A) 0 (B) $\frac{80}{81}$

(C) 1 (D) $\frac{82}{80}$

13. Which of the following can not be the probability of an event ?

(A) $\frac{39}{100}$ (B) $\frac{0.001}{20}$

(C) $\frac{10}{0.2}$ (D) 10%

14. The value of m for which the quadratic equation $3x^2 - 7x + m = 0$ has real and equal roots, is

(A) 7 (B) $\frac{49}{12}$

(C) $\frac{49}{3}$ (D) 4

15. If the zeroes of a polynomial $p(x)$ are -3 and 8, then $p(x)$ equals

(A) $x^2 + 5x - 4$ (B) $(x + 3)(-x + 8)$

(C) $a(x^2 + 5x - 24)$ (D) $x^2 - 24$

16. The value of p for which roots of the quadratic equation $x^2 - px + 6 = 0$ are rational, is

(A) 1 (B) -5

(C) 25 (D) $\sqrt{5}$

17. An arc of length 2.2 cm subtends an angle θ at the centre of the circle with radius 2.8 cm. The value of θ is

(A) $50°$ (B) $60°$

(C) $45°$ (D) $30°$

18. Two dice are rolled together. The probability of getting an outcome (x, y) where $x > y$, is

(A) $\frac{5}{12}$ (B) $\frac{5}{6}$

(C) 1 (D) 0

(Assertion and Reason Based Questions)

Directions : Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the codes (A), (B), (C) and (D) as given below :

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

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

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

19. **Assertion (A)** : H.C.F. $(36\ m^2, 18\ m) = 18\ m$, where m is a prime number.

Reason (R) : H.C.F. of two numbers is always less than or equal to the smaller number.

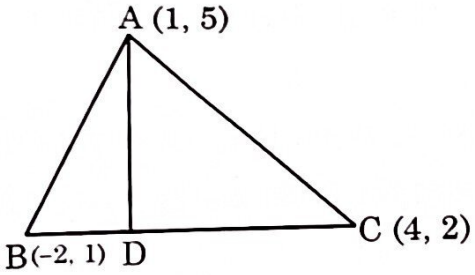
20. **Assertion (A)** : The system of linear equations $3x - 5y + 7 = 0$ and $-6x + 10y + 14 = 0$ is inconsistent.

Reason (R) : When two linear equations don't have unique solution, they always represent parallel lines.

SECTION – B

Q. Numbers 21 to 25 are very short answer questions of 2 marks each.

21. In the given figure, point D divides the side BC of ΔABC in the ratio 1 : 2. Find length AD.



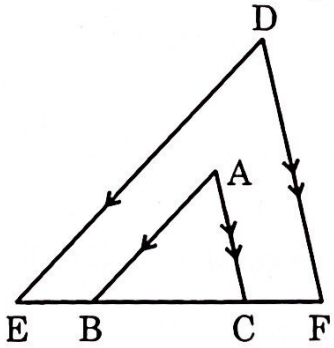
22. (a) Evaluate : $\dfrac{\sin^3 60° - \tan 30°}{\cos^2 45°}$

OR

(b) For acute angles A and B and A + 2B and 2A + B are acute if $\tan (A + 2B) = \sqrt{3}$ and $\sin (2A + B) = \dfrac{1}{\sqrt{2}}$, then find the measures of angles A and B.

23. A bag contains 25 balls. Some of them are yellow and others are green. One ball is drawn at random. If probability of getting a green ball is 3/5, then find the number of yellow balls.

24. In the given figure, AB || DE and AC || DF. Show that $\Delta ABC \sim \Delta DEF$. If BC = 10 cm, EB = CF = 5 cm and AB = 7 cm, then find the length DE.



25. Prove that $14 - 2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is irrational.

SECTION – C

Q. Numbers 26 to 31 are short answer questions of 3 marks each :

26. (a) A circle centered at (2, 1) passes through the points A(5, 6) and B(–3, K). Find the value(s) of K. Hence find length of chord AB.

OR

(b) Prove that the point P dividing the line segment joining the points A(–1, 7) and B(4, –3) in the ratio 3 : 2, lies on the line $x - 3y = -1$. Also find length of PA and PB.

27. Use graphical method to solve the system of linear equations : $x = -3$ and $5x - 2y = -5$.

28. (a) In an A.P., 15^{th} term exceeds the 8^{th} term by 21. If sum of first 10 terms is 55, then form the A.P.

OR

(b) The sum of first n terms of an A.P. is $2n^2 + 13n$. Find its n^{th} term and hence 10^{th} term.

29. The dimensions of a window are 156 cm × 216 cm. Arjun wants to put grill on the window creating complete squares of maximum size. Determine the side length of the square and hence find the number of squares formed.

30. Prove that :

$$\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \tan\theta + \cot\theta.$$

31. A chord of a circle, of radius 14 cm, subtends an angle of 60° at the centre. Find the area of the smaller sector and perimeter of the smaller segment.

SECTION – D

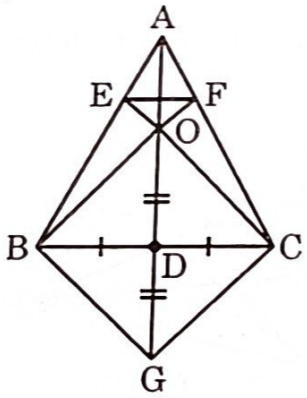
Q. numbers 32 to 35 are long answer questions of 5 marks each.

32. (a) D is the mid-point of side BC of ΔABC. CE and BF intersect at O, a point on AD. AD is produced to G such that OD = DG. Prove that

(i) OBGC is a parallelogram.

(ii) $EF \parallel BC$

(iii) $\Delta AEF \sim \Delta ABC$



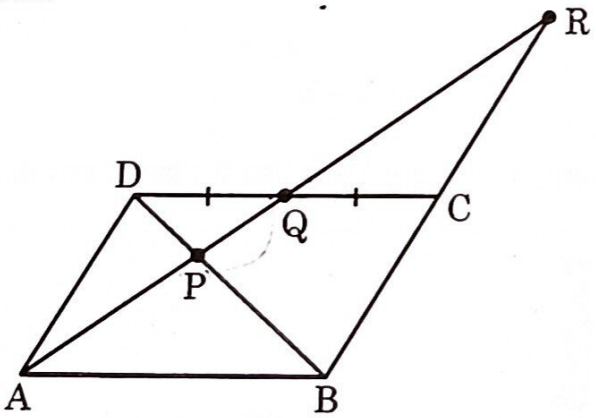
OR

(b) Through the mid-point Q of side CD of a parallelogram ABCD, the line AR is drawn which intersects BD at P and produced BC at R. Prove that

(i) AQ = QR

(ii) AP = 2PQ

(iii) PR = 2AP



33. (a) The mean of the following distribution is 53. Find the missing frequency p.

Class Interval :	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency :	12	15	p	28	13

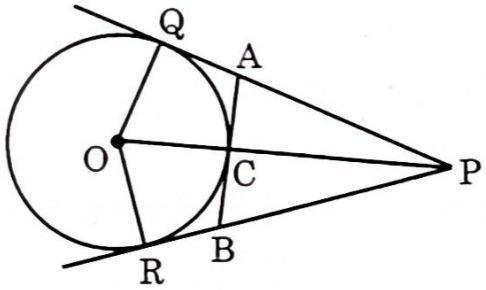
Hence, find mode of the distribution.

OR

(b) Compute median of the following data :

Mid-value :	115	125	135	145	155	165	175
Frequency :	12	15	20	16	10	16	11

34. PQ and PR are two tangents to a circle with centre O and radius 5 cm. AB is another tangent to the circle at C which lies on OP. If OP = 13 cm, then find the length AB and PA.

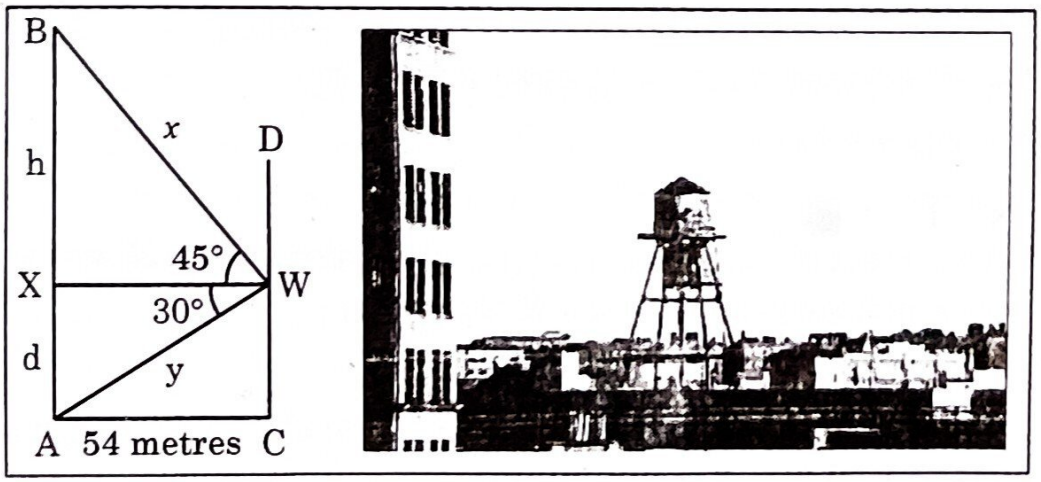


35. Two water taps together can fill a tank in $8\frac{8}{9}$ hours. The tap of larger diameter takes 4 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

SECTION – E

This section (Q. 36 to 38) has 3 case study based questions of 4 marks each.

36.



Elevated water storage tanks are built to store and supply water to nearby colonies. In the diagram given above, AB is an elevated water tank and CD is a nearby multistorey building. The building is 54 metres away from the water tank.

From a window (W) of the building, the angle of elevation of top of the tank is 45° and angle of depression of its foot is 30°.

(i) Write a relation between d (the height of window) and y. 1

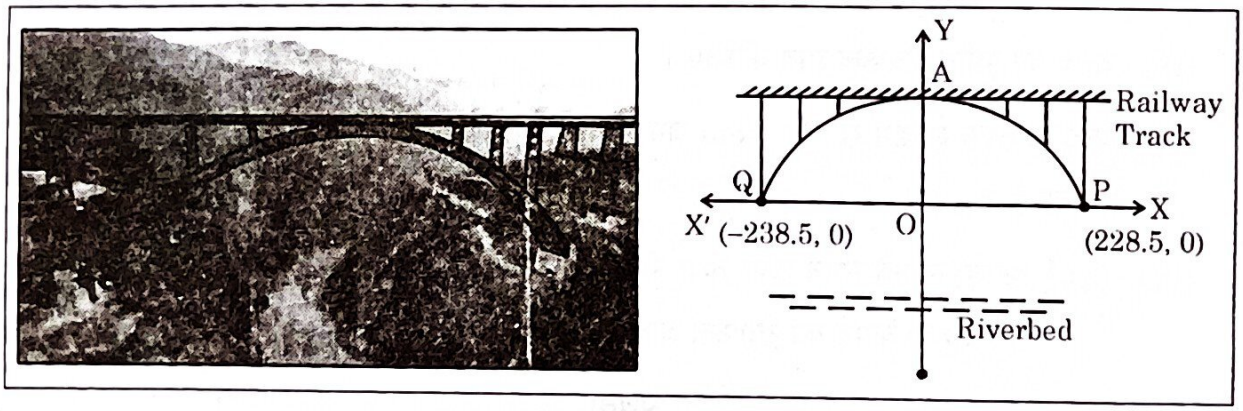
(ii) Determine the value of h. 1

(iii) (a) Determine height of the water tank. 2

OR

(iii) (b) Find the value of x and height of the window above ground level. 2

37.



An arch of a railway bridge, built on Chenab riverbed, is shown in the above diagram. It is a parabolic arch connecting two hills at P and Q. If the parabolic curve is represented by the polynomial

$p(x) = -0.0025x^2 - 0.025x + 136$.

Observe the diagram and based on above information, answer the following questions :

(i) Write the co-ordinates of point A. 1

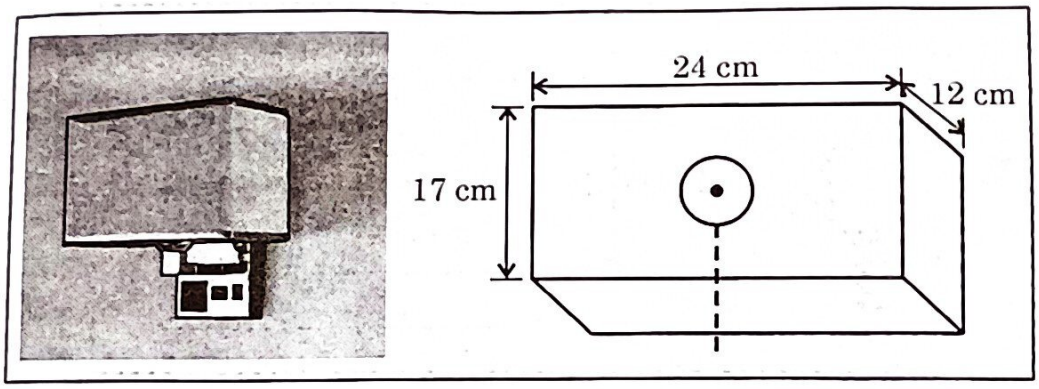
(ii) Find the span of the arch. 1

(iii) (a) Write the zeroes of the polynomial using diagram and verify the relationship between sum of zeroes and polynomials. 2

OR

(iii) (b) Find the values of $p(x)$ at $x = 100$ and $x = -100$. Are they same ? 2

38. A wall mounted lamp, made of fabric, is shown below. Lamp has cuboidal shape, open from top and bottom. A spherical bulb of diameter 7 cm is latched with a very thin rod. (Ignore the rod while making calculations.)



Dimensions of the cuboid are 24 cm × 12 cm × 17 cm.

(i) Find the surface area of the bulb. 1

(ii) What could be the maximum diameter of the bulb if at least 1 cm space is left from each side ? 1

(iii) (a) Find the area of the fabric used if there is a fold of 2 cm on top and bottom edges. 2

OR

(iii) (b) Find the space available inside the lamp. 2