Solutions to RMT/Set-2

1. (*a*) Graph of a polynomial $p(x)$ intersect the x-axis at two distinct points therefore there are two zeroes.

2. (*c*) Linear equations are $x + 2y - 5 = 0$ and $2x - 4y + 6 = 0$.

Here, $a_1 = 1$, $b_1 = 2$, $c_1 = -5$ and $a_2 = 2$, $b_2 = -4$, $c_2 = 6$

Therefore, $\frac{a_1}{a_2} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{2}{-4} = -\frac{1}{2}, \frac{c_1}{c_2} = \frac{-5}{6}$

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$. Hence system of equations is consistent with a unique solution.

3. (*b*) The sum of the length of BP and BQ is equal to semi perimeter of ΔABC.

BP + BQ = AB + AP + BC+ CQ

= AB + AD + BC+ CD

= AB + AC + BC

= Perimeter of ΔABC.

4. (*c*) We have AP, as 14, 19, 24, 29, ..., 119.

Here $a = 14$, $d = 19 - 14 = 5$ and $a_n = 119$

Now, $a_n = a + (n - 1)d$

$\Rightarrow \quad 119 = 14 + (n - 1)5$

$\Rightarrow \quad 119 - 14 = (n - 1)5$

$\Rightarrow \quad \frac{105}{5} = n - 1$

$\Rightarrow \quad n = 22$

5. (*b*) Let r be inner radius and R be outer radius.

Therefore $r = 12$ cm and R = 12 cm + 3 cm = 15 cm

Volume of clay used to make the pot $= \frac{2}{3}\pi(R^3 - r^3)$

$= \frac{2}{3}\pi(15^3 - 12^3)$

$= 1098\pi \text{ cm}^3$

6. (*d*) $\sin (A + B) = \frac{\sqrt{3}}{2}$

$\Rightarrow \quad \sin (A + B) = \sin 60°$

$\Rightarrow \quad A + B = 60°$ ...(*i*)

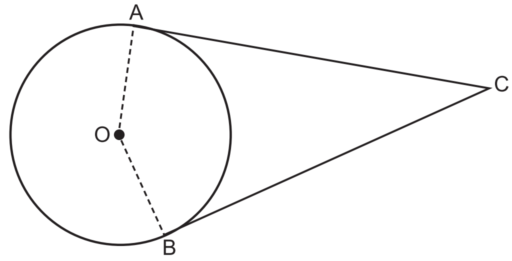
Also, $\sin(A - B) = \frac{1}{2}$

$\Rightarrow \quad \sin(A - B) = \sin 30°$

$\Rightarrow \quad A - B = 30°$ ...(*ii*)

From equations (*i*) and (*ii*), we get A = 45°

7. (*d*) Join OA and OB.



In quadrilateral OACB,

$$\angle AOB + \angle CAO + \angle OBC + \angle ACB = 360°$$

$$\Rightarrow \quad \angle AOB + 90° + 90° + 50° = 360°$$

$$\Rightarrow \quad \angle AOB = 360° - 230°$$

$$\Rightarrow \quad \angle AOB = 130°$$

8. (*a*) The sum and product of the zeroes of the polynomial are −3 and 2.

Therefore polynomial is $P(x) = x^2 - s\,x + p$ (Where s is sum and p is product of zeroes)

$P(x) = x^2 + 3x + 2$

9. (*a*) Using empirical formula: mode = 3 median – 2 mean, we get

$$\text{Mode} = 3 \text{ median} - 2 \text{ mean}$$

$$\Rightarrow \quad 5.3 = 3 \text{ Median} - 2 \times 5$$

$$\Rightarrow \quad 15.3 = 3 \text{ Median}$$

$$\Rightarrow \quad 5.1 = \text{Median}$$

10. (*b*) $\Delta ABC \sim \Delta DEF$

Therefore, $\angle A = \angle D$, $\angle B = \angle E$ and $\angle C = \angle F$

$$\therefore \quad \angle B = 83°$$

In ΔABC,

$$\angle A + \angle B + \angle C = 180° \quad \text{(Angle sum property of triangle)}$$

$$\Rightarrow \quad 47° + 83° + \angle C = 180°$$

$$\Rightarrow \quad \angle C = 180° - 130° = 50°$$

11. (*d*) Quadratic equation is $9x^2 + bx + \frac{1}{4} = 0$

Here, $A = 9$, $C = \frac{1}{4}$, $B = b$

If roots are equal then discriminant, D = 0

$$\Rightarrow \quad B^2 - 4AC = 0$$

$$\Rightarrow \quad b^2 - 4 \times 9 \times \frac{1}{4} = 0$$

$\Rightarrow b^2 = 9 \Rightarrow b = \pm 3$

12. (*b*) As, $\cos^2\theta - \sin^2\theta = \frac{3}{4}$ ...(*i*)

We know that $\cos^2\theta + \sin^2\theta = 1$ ...(*ii*)

On adding the equations, (i) and (ii), we get

$$2\cos^2\theta = \frac{3}{4} + 1$$

$$\Rightarrow \quad \cos\theta = \frac{\sqrt{7}}{2\sqrt{2}}$$

13. (*c*) Sample space = 13

Number of circles = 3

$$P(\text{Colour a circle}) = \frac{3}{13}$$

14. (*d*)

$$\frac{\text{3BHK apartments}}{\text{Total apartments}} = \frac{2}{5}$$

$$\Rightarrow \quad \frac{\text{3BHK apartments}}{20} = \frac{2}{5}$$

$$\Rightarrow \quad \text{3BHK apartments} = 8$$

15. (*c*) Radius of the circle = distance between centre and point on the circle.

Using the distance formula between two points A(x_1, y_1) and B(x_2, y_2) is given by

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\Rightarrow \quad 5 = \sqrt{(-6+2)^2 + (y-2)^2}$$

$$\Rightarrow \quad 25 = 16 + (y - 2)^2$$

$$\Rightarrow \quad 9 = (y - 2)^2$$

$$\Rightarrow \quad y - 2 = \pm 3$$

$$\Rightarrow \quad y = 5, -1 \text{ (ignoring negative value)}$$

16. (*d*) Mode

17. (*d*) Using mid-point formula $x = \frac{x_1 + x_2}{2}, y = \frac{y_1 + y_2}{2}$

$$x = \frac{-1+2}{2} \text{ and } y = \frac{4+5}{2}$$

$$\Rightarrow \quad x = \frac{1}{2} \text{ and } y = \frac{9}{2}$$

Therefore, $x + y = \frac{1}{2} + \frac{9}{2} = 5$

18. (*b*) **Given:** radius of hemisphere r = 1 cm, height of cone, h = 1 cm,

Therefore volume of solid = volume of hemisphere + volume of cone

$$= \frac{2\pi r^3}{3} + \frac{1}{3}\pi r^2 h$$

$$= \frac{2}{3}\pi \times 1^3 + \frac{1}{3}\pi \times 1^2 \times 1$$

$$= \pi \text{ cm}^3$$

19. (*a*)

Factor of 6 = 2 and 3

Factors of 2^n = 2 × 2 × 2 × . . . . . n terms

Therefor 2 is factor but 3 is not factor of 2^n.

Therefore assertion is true and reason is also true and correct explanation

Hence, both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

20. (*d*) The area of sector $= \frac{\text{area of circle} \times \theta}{360°}$, where θ is central angle.

$$\Rightarrow \quad \frac{\text{area of sector}}{\text{area of circle}} = \frac{\theta}{360°}$$

$$\Rightarrow \quad \frac{5}{8} = \frac{\theta}{360°}$$

$$\Rightarrow \quad \theta = 225°$$

Therefore assertion (A) is false but reason (R) is true.

21. (*a*) $k = (3 \times 5 \times p)$

Therefore $10\,k^2 = 10 \times (3 \times 5 \times p)^2$

$\Rightarrow \quad 10\,k^2 = 2 \times 5 \times 3^2 \times 5^2 \times p^2$

$\Rightarrow \quad 10\,k^2 = 2 \times 3^2 \times 5^3 \times p^2$

OR

(*b*) $1260 = 2 \times 2 \times 3 \times 3 \times 5 \times 7$

$1680 = 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 7$

Therefore HCF 1260 and 1680 $= 2 \times 2 \times 3 \times 5 \times 7 = 420$

22. (*a*) Total candies $= 4 + 4 + 2 + 1 = 11$

(*i*) Favourable outcomes (orange and cola candies) $= 4 + 2 = 6$

Total candies = 11

P (orange and cola candies) $= \frac{6}{11}$

(*ii*) Favourable outcomes (mango candies) = 4

P (a mango candy) $= \frac{4}{11}$

OR

(*b*) (*i*) The numbers on both the dice are different = 30, {except (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}

Total outcomes = 36

P(The numbers on both the dice are different) $= \frac{\text{Favourable outcomes}}{\text{Total outcomes}}$

P(The numbers on both the dice are different) $= \frac{30}{36} = \frac{5}{6}$

(*ii*) The second die has a number greater than the first die.

Favourable outcomes = {(1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 3), (2, 4), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6), (4, 5), (4, 6), (5, 6)} = 15

P(The second die has a number greater than the first die) $= \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{15}{36} = \frac{5}{12}$

23. $\tan P = \sqrt{5} - 2$

$\Rightarrow$ Opposite side $= \sqrt{5} - 2$ and adjacent side $= 1$

$(\text{Hypotenuse})^2 = (\text{opposite side})^2 + (\text{adjacent side})^2$

$\Rightarrow$ $(\text{Hypotenuse})^2 = (\sqrt{5} - 2)^2 + (1)^2$

$(\text{Hypotenuse})^2 = 5 + 4 - 4\sqrt{5} + 1$

$= 10 - 4\sqrt{5}$

Hypotenuse $= \sqrt{10 - 4\sqrt{5}}$

Therefore $\sin P \times \cos P = \frac{\sqrt{5} - 2}{\sqrt{10 - 4\sqrt{5}}} \times \frac{1}{\sqrt{10 - 4\sqrt{5}}}$

$= \frac{\sqrt{5} - 2}{10 - 4\sqrt{5}} \times \frac{10 + 4\sqrt{5}}{10 + 4\sqrt{5}}$

$\Rightarrow$ $\sin P \times \cos P = \frac{2\sqrt{5}}{20} = \frac{\sqrt{5}}{10} = \frac{\sqrt{5} \times \sqrt{5}}{10 \times \sqrt{5}} = \frac{1}{2\sqrt{5}}$

24. Coordinates of the points are P(6, –1), Q(1, 3) and R(x, 8)

Since PQ = QR

$\Rightarrow$ $PQ^2 = QR^2$

$\Rightarrow$ $(1 - 6)^2 + \{3 - (-1)\}^2 = (x - 1)^2 + (8 - 3)^2$ $\left[\text{Using distance formula, } \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}\right]$

$\Rightarrow \quad 25 + 16 = (x - 1)^2 + 25$

$\Rightarrow \quad 16 = (x - 1)^2$

$\Rightarrow \quad \pm 4 = (x - 1) \Rightarrow x = 5 \text{ and } x = -3$

25. Let the point on the y-axis be $(0, y)$ and point $(0, y)$ divides the line joining the points $(-2, 0)$ and $(2, 3)$ in the ratio $k : 1$.

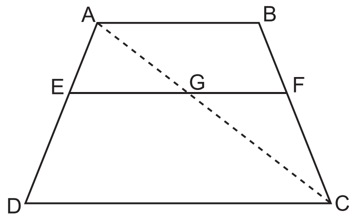
Using section formula: $x = \dfrac{m_1x_2 + m_2x_1}{m_1 + m_2}, y = \dfrac{m_1 y_2 + m_2y_1}{m_1 + m_2}$

$\Rightarrow \quad 0 = \dfrac{k \times 2 + 1 \times (-2)}{k + 1}$

$\Rightarrow \quad 2k = 2$

$k = 1$, therefore ratio is 1 : 1.

26. (*a*)



Given: AB || DC and EF || AB.

To prove: $\dfrac{AE}{ED} = \dfrac{BF}{FC}$.

Construction: Join AC which intersect EF at G.

Proof: Since AB||DC and EF||AB ⇒ EF||DC.

In ΔADC,

EG || DC (As EF || DC)

Therefore, $\dfrac{AE}{ED} = \dfrac{AG}{GC}$ ...(*i*) (Basic proportionality theorem)

In ΔCAB,

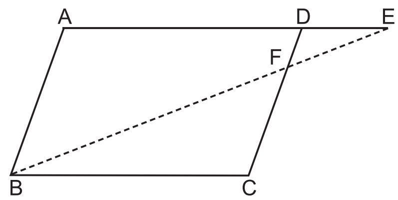
$\dfrac{CF}{FB} = \dfrac{CG}{GA}$ or $\dfrac{AG}{GC} = \dfrac{BF}{FC}$ ...(*ii*) (Basic proportionality theorem)

Therefore, from (*i*) and (*ii*), we get

$\dfrac{AE}{ED} = \dfrac{BF}{FC}$

OR

(*b*) **Given:** Parallelogram ABCD and BE intersects CD at F.



To prove: ΔABE ~ ΔCFB

Proof: In ΔABE and ΔCFB

∠AEB = ∠CBF (Alternate angles)

∠EAB = ∠FCB (Opposite angles of a parallelogram are equal)

Therefore ΔABE ~ ΔCFB (AA criterion of similarity of triangles)

27. $$\frac{14}{x+3} - 1 = \frac{5}{x+1}$$

$\Rightarrow$ $$\frac{14 - x - 3}{x+3} = \frac{5}{x+1}$$

$\Rightarrow$ $$\frac{11 - x}{x+3} = \frac{5}{x+1}$$

$\Rightarrow$ $$11x + 11 - x^2 - x = 5x + 15$$

$\Rightarrow$ $$x^2 - 5x + 4 = 0$$

$\Rightarrow$ $$x^2 - 4x - x + 4 = 0$$

$\Rightarrow$ $$(x - 4)(x - 1) = 0$$

Therefore $x = 4$ or $x = 1$.

28. $p(x) = 2x^2 - 7x - 15$

$= 2x^2 - 10x + 3x - 15$

$= 2x(x - 5) + 3(x - 5) = (x - 5)(2x + 3)$

For zeroes $p(x) = 0$, therefore $x = 5$ or $x = \frac{-3}{2}$

Sum of zeroes $= 5 - \frac{3}{2} = \frac{7}{2}$ which is equal to $\frac{-\text{coefficient of } x}{\text{coefficient of } x^2}$.

Product of zeroes $= 5 \times \frac{(-3)}{2} = \frac{-15}{2}$ which is equal to $\frac{\text{coefficient of } x}{\text{coefficient of } x^2}$.

29. LHS $= \sqrt{\frac{\sec A - 1}{\sec A + 1}}$

$= \sqrt{\frac{\sec A - 1}{\sec A + 1} \times \frac{\sec A - 1}{\sec A - 1}}$

$= \sqrt{\frac{(\sec A - 1)^2}{\sec^2 A - 1}}$

$= \frac{\sec A - 1}{\tan A}$ $(\sec^2 A - 1 = \tan^2 A)$

$= \frac{\sec A}{\tan A} - \frac{1}{\tan A} = \frac{1}{\cos A} \times \frac{\cos A}{\sin A} - \frac{1}{\tan A}$

$= \text{cosec } A - \cot A = \text{RHS}$

30. (*a*) Area of circle $= 154$ cm^2, $\angle AOB = 90°$

Let radius of circle be 'R'.

Therefore $\pi R^2 = 154$

$\Rightarrow R^2 = 154 \times \frac{7}{22} \Rightarrow R = 7$ cm

Now, area of shaded segment = area of sector – area of triangle OAB

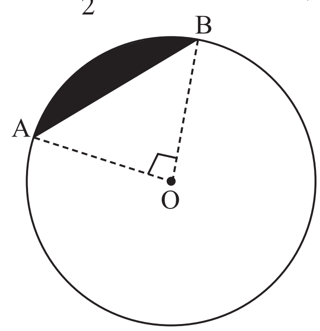
($\because$ Area of a right-angled triangle $= \frac{1}{2} \times$ base $\times$ height)

$= \pi R^2 \frac{\theta}{360°} - \frac{1}{2}R^2$

$= R^2\left(\pi \frac{90°}{360°} - \frac{1}{2}\right)$

$= 7 \times 7 \times \left(\frac{11}{14} - \frac{1}{2}\right)$

$= 7 \times 7 \times \frac{4}{14} = 14$ cm^2



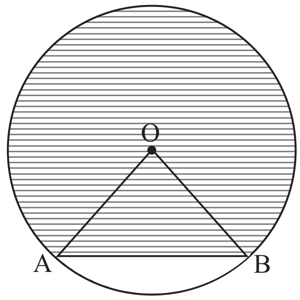
OR

(*b*) **Given:** length of chord AB = 18 cm, central angle AOB = 60°

Therefore triangle AOB is an equilateral triangle.

$\therefore$ OA = OB = AB = 18 cm

Now, area of unshaded region (minor segment) = area of sector OAB – area of ΔOAB



$$= \pi R^2 \frac{\theta}{360°} - \frac{\sqrt{3}}{4}R^2$$

$$= R^2\left(\pi\frac{\theta}{360°} - \frac{\sqrt{3}}{4}\right)$$

$$= (18)^2\left(\pi\frac{60°}{360°} - \frac{\sqrt{3}}{4}\right)$$

$$= (18)^2\left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right)$$

$$= 18 \times 18 \times \left(\frac{2\pi - 3\sqrt{3}}{12}\right) = 27\left(2\pi - 3\sqrt{3}\right)\text{cm}^2$$

Area of circle $= \pi R^2 = \pi \times 18 \times 18$

$= 324\pi \text{ cm}^2$

Area of major segment = Area of circle – area of minor segment

$= (324\pi - 54\pi + 81\sqrt{3}) \text{ cm}^2 = (270\pi + 81\sqrt{3})\text{cm}^2$

31. Let $2 - \sqrt{7}$ be a rational number.

$\Rightarrow \quad 2 - \sqrt{7} = \frac{p}{q}$, where p, q are coprime and $q \neq 0$

$\Rightarrow \quad 2 - \frac{p}{q} = \sqrt{7} \quad \Rightarrow \quad \frac{2q - p}{q} = \sqrt{7}$

$\frac{2q - p}{q}$ is rational because p and q are coprime and $q \neq 0$, but $\sqrt{7}$ is irrational.

It contradict that our assumption is wrong.

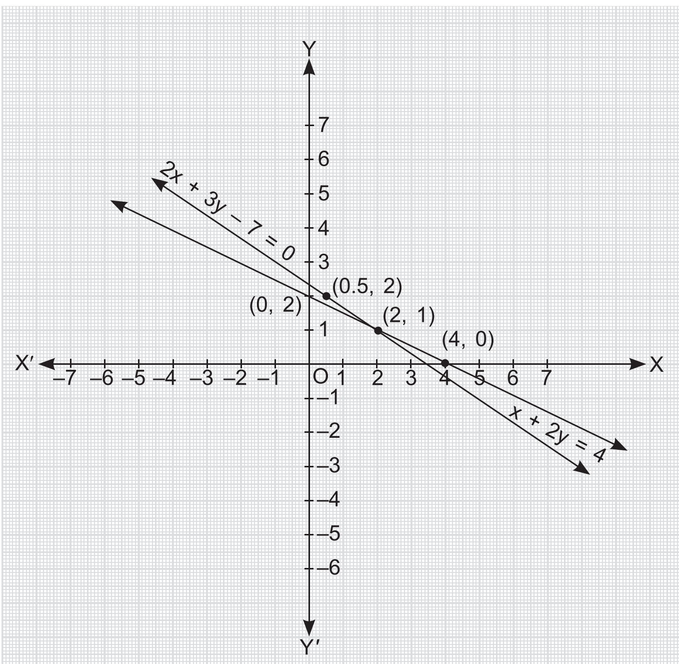
Hence $2 - \sqrt{7}$ is an irrational number.

32. (*a*) Table for $x + 2y = 4$,

x	4	0	2
y	0	2	1

Table for $2x + 3y - 7 = 0$

x	3.5	2	0.5
y	0	1	2



These lines intersect at point (2, 1).

Therefore $x = 2$ and $y = 1$.

OR

(*b*) Let fixed charge be ₹ x and additional charge for each day be ₹ y.

ATQ, $x + 4y = 27$ ...(*i*)

and $x + 2y = 21$ ...(*ii*)

Subtracting equation (*ii*) from equation (*i*), we get

$2y = 6 \Rightarrow y = 3$

Putting $y = 3$ in equation (*i*), we get

$x = 15$

Hence, fixed charge for three days = ₹ 15 and additional charge for each day = ₹ 3

33. Given: A circle with centre O and a tangent XY to the circle at a point P.

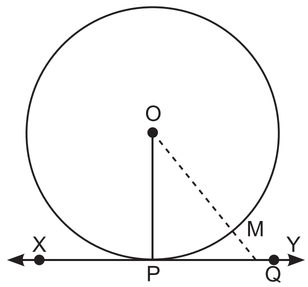
To prove: OP is perpendicular to XY.

Construction: Take a point Q outside the circle on XY other than P and join OQ which intersect the circle at M.

Proof: OQ = OM + MQ

$\therefore$ OQ > OP.

Therefore, OQ is larger than the radius OP of the circle.

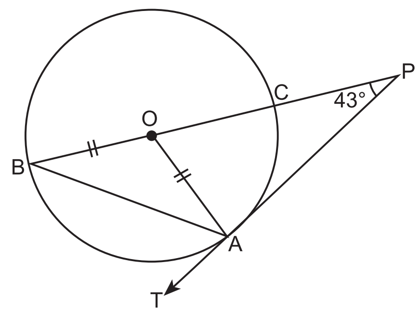


Since this happens for every point on the line XY except the point P, OP is the shortest of all the distances from the point O to the points on XY.

So OP is perpendicular to XY.

In figure

Join OA.



$\therefore \quad \angle OAP = 90°$

In triangle OAP,

$\angle OAP + \angle OPA + \angle AOP = 180°$ (Angle sum property of triangle)

$\Rightarrow \quad 90° + 43° + \angle AOP = 180°$

$\Rightarrow \quad \angle AOP = 180° - 133° = 47°$

Now in triangle ABO, OA = OB

Ext. $\angle AOP = \angle OAB + \angle OBA$

$\Rightarrow \quad 47° = 2\angle OAB$ ($\angle OAB = \angle OBA$ opposite angle of equal sides are equal)

$\Rightarrow \quad \angle OAB = \frac{47°}{2} = 23.5°$

Now, $\angle PAB = \angle PAO. + \angle OAB.$

$\Rightarrow \quad \angle PAB = 90° + 23.5° = 113.5°$

34. (*i*) CF = CD + DE + EF

$\Rightarrow$ 24m = CD + 3m + 12m

$\Rightarrow$ CD = 9 m = BH

BC = 9 m.

In ΔABH,

$$\frac{AB}{BH} = \tan 60°$$

$$\Rightarrow \quad \frac{AB}{9} = \sqrt{3}$$

$$\Rightarrow \quad AB = 9\sqrt{3} \text{ m}$$

$$\text{Height of slide AC} = AB + BC$$

$$= 9\text{m} + 9\sqrt{3}\text{m} = 9\ (1.73 + 1)\text{m} = 24.57\text{m}$$

$$= 25 \text{ m.}$$

(*ii*) In ΔABH,

$$\frac{BH}{AH} = \cos 60°$$

$$\Rightarrow \quad \frac{9}{AH} = \frac{1}{2}$$

$$\Rightarrow \quad AH = 18 \text{ m}$$

In ΔGEF,

$$GF^2 = GE^2 + EF^2 \qquad \text{(Pythagoras theorem)}$$

$$\Rightarrow \quad GF^2 = 9^2 + 12^2 = 81 + 144$$

$$GF^2 = 225 \Rightarrow GF = 15 \text{ m}$$

Total distance covered by the person = GF + HG + AH = 15 m + 3 m + 18 m = 36 m

35. (*a*)

Number of bags	Number of days (f_i)	cf	x_i	u_i	f_iu_i
0-5	$x = 12$	x	2.5	–2	–24
5-10	4	$x + 4$	7.5	–1	–4
10-15	15	$x + 19$	12.5	0	0
15-20	5	$x + 24$	17.5	1	5
20-25	8	$x + 32$	22.5	2	16
Total	**44**				$\Sigma f_iu_i = -7$

Median = 12

Median class = 10-15

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times h$$

$$12 = 10 + \frac{\frac{x+32}{2} - (x+4)}{15} \times 5$$

$$2 = \frac{\frac{x+32}{2} - (x+4)}{15} \times 5$$

$$6 = \frac{x+32}{2} - (x+4)$$

$$\Rightarrow \quad 6 = \frac{x+32-2x-8}{2}$$

$$\Rightarrow \quad 12 = -x + 24 \quad \Rightarrow \quad x = 12$$

$$\text{Mean} = A + \frac{\Sigma f_iu_i}{\Sigma f_i} \times h$$

$$\text{Mean} = 12.5 + \frac{(-7)}{44} \times 5$$

$$\text{Mean} = 12.5 - 0.80$$

$$\text{Mean} = 11.7$$

OR

(*b*) Let $A = 65$, here $h = 10$

Literacy rate (in %)	Number of cities(f_i)	x_i	$u_i = \frac{x_i - A}{h}$	$f_i u_i$
30-40	2	35	–3	–6
40-50	7	45	–2	–14
50-60	11	55	–1	–11
60-70	16	65	0	0
70-80	18	75	1	18
80-90	12	85	2	24
90-100	4	95	3	12
Total	$\Sigma f_i = 70$			$\Sigma f_i u_i = 23$

Modal class = 70-80

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

Here, $l = 70$, $h = 10$, $f_1 = 18$, $f_0 = 16$, $f_2 = 12$

$$\text{Mode} = 70 + \frac{18 - 16}{36 - 16 - 12} \times 10$$

$$\text{Mode} = 70 + \frac{20}{8}$$

Mode = 72.5

Hence, the literacy rate for maximum number of cities is 72.5.

$$\text{Mean} = A + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$$

$$\text{Mean} = 65 + \frac{23}{70} \times 10$$

Mean = 65 + 3.29

Mean = 68.29

The mean of the literacy rate is 68.29.

36. (*i*) AP = 4, 6, 8, 10,. . . . .

(*ii*) AP = 12, 19, 26,. . . . . ..

(*iii*) (*a*) AP = 12, 19, 26,. . . . . ..

Let *n*th figure has 61 matchsticks.

$$a_n = a + (n - 1)d$$

$\Rightarrow$ $61 = 12 + (n - 1)7$

$\Rightarrow$ $49 = (n - 1)7$

$\Rightarrow$ $n = 8$,

Hence 8th figure will contain 61 matchsticks.

OR

(*iii*) (*b*) AP = 4, 6, 8, 10,. . . . .

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$\Rightarrow \qquad S_{10} = \frac{10}{2}[8+(10-1)2]$$

$$S_{10} = \frac{10}{2}[8+(9)2]$$

$$= 130$$

Hence, in first ten figures there are 130 triangles.

37. (*i*) In ΔEAB and ΔBCM.

$\angle AEB = \angle MBC$ (Alternate angles)

$\angle EAB \cong \angle MCB$ (Opposite angles of a parallelogram are equal)

$\therefore$ $\Delta EAB \sim \Delta BCM$ (AA criterion)

(*ii*) In ΔBLC and ΔELA

$\angle LBC = \angle LEA$ (Alternate angles)

$\angle BLC = \angle ELA$ (Vertically opposite angles)

$\Delta BLC \sim \Delta ELA$ (AA criterion)

Similarity criterion is AA.

(*iii*) (*a*) In ΔDEM and ΔCBM.

$\angle DME = \angle BMC$ (Vertically opposite angles)

$\angle DEM = \angle MBC$ (Alternate angles)

$\Delta DEM \sim \Delta CBM.$ (AA criterion)

$\frac{DE}{CB} = \frac{DM}{MC}$ (CPST)

$DE = CB$ (As DM = MC)

$AD = CB$ (Opposite sides of parallelogram are equal)

Therefore, $AD = DE$

OR

(*iii*) (*b*) In ΔBLC and ΔELA

$\angle LBC = \angle LEA$ (Alternate angles)

$\angle BLC = \angle ELA$ (Vertically opposite angles)

$\Delta BLC \sim \Delta ELA$ (AA criterion)

$$\Rightarrow \qquad \frac{BL}{EL} = \frac{BC}{AE}$$

$$\Rightarrow \qquad \frac{BL}{EL} = \frac{BC}{AD+DE}$$

$$\Rightarrow \qquad \frac{BL}{EL} = \frac{AD}{2AD}$$

$$\Rightarrow \qquad EL = 2BL$$

38. (*i*) Total height = 18.5 m

Height of conical part = 18.5 m – 8 m = 10.5 m

$$(\text{Slant height})^2 = (\text{radius})^2 + (\text{height})^2$$

$$\Rightarrow \quad (\text{Slant height})^2 = (14)^2 + (10.5)^2$$

$$(\text{Slant height})^2 = 196 + 110.25$$

$$= 306.25$$

Slant height = 17.5 m

(*ii*) Floor area = πr^2

$$\text{Floor area} = \frac{22}{7} \times 14 \times 14$$

$$= 616 \text{ m}^2$$

(*iii*) (*a*) Area of cloth used to make tent = CSA of cone + CSA of cylinder

$$= \pi rl + 2\pi rh$$

$$= \pi \times 14 \times 17.5 + 2\pi \times 14 \times 8$$

$$= \pi \times 14(17.5 + 16)$$

$$= 1474 \text{ m}^2$$

OR

(*iii*) (*b*) Volume of air inside the tent = volume of cone + volume of cylinder

$$= \frac{1}{3}\pi r^2 h + \pi r^2 H$$

$$= \frac{1}{3} \times \pi \times 14 \times 14 \times 10.5 + \pi \times 14 \times 14 \times 8$$

$$= \pi \times 14 \times 14(3.5 + 8)$$

$$= 7084 \text{ m}^3.$$