Blue Print II X – Mathematics

Form of Questions Unit	VSA (1 Mark) each	SAI (2 Marks) each	SA II (3 Marks) each	LA (6 Marks) each	Total
Number systems	1(1)	—	3(1)	—	4(2)
Algebra	3(3)	2(1)	9(3)	6(1)	20(8)
Trigonometry	1(1)	2(1)	3(1)	6(1)	12(4)
Coordinate Geometry	—	2(1)	6(2)	—	8(3)
Geometry	2(2)	2(1)	6(2)	6(1)	16(6)
Mensuration	1(1)	—	3(1)	6(1)	10(3)
Statistic and Probability	2(2)	2(1)	—	6(1)	10(4)
Total	**10(10)**	**10(5)**	**30(10)**	**30(5)**	**80(30)**

Sample Question Paper - I

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.

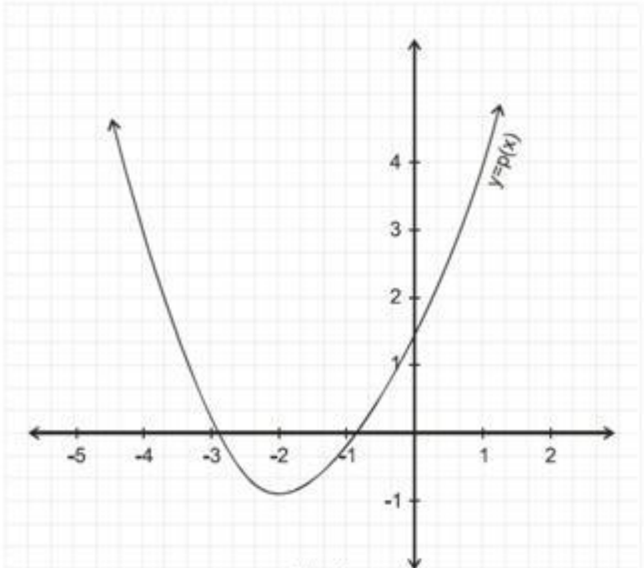


Fig. 1

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°, 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.

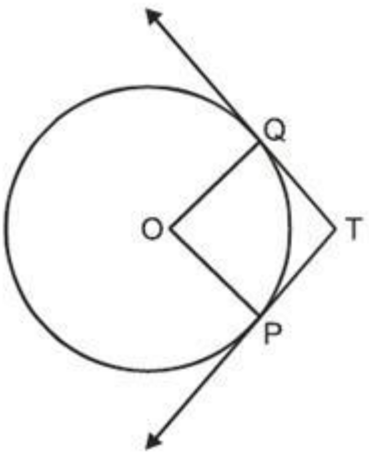


Fig. 2

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 ÐPOQ?

8. In fig. 3, what are the angles of depression from the observing positions O1 and O2 of the object at A?

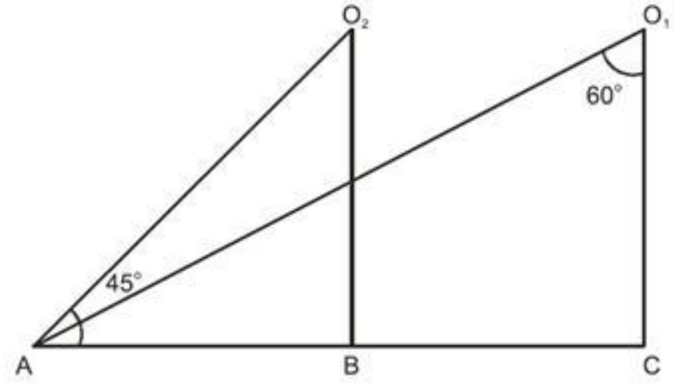


Fig. 3

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?

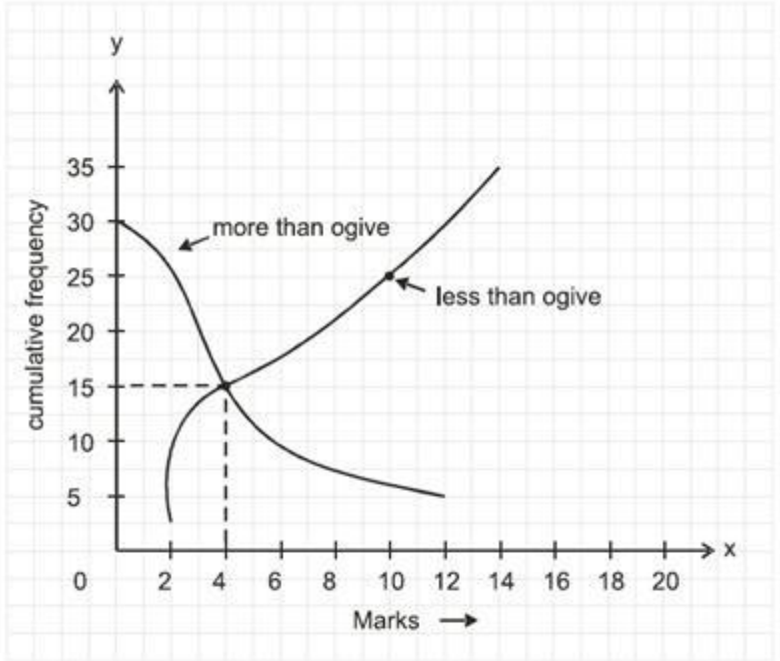


Fig. 4

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

14. The coordinates of the vertices of DABC are A (4, 1), B (-3, 2) and C (0, *k*). Given that the area of ABC is 12 sq. units, 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 1km/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 4cm. Let P be a point whose distance from its centre is 6 cm. Construct two tangents to it from P.

20. Prove that:

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

OR

Evaluate:

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

21. If 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.

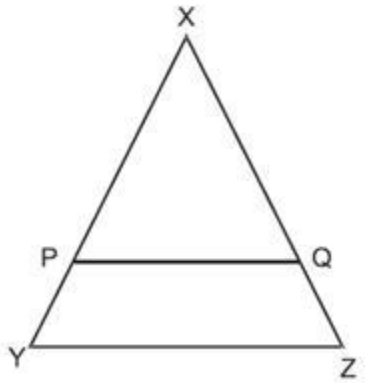


Fig. 5

A circle touches the side BC of a DABC at a point P and touches AB and AC when produced at Q and R respectively. Show that AQ = $\frac{1}{2}$ (Perimeter of DABC)

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 the 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, DABC and DAMP are right angled at B and M respectively. Prove that CA x MP = PA x BC.

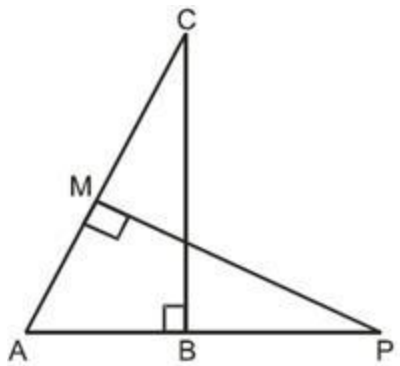


Fig. 6

25. In Fig. 7, OAPB is a sector of a circle of radius 3.5 cm with the centre at O and ÐAOB = 120°. Find the length of OAPBO.

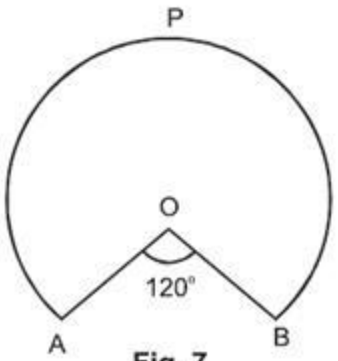


Fig. 7

OR

Find the area of the shaded region of fig. 8 if the diameter of the circle with centre O is 28 cm and

$AQ = \frac{1}{4} AB$.

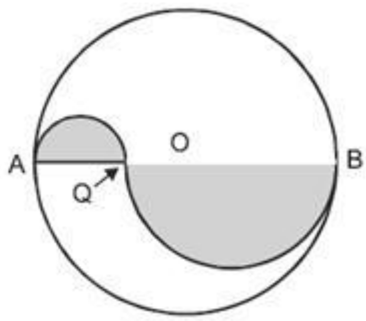


Fig. 8

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 attitude 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 40 m high, the angles of elevation of the top of a light house are found to be 30° and 60° respectively. Find the height of the lighthouse. Also find the distance between the top of the lighthouse and the foot of the tower.

29. A solid is composed of a cylinder with hemispherical ends. If the whole length of the solid is 100 cm and the diameter of the hemispherical ends is 28 cm. 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 8 cm 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 p = 3.14)

30. The mean of the following frequency table is 53. But the frequencies f_1 and f_2 of 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 -10	Total
Number of people	15	$f1$	21	$f2$	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

Sample Question Paper I

X- Mathematics

Section A

Q.No.	**Value points**	**Marks**
1	2×7^2	1
2	- 3 and -1	
3	k = 10	

4 one 1
5
6 $\frac{3}{4}$ 1
7
8
9
10 $\pi : \sqrt{3}$ 1

ÐPOQ = 80°

30°, 45° 1

$\frac{1}{2}$ 1

4 1

1

1

1

11 **SECTION B** 1

Let ‘a’ be the first term and ‘d’ be the common difference of the A.P. As we know that an = a+ (n - 1)d Þ 47 = 2 +9d Þ d = 5 1

$\therefore \; s_{15} = \frac{15}{2}[2 \times 2 + (15 - 1)5]$

$= 555$

12 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. 1

1

13 1

$\frac{3}{x} + \frac{8}{y} = -1$ ——-—(i) 1

$\frac{1}{x} - \frac{2}{y} = 2$ ——-—(ii) (i) + (ii) x 4 =

$\frac{7}{x} = 7$

$\Rightarrow x = 1$ From (ii), we get

$1 - \frac{2}{y} = 2$

$\Rightarrow y = -2$

14 1

$ABC = \frac{1}{2}[4\,(2 - k) + (-3)\,(k - 1) + 0\,(1 - 2)] = 12$ units^2

$\Rightarrow \pm 12 = \frac{1}{2}[8 - 4k - 3k + 3]$ = –7*k* = 13, - 35 ½

$= k = -\frac{13}{7}, 5$ ½

15 Let the quadratic polynomial be $x^2 + bx + c$ and its zeroes be a and b. we have ½

$\alpha + \beta = 2\sqrt{3} = -b$

$\alpha\beta = 2 = c$ ½

$\Rightarrow b = -2\sqrt{3}$ and c = 2, So a quadratic polynomial which satisfies the given conditions is ½

$x^2 - 2\sqrt{3}x + 2$ OR By long division method Quotient = $3x^2 - 4x + 2$ Remainder = 0

½

1

1

16 **SECTION B** ½

Let the original speed of walking of the student be x km/h Increased speed = (x +1) km/h 1

$\therefore \frac{3}{x} - \frac{3}{x+1} = \frac{15}{60}$ Þ 4 × 3(x + 1 – x) = x^2 + x Þ x^2 + x – 12 = 0 Þ (x + 4) (x – 3) = 0 Þ x = 3, x = –4 (rejected) \ His original speed was 3 km/h. ½

½

17 Let us assume, to the contrary, that ½

$3 + 5\sqrt{2}$ is a rational number, say x

$\Rightarrow 5\sqrt{2} = x - 3$ ½

$\Rightarrow \sqrt{2} = \frac{x-3}{5}$ Now x, 3 and 5 are all rational numbers 1

$\Rightarrow \frac{x-3}{5}$ is also a rational number

$\Rightarrow \sqrt{2}$ is a rational number **Prove :** ½

$\sqrt{2}$ is not a rational number \ Our assumption is wrong Hence, ½

$3 + 5\sqrt{2}$ is not a rational number.

18 Condition for $ax^2 + bx + c = 0$, have equal roots is $b^2 - 4ac = 0$ \ $[-(k - 2)]^2 - 4(2)(1) = 0$ \ $K^2 - 4k - 4 = 0$ ½

$\therefore \quad k = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(-4)}}{2}$

½

$\therefore \quad k = \frac{4 \pm \sqrt{2}}{2}$

$\therefore \quad k = 2 + 2\sqrt{2}$ or ½

$k = 2 - 2\sqrt{2}$

½

1

19 Construction of circle Location of point P Construction of the tangents ½

½

2

20 ½

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

½

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

$$LHS = \frac{\sin\theta\cot\theta-\sin\theta\operatorname{cosec}\theta-\sin\theta\cot\theta-\sin\theta\operatorname{cosec}\theta}{(\cot\theta+\operatorname{cosec}\theta)(\cot\theta-\operatorname{cosec}\theta)}$$ 1

$$= \frac{-2\sin\theta\operatorname{cosec}\theta}{\cot^2\theta-\operatorname{cosec}^2\theta}$$ ½

$$= \frac{-2\left(\sin\theta\times\frac{1}{\sin\theta}\right)}{-1}$$ ½

= 2 = RHS i.e. LHS = RHS Hence, proved. **OR** Sec 29° = sec (90° – 61°) = coses 61°, cot 17° = cot (90° – 73°) = tan 73° 1 cot 8° = co (90° – 82) = tan 82° $\sin^2 38° = \sin^2 (90° – 52°) = \cos^2 52°$ cot 45° = 1 1

$$\therefore \frac{\sec 29°}{\operatorname{cosec} 61°} + 2\cot 8°\cot 17°\cot 82°\cot 73° - 3(\cos^2 52 + \sin^2 52°)$$ 1

$$= \frac{\operatorname{cosec} 61°}{\operatorname{cosec} 61°} + 2\tan 82°\tan 73°\cot 82°\cot 73° - 3(\cos^2 52 + \sin^2 52°)$$

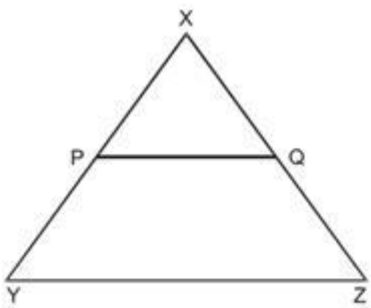
Þ = 1 + 2 – 3 = 0

½

½

21 ½

$$\frac{XP}{XY} = \frac{XQ}{XZ} = \frac{3}{4} \qquad \angle X = \angle X$$ ½



Δ XPQ ~ Δ XYZ ½

$$\frac{XP}{XY} = \frac{3}{4}$$ ½

$$\angle \quad \frac{ar\,\Delta\,XPQ}{ar\,\Delta\,XYZ} = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$$ ½

$$ar\,\Delta\,XPQ = \frac{9}{16} \times 32 = 18\,cm^2$$ ½

ar of quad PYZQ = (32 - 18) cm^2 = 14 cm^2 ½

½

½

½

½

½

OR

BP = BQ and CP = CR

AQ = AR

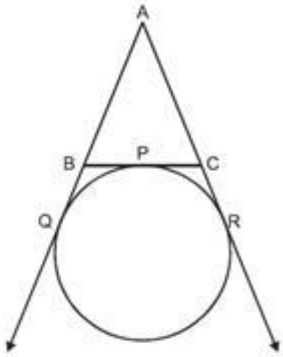
AQ + AR = AB + BQ + AC + CR

AQ + AQ = AB + BP + AC + PC

2 AQ = AB + AC + BC

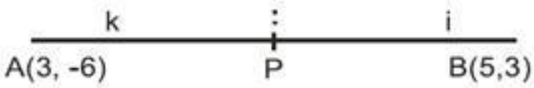
AQ = $\frac{1}{2}$ [AB + AC + BC]

AQ = $\frac{1}{2}$ (perimeter of Δ ABC)



22 Let the ratio be *k* : 1 then the coordinates of the point which divides AB in the ratio *k* : 1 are ½

$\left(\frac{5k+3}{k+1}, \frac{3k-6}{k+1}\right)$ ½



This point lies on x – axis ½

$\frac{3k-6}{k+1} = 0$

Þ k = 2 Hence the ratio is 2 : 1 Putting *k* = 2 we get the point of intersection ½

$\left(\frac{13}{3}, 0\right)$

23 Let P (x, y) be equidistant from the point A (2, 5) and B (–3, 7). AP = BP so $AP^2 = BP^2$ $(x – 2)^2 + (y – 5)^2 = (x + 3)^2 + (y – 7)^2$ X^2 - 4x + 4 + y^2 - 10y + 25 = x^2 + 6x + 9 + y^2 – 14y + 49 – 10x + 4y = 29 Hence, 10x – 4y + 29 = 0 is the required relation. ½

½

1

1

24 D AMP ~ D ABC 1

$\therefore \frac{PA}{CA} = \frac{MP}{BC}$

Þ CA × MP = PA × BC 1

½

½

25 Length of OAPBO = length of arc BPA + 2 (radius) 1

$= \frac{240}{360} \times 2 \times \frac{22}{7} \times 3.5 + 2 \times 3.5$ 1

$= \frac{2}{3} \times 2 \times \frac{22}{7} \times \frac{7}{2} + 7$ 1

$= 14\frac{2}{3} + 7 = 21\frac{2}{3}$

Length of OAPBO = ½

$21\frac{2}{3}\,cm$

OR Diameter AQ =

$\frac{1}{4} \times 28 = 7\ cm$

$\Rightarrow\ r_1 = \frac{7}{2}\ cm$ ½

Diameter QB =

$\frac{3}{4} \times 28 = 21\ cm$ 1

$\Rightarrow\ r_2 = \frac{21}{2}\ cm$ 1

Area of shaded region

$= \frac{\pi}{2} \times \left[\left(\frac{7}{2}\right)^2 + \left(\frac{21}{2}\right)^2\right]$

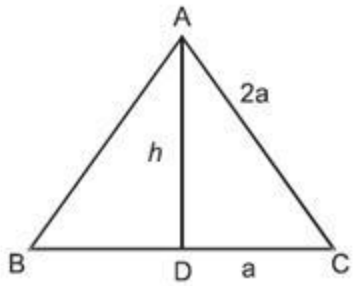
$= \frac{\pi}{2} \times \left(\frac{7}{2}\right)^2 [1 + 3^2]$

$= \frac{1}{2} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} [10]$

$= \frac{77 \times 5}{5} = \frac{385}{2} = 192.5\ cm^2$

26 Given, to prove, constant, figure ½ x 4 = 2

2



½

½

Proof of theorem AD ^ BC $(2a)^2 = h^2 + a^2$ $h^2 = 4a^2 - a^2$ ½

$h = \sqrt{3}a$

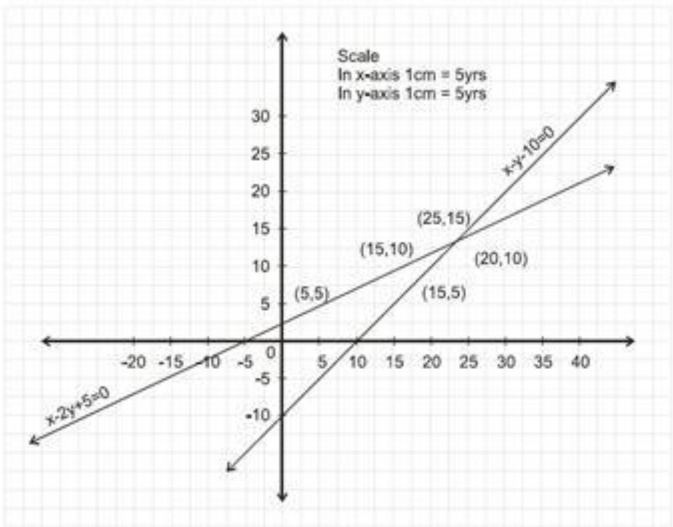
2a = 2 Þ a = 1 cm ½

$\therefore\ h = \sqrt{3}\ cm$

27. Present age of sagar be x yrs & that of Tiru be y years. x – 5 = 2 (y – 5) x + 10 = (y + 10) + 10 x – 2y + 5 = 0 x – y – 10 = 0 ½
Equations : 1+1

x51525
y51015 ½
x51525
y51015

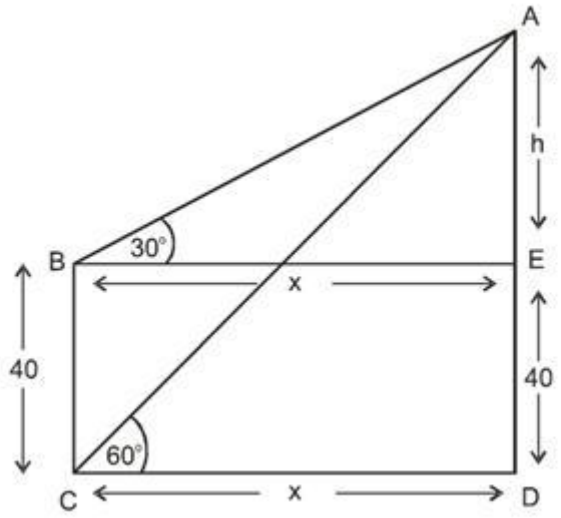
1



Group : 1+1

Since the lines intersect at (25, 15) Sagar's present age = 25 yrs, Tiru's present age = 15 yrs. From graph it is clear that Sagar was 10 years's old, when Tiru was born.

28 1



1

½

1

½

½

½

½

½

For correct figure Let AE = h metre and BE = CD = x metre

$\therefore \frac{x}{h} = \cot 30° = \sqrt{3}$ ½

$\frac{h+40}{x} = \tan 60° = \sqrt{3}$

$h + 40 = \sqrt{3} \times h(\sqrt{3})$ h = 20 m Height of lighthouse is 20 + 40 = 60m

$\frac{AD}{AC} = \sin 60° = \frac{\sqrt{3}}{2}$

$\Rightarrow \; AC = 60\frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$\Rightarrow AC = 40\sqrt{3}\, m$

Hence, the distance of the top of lighthouse from the foot of the tower is $40\sqrt{3}\, m.$

29 Radius of hemisphere = 14 cm Length of cylindrical part = [100 – 2(14)] = 72 cm radius of cylindrical part = radius of hemispherical ends = 14 cm Total area to be polished = 2 (C.S.A. of hemispherical ends) + C.S.A. of cylinder 1

$= 2(2\pi r^2) + 2\pi rh$ ½

$= 2 \times \frac{22}{7} \times 14(2 \times 14 + 72) = 8800\ cm^2$ Cost of polishing the surface = Rs. 8800 x 0.05 1 = Rs. 440 **OR** The container is a frustum of a cone height 8 cm and radius of the bases 10 cm and 4 cm respectively h = 8 cm, r_1 = 10 cm, r_2 = 4cm 1

$Slant\ height = \sqrt{8^2 + (10-4)^2} = \sqrt{8^2 + 6^2} = 10\ cm$ 1

$Volume\ container = \frac{1}{3}\pi h\ (r_1^2 + r_2^2 + r_1 r_2)$ 1

$= \frac{1}{3} \times 3.14 \times 8\ (100 + 16 + 40) cm^3$ 1

$= \frac{1}{3} \times 3.14 \times 8\ (156)$ = 1306.24 cm^3 = 1.31 Litres Cost of oil = Rs. (1.31 x 50) = Rs. 65.50 Surface area of the container (excluding the upper end) ½

$= \pi \times [l(r_1 + r_2) + r_2^2]$ = 3.14 × [10(10 + 4) + 16] = 3.14 × 156 = 489.84 cm^2 cost of metal = Rs.

$$\left(489.84 \times \frac{5}{100}\right) = Rs\ 24.49$$ 1

1

1

½

1

½

30

Age	Number of people f_1	Class mark (x_1)	x_1f_1	
				1
0–20	15	10	150	
20–40	f_1	30	$30f_1$	1
40–60	21	50	1050	
60–80	f_2	70	$70f_2$	
80–100	17	90	1530	½

$$\sum f_1 = 53 + f_1 + f_2 = 100$$

1

$$\sum x_1 f_1 = 2730 + 30f_1 + 70f_2$$ $= f_1 + f_2 = 47$ ——(i)

1

$$\bar{x} = \frac{\sum x_1 f_1}{\sum f_1}$$

1

$$53 = \frac{2730 + 30\,f_1 + 70\,f_2}{100}$$

Þ $3f_1 + 7f_2 = 257$ ———(ii) Multiplying (i) by 3 and subtracting it from (ii) we get $f_2 = 29$

Put $f_2 = 29$ in (i) we get $f_1 = 18$ Hence, $f_1 = 18$ and $f_2 = 29$. **OR** 1

Age	Frequency	Cumulative frequency (C.F)	
0 – 100	**2**	**2**	½
100 – 200	**5**	**7**	
200 – 300	**9**	**16**	
300 – 400	**12**	**28**	1
400 – 500	**17**	**45**	
500 – 600	**20**	**65**	
600 – 700	**15**	**80**	1
700 – 800	**9**	**89**	
800 – 900	**7**	**96**	
900 – 1000	**4**	**100**	

2

$$N = \sum f_1 = 100$$

1

$$\therefore\ \frac{N}{2} = 50$$

\ Median class is 500 – 600. l = 500, f = 20, F = 45, h = 100 Hence,

1

$$\text{Median} = l + \left(\frac{\frac{N}{2} - F}{f}\right) \times h$$

$$\text{Median} = 500 + \left(\frac{50 - 45}{20}\right) \times 100$$

Median = 525