

Sample Question Paper

Mathematics - Class X

Time : Three hours

Max.Marks :80

General Instructions.

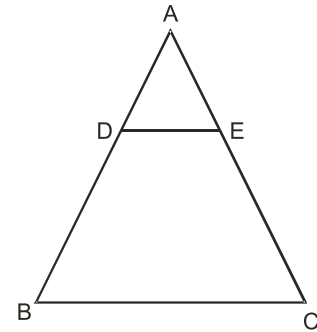
1. All Questions are compulsory.
2. The question paper consists of thirty questions divided into 4 sections A, B, C and D. Section A comprises of ten questions of 01 mark each, section B comprises of five questions of 02 marks each, section C comprises of ten questions of 03 marks each and section D comprises of five questions of 06 marks each.
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
4. There is no overall choice. However, internal choice has been provided in one question of 02 marks each, three questions of 03 marks each and two questions of 06 marks each. You have to attempt only one of the alternatives in all such questions.
5. In question on construction, drawings should be neat and exactly as per the given measurements.
6. Use of calculators is not permitted. However you may ask for mathematical tables.

Section A

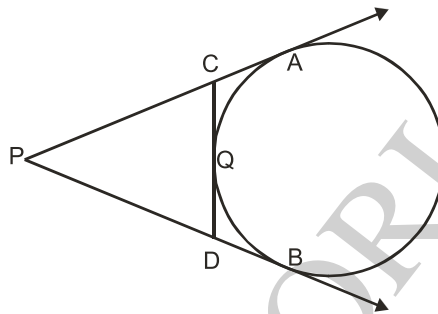
1. Write the condition to be satisfied by q so that a rational number $\frac{p}{q}$ has a terminating decimal expansion.
2. The sum and product of the zeroes of a quadratic polynomial are $-\frac{1}{2}$ and -3 respectively. What is the quadratic polynomial?
3. For what value of k the quadratic equation $x^2 - kx + 4 = 0$ has equal roots?
4. Given that $\tan\theta = \frac{1}{\sqrt{5}}$, what is the value of $\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta}$
5. Which term of the sequence 114, 109, 104 is the first negative term ?

6. A cylinder, a cone and a hemisphere are of equal base and have the same height. What is the ratio in their volumes?

7. In the given figure, DE is parallel to BC and $AD = 1\text{cm}$, $BD = 2\text{cm}$. What is the ratio of the area of $\triangle ABC$ to the area of $\triangle ADE$?

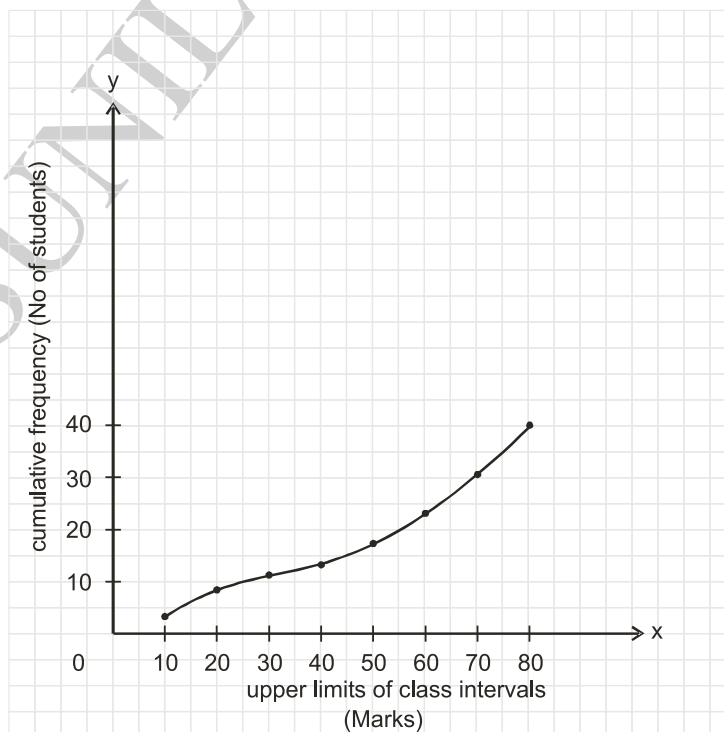


8. In the figure given below, PA and PB are tangents to the circle drawn from an external point P. CD is a third tangent touching the circle at Q. If $PB = 10\text{cm}$, and $CQ = 2\text{cm}$, what is the length of PC?



9. Cards each marked with one of the numbers 4,5,6....20 are placed in a box and mixed thoroughly. One card is drawn at random from the box. What is the probability of getting an even prime number ?

10. A student draws a cumulative frequency curve for the marks obtained by 40 students of a class, as shown below. Find the median marks obtained by the students of the class.



Section B

- 11 Without drawing the graphs, state whether the following pair of linear equations will represent intersecting lines, coincident lines or parallel lines :

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

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

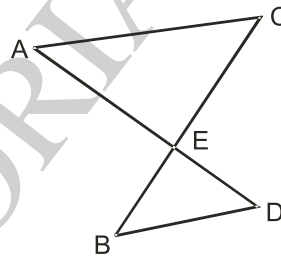
Justify your answer.

12. Without using trigonometric tables, find the value of $\frac{\cos 70^\circ}{\sin 20^\circ} + \cos 57^\circ \operatorname{cosec} 33^\circ - 2 \cos 60^\circ$

- 13 Find a point on the y-axis which is equidistant from the points A(6,5) and B (-4,3).

- 14 In the figure given below, AC is parallel to BD,

Is $\frac{AE}{CE} = \frac{DE}{BE}$? Justify your answer.



15. A bag contains 5 red, 8 green and 7 white balls. One ball is drawn at random from the bag, find the probability of getting
- a white ball or a green ball.
 - neither a green ball nor a red ball.

OR

One card is drawn from a well shuffled deck of 52 playing cards. Find the probability of getting

- a non-face card
- A black king or a red queen.

Section C

- 16 Using Euclid's division algorithm, find the HCF of 56, 96 and 404.

OR

Prove that $3 - \sqrt{5}$ is an irrational number

17. If two zeroes of the polynomial $x^4 + 3x^3 - 20x^2 - 6x + 36$ are $\sqrt{2}$ and $-\sqrt{2}$, find the other zeroes of the polynomial.
18. Draw the graph of the following pair of linear equations

$$x + 3y = 6$$

$$2x - 3y = 12$$

Hence find the area of the region bounded by the

$$x = 0, y = 0 \text{ and } 2x - 3y = 12$$

19. A contract on construction job specifies a penalty for delay of completion beyond a certain date as follows: Rs 200 for 1st day, Rs. 250 for second day, Rs. 300 for third day and so on. If the contractor pays Rs 27750 as penalty, find the number of days for which the construction work is delayed.

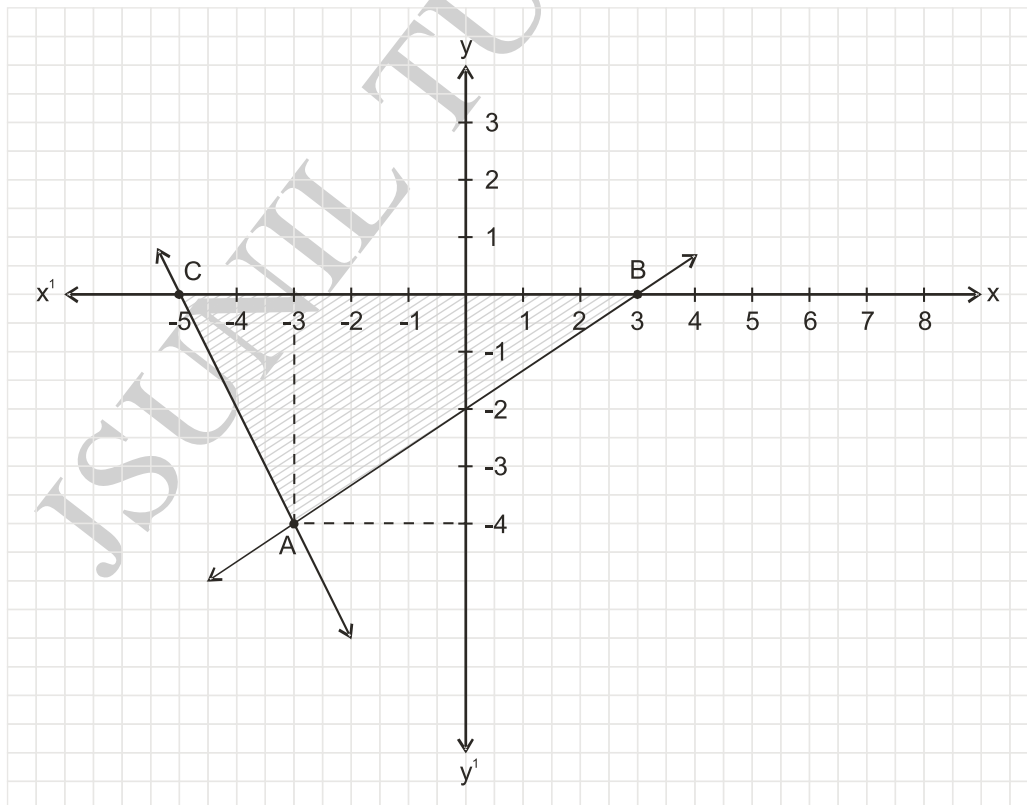
20. Prove that: $\frac{1 + \cos A}{\sin A} + \frac{\sin A}{1 + \cos A} = 2 \operatorname{cosec} A$

OR

Prove that:

$$\frac{\sin A + \cos A}{\sin A - \cos A} + \frac{\sin A - \cos A}{\sin A + \cos A} = \frac{2}{\sin^2 A - \cos^2 A}$$

21. Observe the graph given below and state whether triangle ABC is scalene, isosceles or equilateral. Justify your answer. Also find its area.



22. Find the area of the quadrilateral whose vertices taken in order are A (-5,-3) B(-4, -6), C(2,-1) and D (1,2).
23. Construct a $\triangle ABC$ in which $CA = 6\text{cm}$, $AB = 5\text{cm}$ and $\angle BAC = 45^\circ$, then construct a triangle similar to the given triangle whose sides are $\frac{6}{5}$ of the corresponding sides of the $\triangle ABC$.
24. Prove that the intercept of a tangent between two parallel tangents to a circle subtends a right angle at the centre of the circle.
25. A square field and an equilateral triangular park have equal perimeters. If the cost of ploughing the field at rate of Rs 5/ m^2 is Rs 720, find the cost of maintaining the park at the rate of Rs 10/ m^2 .

OR

An iron solid sphere of radius 3cm is melted and recast into small spherical balls of radius 1cm each. Assuming that there is no wastage in the process, find the number of small spherical balls made from the given sphere.

Section D

26. Some students arranged a picnic. The budget for food was Rs 240. Because four students of the group failed to go, the cost of food to each student got increased by Rs 5. How many students went for the picnic?

OR

A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500km away in time, it had to increase the speed by 250 km/h from the usual speed. Find its usual speed.

27. From the top of a building 100 m high, the angles of depression of the top and bottom of a tower are observed to be 45° and 60° respectively. Find the height of the tower. Also find the distance between the foot of the building and bottom of the tower.

OR

The angle of elevation of the top a tower at a point on the level ground is 30° . After walking a distance of 100m towards the foot of the tower along the horizontal line through the foot of the tower on the same level ground, the angle of elevation of the top of the tower is 60° . Find the height of the tower.

28. Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Using the above, solve the following:

A ladder reaches a window which is 12m above the ground on one side of the street. Keeping its foot at the same point, the ladder is turned to the other side of the street to reach a window 9m high. Find the width of the street if the length of the ladder is 15m.

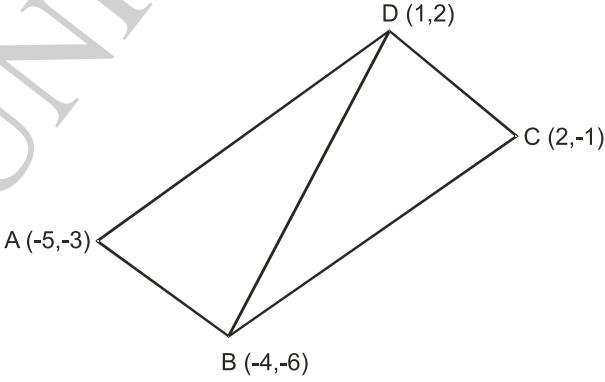
29. The interior of building is in the form of a right circular cylinder of radius 7m and height 6m, surmounted by a right circular cone of same radius and of vertical angle 60° . Find the cost of painting the building from inside at the rate of Rs 30/m²
30. The following table shows the marks obtained by 100 students of class X in a school during a particular academic session. Find the mode of this distribution.

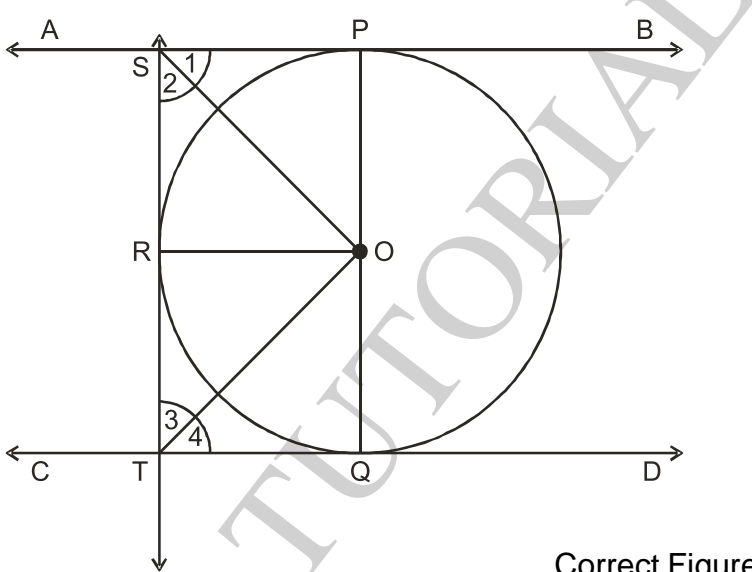
Marks	No. of students
Less than 10	7
Less than 20	21
Less than 30	34
Less than 40	46
Less than 50	66
Less than 60	77
Less than 70	92
Less than 80	100

Marking Scheme
Sample Question Paper I
X- Mathematics

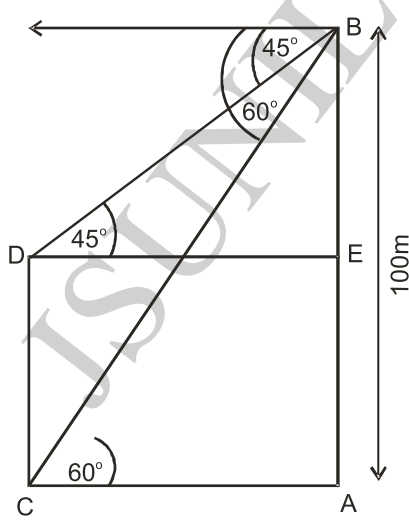
Q.No.	Value points	Marks
Section A		
1	q should be expressible as $2^x \cdot 5^y$ where x, y are whole numbers	1
2	$2x^2 + x - 6$	1
3	± 4	1
4	$\frac{2}{3}$	1
5	24^{th}	1
6	$3 : 1 : 2$	1
7	$9 : 1$	1
8	8 cm.	1
9	0	1
10	55.	1
Section B		
11	<p style="text-align: center;">Parallel lines</p> <p>Here $\frac{a_1}{a_2} = 3, \frac{b_1}{b_2} = 3, \frac{c_1}{c_2} = \frac{10}{9}$</p> <p>$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$</p> <p>Given system of equations will represent parallel lines.</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
12.	<p style="text-align: center;">$\cos 70^\circ = \sin (90^\circ - 70^\circ) = \sin 20^\circ$</p> <p>$\cos 57^\circ = \sin (90^\circ - 57^\circ) = \sin 33^\circ$</p> <p>$\cos 60^\circ = \frac{1}{2}$</p> <p>$\frac{\cos 70^\circ}{\sin 20^\circ} + \cos 57^\circ \operatorname{cosec} 33^\circ - 2 \cos 60^\circ$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

Q.No	Value Points	Marks
	Section C	
16	<p>Using Euclid's division algorithm we have.</p> $96 = 56 \times 1 + 40$ $56 = 40 \times 1 + 16$ $40 = 16 \times 2 + 8$ $16 = 8 \times 2 + 0 \therefore \text{HCF of 56 and 96 is 8.}$ <p>Now to find HCF of 56, 96 and 404 we apply Euclid's division algorithm to 404 and 8 i.e.</p> $404 = 8 \times 50 + 4$ $8 = 4 \times 2 + 0 \therefore 4 \text{ is the required HCF}$ <p style="text-align: center;">OR</p> <p>Let $3 - \sqrt{5}$ be a rational number, say x</p> $\therefore 3 - \sqrt{5} = x$ $\Rightarrow \sqrt{5} = 3 - x$ <p>Here R.H.S is a rational number, as both 3 and x are so</p> $\Rightarrow \sqrt{5} \text{ is a rational number}$ <p>proving that $\sqrt{5}$ is not rational</p> <p>\therefore Our supposition is wrong</p> $\Rightarrow 3 - \sqrt{5} \text{ is an irrational number}$	<p>2</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$1\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
17.	<p>Since $\sqrt{2}$ and $-\sqrt{2}$ are two zeroes of the polynomial</p> <p>$\therefore (x - \sqrt{2})(x + \sqrt{2})$ is a factor of the polynomial.</p> <p>By long division method</p> $x^4 + 3x^3 - 20x^2 - 6x + 36 = (x^2 - 2)(x^2 + 3x - 18)$ $= (x^2 - 2)(x + 6)(x - 3)$ <p>\therefore The other zeroes of the Polynomial are -6,3.</p>	<p>1</p> <p>1</p> <p>1</p>

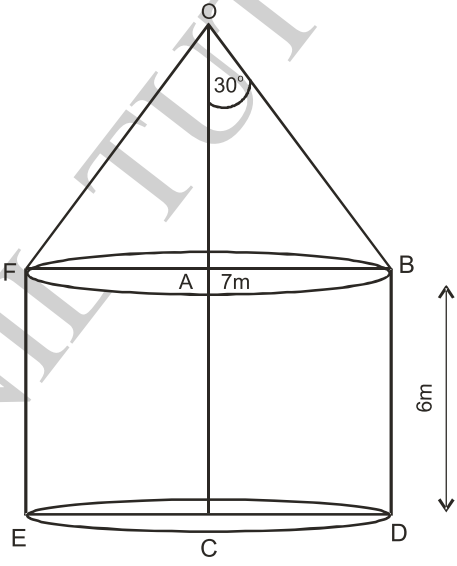
Q.No	Value Points	Marks
	<p>OR</p> <p>LHS = $\frac{(\sin A + \cos A)^2 + (\sin A - \cos A)^2}{(\sin A - \cos A)(\sin A + \cos A)}$</p> <p>= $\frac{\sin^2 A + \cos^2 A + 2\sin A \cos A + \sin^2 A + \cos^2 A - 2\sin A \cos A}{\sin^2 A - \cos^2 A}$</p> <p>= $\frac{2}{\sin^2 A - \cos^2 A} = \text{RHS.}$</p>	<p>1</p> <p>1</p> <p>1</p>
21	<p>Scalene.</p> <p>Justification: Coordinates of A,B and C are respectively (-3, -4), (3,0), (-5,0).</p> <p>$AB = \sqrt{52}$</p> <p>$BC = \sqrt{8}$</p> <p>$CA = \sqrt{20}$</p> <p>Clearly $AB \neq BC \neq CA \therefore$ the given triangle is scalene.</p> <p>Area = $\frac{1}{2} BC \times (\perp \text{ from A on BC})$</p> <p>= $\frac{1}{2} (8 \times 4) = 16 \text{ sq}\cdot\text{u.}$</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>
22.	<div style="text-align: center;">  </div> <p>Area of quad ABCD = area $\triangle ABD$ + area $\triangle BCD$.</p> <p>area $\triangle ABD = \frac{1}{2} [-5(-6-2) - 4(2+3) + (-3+6)]$</p> <p>= $\frac{23}{2} \text{ sq}\cdot\text{u.}$</p> <p>Area $\triangle BCD = \frac{1}{2} [-4(-1-2) + 2(2+6) + 1(-6+1)]$</p>	<p>$\frac{1}{2}$</p> <p>1</p>

Q.No	Value Points	Marks
	$= \frac{23}{2} \text{ sq}\cdot\text{u.}$ $\text{Area of quad ABCD} = \left(\frac{23}{2} + \frac{23}{2} \right) = 23 \text{ sq}\cdot\text{u.}$	<p>1</p> <p>$\frac{1}{2}$</p>
23.	For construction of ΔABC For constructio of the required similar triangle	<p>1</p> <p>2</p>
24.	<div style="text-align: center;">  </div> <p>Since tangent is perpendicular to the radius :</p> $\angle SPO = \angle SRO = \angle OQT = 90^\circ$ <p>In right triangles OPS and ORS</p> <p>OS = OS (Common)</p> <p>OP = OR (radii of circle)</p> <p>$\therefore \Delta OPS \cong \Delta ORS$ (RHS Congruence)</p> <p>$\therefore \angle 1 = \angle 2$</p> <p>Similarly $\angle 3 = \angle 4$</p> <p>Now $\angle 1 + \angle 2 + \angle 3 + \angle 4 = 180^\circ$ (Sum of angles on the same side of Iranversal)</p> <p>$\Rightarrow \angle 2 + \angle 3 = 90^\circ$</p> <p>$\therefore \angle SOT = 90^\circ$</p>	<p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
25.	Let the side of the square be 'a' meters	

Q.No	Value Points	Marks
	$5 \times a^2 = 720 \Rightarrow a = 12\text{m.}$ \therefore Perimeter of square = 48 m. \Rightarrow Perimeter of triangle = 48m. \Rightarrow Side of triangle = 16m. Now Area of triangle = $\frac{\sqrt{3}}{4} \times 16 \times 16$ $= 64 \sqrt{3} \text{ m}^2.$ Cost of maintaining the park $= \text{Rs. } (10 \times 64 \sqrt{3})$ $= \text{Rs. } (640 \sqrt{3}).$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2}$
	OR	
	radius of sphere = 3cm. Volume of sphere = $\frac{4}{3} \pi \times 3 \times 3 \times 3$ $= 36 \pi \text{ cm}^3$ radius of spherical ball = 1 cm. Volume of one spherical ball = $\frac{4}{3} \pi \times 1 \times 1 \times 1$ $\frac{4\pi}{3} \text{ cm}^3$	1 $\frac{1}{2}$
	Let the number of small spherical balls be N. $\left(\frac{4\pi}{3}\right) \times N = 36 \pi$ $\Rightarrow N = 27$	1 $\frac{1}{2}$
	Section D	
26.	Let the number of students who arranged the picnic be x. \therefore Cost of food for one student = $\frac{240}{x}$ New cost of food for one student = $\frac{240}{x-4}$	1 $\frac{1}{2}$

Q.No	Value Points	Marks
	$\frac{240}{x-4} - \frac{240}{x} = 5$ $\Rightarrow x^2 - 4x - 192 = 0$ $\Rightarrow (x - 16)(x + 12) = 0$ $\Rightarrow x = 16 \text{ or } x = -12 \text{ (Rejected)}$ <p>No of students who actually went for the picnic = $16 - 4 = 12$</p> <p style="text-align: center;">OR</p> <p>Let the usual speed of plane be x km/hour</p> <p>Time taken = $\left(\frac{1500}{x}\right)$ hrs. with usual speed</p> <p>Time taken after increasing speed = $\left(\frac{1500}{x+250}\right)$ hrs</p> $\frac{1500}{x} - \frac{1500}{x+250} = \frac{1}{2}$ $\Rightarrow x^2 + 250x - 750000 = 0$ $\Rightarrow (x + 1000)(x - 750) = 0$ $\Rightarrow x = 750 \text{ or } -1000 \text{ (Rejected)}$ <p>\therefore usual speed of plane = 750km/h.</p>	<p>1½</p> <p>1</p> <p>1</p> <p>½</p> <p>½</p> <p>1</p> <p>½</p> <p>1½</p> <p>1</p> <p>1</p> <p>½</p> <p>½</p>
27.	 <p style="text-align: center;">Correct Figure</p> <p>In right $\triangle BAC$, $\frac{AB}{AC} = \tan 60^\circ$</p> $\frac{100}{AC} = \tan 60^\circ$ $\Rightarrow AC = \left(\frac{100}{\sqrt{3}}\right) \text{ m.}$	<p>1</p> <p>1½</p>

Q.No	Value Points	Marks
	<p>In right $\triangle BED$, $\frac{BE}{DE} = \tan 45^\circ = 1$</p> <p style="text-align: center;">$BE = DE$</p> <p style="text-align: center;">$\therefore BE = \left(\frac{100}{\sqrt{3}}\right) \text{ m.}$</p> <p>Height of tower (CD) = AE</p> <p style="text-align: center;">$= AB - BE$</p> <p style="text-align: center;">$= \left(100 - \frac{100}{\sqrt{3}}\right) \text{ m.}$</p> <p style="text-align: center;">$= 42.27 \text{ m.}$</p> <p>Distance between the foot the building and the bottom of the tower (AC) = 57.73 m.</p> <p style="text-align: center;">OR</p> <div style="text-align: center;"> <p style="text-align: center;">Correct figure</p> </div> <p>In right $\triangle BAC$, $\frac{AB}{AC} = \tan 30^\circ$</p> <p style="text-align: center;">$AB = (100 + AD) \times \frac{1}{\sqrt{3}} \quad (i)$</p> <p>In right $\triangle BAD$,</p> <p style="text-align: center;">$\frac{AB}{AD} = \tan 60^\circ$</p> <p style="text-align: center;">$AB = AD \times \sqrt{3} \quad (ii)$</p> <p>From (i) and (ii) we get</p>	<p>1½</p> <p>1</p> <p>½</p> <p>½</p> <p>1</p> <p>1½</p> <p>1½</p>

Q.No	Value Points	Marks
	$\frac{100 + AD}{\sqrt{3}} = AD \times \sqrt{3}$ $100 + AD = 3AD$ $\Rightarrow AD = 50 \text{ m}$ <p>From (ii) $AB = 50\sqrt{3} \text{ m}$</p> $= 50 \times 1.732 \text{ m}$ <p>or, $AB = 86.6 \text{ m}$.</p>	<p>1½</p> <p>1½</p>
28.	<p>Fig, Given, To Prove, Construction</p> <p>Proof</p> <p>2nd part of the question:</p> <p>$AE = 9\text{m}$.</p> <p>$CE = 12\text{m}$.</p> <p>width of street = 21 m.</p>	<p>$\frac{1}{2} \times 4 =$</p> <p>2</p> <p>2</p> <p>1</p> <p>½</p> <p>½</p>
29.	<div style="text-align: center;">  <p style="text-align: center;">Correct Figure.</p> <p>Internal curved surface area of cylinder</p> $= 2\pi rh.$ $= (2\pi \times 7 \times 6) \text{ m}^2$ $= (2 \times \frac{22}{7} \times 7 \times 6) \text{ m}^2$ $= 264 \text{ m}^2$ </div>	<p>1</p> <p>1½</p>

Q.No	Value Points	Marks																		
	<p>In right $\triangle OAB$, $\frac{AB}{OB} = \sin 30^\circ$</p> $\frac{7}{OB} = \frac{1}{2}$ <p>\therefore Slant height of cone (OB) = 14m.</p> <p>Internal curved surface area of cone</p> $= \pi r l$ $= \frac{22}{7} \times 7 \times 14$ $= 308 \text{m}^2.$ <p>Total Area to be painted = (264 + 308)</p> $= 572 \text{m}^2.$ <p>Cost of painting = Rs (30 x 572)</p> $= \text{Rs } 17160.$	<p>1</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p>																		
30	<p>The given data can be written as -</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;">Marks</th> <th style="text-align: left;">No of students</th> </tr> </thead> <tbody> <tr><td>0 - 10</td><td>7</td></tr> <tr><td>10 - 20</td><td>14</td></tr> <tr><td>20 - 30</td><td>13</td></tr> <tr><td>30 - 40</td><td>12</td></tr> <tr><td>40 - 50</td><td>20</td></tr> <tr><td>50 - 60</td><td>11</td></tr> <tr><td>60 - 70</td><td>15</td></tr> <tr><td>70 - 80</td><td>8</td></tr> </tbody> </table>	Marks	No of students	0 - 10	7	10 - 20	14	20 - 30	13	30 - 40	12	40 - 50	20	50 - 60	11	60 - 70	15	70 - 80	8	<p>1</p>
Marks	No of students																			
0 - 10	7																			
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60 - 70	15																			
70 - 80	8																			
	$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$	1																		
	<p>Here Modal class is 40 - 50</p>	1																		
	$\therefore \text{Mode} = 40 + \frac{(20-12)}{(2 \times 20 - 12 - 11)} \times 10$ $= 40 + \frac{80}{17}$ $= 44.7$	<p>2</p> <p>1</p>																		

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Mathematics - Class X

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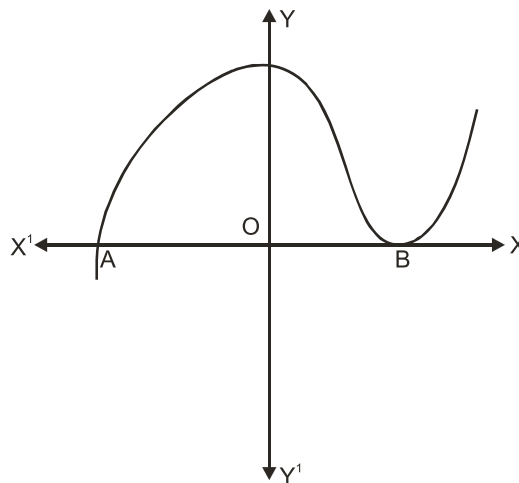
Max. Marks : 80

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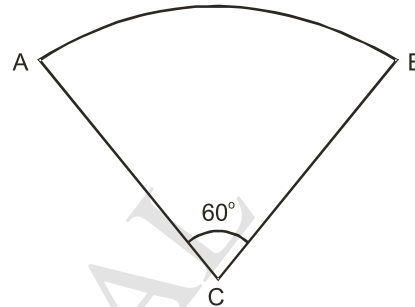
1. State the Fundamental Theorem of Arithmetic.
2. The graph of $y=f(x)$ is given below. Find the number of zeroes of $f(x)$.



3. Give an example of polynomials $f(x)$, $g(x)$, $q(x)$, and $r(x)$ satisfying $f(x) = g(x) \cdot q(x) + r(x)$ where $\deg r(x) = 0$.

4. What is the nature of roots of the quadratic equation $4x^2 - 12x - 9 = 0$?

5. If the adjoining figure is a sector of a circle of radius 10.5 cm,



find the perimeter of the sector. (Take $\pi = \frac{22}{7}$)

6. The length of tangent from a point A at a distance of 5 cm from the centre of the circle is 4 cm. What will be the radius of the circle?

7. Which measure of central tendency is given by the x-coordinate of the point of intersection of the 'more than' ogive and 'less than' ogive?

8. A bag contains 5 red and 4 black balls. A ball is drawn at random from the bag. What is the probability of getting a black ball?

9. What is the distance between two parallel tangents of a circle of the radius 4 cm?

10. The height of a tower is 10m. Calculate the height of its shadow when Sun's altitude is 45° .

Section B

11. From your pocket money, you save Rs. 1 on day 1, Rs. 2 on day 2, Rs. 3 on day 3 and so on. How much money will you save in the month of March 2008 ?

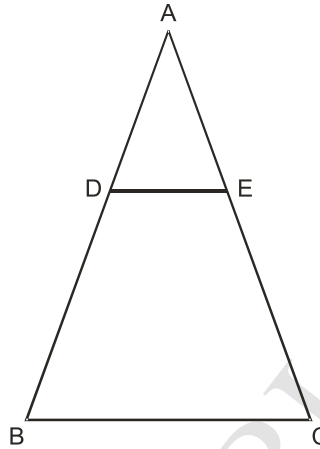
12. Express $\sin 67^\circ + \cos 75^\circ$ in terms of trigonometric ratios of angles between 0° and 45°

OR

If A,B,C are interior angles of a ΔABC , then show that

$$\cos\left(\frac{B+C}{2}\right) = \sin\frac{A}{2}$$

13. In the figure given below, $DE \parallel BC$. If $AD = 2.4$ cm, $DB = 3.6$ cm and $AC = 5$ cm Find AE .



14. Find the values of x for which the distance between the point $P(2, -3)$ and $Q(x, 5)$ is 10 units.
15. All cards of ace, jack and queen are removed from a deck of playing cards. One card is drawn at random from the remaining cards. find the probability that the card drawn is
- a face card
 - not a face card

Section C

16. Find the zeroes of the quadratic polynomial $x^2 + 5x + 6$ and verify the relationship between the zeroes and the coefficients.
17. Prove that $5 + \sqrt{2}$ is irrational.
18. For what value or 'k' will the following pair of linear equations have infinitely many solutions

$$\begin{aligned} kx + 3y &= k-3 \\ 12x + ky &= k \end{aligned}$$

OR

Solve for x and y

$$\frac{5}{x} + \frac{1}{y} = 2$$

$$\} x \neq 0, y \neq 0$$

$$\frac{6}{x} - \frac{3}{y} = 1$$

19. Determine an A.P. whose 3rd term is 16 and when 5th term is subtracted from 7th term, we get 12.

OR

Find the sum of all three digit numbers which leave the remainder 3 when divided by 5.

20. Prove that

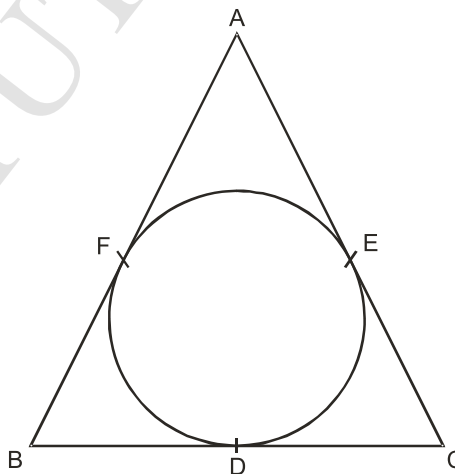
$$\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{Cosec} A$$

21. Prove that the points A(-3,0), B(1,-3) and C(4,1) are the vertices of an isoscles right triangle.

OR

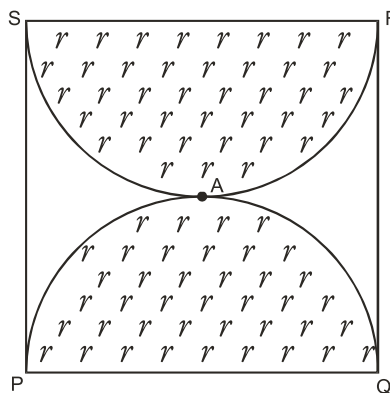
For what value of 'K' the points A (1,5), B (K,1) and C (4,11) are collinear?

22. In what ratio does the point P(2,-5) divide the line segment joining A(-3,5) and B(4,-9)?
23. Construct a triangle similar to given ABC in which AB = 4 cm, BC = 6 cm and $\angle ABC = 60^\circ$, such that each side of the new triangle is $\frac{3}{4}$ of given $\triangle ABC$.
24. The incircle of $\triangle ABC$ touches the sides BC, CA and AB at D,E, and F respectively. IF AB = AC, prove that BD=CD.



25. PQRS is a square land of side 28m. Two semicircular grass covered portions are to be made on two of its opposite sides as shown in the figure. How much area will be left

uncovered? (Take $\pi = \frac{22}{7}$)



Section D

26. Solve the following system of linear equations graphically:

$$3x + y - 12 = 0$$

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

Shade the region bounded by these lines and the x-axis. Also find the ratio of areas of triangles formed by given lines with x-axis and the y-axis.

27. There are two poles, one each on either bank of a river, just opposite to each other. One pole is 60m high. From the top of this pole, the angles of depression of the top and the foot of the other pole are 30° and 60° respectively. Find the width of the river and the height of the other pole.

28. Prove that the ratio of areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

Use the above theorem, in the following.

The areas of two similar triangles are 81 cm^2 and 144 cm^2 . If the largest side of the smaller triangle is 27 cm, find the largest side of the larger triangle.

OR

Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Use the above theorem, in the following.

If ABC is an equilateral triangle with $AD \perp BC$, then $AD^2 = 3 DC^2$.

29. An iron pillar has lower part in the form of a right circular cylinder and the upper part in the form of a right circular cone. The radius of the base of each of the cone and cylinder is 8 cm. The cylindrical part is 240 cm high and the conical part is 36 cm high. Find the weight

of the pillar if 1 cm^3 of iron weighs 7.5 grams. (Take $\pi = \frac{22}{7}$)

OR

A container (open at the top) made up of a metal sheet is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm respectively. Find

- the cost of milk when it is completely filled with milk at the rate of Rs 15 per litre.
- the cost of metal sheet used, if it costs Rs 5 per 100 cm^2

(Take $\pi = 3.14$)

30. The median of the following data is 20.75. Find the missing frequencies x and y , if the total frequency is 100.

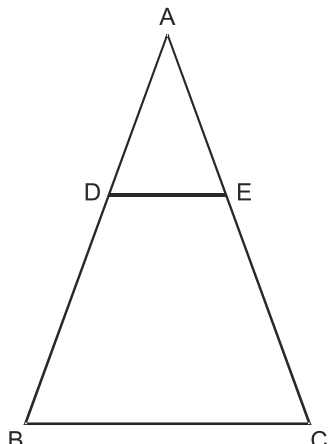
Class Interval	Frequency
0 - 5	7
5 - 10	10
10 - 15	x
15 - 20	13
20 - 25	y
25 - 30	10
30 - 35	14
35 - 40	9

Marking Scheme

X Mathematics - Paper II

Section A

Q.No	Value Points	Marks
1.	Every Composite number can be factorised as a product of prime numbers. This factorisation is unique, apart from the order in which the prime factors occur.	1
2.	Two	1
3.	One such example : $f(x) = x^2 + 1$, $g(x) = x + 1$, $q(x) = (x-1)$ and $r(x) = 2$	1
4.	Real and Unequal	1
5.	32cm.	1
6.	3cm	1
7.	Median.	1
8.	$\frac{4}{9}$	1
9.	8 cm	1
10.	10 m.	1
Section B		
11.	<p>Let money saved be Rs x</p> <p>$\therefore x = 1+2+3+\dots+31$ (\because 31 days in march)</p> $= \frac{31}{2} [1 + 31] \quad \left[\because S_n = \left(\frac{n}{2} \right) (a+l) \right]$ $= \frac{31}{2} \times 32^{16}$ $= 496$ <p>Money Saved = Rs 496</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
12.	<p>$\sin 67^\circ = \sin (90^\circ - 23^\circ)$</p> <p>$\cos 75^\circ = \cos (90^\circ - 15^\circ)$</p> <p>$\therefore \sin 67^\circ + \cos 75^\circ$</p> <p>$= \sin (90^\circ - 23^\circ) + \cos (90^\circ - 15^\circ)$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

Q.No	Value Points	Marks
	<p>$\cos 23^\circ + \sin 15^\circ$</p> <p style="text-align: center;">OR</p> <p>$(\because A+B+C=180^\circ)$ $(\Rightarrow B+C=180^\circ - A)$</p> <p>$\therefore \frac{B+C}{2} = 90^\circ - \frac{A}{2}$</p> <p>$\therefore \text{LHS} = \cos(90^\circ - \frac{A}{2})$</p> <p>$= \sin \frac{A}{2}$</p> <p>$= \text{R.H.S}$</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
13.	<p>In ABC, DE BC,</p> <p>\therefore By B.P.T,</p> $\frac{AE}{EC} = \frac{AD}{DB}$ <p>$\Rightarrow \frac{AE}{AC - AE} = \frac{2.4}{3.6} = \frac{2}{3}$</p> <p>$= 3AE = 2(AC - AE)$</p> <p>$= 5AE = 2AC$ $= 2 \times 5\text{cm}$</p> <p>$= AE = 2\text{cm}$</p>	 <p>1m</p> <p>1m</p>
14.	<p>Given PQ = 10 Units</p> <p>\therefore By Distance Formula</p> $\sqrt{(x-2)^2 + (5+3)^2} = 10$ <p>$\Rightarrow (x-2)^2 + 64 = 100$</p> <p>$\Rightarrow (x-2)^2 = 36$</p> <p>$\Rightarrow x-2 = +6, -6$</p> <p>$\Rightarrow x = 8, -4$</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

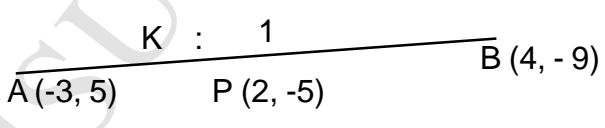
Q.No	Value Points	Marks
15.	<p>Total Number of Cards = 52</p> <p>Cards removed (all aces, jacks and queens)</p> <p style="padding-left: 40px;">= 12</p> <p>Cards Left = 52 - 12</p> <p style="padding-left: 40px;">= 40</p> <p>P (Event) = $\frac{\text{Total number of favourable outcomes}}{\text{Total number of possible outcomes}}$</p> <p>$\therefore P(\text{getting a face Card}) = \frac{4}{40} = \frac{1}{10}$</p> <p>P (Not getting a face Card) = $1 - \frac{1}{10}$</p> <p style="padding-left: 40px;">= $\frac{9}{10}$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
Section C		
16.	<p>$x^2 + 5x + 6 = (x+2)(x+3)$</p> <p>Value of $x^2 + 5x + 6$ is zero</p> <p>When $x+2=0$ or $x+3=0$</p> <p>i.e. $x = -2$ or $x = -3$</p> <p>Sum of zeroes = $(-2) + (-3)$</p> <p style="padding-left: 40px;">= -5</p> <p style="padding-left: 40px;">= $-\left(\frac{5}{1}\right)$</p> <p style="padding-left: 40px;">= $-\left(\frac{\text{Co-efficient of } x}{\text{Coefficient of } x^2}\right)$</p> <p>Product of zeroes = $(-2) \times (-3)$</p> <p style="padding-left: 40px;">= 6</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>

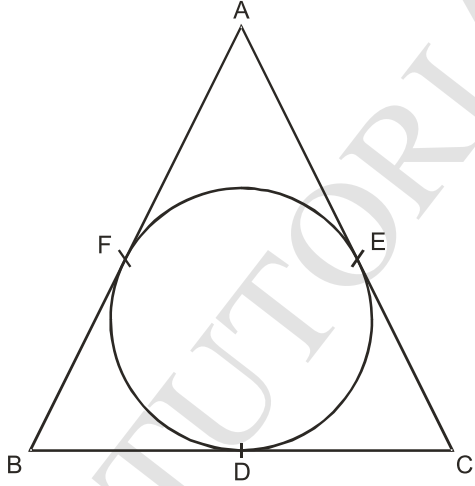
Q.No	Value Points	Marks
17.	$= \frac{6}{1}$	1
	$= \left(\frac{\text{Constant term}}{\text{Coefficient of } x^2} \right)$	1
	Suppose $5 + \sqrt{2}$ is a rational number, say n.	½
	$\Rightarrow \sqrt{2} = n - 5$ <p>As n is rational and we know that 5 is rational, $\therefore n - 5$ is a rational number. $\therefore \sqrt{2}$ is a rational number</p>	½
	Prove that $\sqrt{2}$ is not a rational number \therefore Our supposition is wrong Hence $5 + \sqrt{2}$ is an irrational number	1½ ½
18.	<p>For infinitely many solutions</p> $\frac{k}{12} = \frac{3}{k} = \frac{k-3}{k} \quad (k \neq 0)$ $\frac{k}{12} = \frac{3}{k}$ $= k^2 = 36$ $= k = +6$ $\frac{3}{k} = \frac{k-3}{k}$ $\Rightarrow 3 = k-3 \quad (k \neq 0)$ $\Rightarrow k = 6$ <p>The required value of k is 6.</p> <p style="text-align: center;">OR</p> <p>Put $\frac{1}{x} = u$</p> $\frac{1}{y} = v$	1 1 ½ ½

Q.No	Value Points	Marks
	$\therefore 5u + v = 2 \quad (i)$ $6u - 3v = 1 \quad (ii)$ <p>Multiplying equation (i) by 3 and adding to (ii) we get</p> $15u + 3v = 6$ $6u - 3v = 1$ <p>Adding $21u = 7$</p> $u = \frac{7}{21} = \frac{1}{3}$ $u = \frac{7}{21} = \frac{1}{3}$ <p>From (i) $v = 2 - 5u$</p> $= 2 - 5 \left(\frac{1}{3} \right)$ $= \frac{6-5}{3}$ $v = \frac{1}{3}$ <p>$\therefore x = 3$ $y = 3$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>
19.	<p>Let the A.P be a, a+d, a+2d, - - - -</p> <p>a is the first term, d is the common difference</p> <p>It is given that</p> $a + 2d = 16 \quad (1)$ $(a+6d) - (a+4d) = 12 \quad (2)$ <p>From (2), $a + 6d - a - 4d = 12$</p> $2d = 12$ $d = 6$ <p>Put d = 6 in (1) $a = 16 - 2d$</p> $= 16 - 2(6)$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

Q.No	Value Points	Marks
	$= 16 - 12$ $= 4$ <p>Required A.P. is 4,10,16,22- - - -</p> <p style="text-align: center;">OR</p> <p>The three digit numbers which when divided by 5 leave the remainder 3 are 103, 108, 113, - - - - , 998</p> <p>Let their number be n, then</p> $t_n = a + (n-1)d$ $998 = 103 + (n-1) 5$ $= 103 + 5n - 5$ $5n = 998 - 98$ $n = \frac{900}{5} = 180$ $n = 180$ <p>Now, $S_n = \frac{n}{2} [a + l]$</p> $S_{180} = \frac{180}{2} [103 + 998]$ $= 90 \times 1101$ $= 99090 \text{ Ans.}$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
20.	<p>L.H.S.</p> $= \sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}}$ $= \frac{\sec A - 1 + \sec A + 1}{\sqrt{\sec^2 A - 1}}$ $= \frac{2 \sec A}{\sqrt{\tan^2 A}} \quad (\because \sec^2 A - 1 = \tan^2 A)$	<p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p>

Q.No	Value Points	Marks
	$= \frac{2 \sec A}{\tan A}$ $= 2 \operatorname{cosec} A$ $= \text{R.H.S.}$	$\frac{1}{2}$ $\frac{1}{2}$
21.	<p>By distance formula</p> $\begin{aligned} AB &= \sqrt{(1+3)^2 + (-3-0)^2} \\ &= \sqrt{4^2 + (-3)^2} \\ &= \sqrt{16+9} \\ &= \sqrt{25} \\ &= 5 \text{ units} \end{aligned}$ $\begin{aligned} BC &= \sqrt{(4-1)^2 + (1+3)^2} \\ &= \sqrt{3^2 + 4^2} \\ &= \sqrt{25} \\ &= 5 \text{ units} \end{aligned}$ $\begin{aligned} AC &= \sqrt{(4+3)^2 + (1-0)^2} \\ &= \sqrt{7^2 + 1^2} \\ &= \sqrt{49+1} = \sqrt{50} = 5\sqrt{2} \text{ units} \end{aligned}$ <p>Since $AB = BC = 5$ $\triangle ABC$ is isosceles (1) Now, $(AB)^2 + (BC)^2$$\begin{aligned} &= 5^2 + 5^2 \\ &= 25 + 25 \\ &= 50 \\ &= (AC)^2 \end{aligned}$<p>$\therefore$ By converse of pythagoras theorem</p></p>	1 $\frac{1}{2}$

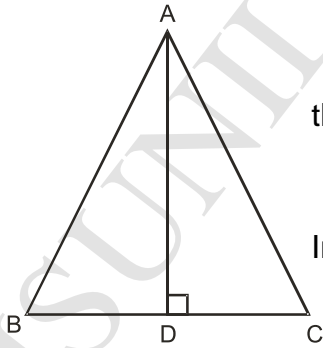
Q.No	Value Points	Marks
	ΔABC is a right triangle (2)	1
	From (1) and (2)	
	ΔABC is an isosceles right triangle	$\frac{1}{2}$
	OR	
	We have $A(x_1, y_1) = A(1, 5)$ $B(x_2, y_2) = B(K, I)$ $C(x_3, y_3) = C(4, 11)$	
	Since the given points are collinear the area of the triangle formed by them must be 0.	1
	$[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] = 0$	$\frac{1}{2}$
	$\Rightarrow 1(1 - 11) + K(11 - 5) + 4(5 - 1) = 0$	$\frac{1}{2}$
	$\Rightarrow -10 + 6K + 4(4) = 0$	
	$\Rightarrow 6K + 6 = 0$	$\frac{1}{2}$
	$\Rightarrow 6K = -6$	
	$K = -1$	
	The required value of $K = -1$	$\frac{1}{2}$
22.	Let the point $P(2, -5)$ divide the line segment joining $A(-3, 5)$ and $B(4, -9)$ in the ratio $K : 1$	$\frac{1}{2}$
		
	By Section formula	
	$2 = \frac{4k - 3}{k + 1}$	1
	$\therefore 2(k + 1) = 4k - 3$	$\frac{1}{2}$

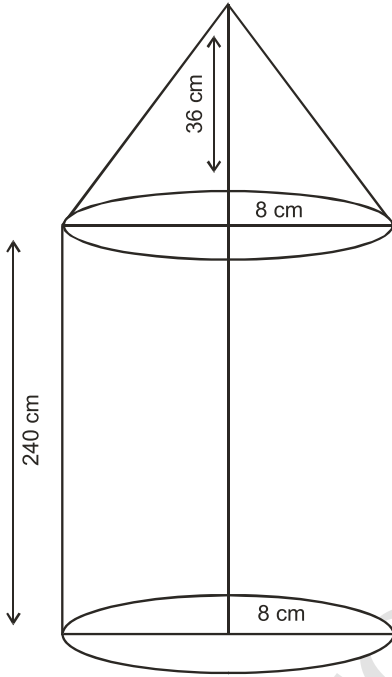
Q.No	Value Points	Marks
	$-2k = -5$ $k = \frac{5}{2}$ <p>∴ The required ratio is 5:2</p>	$\frac{1}{2}$ $\frac{1}{2}$
23.	For constructing $\triangle ABC$ For constructing similar triangle to $\triangle ABC$ with given dimensions	1 2
24.	<div style="text-align: center;">  </div> <p>Since the lengths of tangents drawn from an external point to a circle are equal</p> <p>∴ we have</p> $AF = AE \quad - (1)$ $BF = BD \quad - (2)$ $CD = CE \quad - (3)$ <p>Adding 1, 2 and 3, we get</p> $AF + BF + CD = AE + BD + CE$ $AB + CD = AC + BD$ <p>But $AB = AC$ (given)</p> <p>∴ $CD = BD$</p>	$\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$

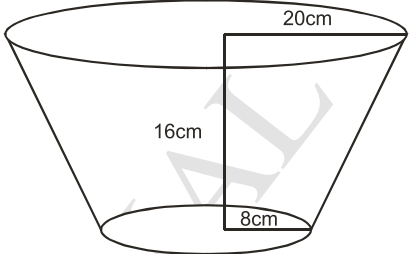
Q.No	Value Points	Marks																
25.	<div style="text-align: center;"> </div> <p>Area left uncovered</p> <p>= Area (Square PQRS) - 2 (Area of Semircircle PAQ)</p> $= [(28 \times 28) - 2 \frac{1}{2} (\frac{22}{7} (14)^2)]m^2$ $= (784 - \frac{22}{7} \times 14 \times 14) m^2$ $= (784 - 616) m^2$ $= 168 m^2$	<p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>																
Q.26	<p style="text-align: center;">Section D</p> <p>We have $3x + y - 12 = 0$</p> $y = 12 - 3x$ <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>y</td> <td>6</td> <td>3</td> <td>0</td> </tr> </table> <p>and $x - 3y + 6 = 0$</p> $y = \frac{6+x}{3}$ <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>3</td> <td>6</td> <td>-6</td> </tr> <tr> <td>y</td> <td>3</td> <td>4</td> <td>0</td> </tr> </table>	x	2	3	4	y	6	3	0	x	3	6	-6	y	3	4	0	
x	2	3	4															
y	6	3	0															
x	3	6	-6															
y	3	4	0															

Q.No	Value Points	Marks
	<div data-bbox="370 233 1230 905" data-label="Figure"> </div> <p data-bbox="380 919 982 993">Since the lines intersect at (3, 3), there is a unique solution given by $x=3, y = 3$</p> <p data-bbox="380 1014 699 1050">Correct shaded portion</p> <p data-bbox="380 1073 1040 1199">Area of triangle ABC formed by lines with x - axis $= \frac{1}{2} \times 10 \times 3$ $= 15\text{sq. units}$</p> <p data-bbox="380 1220 886 1346">Area of triangle BDE formed by lines with y - a x is $= \frac{1}{2} \times 10 \times 3$ $= 15\text{ sq units}$</p> <p data-bbox="380 1419 797 1455">\therefore Ratio of these areas = 1 : 1</p>	<p align="center">2</p> <p align="center">1</p> <p align="center">$\frac{1}{2}$</p> <p align="center">1</p> <p align="center">1</p> <p align="center">$\frac{1}{2}$</p>
27.	<div data-bbox="456 1476 948 1953" data-label="Diagram"> </div> <p align="right" data-bbox="1049 1892 1240 1927">Correct figure</p>	<p align="center">1</p>

Q.No	Value Points	Marks
	<p>Let AB be the first pole and CD be the other one.</p> <p>CA is the width of the river.</p> <p>Draw $DE \perp AB$.</p> <p>Let $CD = h$ metre = AE</p> <p>$BE = (60-h)$ m</p>	<p>$\frac{1}{2}$</p>
	<p>In rt. ($\triangle BAC$), $\frac{BA}{CA} = \tan 60^\circ$</p>	<p>$\frac{1}{2}$</p>
	$\frac{60}{CA} = \sqrt{3}$	
	$CA = \frac{60}{\sqrt{3}}$	
	$= 20\sqrt{3}$	<p>1</p>
	<p>\therefore width of river = $20\sqrt{3}$</p> <p>or</p> <p>= 34.6m</p>	<p>$\frac{1}{2}$</p>
	<p>Now, In rt. ($\triangle BED$)</p>	<p>$\frac{1}{2}$</p>
	$\frac{BE}{DE} = \tan 30^\circ$	
	$\therefore \frac{60-h}{20\sqrt{3}} = \frac{1}{\sqrt{3}}$	<p>$\frac{1}{2}$</p>
	$60-h = 20$	
	$h = 40$	<p>1</p>
	<p>\therefore Height of the other pole = 40m.</p>	<p>$\frac{1}{2}$</p>

Q .No	Value Points		Marks
28.	<p>Given, to prove, construction and figure</p> <p>Correct Proof</p> <p>Let the largest side of the larger triangle be x cm, then</p> $\frac{x^2}{27^2} = \frac{144}{81} \quad (\text{Using the theorem})$ <p>$\therefore x = 36\text{cm}$</p>	<p>$\frac{1}{2} \times 4$</p>	<p>2</p> <p>2</p>
	<p style="text-align: center;">OR</p> <p>Correct given, to prove, construction and figure</p> <p>Correct proof</p> <p>Let AC = a units</p> <p>then $DC = \frac{a}{2}$ units</p> <p>In rt $\triangle ADC$, by the above theorem</p> $AD^2 + DC^2 = AC^2$	<p>$\frac{1}{2} \times 4$</p>	<p>2</p>
	<div style="display: flex; align-items: center;">  <p> $AD^2 = a^2 - \left(\frac{a}{2}\right)^2 = a^2 - \frac{a^2}{4}$ </p> <p> $AD^2 = 3 \left(\frac{a}{2}\right)^2 = 3DC^2$ </p> <p>$\therefore AD^2 = 3DC^2$</p> </div>		<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>

Q.No	Value Points	Marks
29.		
	<p>Radius of base of Cylinder (r) = 8cm</p> <p>Radius of base of Cone(r) = 8cm</p> <p>Height of Cylinder (h) = 240cm</p> <p>Height of Cone (H) = 36cm</p>	1
	<p>Total volume of the pillar</p> <p>= Volume of cylinder + volume of Cone</p>	½
	$= \pi r^2 h + \frac{1}{3} \pi r^2 H$	1
	$= \pi r^2 \left(h + \frac{1}{3} H \right)$	
	$= \frac{22}{7} \times 8 \times 8 \left[240 + \frac{1}{3} (36) \right] \text{ cm}^3$	
	$= \left(\frac{22}{7} \times 8 \times 8 \times 252 \right) \text{ cm}^3$	
	$= 50688 \text{ cm}^3$	2

Q.No	Value Points	Marks
	<p>Weight of the pillar</p> <p>= $(50688 \times \frac{7.5}{1000})$ kg</p> <p>= 380.16 kg</p>	<p>1</p> <p>$\frac{1}{2}$</p>
	<p>OR</p>	
	<p>The Container is a frustum of cone</p> <p>$h = 16\text{cm}, r = 8\text{cm}, R = 20\text{cm}$</p>	 <p>$\frac{1}{2}$</p>
	<p>Volume of the container</p> <p>= $\frac{1}{3} \times \pi h (R^2 + Rr + r^2)$</p> <p>= $\frac{1}{3} \times 3.14 \times 16 ((20)^2 + 20(8) + (8)^2) \text{ cm}^3$</p> <p>= $\frac{1}{3} \times 3.14 \times 16 (400 + 160 + 64) \text{ cm}^3$</p> <p>= $(\frac{1}{3} \times 3.14 \times 16 \times 624) \text{ cm}^3$</p> <p>= $(3.14 \times 3328) \text{ cm}^3$</p> <p>= 10449.92 cm^3</p> <p>= 10.45 litres</p>	<p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p>
	<p>Cost of milk = Rs (10.45 x 15)</p> <p>= Rs 156.75</p>	<p>$\frac{1}{2}$</p>
	<p>Now, slant height of the frustum of cone</p> <p>L = $\sqrt{h^2 + (R-r)^2}$</p> <p>= $\sqrt{(16)^2 + (20-8)^2}$</p> <p>= $\sqrt{256 + 144}$</p> <p>= 20cm</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

Q.No	Value Points	Marks
	$\therefore l = 20$ $f = y$ $c.f = 30 + x$ $h = 5$ <p>Using formula,</p> $\text{Median} = l + \frac{\frac{n}{2} - c.f}{f} \times h$ $20.75 = 20 + \frac{50 - (30 + x)}{y} \times 5$ $\Rightarrow \frac{3}{4} = \frac{(20 - x)}{y} \times 5$ $\Rightarrow 3y = 400 - 20x$ $\Rightarrow 20x + 3y = 400 \quad (2)$ <p>Solving 1 and 2, we get</p> $x = 17$ $y = 20$	<p>$\frac{1}{2}$</p> <p>1</p> <p>$1\frac{1}{2}$</p> <p>1</p>

Sample Question Paper
Mathematics - Class X

Time : Three hours

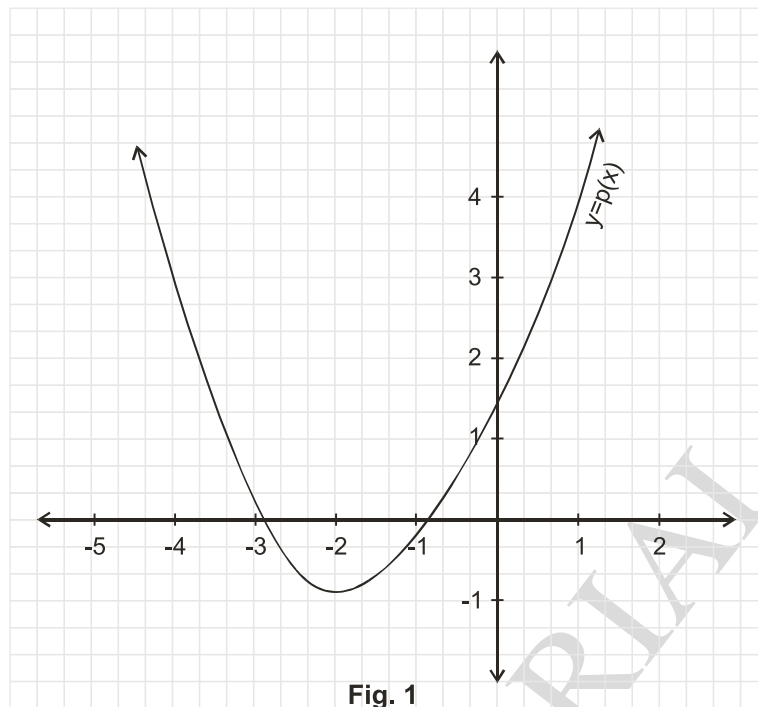
Max. Marks : 80

General Instructions :

1. All Questions are compulsory.
 2. The question paper consists of thirty questions divided into 4 sections A, B, C and D. Section A comprises of ten questions of 01 mark each, section B comprises of five questions of 02 marks each, section C comprises of ten questions of 03 marks each and section D comprises of five questions of 06 marks each.
 3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
 4. There is no overall choice. However, internal choice has been provided in one question of 02 marks each, three questions of 03 marks each and two questions of 06 marks each. You have to attempt only one of the alternatives in all such questions.
 5. In question on construction, drawings should be neat and exactly as per the given measurements.
 6. Use of calculators is not permitted. However, you may ask for mathematical tables.
-

SECTION-A

1. Write 98 as product of its prime factors.
2. In fig. 1 the graph of a polynomial $p(x)$ is given. Find the zeroes of the polynomial.



3. For what value of k , the following pair of linear equations has infinitely many solutions?

$$10x + 5y - (k-5) = 0$$

$$20x + 10y - k = 0$$
4. What is the maximum value of $\frac{1}{\sec \theta}$?
5. If $\tan A = \frac{3}{4}$ and $A+B = 90^\circ$, then what is the value of $\cot B$?
6. What is the ratio of the areas of a circle and an equilateral triangle whose diameter and a side are respectively equal ?

7.

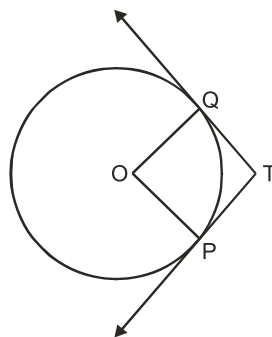


Fig. 2

Two tangents TP and TQ are drawn from an external point T to a circle with centre O, as shown in fig. 2. If they are inclined to each other at an angle of 100° then what is the value of $\angle POQ$?

8. In fig. 3 what are the angles of depression from the observing positions O_1 and O_2 of the object at A?

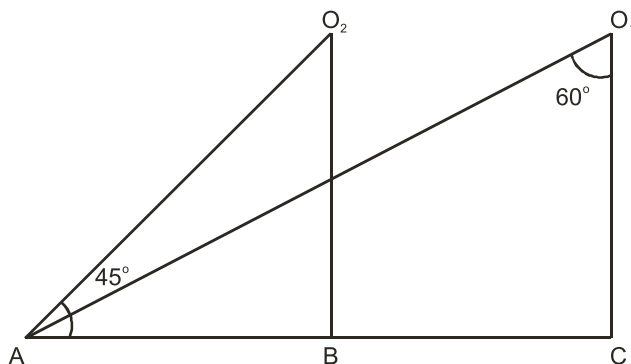


Fig. 3

9. A die is thrown once. what is the probability of getting a prime number?
10. What is the value of the median of the data using the graph in fig. 4, of less than ogive and more than ogive?

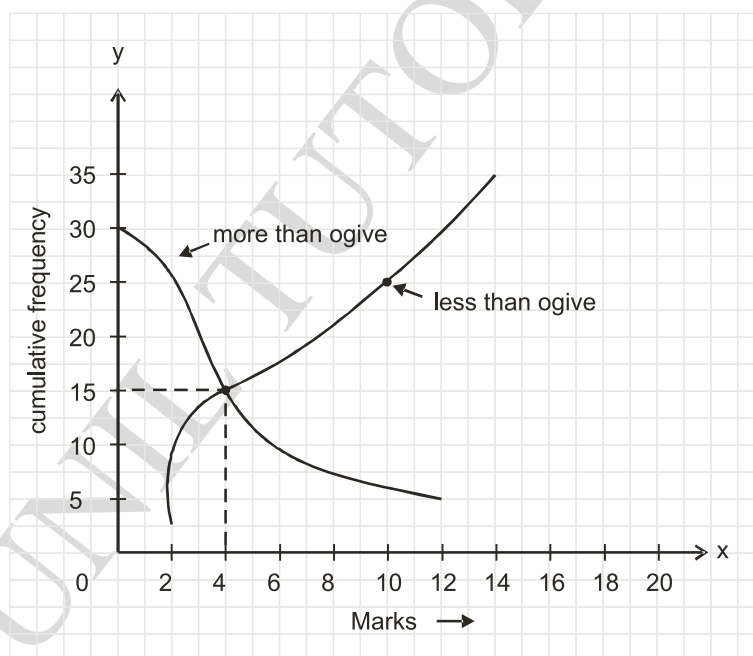


Fig. 4

SECTION : B

11. If the 10th term of an A.P. is 47 and its first term is 2, find the sum of its first 15 terms.
12. Justify the statement : "Tossing a coin is a fair way of deciding which team should get the batting first at the beginning of a cricket game."
13. Find the solution of the pair of equations:

$$\frac{3}{x} + \frac{8}{y} = -1, \quad \frac{1}{x} - \frac{2}{y} = 2, \quad x, y \neq 0$$

14. The coordinates of the vertices of $\triangle ABC$ are $A(4, 1)$, $B(-3, 2)$ and $C(0, k)$ Given that the area of ABC is 12 unit^2 , find the value of k .
15. Write a quadratic polynomial, sum of whose zeroes is $2\sqrt{3}$ and their product is 2.

OR

What are the quotient and the remainder, when $3x^4 + 5x^3 - 7x^2 + 2x + 2$ is divided by $x^2 + 3x + 1$?

SECTION-C

16. If a student had walked 1 km/hr faster, he would have taken 15 minutes less to walk 3 km. Find the rate at which he was walking.
17. Show that $3+5\sqrt{2}$ is an irrational number.
18. Find the value of k so that the following quadratic equation has equal roots:
 $2x^2 - (k-2)x + 1 = 0$
19. Construct a circle whose radius is equal to 4 cm . Let P be a point whose distance from its centre is 6 cm . Construct two tangents to it from P .
20. Prove that

$$\frac{\sin \theta}{\cot \theta + \operatorname{cosec} \theta} = 2 + \frac{\sin \theta}{\cot \theta - \operatorname{cosec} \theta}$$

OR

Evalute

$$\frac{\sec 29^\circ}{\operatorname{Cosec} 61^\circ} + 2 \cot 8^\circ \cot 17^\circ \cot 45^\circ \cot 73^\circ \cot 82^\circ - 3(\sin^2 38^\circ + \sin^2 52^\circ)$$

21. In fig. 5, $\frac{XP}{PY} = \frac{XQ}{QZ} = 3$, if the area of XYZ is 32 cm^2 , then find the area of the quadrilateral $PYZQ$.

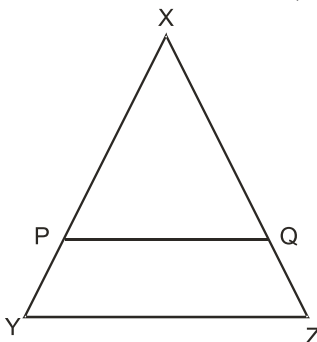


Fig. 5

OR

A circle touches the side BC of a $\triangle ABC$ at a point P and touches AB and AC when produced at Q and R respectively. Show that

$$AQ = \frac{1}{2} (\text{Perimeter of } \triangle ABC)$$

22. Find the ratio in which the line segment joining the points A (3, -6) and B(5,3) is divided by x - axis. Also find the coordinates of the point of intersection.
23. Find a relation between x and y such that the point P(x,y) is equidistant from the points A(2, 5) and B(-3, 7)
24. If in fig. 6, $\triangle ABC$ and $\triangle AMP$ are right angled at B and M respectively. prove that $CA \times MP = PA \times BC$

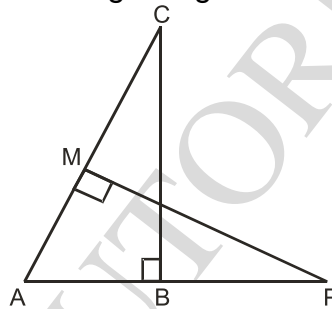


Fig. 6

25. In Fig. 7, OAPB is a sector of a circle of radius 3.5 cm with the centre at O and $\angle AOB = 120^\circ$. Find the length of OAPBO.

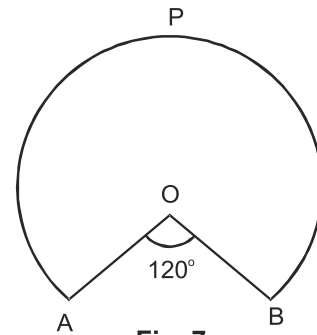


Fig. 7

OR

Find the area of the shaded region of fig. 8 if the diameter of the circle with centre O is

$$28 \text{ cm and } AQ = \frac{1}{4} AB.$$

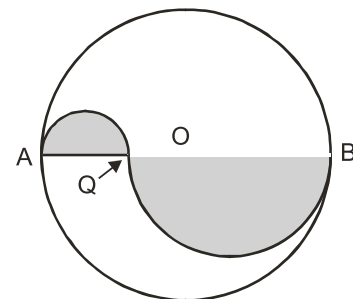


Fig. 8

SECTION-D

- [26] Prove that in a triangle, if the square of one side is equal to the sum of the squares of the other two sides the angle opposite to the first side is a right angle. Using the converse of above, determine the length of an altitude of an equilateral triangle of side 2 cm.
- [27] Form a pair of linear equations in two variables using the following information and solve it graphically.
Five years ago, Sagar was twice as old as Tiru. Ten year later Sagar's age will be ten years more than Tiru's age. Find their present ages. What was the age of Sagar when Tiru was born?
- [28] From the top and foot of a tower 40m high, the angle of elevation of the top of a light house is found to be 30° and 60° respectively. Find the height of the lighthouse. Also find the distance of the top of the lighthouse from the foot of the tower.
- [29] A solid is composed of a cylinder with hemispherical ends. If the whole length of the solid is 100cm and the diameter of the hemispherical ends is 28cm. find the cost of polishing the surface of the solid at the rate of 5 paise per sq.cm.

OR

An open container made up of a metal sheet is in the form of a frustum of a cone of height 8cm with radii of its lower and upper ends as 4 cm and 10 cm respectively. Find the cost of oil which can completely fill the container at the rate of Rs. 50 per litre. Also, find the cost of metal used, if it costs Rs. 5 per 100 cm^2 (Use $\pi = 3.14$)

- [30] The mean of the following frequency table is 53. But the frequencies f_1 and f_2 in the classes 20-40 and 60-80 are missing. Find the missing frequencies.

Age (in years)	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	Total
Number of people	15	f_1	21	f_2	17	100

OR

Find the median of the following frequency distribution:

Marks	Frequency
0-100	2
100-200	5
200-300	9
300-400	12
400-500	17
500-600	20
600-700	15
700-800	9
800-900	7
900-1000	4

MARKING SCHEME III

X MATHEMATICS

SECTION A

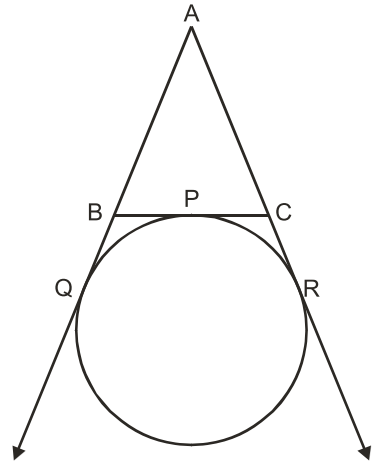
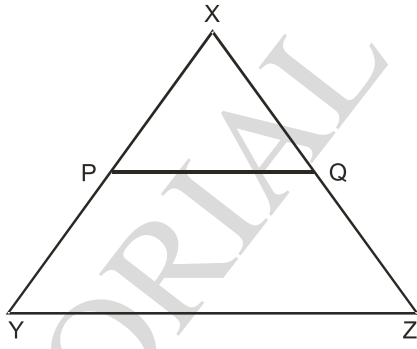
Q.No	Value Points	Marks
1.	2×7^2	1
2.	- 3 and -1	1
3.	$k = 10$	1
4.	one	1
5.	$\frac{3}{4}$	1
6.	$\pi : \sqrt{3}$	1
7.	$\angle POQ = 80^\circ$	1
8.	$30^\circ, 45^\circ$	1
9.	$\frac{1}{2}$	1
10.	4	1
SECTION B		
11.	<p>Let a be first term and d be the common difference of the A.P.</p> <p>As we know that $a_n = a + (n - 1)d \Rightarrow 47 = 2 + 9d \Rightarrow d=5$</p> <p>$\therefore S_{15} = \frac{15}{2} [2 \times 2 + (15 - 1) 5] = 555$</p>	<p>1</p> <p>1</p>
12.	<p>When we toss a coin, the outcomes head or tail are equally likely. So that the result of an individual coin toss is completely unpredictable. Hence both the teams get equal chance to bat first so the given statement is justified.</p>	<p>1</p> <p>1</p>
13.	<p>$\frac{3}{x} + \frac{8}{y} = -1,$(i)</p>	

Q.No	Value Points	Marks
	$\frac{1}{x} - \frac{2}{y} = 2 \quad \dots\dots\dots(ii)$ <p>(i) + (ii) $\times 4 = \frac{7}{x} = 7 \Rightarrow x = 1$</p> <p>From (ii) we get $1 - \frac{2}{y} = 2 \Rightarrow y = -2$</p>	<p>1</p> <p>1</p>
14.	$ABC = \frac{1}{2} [4(2-k) + (-3)(k-1) + 0(1-2)] = 12 \text{ units}^2$ $\Rightarrow \pm 12 = \frac{1}{2} [8 - 4k - 3k + 3]$ $= -7k = 13, -35$ $= k = -\frac{13}{7}, 5$	<p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
15.	<p>Let the quadratic polynomial be $x^2 + bx + c$ and its zeroes be α and β then we have</p> $\alpha + \beta = 2\sqrt{3} = -b$ $\alpha\beta = 2 = c$ $\Rightarrow b = -2\sqrt{3} \text{ and } c = 2, \text{ So a quadratic polynomial which satisfies the given conditions is } x^2 - 2\sqrt{3}x + 2$ <p style="text-align: center;">OR</p> <p>By long division method Quotient = $3x^2 - 4x + 2$ Remainder = 0</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p>
16.	<p>SECTION C</p> <p>Let the original speed of walking of the student be x km/h Increased speed = $(x + 1)$ km/h</p> $\therefore \frac{3}{x} - \frac{3}{x+1} = \frac{15}{60}$	<p>$\frac{1}{2}$</p> <p>1</p>

Q.No	Value Points	Marks
	$\Rightarrow 4 \times 3(x+1-x) = x^2 + x$ $\Rightarrow x^2 + x - 12 = 0$ $\Rightarrow (x+4)(x-3) = 0$ $\Rightarrow x = 3, x = -4 \text{ (rejected)}$ <p>\therefore His original speed was 3 km/h</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
17.	<p>Let us assume, to the contrary, that $3 + 5\sqrt{2}$ is a rational number, say x</p> $\Rightarrow 5\sqrt{2} = x - 3$ $\Rightarrow \sqrt{2} = \frac{x-3}{5}$ <p>Now x, 3 and 5 are all rational numbers</p> $\Rightarrow \frac{x-3}{5} \text{ is also a rational number}$ $\Rightarrow \sqrt{2} \text{ is a rational number}$ <p>Prove : $\sqrt{2}$ is not a rational number</p> <p>\therefore Our assumption is wrong</p> <p>Hence $3 + 5\sqrt{2}$ is not a rational number</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$1\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
18.	<p>Condition for $ax^2+bx+c=0$, have equal roots is</p> $b^2 - 4ac = 0$ $\therefore [-(k-2)]^2 - 4(2)(1) = 0$ $\therefore k^2 - 4k - 4 = 0$ $\therefore k = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(-4)}}{2}$ $\therefore k = \frac{4 \pm 4\sqrt{2}}{2}$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

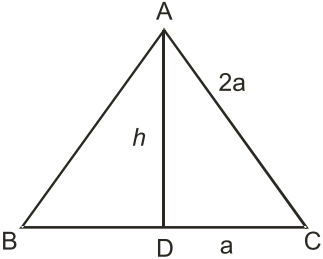
Q.No	Value Points	Marks
	$\therefore k = 2 + 2\sqrt{2}$ or $k = 2 - 2\sqrt{2}$	1
19.	Construction of circle Location of point P Construction of the tangents	1/2 1/2 2
20.	$\frac{\sin\theta}{\cot\theta + \operatorname{cosec}\theta} = 2 + \frac{\sin\theta}{\cot\theta + \operatorname{cosec}\theta}$ is true if $\frac{\sin\theta}{\cot\theta + \operatorname{cosec}\theta} - \frac{\sin\theta}{\cot\theta - \operatorname{cosec}\theta} = 2$ $\text{LHS} = \frac{\sin\theta \cot\theta - \sin\theta \operatorname{cosec}\theta - \sin\theta \cot\theta - \sin\theta \operatorname{cosec}\theta}{(\cot\theta + \operatorname{cosec}\theta)(\cot\theta - \operatorname{cosec}\theta)}$ $= \frac{-2 \sin\theta \operatorname{cosec}\theta}{\cot^2\theta - \operatorname{cosec}^2\theta}$ $= \frac{-2 \left(\sin\theta \times \frac{1}{\sin\theta} \right)}{-1}$ $= 2$ = RHS i.e. LHS = RHS Hence proved	1/2 1/2 1 1/2
	OR	
	$\sec 29^\circ = \sec (90^\circ - 61^\circ) = \operatorname{cosec} 61^\circ$, $\cot 17^\circ = \cot (90^\circ - 73^\circ) = \tan 73^\circ$	1
	$\cot 8^\circ = \cot (90^\circ - 82^\circ) = \tan 82^\circ$ $\sin^2 38^\circ = \sin^2 (90^\circ - 52^\circ) = \cos^2 52^\circ$	1
	$\cot 45^\circ = 1$	
	$\therefore \frac{\sec 29^\circ}{\operatorname{cosec} 61^\circ} + 2 \cot 8^\circ \cot 17^\circ \cot 82^\circ \cot 73^\circ - 3 (\sin^2 38^\circ + \sin^2 52^\circ)$	
	$= \frac{\operatorname{cosec} 61^\circ}{\operatorname{cosec} 61^\circ} + 2 \tan 82^\circ \tan 73^\circ \cot 82^\circ \cot 73^\circ - 3 (\cos^2 52^\circ + \sin^2 52^\circ)$	1/2

Q.No	Value Points	Marks
	$\Rightarrow \quad = 1 + 2 - 3$ $= 0$	1/2
21	<p> $\frac{XP}{XY} = \frac{XQ}{XZ} = \frac{3}{4} \quad \angle X = \angle X$ </p> <p> $\Delta XPQ \sim \Delta XYZ$ </p> <p> $\frac{XP}{XY} = \frac{3}{4}$ </p> <p> $\therefore \frac{\text{ar } \Delta XPQ}{\text{ar } \Delta XYZ} = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$ </p> <p> $\text{ar } \Delta XPQ = \frac{9}{16} \times 32 = 18 \text{ cm}^2$ </p> <p> $\text{ar of quad } PYZQ = (32 - 18) \text{ cm}^2 = 14 \text{ cm}^2$ </p> <p style="text-align: center;">OR</p> <p> $BP = BQ \text{ and } CP = CR$ </p> <p> $AQ = AR$ </p> <p> $AQ + AR = AB + BQ + AC + CR$ </p> <p> $AQ + AQ = AB + BP + AC + PC$ </p> <p> $2AQ = AB + AC + BC$ </p> <p> $AQ = \frac{1}{2} [AB + AC + BC]$ </p> <p> $AQ = \frac{1}{2} (\text{perimeter of } \Delta ABC)$ </p>	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>



Q.No	Value Points	Marks
22.	<p>Let the ratio be $k : 1$ then the coordinates of the point which divides AB in the ratio $k : 1$ are</p> $\left(\frac{5k+3}{k+1}, \frac{3k-6}{k+1} \right)$ <div style="display: flex; align-items: center; justify-content: center; margin: 10px 0;"> <div style="text-align: center; margin-right: 20px;"> $\frac{k}{A(3, -6)}$ </div> <div style="text-align: center; margin-right: 20px;"> \vdots P </div> <div style="text-align: center; margin-left: 20px;"> $\frac{i}{B(5,3)}$ </div> </div> <p>This point lies on x - axis</p> $\frac{3k-6}{k+1} = 0$ $\Rightarrow k = 2$ <p>hence the ratio is 2:1</p> <p>Putting $k = 2$ we get the point of intersection</p> $\left(\frac{13}{3}, 0 \right)$	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
23.	<p>Let P (x,y) be equidistant from the point A (2, 5) and B (-3, 7).</p> <p>$\therefore AP = BP$ so $AP^2 = BP^2$</p> $(x - 2)^2 + (y - 5)^2 = (x + 3)^2 + (y - 7)^2$ $x^2 - 4x + 4 + y^2 - 10y + 25 = x^2 + 6x + 9 + y^2 - 14y + 49$ $- 10x + 4y = 29$ <p>or $10x - 4y + 29 = 0$ is the required relation</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p>
24.	<p>$\triangle AMP \sim \triangle ABC$</p> $\therefore \frac{PA}{CA} = \frac{MP}{BC}$ $\Rightarrow CA \times MP = PA \times BC$	<p>1</p> <p>$1\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>

Q.No	Value Points	Marks
25.	<p>length of OAPBO = length of arc BPA + 2 (radius)</p> $= \frac{240}{360} \times 2 \times \frac{22}{7} \times 3.5 + 2 \times 3.5$ $= \frac{2}{3} \times 2 \times \frac{22}{7} \times \frac{7}{2} + 7$ $= 14 \frac{2}{3} + 7 = 21 \frac{2}{3}$ <p>Length of OAPBO = $21 \frac{2}{3}$ cm</p> <p style="text-align: center;">OR</p> <p>Diameter AQ = $\frac{1}{4} \times 28 = 7$ cm $\Rightarrow r_1 = \frac{7}{2}$ cm</p> <p>Diameter QB = $\frac{3}{4} \times 28 = 21$ cm $\Rightarrow r_2 = \frac{21}{2}$ cm</p> <p>area of shaded region = $= \frac{\pi}{2} \times \left[\left(\frac{7}{2} \right)^2 + \left(\frac{21}{2} \right)^2 \right]$</p> $= \frac{\pi}{2} \times \left(\frac{7}{2} \right)^2 [1+3^2]$ $= \frac{1}{2} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} [10]$ $= \frac{77 \times 5}{2} = \frac{385}{2} = 192.5 \text{ cm}^2$	<p>1</p> <p>1</p> <p>1</p> <p>1/2</p> <p>1/2</p> <p>1</p> <p>1</p>

Q.No	Value Points	Marks
SECTION D		
26.	<p>Given, to prove, constand, figure</p> <p>Proof of theorem</p> <p>$AD \perp BC$</p> <p>$(2a)^2 = h^2 + a^2$</p> <p>$h^2 = 4a^2 - a^2$</p> <p>$h = \sqrt{3} a$</p> <p>$2a = 2 \Rightarrow a = 1 \text{ cm}$</p> <p>$\therefore h = \sqrt{3} \text{ cm}$</p>	<p>$\frac{1}{2} \times 4 =$</p> <p>2</p> <p>2</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
		

27. Present age of sagar be x yrs & that of Tiru be y years.

$$x - 5 = 2 (y - 5)$$

$$x - 2y + 5 = 0$$

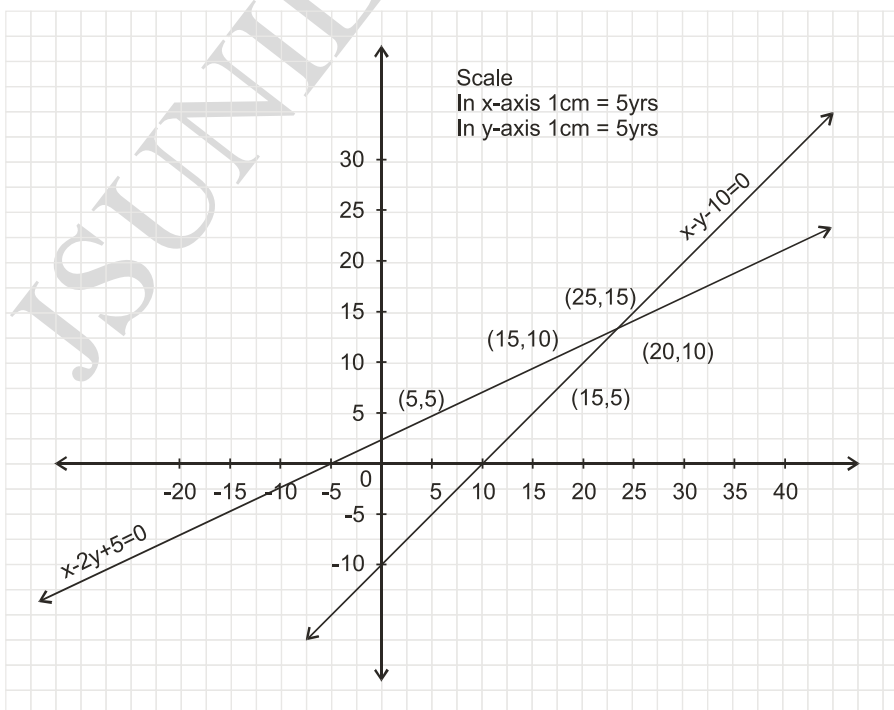
$$x + 10 = (y + 10) + 10$$

$$x - y - 10 = 0$$

Equations : 1+1

x	5	15	25
y	5	10	15

x	15	20	25
y	5	10	15



Group : 1+1

Q.No	Value Points	Marks
28	<p>Since the lines intersect at (25, 15) Sagar's present age = 25 yrs, Tiru's present age = 15 yrs.</p>	<p>$\frac{1}{2}$ $\frac{1}{2}$</p>
	<p>From graph it is clear that Sagar was 10 years's old, when Tiru was born. 1</p>	1
	<p>For correct figure</p>	1
	<p>Let AE = h metre and BE = CD = x metre</p>	
	$\therefore \frac{x}{h} = \cot 30^\circ = \sqrt{3}$	1
	$\Rightarrow x = h\sqrt{3} \Rightarrow BE = CD = h\sqrt{3} \text{ m}$	$\frac{1}{2}$
	$\frac{h+40}{x} = \tan 60^\circ = \sqrt{3}$	
	$h+40 = \sqrt{3} \times h (\sqrt{3})$	1
	$h = 20\text{m}$	$\frac{1}{2}$
	<p>height of lighthouse is $20 + 40 = 60\text{m}$</p>	$\frac{1}{2}$
	$\frac{AD}{AC} = \sin 60^\circ = \frac{\sqrt{3}}{2}$	$\frac{1}{2}$
	$\Rightarrow AC = 60 \times \frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$	$\frac{1}{2}$
	$\Rightarrow AC = 40\sqrt{3} \text{ m}$	
	<p>Hence the distance of the top of lighthouse from the foot of the tower is $40\sqrt{3} \text{ m}$</p>	$\frac{1}{2}$

Q.No	Value Points	Marks
29.	<p>Radius of hemisphere = 14cm.</p> <p>Length of cylindrical part = $[100 - 2(14)] = 72\text{cm}$</p> <p>radius of cylindrical part = radius of hemispherical ends = 14cm</p> <p>Total area to be polished</p> <p>= 2 (C.S.A. of hemispherical ends) + C.S.A. of cylinder</p> <p>= $2 (2 \pi r^2) + 2 \pi rh$</p> <p>= $2 \times \frac{22}{7} \times 14 (2 \times 14 + 72) = 8800\text{cm}^2$</p> <p>Cost of polishing the surface = Rs. 8800×0.05</p> <p>= Rs. 440</p> <p style="text-align: center;">OR</p> <p>The container is a frustum of a cone height 8cm and radius of the bases 10 cm and 4 cm respectively</p> <p>$h = 8\text{cm}, r_1 = 10\text{cm}, r_2 = 4\text{cm}$</p> <p>Slant height $l = \sqrt{8^2 + (10 - 4)^2} = \sqrt{8^2 + 6^2} = 10\text{cm}$</p> <p>Volume of container = $\frac{1}{3} \pi h (r_1^2 + r_2^2 + r_1 r_2)$</p> <p style="padding-left: 40px;">= $\frac{1}{3} \times 3.14 \times 8 (100 + 16 + 40) \text{cm}^3$</p> <p style="padding-left: 40px;">= $\frac{1}{3} \times 3.14 \times 8 (156)$</p> <p style="padding-left: 40px;">= $1306.24 \text{cm}^3 = 1.31 / \text{Litres (approx)}$</p> <p>Quantity of oil = 1.31/ Litres</p> <p>Cost of oil = Rs. (1.31×50)</p> <p style="padding-left: 40px;">= Rs. 65.50</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>

Q.No	Value Points	Marks																								
	<p>Surface area of the container (excluding the upper end)</p> $= \pi \times [l(r_1 + r_2) + r_2^2]$ $= 3.14 \times [10(10 + 4) + 16]$ $= 3.14 \times 156$ $= 489.84 \text{ cm}^2$ <p>cost of metal = Rs. $\left(489.84 \times \frac{5}{100}\right)$ =Rs 24.49</p>	<p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p>																								
30.	<table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 20%;">Age</th> <th style="width: 20%;">Number of people f_i</th> <th style="width: 20%;">Class mark(x_i)</th> <th style="width: 40%;"> $x_i f_i$</th> </tr> </thead> <tbody> <tr> <td>0-20</td> <td style="text-align: center;">15</td> <td style="text-align: center;">10</td> <td style="text-align: center;">150</td> </tr> <tr> <td>20-40</td> <td style="text-align: center;">f_1</td> <td style="text-align: center;">30</td> <td style="text-align: center;">$30f_1$</td> </tr> <tr> <td>40-60</td> <td style="text-align: center;">21</td> <td style="text-align: center;">50</td> <td style="text-align: center;">1050</td> </tr> <tr> <td>60-80</td> <td style="text-align: center;">f_2</td> <td style="text-align: center;">70</td> <td style="text-align: center;">$70f_2$</td> </tr> <tr> <td>80-100</td> <td style="text-align: center;">17</td> <td style="text-align: center;">90</td> <td style="text-align: center;">1530</td> </tr> </tbody> </table> <p> $\sum f_i = 53 + f_1 + f_2 = 100$ $\sum x_i f_i = 2730 + 30 f_1 + 70f_2$ </p> <p> $\Rightarrow f_1 + f_2 = 47$ ----- (i) </p> <p> $\bar{x} = \frac{\sum x_i f_i}{\sum f_i}$ $53 = \frac{2730 + 30 f_1 + 70f_2}{100}$ </p> <p> $\Rightarrow 3f_1 + 7f_2 = 257$ ----- (ii) </p> <p>Multiplying (i) by 3 and subtracting it from (ii) we get</p> <p> $f_2 = 29$ </p>	Age	Number of people f_i	Class mark(x_i)	$x_i f_i$	0-20	15	10	150	20-40	f_1	30	$30f_1$	40-60	21	50	1050	60-80	f_2	70	$70f_2$	80-100	17	90	1530	<p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p>
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Q.No	Value Points	Marks
	Put $f_2 = 29$ in (i) we get $f_1 = 18$ Hence $f_1 = 18$ and $f_2 = 29$	1 $\frac{1}{2}$
	OR	

Age	frequency	Cumulative frequency (C.F)
0 - 100	2	2
100 - 200	5	7
200 - 300	9	16
300 - 400	12	28
400 - 500	17	45
500 - 600	20	65
600 - 700	15	80
700 - 800	9	89
800 - 900	7	96
900 - 1000	4	100

$N = \sum f_i = 100 \therefore \frac{N}{2} = 50$	1
\therefore median class is 500 - 600	1
$l = 500, f = 20, F = 45, h = 100$	2
Hence	
$\text{Median} = l + \left(\frac{\frac{N}{2} - F}{f} \right) \times h$	1
$\text{Median} = 500 + \left(\frac{50 - 45}{20} \right) \times 100$	
$\text{Median} = 525$	1