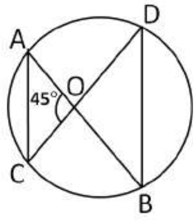
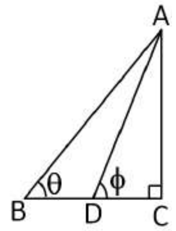
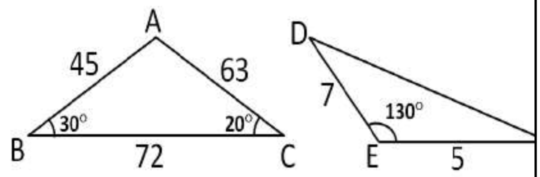
O.S.D.A.V.Public School, Kaithal
Pre-board Exam 2024
Subject : Mathematics
Class :X(set-A)

Time:- 3 hrs.
M.M.:- 80

- **All Questions are compulsory.**

SECTION - A

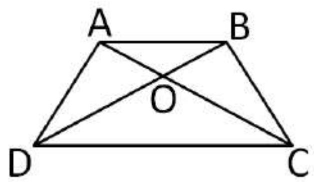
SN	Section A consists of 20 questions of 1 mark each.	Marks
1.	If the HCF of 85 and 153 is expressible in the form 85n – 153 , then the value of n is (a) 3 (b) 2 (c) 4 (d) 1	1
2.	Which of the following quadratic equations has its roots as $2+\sqrt{3}$ and $2-\sqrt{3}$? (a) $2x^2 - 4x + 1 = 0$ (b) $x^2 - 4x + 1 = 0$ (c) $x^2 - 6x + 4 = 0$ (d) None of these	1
3.	If the sum of the squares of zeroes of a quadratic polynomial $f(x) = x^2 - 8x + k$ is 40, then the value of 'k' is (a) 24 (b) 12 (c) 6 (d) 22	1
4.	If $2^{x-y} = 8$ and $2^{x+y} = 64$, then the value of x and y are (a) $\frac{9}{2}$, $\frac{3}{2}$ (b) $\frac{-9}{2}$, $\frac{3}{2}$ (c) $\frac{9}{2}$, $\frac{-3}{2}$ (d) 3 , 2	1
5.	If P(1,2) , Q(4,6) , R(5,7) and S(m,n) are the vertices of a parallelogram PQRS taken in order, then (a) $m = 2, n = 4$ (b) m = 3 , n = 4 (c) $m = 2, n = 3$ (d) m = 3 , n = 5	1
6.	O is the point of intersection of two chords AB and CD, such that OB = OD and $\angle AOC = 45°$, then the triangles OAC and ODB are  (a) equilateral but not similar (b) isosceles but not similar (c) equilateral and similar (d) isosceles and similar	1

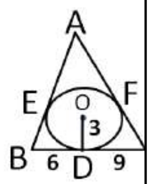
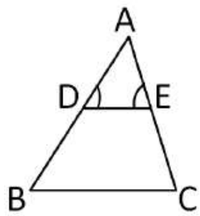
7.	In the figure, $\triangle$ABC is right angled at C. D is the midpoint of BC. Then $\frac{\tan\theta}{\tan\phi}$ = (a) $\frac{1}{2}$ (b) 2 (c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$  	1
8.	If $\sin x + cosec\, x = 2$, then $\sin^{19} x + cosec^{20} x$ is (a) 2^{19} (b) 2^{20} (c) 2 (d) 2^{39}	1
9.	In the figure, the measures of $\angle D$ and $\angle$F respectively are (a) 50° , 40° (b) 20° , 30° (c) 40° , 50° (d) 30 , 20  	1
10.	The value of x for which DE || BC in the given figure is (a) 4 (b) 1 (c) 3 (d) 2	1
11.	If the perimeter of a square is equal to the perimeter of a circle, then the ratio of their areas is (a) 22 : 13 (b) 11 : 14 (c) 14 : 11 (d) 13 : 22	1
12.	In the figure, if $\angle AOB = 125°$, then $\angle$COD = (a) 62.5° (b) 45° (c) 35° (d) 55	1

13.	A sphere of diameter 18 cm is dropped into a cylindrical vessel of diameter 36 cm partly filled with water. If the sphere is completely submerged, then the water level rises by _____ cm. (a) 3 (b) 4 (c) 5 (d) 6	1
14.	If for a data mean : median = 9 : 8 , then median : mode is (a) 8 : 9 (b) 4 : 3 (c) 7 : 6 (d) 5 : 4	1
15.	A chord of a circle of radius 14cm subtends a right angle at the centre. Then the area of the minor sector is (a) 154 cm^2 (b)) 156 cm^2 (c) 158 cm^2 (d) 60 cm^2	1
16.	For the following distribution	1

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

	the difference between the upper limit of the modal class and the lower limit of the median class is (a) 5 (b) 10 (c) 15 (d) 20	
17.	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, then the probability of losing the game is (a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{8}$ (d) $\frac{5}{8}$	1
18.	If $\frac{sin^2\theta}{7} + \frac{cos^2\theta}{7} = \frac{x}{21}$, then x is (a) 1 (b) 2 (c) 3 (d) 4	1
	Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.	
19.	**Assertion** : $\sqrt{p}$ is an irrational number where p is a prime number. **Reason** : Square root of any prime number is an irrational number. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true.	1

20.	**Assertion** : : If A and B are the points (–3 , 4) and (2 , 1) respectively, then the coordinates of the point C on AB produced such that AC = 2BC are (7, –2) *Reason* : The midpoint of the line joining (x_1 , y_1) and $\left(x_2, y_2\right)$ is $\left(\frac{x_1+x_2}{3}, \frac{y_1+y_2}{3}\right)$ (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true.	1
	SECTION - B	
	Section B consists of 5 questions of 2 marks each.	
21.	Find the value(s) of k so that the pair of equations x + 2y = 5 and 3x + ky + 15 = 0 has a unique solution.	2
22.	In the figure, $\frac{AO}{CO} = \frac{BO}{DO} = \frac{2}{3}$ and AB = 4cm. Find DC.  	2
23.	In the figure, AB is a diameter of a circle with centre O and AT is a tangent. If $\angle AOQ$ = 58° , find $\angle ATQ$.	2
24.	A bicycle wheel makes 5000 revolutions in moving 11km. Find the diameter of the wheel in metres.	2
25.	Evaluate $\frac{3sin\,3A+2\,cos(5A+10)^0}{\sqrt{3}\,tan\,3A - cosec\,(5A-20)^0}$ when $A = 10^0$	2
	Section C	
	Section C consists of 6 questions of 3 marks each.	
26.	Prove that $6 + \sqrt{2}$ is irrational.	3
27.	Find the zeroes of the polynomial $3x^2-5x+2$ and verify the relationship between the zeroes and the coefficients.	3

28.	The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in a row, there would be 2 rows more. Find the number of students in the class.	3
29.	Prove that $\frac{1}{cosecA - cotA} - \frac{1}{\sin A} = \frac{1}{\sin A} - \frac{1}{cosecA + cotA}$	3
30.	$\triangle$ABC is drawn to circumscribe a circle of radius 3cm such that the segments BD and DC are respectively of lengths 6cm and 9cm. If the area of $\triangle$ABC is 54cm^2, find AB and AC.  	3
31.	From a pack of 52 cards, one card is chosen at random. Find the probability of getting a) a red face card b) an Ace c) a queen	3
	Section D	
	Section D consists of 4 questions of 5 marks each.	
32.	A pole has to be erected at a point on the boundary of a circular park of diameter 13m in such a way that the difference of its distances from two diametrically opposite fixed gates A and B on the boundary is 7m. Is it possible to do so? If yes at what distances from the two gates should the pole be erected?	5
33.	Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then the other two sides are divided in the same ratio. In the figure, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$. Using the above theorem, prove that ΔBAC is an isosceles triangle.  	5
34.	A wooden toy was made by scooping out a hemisphere of same radius from each end of a solid cylinder. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the volume of wood in the toy.	5
35.	A survey regarding the heights (in cm) of 50 girls of class X of a school was conducted and the following data was obtained.	5

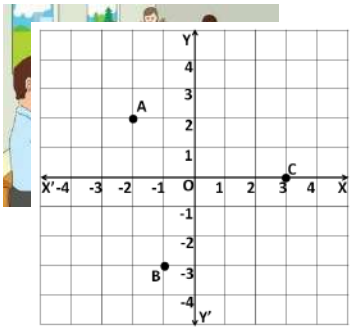
Height (in cm)	120 – 130	130 – 140	140 – 150	150 – 160	160 – 170
No. of girls	2	8	12	20	8

Find the mean and mode of the above data.

	SECTION - E	
	Case study based questions are compulsory.	

36. **Case Study – 1**

Ajay , Biju and Collin are childhood friends. They always want to sit in a row in the classroom. But the class teacher changes the seating arrangement everyday. Biju is very good in maths. He considers the centre of the class as origin and marks their positions on a paper in a coordinate system.
One day Biju made the following diagram of their seating position.



(i) Find the ratio in which AB is divided by the x-axis. 1

(ii) What is the position of David, if he is sitting at the midpoint of AC. 1

(iii) Collin wants to sit at the position (x , y) such that he is equidistant from Ajay and Biju. Find the relation between x and y. 2

37. **Case Study – 2**

Rishi wants to buy a car and plans to take loan from a bank. He pays his total loan amount of Rs.11,80,000 by paying every month starting with the first instalment of Rs.10,000. If he increases the instalment by Rs.1000, every month, answer the following questions.

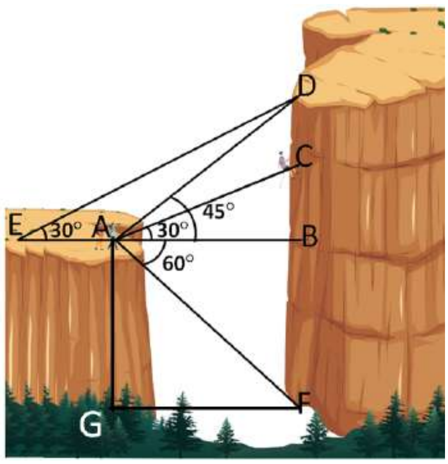
(i) What is the amount paid by Rishi in 30th instalment? 1

(ii) Determine the amount paid by Rishi in 30 instalments. 1

(iii)Find the difference between the amount paid in the 25th instalment and 15th instalments. 2

38. **Case Study – 3**

Trekking : Himalyas trekking club has just hiked to the point A on the south rim of a large canyon, when they spot a climber at point C, trying to reach the point D at the top of the northern rim. The distance AB between the northern and southern walls of the canyon is 150m. The hikers observe an angle of depression of 60° to the bottom F of the north face. The angle of elevation of the climber and the top of the northern rim were found to be 30° and 45°.



(Use $\sqrt{3}$= 1.7)

(i) How high is the southern rim AG of the canyon? 1

	(ii) How high is the northern rim FD? 1 (iii) How much more should the climber climb to reache the top? 2 **[OR]** The hikers move to the point E on the southern face such that E, A and B are on a straight line. Now they observe the angle of elevation of the point D to be 30°. Find the distance AE.	

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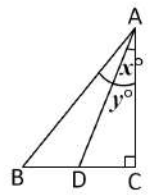
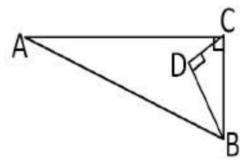
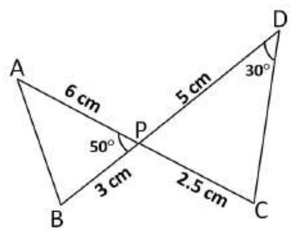
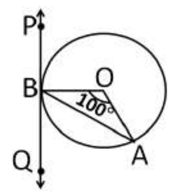
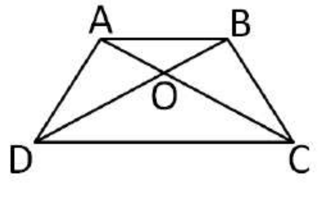
- **All Questions are compulsory.**

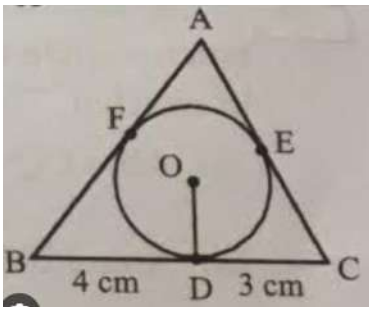
SECTION - A

SN	Section A consists of 20 questions of 1 mark each.	Marks
1.	The largest number which divides 70 and 125, leaving remainders 5 and 8 respectively is (a) 65 (b) 13 (c)875 (d) 1750	
2.	The quadratic equation $2x^2 - \sqrt{5}\ x + 1 = 0$ has (a) 2 distinct real roots (b) 2 equal real roots (c) No real roots (d) more than 2 real roots	
3.	The zeroes of $5x^2 - 7\ x + k$ are $sin\ A$ and $cos\ A$. Then the value of k is (a) $\frac{12}{7}$ (b) $\frac{7}{12}$ (c)$\frac{12}{5}$ (d)$\frac{5}{12}$	
4.	For what value of k, do the equations $3x - y + 8 = 0$ and $6x - ky = -16$ represent coincident lines? (a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c)2 (d) -2	
5.	If the distance of the point (4, a) from the x –axis is half its distance from the y – axis, then a is equal to (a) 4 (b) 8 (c)2 (d)6	
6.	In two triangles DEF and PQR , $\angle D = \angle Q$ and $\angle R = \angle E$, then which of the following is NOT true? (a) $\frac{EF}{RP} = \frac{DF}{QP}$ (b) $\frac{DE}{PQ} = \frac{EF}{RP}$ (c) $\frac{DE}{QR} = \frac{DF}{QP}$ (d) $\frac{EF}{RP} = \frac{DE}{QR}$	
7.	In the figure. ΔABC is right angled at C. D is the mid-point of BC. Then $\frac{cot\ x^{\circ}}{cot\ y^{\circ}} =$ (a)$\frac{1}{2}$ (b) 2 (c $\sqrt{3}$ (d)$\frac{1}{\sqrt{3}}$  	
8.		

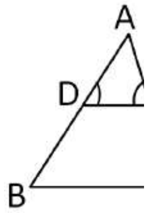
	In the figure, $\angle ACB = 90^\circ$, $\angle BDC = 90^\circ$, CD = 4cm, BD = 3cm, AC = 12cm. Then cos A – sin A = (a) $\frac{5}{12}$ (b) $\frac{5}{13}$ (c) $\frac{7}{12}$ (d) $\frac{7}{13}$ 
9.	Two line segments AC and BD intersect each other at the point P such that PA = 6cm, PB = 3cm, PC = 2.5cm, PD = 5cm, $\angle APB = 50^\circ$ and $\angle CDP = 30^\circ$. Then $\angle PBA$ is equal to (a) 50° (b) 30° (c) 60° (d) 100° 
10.	If △ABC ~ △DEF such that DE = 3cm, EF = 2cm, DF = 2.5 cm, BC = 4cm then perimeter of △ABC is (a) $18cm$ (b) $20cm$ (c) $12cm$ (d) $15cm$
11.	In the given figure PQ is a tangent to the circle with centre 'O' at the point B. If $\angle AOB = 100^\circ$, then $\angle ABQ$ is (a) 50° (b) 40° (c) 60° (d) 80° 
12.	If the perimeter of a semicircular protractor is 66cm, then the radius of the protractor is (a) $\frac{36}{7}$ cm (b) $\frac{77}{6}$ cm (c) $21cm$ (d) $42cm$
13.	The ratio of the volume of a cube to that of a sphere, which will exactly fit inside the cube is (a) 6 : π (b) 2 : 3 (c) 3 : 2 (d) π : 6
14.	If the difference of mode and median of a data is 24, then the difference of median and mean is (a) 12 (b) 24 (c) 8 (d) 36
15.	If the circumferences of two circles are in the ratio 4 : 9, then the ratio of their areas is (a) 9 : 4 (b) 4 : 9 (c) 2 : 3 (d) 16 : 81
16.	In the following distribution, the sum of lower limit of median class and the upper limit of the modal class is

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

	(a) 80 (b) 70 (c) 90 (d) 60	
17.	A die is rolled twice. The probability that 5 will not come up either time is (a) $\frac{11}{36}$ (b) $\frac{11}{3}$ (c) $\frac{13}{36}$ (d) $\frac{25}{36}$	
18.	If $3\cos\theta = 2\sin\theta$, then the value of $\frac{4\sin\theta - 3\cos\theta}{2\sin\theta + 6\cos\theta}$ is (a) $\frac{1}{8}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$	
	Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.	
19.	**Assertion :** If product of two numbers is 5780 and their HCF is 17, then their LCM is 340. **Reason :** HCF is always a factor of LCM. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true.	
20.	**Assertion :** The two vertices of a triangle are A(6 , 3) and B(–1 ,7) and its centroid is G(1,5). Then the third vertex C of $\triangle$ABC is (5, –2). **Reason :** The centroid of triangle formed by the points A (x_1 , y_1), B(x_2 , y_2) and C(x_3 , y_3) is $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$ (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true	
	SECTION - B	
	Section B consists of 5 questions of 2 marks each.	
21.	Find the value(s) of k so that the pair of equations x + 2y = 5 and 3x + ky + 15 = 0 has a unique solution.	2
22.	In the figure, $\frac{AO}{CO} = \frac{BO}{DO} = \frac{1}{3}$ and AB = 5cm. Find DC.  	2
23.	In the figure, AB is a diameter of a circle with centre O and AT is a tangent. If $\angle AOQ = 58°$, find $\angle ATQ$.	2

24	The diameter of the driving wheel of a bus is 140 cm. How many revolutions per minute must the wheel make in order to keep a speed of 66 km per hour ?	2
25.	If $2sin\ 3x = \sqrt{3}$, find the value of $tan\ (x + 25)^0$	2
	Section C	
	Section C consists of 6 questions of 3 marks each.	
26.	Prove that $6 + \sqrt{3}$ is irrational.	3
27.	Find the zeroes of the polynomial $4x^2+4x-3$ and verify the relationship between the zeroes and the coefficients.	3
28.	The students of a class are made to stand in rows. If 4 students are extra in a row there would be 2 rows less. If 4 students less in a row there would be 4 rows more. Find the number of students in the class	3
29.	Prove that $\frac{1}{secA - tanA} - \frac{1}{cosA} = \frac{1}{cosA} - \frac{1}{secA + tanA}$	3
30.	In the given figure, a triangle ABC is drawn to circumscribe a circle of radius 2 cm such that the segments BD and DC into which BC is divided by the point of contact D, are of lengths 4 cm and 3 cm respectively. If the area $\Delta ABC = 21\ cm^2$ then find the lengths of sides AB and AC. 	3
31.	From a pack of 52 cards, a card is chosen at random . Find the probability of getting a) a black king b) a jack c) a red queen	3
	Section D	
	Section D consists of 4 questions of 5 marks each.	
32.	A pole has to be erected at a point on the boundary of a circular park of diameter 10m in such a way that the difference of its distances from two diametrically opposite fixed gates A and B on the boundary is 2m. Is it possible to do so? If yes, at what distances from the two gates should the pole be erected?	5

33. Prove Basic proportionality theorem.
In the figure, DE||BC , AD=3cm, DB=4cm, AE=2cm
Using the above theorem, Find the length of Ec? **5**



34. From a solid cylinder of height 7 cm and base diameter 12 cm, a conical cavity of same height and same base diameter is hollowed out. Find the total surface area of the remaining solid **5**

35. A survey regarding the heights (in cm) of 50 girls of class X of a school was conducted and the following data was obtained. **5**

Height (in cm)	100 – 120	120 – 140	140 – 160	160 – 180	180 – 200
No. of girls	4	6	11	15	8

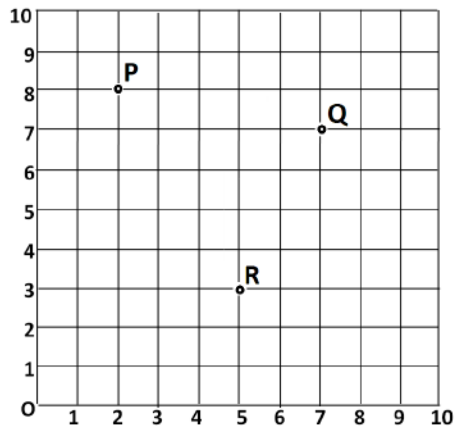
Find the mean and mode of the above data.

SECTION - E

Case study based questions are compulsory.

36. **Case Study – 1**

Car pooling is the sharing of car journeys by people who travel to the same destination every day. It is an environmentally friendly way to travel. Three friends Priya, Quinn and Rakhi live in societies represented by the points P, Q and R respectively. They all work in offices located in the same building situated at the point O.



Based on the above information, answer the following questions.

(i) They decide to meet at the café located at the centroid of $\triangle$PQR. Find the coordinates of the café.	1
(ii) Find the distance between the societies of Priya and Quinn.	1
(iii) Find the points of trisection of the line segment PR.	2

37. **Case Study – 2**

Amit was playing a number card game. In the game, some cards marked positive and some negative are arranged in the decreasing order in a row such that they are following an Arithmetic Progression. On his first turn, Amit picks up 6^{th} and 14^{th} cards and finds their sum to be –76. On the second turn he picks up 8^{th} and 16^{th} cards and finds their sum to be –96.

Based on the above information, answer the following questions.

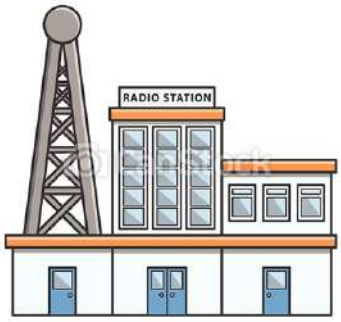
i) What is the difference between the numbers on any two consecutive cards? (1)

ii) What is the number on the first card? (1)

iii) Find the sum of numbers on the first 15 cards? (2)

38. **Case Study – 3**

Radio frequency towers are backbone of wireless communication. A radio station tower is supported by 2 wires from the point O on the ground to the points A and B on the tower. Distance between the base of the tower and point O is 36m. From the point O, the angle of elevation of the point B is 30° and the angle elevation of the point A is 45°.



Based on the above information answer the following questions

i) Draw a neat labelled diagram to show the above situation. (1)

ii) Find the height of point B. (1)

iii) Find the length of the wire from the point O to the point A. (2)

Pre-Board Question Paper(2024-25)

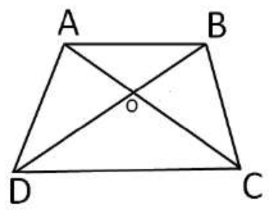
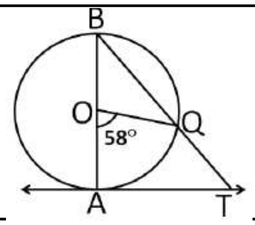
Marking Scheme

Time Allowed: 3 Hours	**Maximum Marks: 80**	

Set-A

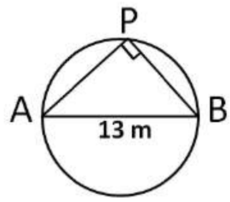
SECTION - A

I	**Choose and write the correct option in the following questions**	
1.	(b) 2	1
2.	(b) $x^2 - 4x + 1 = 0$	1
3.	(b) 12	1
4.	(a) $\frac{9}{2} = \frac{3}{2}$	1
5.	(c) m=2 , n=3	1
6.	(d) isos & similar	1
7.	(a) $\frac{1}{2}$	1
8.	(c) 2	1
9.	(b) 20°, 30°	1
10.	(d) 2	1
11.	(b) 11 : 14	1
12.	(d) 55°	1
13.	(a) 3	1
14.	(b) 4 : 3	1
15.	(a) $154\ cm^2$	1
16	(b) 10	1
17.	(b) $\frac{3}{4}$	1
18.	(c) 3	1
19.	(a)	1
20.	(c)	1
	SECTION - B	

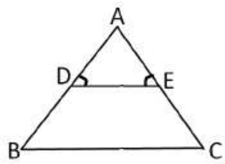
21.	The given system of equations can be written as $x + 2y - 5 = 0$ $3x + ky + 15 = 0$ This system of equation is of the form $a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$ where, $a_1 = 1, b_1 = 2, c_1 = -5$ and $a_2 = 3, b_2 = k, c_2 = -15$ The given system of equations will have a unique solution, if $\frac{1}{3} \neq \frac{2}{k} \Rightarrow k \neq 6.$	½ 1+½
22.	In ΔAOB & ΔCOD $\frac{OA}{OC} = \frac{OB}{OD}$ (data) $\angle AOB = \angle COD\ (VOA)$ $\therefore \Delta AOB \sim \Delta COD\ (SAS)$  $\therefore \frac{AB}{CD} = \frac{OA}{OC}$ $\frac{4}{CD} = \frac{2}{3} \Rightarrow CD = \frac{4 \times 3}{2} = 6cm$	**1** **½** **½**
23.	$\angle BAT = 90°$ (tgt ⊥ radius at pt of contact) $\angle ABT = \frac{58°}{2} = 29°\ (DMT)$ $\angle ATB = 180° - (90° + 29°) = 61°\ (AMS)$  	**1** **½** **½**
24.	n=5000, n $\times 2\pi r = 11\ km$ $5000 \times 2\pi r = 11 \times 1000m$ $2r = \frac{11 \times 7}{5 \times 22} = \frac{7}{10}\ m$ $\frac{7}{10} \times 100 = 70\ cm$	**½** **½** **1**
25.	A = 10; $\frac{3sinsin\ 30°+2cos60°}{\sqrt{3}\ tan30°-cosec30°} = \frac{\frac{3}{2}+\frac{2}{2}}{\frac{\sqrt{3}}{\sqrt{3}}-2}$ $= \frac{\frac{5}{2}}{-1} = \frac{-5}{2}$	**1½** **½**

	SECTION – C	
26.	Proof of $\sqrt{2}$ is irrational Proof of $6 + \sqrt{2}$ is irrational	**2** **1**
27.	$3x^2-5x+2$ Splitting the middle term, we get $=3x^2-3x-2x+2$ $=3x(x-1)-2(x-1)$ $(3x-2)(x-1)=0$ $(3x-2)(x-1)=0$ Using zero product property, we get $3x-2=0 \Rightarrow x=2/3$ $x-1=0 \Rightarrow x=1$ Therefore, the zeroes of the polynomial are 2/3 and 1. If α and β are two zeroes of a polynomial $\alpha+\beta=1+(\frac{2}{3})=5/3$ $\alpha+\beta=-b/a=5/3$ $\alpha\beta=1x(\frac{2}{3})=(\frac{2}{3})$ $\alpha\beta=c/a=(\frac{2}{3})$ Hence verified.	**1** **1** **1**

28	Let the number of rows be x and number of students in a row be y. Total students of the class= Number of rows × Number of students in a row $= x \times y = xy$ Case 1 Total number of students $= (x-1)(y+3)$ $\Rightarrow xy = (x-1)(y+3) = xy - y + 3x - 3$ $\Rightarrow 3x - y - 3 = 0$ $\Rightarrow 3x - y = 3$..... (i) Case 2 Total number of students$= (x+2)(y-3)$ $\Rightarrow xy = xy + 2y - 3x - 6$ $\Rightarrow 3x - 2y = -6$..... (ii) Subtracting equation (ii) from (i), $\Rightarrow (3x-y)-(3x-2y) = 3-(-6)$ $\Rightarrow -y + 2y = 3 + 6$ $\Rightarrow y = 9$ By substituting value of y in (i), we get $\Rightarrow 3x - 9 = 3$ $\Rightarrow 3x = 9 + 3 = 12$ $\Rightarrow x = 4$ Number of rows $= x = 4$ Number of students in a row $= y = 9$ Number of total students in a class $= x \times y = 4 \times 9 = 36$	½ ½ ½ ½ ½ ½
29.	LHS = $\frac{1}{cosec\,\theta - cot\theta} - \frac{1}{sin\theta}$ $= \frac{1}{cosec\,\theta - cot\theta} \times \frac{cosec\,\theta + cotcot\,\theta}{cosec\,\theta + cot\theta} - \frac{1}{sin\theta}$ $= \frac{cosec\,\theta + cotcot\,\theta}{cosec^2\,\theta - cot^2\theta} - \frac{1}{sin\theta}$ $= cosec\theta + cot\theta - cosec\,\theta = \cot cot\,\theta$ RHS = $cosec\theta - (cosec\,\theta - \cot cot\,\theta)$ $= cosec\theta + cot\theta - cosec\,\theta = \cot cot\,\theta$ LHS = RHS	1 ½ ½ 1
30.	s= $\frac{x+6+x+9+15}{2} = x + 15$ $\therefore 54 = \sqrt{(x+15)(9)(6)(x)}$ $54^2 = 54x(x+15) \Rightarrow x^2 + 15x - 54 = 0$ $= (x-3)(x+18) = 0$ $x = 3\ or - 18$ $x \neq -18\ as\ length\ canot\ be\ negative$ $\therefore x = 3$ $\therefore AB = 9cm,\ AC = 12\ cm$	½ 1 ½ 1 ½
31.	n(s)=52	

	(a) p(Red Face Card) =$(6/52) = 3/26$ (b) p(an Ace) = (4/52) =1/13 (c) p(queen) =1/13	**1** **1** **1**
	SECTION - D	
32.	P – Pole, A,B - Gates Let AP =a and PB = b  ⇒ a-b =7 = > a=b+7 $AB^2 = AP^2 + BP^2\ (by\ thm)$ $13^2 = a^2 + b^2 = (b+7)^2 + b^2$ $b^2 + 7b - 60 = 0$ $(b+12)(b-5) = 0$ $\Rightarrow b = 5\ or\ b = -12$ $b \neq -12\ as\ distance\ is\ not\ negative$ $\therefore b = 5,\ a = 12$	½ ½ **1** **1** **1** ½ ½

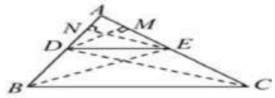
33.)



½

½

Given: A triangle ABC in which a line parallel to side BC intersects other two sides AB and AC at D and E respectively.



To prove: $\frac{AD}{DB} = \frac{AE}{EC}$

Construction: Join BE and CD and draw DM ⊥ AC and EN ⊥ AB.

Proof: area of Δ ADE $\left(= \frac{1}{2} \text{base} \times \text{height}\right) = \frac{1}{2} AD \times EN$.

(Taking AD as base)

So, $ar(BDE) = \frac{1}{2} DB \times EN$, [The area of Δ ADE is denoted as ar (ADE)]. **1**

Similarly, $ar(BDE) = \frac{1}{2} DB \times EN$,

$ar(ADE) = \frac{1}{2} AE \times DM$ and $ar(DEC) = \frac{1}{2} EC \times DM$. (Taking AE as base) **1**

$\therefore \frac{ar(ADE)}{ar(BDE)} = \frac{\frac{1}{2} AD \times EN}{\frac{1}{2} DB \times EN} = \frac{AD}{DB}$ ...(i) **1**

and $\frac{ar(ADE)}{ar(DEC)} = \frac{\frac{1}{2} AE \times DM}{\frac{1}{2} EC \times DM} = \frac{AE}{EC}$ ...(ii)

$ar(BDE) = ar(DEC)$ ..... (iii)

[Δ BDE and DEC are on the same base DE and between the same parallels BC and DE.]

Therefore, from (i), (ii) and (iii), we have:

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

Fig construction

Proof:

Proof: $In\ \Delta ABC,\ \frac{AD}{BD} = \frac{AE}{EC}$ (given)

= > DE ∥ BC (BPT converse) ½

$\therefore \angle B = \angle D\ and\ \angle C = \angle E\ (corresponding\ angles)$

½

But $\angle D = \angle E\ (given) = \ > \angle B = \angle C$

= > AB = AC (Isosceles Δle property converse)

34.

Given height of cylinder = 10 cm

Radius of cylinder = 3.5 cm

The volume of toy= Volume of cylinder $-2\times$ Volume of a hemisphere **1**

$= \pi r^2 h - (2 \times \frac{2}{3}\pi r^3)$ **2**

$= [\pi(3.5)^2 \times 10] - (2 \times \frac{2}{3} \times \pi(3.5)^3) = 205.251\ cm^3$ **2**

35.

Height (in cm)	No. of students (f_i)	x_i	$d_i = x_i - A$	$f_i d_i$
120 - 130	2	125	-20	-40
130 – 140	8	135	-10	-80
140 – 150	12	145	0	0
150 – 160	20	155	10	200
160 – 170	8	165	20	160

$\Sigma f_i : 50$ $\Sigma f_i d_i : 240$ **1**

A=145

Mean = A + $\frac{\Sigma f_i d_i}{\Sigma f_i}$ **1**

$= 145 + \frac{240}{50}$

$= 149.8$ **1**

Modal class = 150 − 160 **1**

$l = 150, f_0 = 12, f_1 = 20, f_2 = 8, h = 10$

∴Mode = $l + (\frac{f_1 - f_0}{2f_1 - f_0 - f_2}) \times h$ **½**

$= 150 + \left[\frac{20-12}{40-12-8}\right] \times 10$ **½**

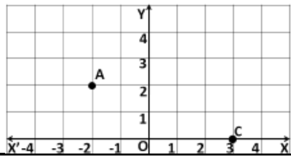
$= 154$

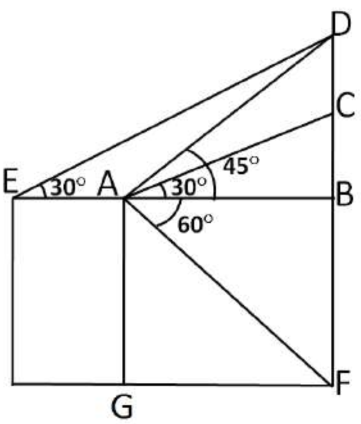
SECTION - E

36. A$((-2, 2), B(-1, -3), C(3, 0)$

(1) $\frac{k(-3)+1(2)}{k+1} = 0$

$=> -3k + 2 = 0 = > k = \frac{2}{3}$



	$\therefore ratio\ is\ 2:3$ (2) $\left(\frac{-2+3}{2}\ ,\ \ \frac{2+0}{2}\right)\ =\ \left(\frac{1}{2}\ ,\ 1\right)$ (3) Let C be (x , y) $AC^2\ =\ BC^2$ $(x\ +\ 2)^2 + (y\ -\ 2)^2 =\ (x\ +\ 1)^2 +\ (y\ +\ 3)^2$ $x\ -\ 5y\ -\ 1\ =\ 0$	1 1 1+1
37.	a = 10,000, d = 1000 $S_n\ =\ 11,80,000$ (i) $a_{30}\ =\ a\ +\ 24d\ =\ Rs.\ 39,000$ (ii) $S_{30}\ =\ 15(20,000\ +\ 29,000) =\ 15\times 49,000\ => Rs. 7,35,000$ (iii) $a_{25} -\ \ a_{15} = a\ +\ 24d\ -\ a\ -\ 14d\ =\ 10d\ =\ Rs.\ 10,000$	1 1 2
38.	i) $tan\ 60° = \frac{BF}{AB} \Rightarrow \sqrt{3} = \frac{BF}{150} \Rightarrow BF\ =\ 150\sqrt{3}\ =\ 150\times 1.7\ =\ 522\ m$ $\therefore Height\ of\ the\ southern\ rim\ =\ 255m$ ii) tan $tan\ 45°\ =\ \frac{BD}{AB}\ \Rightarrow BD\ =\ AB\ =\ 150$ $\therefore DF\ =\ DB\ +\ BF\ =\ 150\ +\ 255\ =\ 405m$  iii) $tan\ 30°\ =\ \frac{BC}{AB}\ \ \Rightarrow BC\ = \frac{150}{\sqrt{3}}\ =\ 50\sqrt{3}$ = 50 ×1.7 = 85m $\therefore CD\ =\ BD\ -\ BC\ =\ 150\ -\ 85\ =\ 65m$	1

	[OR] $tan\ 30° = \frac{BD}{EB} \Rightarrow EB = 150\sqrt{3} = 255$ $$EA = EB - AB = 255 - 150 = 105\ m$$	1 1 1

Pre-Board Question Paper(2024-25)

Marking Scheme

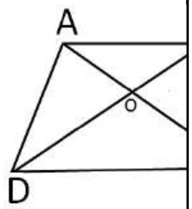
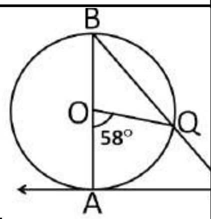
Maximum Marks: 80

Set-B

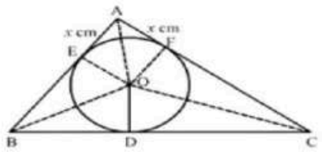
SECTION - A

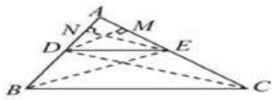
I	**Choose and write the correct option in the following questions**	
1.	(b) 13	1
2.	(c) no real roots	1
3.	(c) $\frac{12}{5}$	1
4.	(c) 2	1
5.	(c) 2	1
6.	(b) $\frac{DE}{PQ} = \frac{EF}{RP}$	1
7.	(b)2	1
8.	(d) $\frac{7}{13}$	1
9	(d) 100°	1
10.	(d) 15 cm	1
11.	(a) 50°	1
12.	(b) 77/6	1
13.	(a) 6 : π	1
14.	(a) 12	1
15.	(d) 16 :81	1
16.	(c)90	1
17.	(d) $\frac{25}{36}$	1
18.	(b) $\frac{1}{3}$	1
19	(b) Both A & R are true but R is not the correct explanation of A.	1
20	(d) A is false but R is true.	1

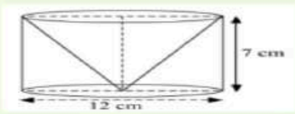
SECTION - B

21.	The given system of equations can be written as $x + 2y - 5 = 0$ $3x + ky + 15 = 0$ This system of equation is of the form $a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$ where, $a_1 = 1, b_1 = 2, c_1 = -5$ and $a_2 = 3, b_2 = k, c_2 = -15$ The given system of equations will have a unique solution, if $\frac{1}{3} \neq \frac{2}{k} \Rightarrow k \neq 6.$		½ 1+½
22.	In ΔAOB & ΔCOD $\frac{OA}{OC} = \frac{OB}{OD}$ (data) $\angle AOB = \angle COD\ (VOA)$ $\therefore \Delta AOB \sim \Delta COD\ (SAS)$ $\therefore \frac{AB}{CD} = \frac{OA}{OC}$ $\frac{5}{CD} = \frac{1}{3} \Rightarrow CD = 5X3 = 15\ cm$  		1 ½ ½
23.	$\angle BAT = 90°$ (tgt ⊥ radius at pt of contact) $\angle ABT = \frac{58°}{2} = 29°\ (DMT)$ $\angle ATB = 180° - (90° + 29°) = 61°\ (AMS)$  		1 ½ ½
24.	n=5000, n $\times\ 2\pi r = 11\ km$ $5000 \times 2\pi r = 11 \times 1000m$ $2r = \frac{11 \times 7}{5 \times 22} = \frac{7}{10}\ m$ $\frac{7}{10} \times 100 = 70\ cm$		½ ½ 1
25.	A = 10; $\frac{3sin\ 30° + 2cos60°}{\sqrt{3}\ tan30° - cosec30°} = \frac{\frac{3}{2}+\frac{2}{2}}{\frac{\sqrt{3}}{\sqrt{3}} - 2}$ $= \frac{\frac{5}{2}}{-1} = \frac{-5}{2}$		½+1 ½
	SECTION – C		

26.	Proof of $\sqrt{2}$ is irrational Proof of $6 + \sqrt{2}$ is irrational		**2** **1**
27.	$4x^2 + 4x - 3$ splitting middle terms $4x^2 - 2x + 6x - 3 = 0$ $\Rightarrow 2x(2x - 1) + 3(2x - 1) = 0$ $\Rightarrow (2x + 3)(2x - 1) = 0$ So $x = \frac{-3}{2}$ & $x = \frac{1}{2}$ So $(-\frac{3}{2}, \frac{1}{2})$ are the roots of the given equation. $\alpha + \beta = \frac{-b}{a}$ $\Rightarrow \frac{-3}{2} + \frac{1}{2} = \frac{-2}{2} = -1$ $\frac{-b}{a} = \frac{-4}{4} = -1$ $\alpha\beta = (\frac{-3}{2})(\frac{1}{2}) = \frac{-3}{4} = \frac{c}{a}$ So $\alpha + \beta = \frac{-b}{a}$ & $\alpha\beta = \frac{c}{a}$ Hence proved.		**1** **1** **1**
28.	Let the number of rows be x and the number of students in each row be y. Total number of students = xy $(x - 2)(y + 4) = xy$ $\Rightarrow xy + 4x - 2y - 8 = xy$ $\Rightarrow 4x - 2y = 8$ ...(1) and $(x + 4)(y - 4) = xy$ $xy - 4x + 4y - 16 = xy$ $\Rightarrow -4x + 4y = 16$ ...(2) From eqn. (1) and (2) $4x - 2y - 4x + 4y = 24$ $2y = 24 \Rightarrow y = 12$ and $4x - 2 \times 12 = 8$ $\Rightarrow 4x = 8 + 24 = 32 \Rightarrow x = 8$ Total no. of students = $12 \times 8 = 96$.		½ ½ ½ ½ ½ ½

29.	$\frac{1}{\sec A - \tan A} - \frac{1}{\cos A} = \frac{1}{\cos A} - \frac{1}{\sec A + \tan A}$ LHS $\frac{1}{\sec A - \tan A} - \frac{1}{\cos A}$ $\frac{1}{\sec A - \tan A} \cdot \frac{\sec A + \tan A}{\sec A + \tan A} - \frac{1}{\cos A}$ $\frac{\sec A + \tan A}{\sec^2 A - \tan^2 A} - \frac{1}{\cos A}$ $\frac{\sec A + \tan A}{1} - \frac{1}{\cos A}$ $= \tan A$ RHS $\frac{1}{\cos A} - \frac{1}{\sec A + \tan A} + \frac{\sec A - \tan A}{\sec A - \tan A}$ $\frac{1}{\cos A} - \frac{\sec A - \tan A}{\sec^2 A - \tan^2 A}$ $\frac{1}{\cos A} - \sec A - \tan A$ $= \tan A$ $\therefore$ LHS = RHS		½ ½ ½ ½ ½ ½
30.	 We know that tangent segments to a circle from the same external point are congruent Now, we have AE = AF, BD = BE =4 cm and CD = CF = 3 cm Now $Area(\Delta ABC) = Area(\Delta BOC) + Area(\Delta AOB) + Area(\Delta AOC)$ $\Rightarrow 21 = \frac{1}{2} \times BC \times OD + \frac{1}{2} \times AB \times OE + \frac{1}{2} \times AC \times OF$ $\Rightarrow 42 = 7 \times 2 + (4 + x) \times 2 + (3 + x) \times 2$ $\Rightarrow 21 = 7 + 4 + x + 3 + x$ $\Rightarrow 21 = 14 + 2x$ $\Rightarrow 2x = 7$ $\Rightarrow x = 3.5cm$ $\therefore AB = 4 + 3.5 = 7.5cm$ and $AC = 3 + 3.5 = 6.5cm$		½ ½ **1** ½ ½
31.	n(s)=52 (a) p(Black king) = $\frac{2}{52}$ =1/26 (b) p(a jack) = 4/52=1/13 (c) p(red queen) =2/52=1/26		**1** **1** **1**

	SECTION - D		
32.	P – Pole, A,B - Gates Let AP =a and PB = b ⇒ a-b =2 = > a=b+2 $AB^2=AP^2+BP^2$ (by thm) $100=a^2+b^2=(b+2)^2+b^2$ $b^2+2b-48=0$ b=6 or b = - 8 b ≠ -8 as distance is not negative ∴b=6, a=8		 ½ 1 1 1 1 ½
33.	Given: A triangle ABC in which a line parallel to side BC intersects other two sides AB and AC at D and E respectively.  To prove: $\frac{AD}{DB}=\frac{AE}{EC}$ **Construction:** Join BE and CD and draw DM ⊥ AC and EN ⊥ AB. Proof: area of Δ ADE $(=\frac{1}{2}\text{base}\times\text{height})=\frac{1}{2}AD\times EN$. (Taking AD as base) So, $ar(BDE)=\frac{1}{2}DB\times EN$. [The area of Δ ADE is denoted as ar (ADE)]. Similarly, $ar(BDE)=\frac{1}{2}DB\times EN$, $ar(ADE)=\frac{1}{2}AE\times DM$ and $ar(DEC)=\frac{1}{2}EC\times DM$. (Taking AE as base) ∴ $\frac{ar(ADE)}{ar(BDE)}=\frac{\frac{1}{2}AD\times EN}{\frac{1}{2}DB\times EN}=\frac{AD}{DB}$ ...(i) and $\frac{ar(ADE)}{ar(DEC)}=\frac{\frac{1}{2}AE\times DM}{\frac{1}{2}EC\times DM}=\frac{AE}{EC}$ ...(ii) $ar(BDE)=ar(DEC)$ ..... (iii) [Δ BDE and DEC are on the same base DE and between the same parallels BC and DE.] Therefore, from (i), (ii) and (iii), we have: $\frac{AD}{DB}=\frac{AE}{EC}$. 2xEC=4x2 EC=8/3		 ½ ½ ½ ½ 1½ ½ 1
34.			

	Height (h) of cylindrical part = height (h) of the conical part = 7 cm		
	Diameter of the cylindrical part = 12 cm		
	Therefore, Radius (r) of the cylindrical part $= \frac{12}{2} = 6$ cm		
	So, Radius of the conical part = 6 cm		
	Slant height (l) of conical part $= \sqrt{r^2 + h^2}$ cm		
	$= \sqrt{6^2 + 7^2}$		
	$= \sqrt{36 + 49}$		
	$= \sqrt{85}$		
	≈ 9.22 cm.		1
	The total surface area of the remaining solid = CSA of the cylindrical part + CSA of the conical part + Base area of the circular part		
	$= 2\pi rh + \pi rl + \pi r^2$		
	$= 2 \times \frac{22}{7} \times 6 \times 7 + \frac{22}{7} \times 6 \times 9.22 + \frac{22}{7} \times 6 \times 6$		1½ 1½
	$= 264 + 173.86 + 113.14$		
	$= 551$ cm^2		1
			

35.

CI	f_i	x_i	$d_i = x_i - a$	f_id_i	
100-120	4	110	−40	−160	
120-140	6	130	−20	−120	−280
140-160	11	150 = a	0	0	
160-180	15	170	20	300	
180-200	8	190	40	320	+620
Total	44			340	

1+1

$$\bar{x} = a + \frac{\Sigma f_id_i}{\Sigma f_i}$$

$$= 150 + \frac{\cancel{340}^{\cancel{170}\,85}}{\cancel{44}_{\cancel{22}\,11}}$$

½

$$\Rightarrow 150 + \frac{85}{11} \Rightarrow 150 + 7.72$$

$$\Rightarrow 150.0 + 7.72 = 157.72$$

½

$$\boxed{157.72} \rightarrow \text{Ans}$$

1

1

$l = 160 \quad h = 20 \quad f_1 = 15 \quad f_0 = 11 \quad f_2 = 8$

$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$= 160 + \left[\frac{15 - 11}{2(15) - 11 - 8}\right]$$

$$= 160 + \frac{4}{30 - 19} \times 20$$

$$= 160 + \frac{4}{11} \times 20$$

$$= 160 + \frac{80}{11}$$

$$= 160 + 7.2$$

$$= 167.2 \text{ Ans}$$

SECTION - E

36

i) $\left(\frac{2+7+5}{3}, \frac{8+7+3}{3}\right)$ ½

$= \frac{14}{3}, \frac{18}{3} = \left(\frac{14}{3}, 6\right)$ ½

ii) $\sqrt{(7-2)^2 + (7-8)^2}$

$= \sqrt{25 + 1}$ ½

$= \sqrt{26}$ ½

iii) Mid pt $\left(\frac{9}{2}, \frac{15}{2}\right)$ ½

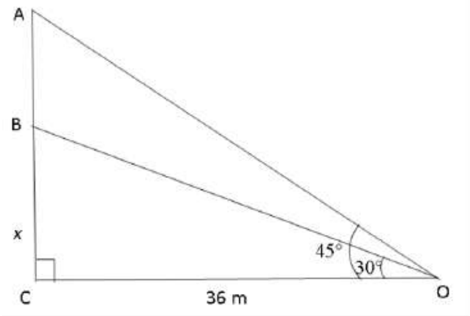
Median $= \sqrt{\left(5 - \frac{9}{2}\right)^2 + \left(3 - \frac{15}{2}\right)^2}$ 1

$= \sqrt{\frac{1}{4} + \frac{81}{4}} = \frac{\sqrt{82}}{2}$ ½

[OR]

A divides PR in the ratio 2 : 1

	A is $\left(\frac{10+2}{3}, \frac{6+8}{3}\right) = \left(4, \frac{14}{3}\right)$ B is the midpoint of AR. B is $\left(\frac{9}{2}, \frac{\frac{14}{3}+3}{2}\right)$ $= \left(\frac{9}{2}, \frac{23}{6}\right)$	1 1
37. (i) (ii) (iii)	Let the numbers on the cards be a, a+d, a+2d, …. $(a + 5d) + (a + 13d) = -76$ $2a + 18d + -76$ $a + 9d = -38$ ------- (1) $(a + 7d) + (a + 15d) = -96$ $2a + 22d = -96$ $a + 11d = -48$ ------ (2) *On solving* (1) & (2) *we get* $2d = -10$ $d = -5$ a + 9 (-5) = -38 a = 7 First card = 7 $a_9 = a + 8d$ 7 + 8 (-5) = -33 $a_{15} = a + 14d$ 7 + 14 (-5) = -63 -33 + (-63) = -129 **[OR]** AP is 7, 2, -2, …. $s_n = \frac{n}{2}[2a + (n-1)d]$ $s_{15} = \frac{15}{2}[2(7) + 14(-5)]$ $s_{15} = -420$	½ ½ ½ ½ 1 ½ ½ ½ ½ ½ ½
38. (i)		1

(ii)		½
(iii)	In ΔBOC, $\tan 30° = \frac{BC}{OC} = \frac{x}{36}$ $\frac{1}{\sqrt{3}} = \frac{x}{36}$ x = $\frac{36}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 12\sqrt{3}m$ = 20.784 m BC = $12\sqrt{3}$ m = 20. 784 m In ΔACO, $cos\ 45° = \frac{OC}{OA}$ $\frac{1}{\sqrt{2}} = \frac{36}{OA}$ OA = $36\sqrt{2}$ = 36×1.414 = 50.904 m **[OR]** In ΔBCO, $cos\ 30° = \frac{OC}{OA}$ $\frac{\sqrt{3}}{2} = \frac{36}{OB}$ OB = $\frac{72}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 24\sqrt{3}$ m ⇒ 41.568 m	½ 1 ½ ½ 1 ½ ½