SQP SOLUTIONS

1. **(c) :** Two tangents can be drawn to a circle from a point lying outside the circle.

2. **(a) :** Given, $\Delta ABC \sim \Delta PQR$

$\dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{AC}{PR} \Rightarrow \dfrac{6}{3} = \dfrac{8}{PR} \Rightarrow PR = \dfrac{8 \times 3}{6} = 4$

3. **(d) :** We have, $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$

Discriminant, $D = b^2 - 4ac$

where $a = 3\sqrt{3}, b = 10, c = \sqrt{3}$

$\therefore \quad D = (10)^2 - 4(3\sqrt{3})(\sqrt{3}) = 100 - 36 = 64$

4. **(c) :** Let $P(x, y)$ be the midpoint of the line segment joining the points $A(2, 2)$ and $B(-4, -4)$.

$\therefore \; x = \dfrac{2+(-4)}{2}$ and $y = \dfrac{2+(-4)}{2} = \dfrac{-2}{2} = -1 = \dfrac{-2}{2} = -1$

$\therefore \quad P(-1, -1)$ is the midpoint of AB.

5. **(c) :** No tangent can be drawn from a point lying inside the circle.

6. **(b) :** We have, $\tan^2 45° + \cot^2 45° = (1)^2 + (1)^2 = 2$

7. **(d) :** We have, $121 = 11 \times 11$

$1001 = 7 \times 11 \times 13$

Hence, H.C.F. of 121 & 1001 is 11.

8. **(c) :** In ΔABC, $DE \parallel AB$

$\therefore$ By basic proportionality theorem,

$\dfrac{AE}{EC} = \dfrac{BD}{DC} \Rightarrow \dfrac{3}{y} = \dfrac{12}{x} \Rightarrow \dfrac{x}{y} = \dfrac{12}{3} = \dfrac{4}{1}$

$\Rightarrow \quad x : y = 4 : 1$

9. **(d) :** The given polynomial is $ax^2 - 6x - 6$

$\therefore$ Product of its zeroes $= \dfrac{-6}{a}$

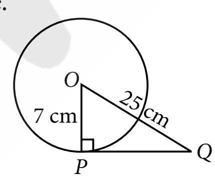
$\Rightarrow \quad \dfrac{-6}{a} = 4$ [$\because$ Product of zeroes = 4 (Given)]

$\Rightarrow \quad a = -\dfrac{3}{2}$

10. **(c) :** $\because$ PQ is a tangent to the circle.

$\therefore \quad OP \perp PQ$

In right ΔOPQ,



$PQ^2 = OQ^2 - OP^2$

$= 25^2 - 7^2 = 625 - 49 = 576$

$\Rightarrow \quad PQ = 24$ cm

11. **(c) :** $\sin^4 45° = \left(\dfrac{1}{\sqrt{2}}\right)^4 = \dfrac{1}{4}$

12. **(b) :** Required area of ring = 1386 – 962.5 = 423.5 cm^2

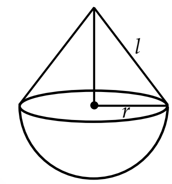
13. **(b) :** We have, $\dfrac{AD}{DB} = \dfrac{3}{4}$ and $\dfrac{AE}{EC} = \dfrac{6}{8} = \dfrac{3}{4}$

$\therefore \quad \dfrac{AD}{DB} = \dfrac{AE}{EC} \Rightarrow DE \parallel BC$

[By converse of Basic Proportionality Theorem]

14. **(b) :** Let r be the radius of hemisphere and conical part. Also, let l be the slant height of conical part.

Given, Surface area of hemisphere
= Surface area of conical part



$\Rightarrow \quad 2\pi r^2 = \pi rl \Rightarrow 2r = l$

$\Rightarrow \quad \dfrac{r}{l} = \dfrac{1}{2}$

$\therefore \quad$ Required ratio = 1 : 2

15. **(b) :** We have, $\sin \alpha = 1/2$

Now, $3\sin \alpha - 4 \sin^3 \alpha$

$= 3\left(\dfrac{1}{2}\right) - 4\left(\dfrac{1}{2}\right)^3 = \dfrac{3}{2} - \dfrac{4}{8} = \dfrac{3}{2} - \dfrac{1}{2} = 1$

16. **(d) :** Total number of observations = 10

Median = 27.5

$\Rightarrow \quad 27.5 = \dfrac{24 + x + 27 + x}{2}$

$\Rightarrow \quad 55 = 51 + 2x \Rightarrow 2x = 4 \Rightarrow x = 2$

17. **(b) :** Given, $\sin\theta = \cos\theta$

$\Rightarrow \quad \dfrac{\sin\theta}{\cos\theta} = 1 \Rightarrow \tan\theta = 1$

$\Rightarrow \quad \tan\theta = \tan 45°$ [$\because \tan 45° = 1$]

$\Rightarrow \quad \theta = 45°$

18. **(a) :** Total surface area of solid = Curved surface area of cylinder + Curved surface area of hemisphere = $2\pi rh + 2\pi r^2 = 2\pi r(h + r)$

19. **(a) :** Given, $P(E) = 0.45$

We know, $P(\overline{E}) = 1 - P(E) = 1 - 0.45 = 0.55$

Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

20. **(a) :** Clearly, reason (R) is true.

Now, $a_7 - a_{11} = 300$

$\Rightarrow \quad (a + 6d) - (a + 10d) = 300 \quad [\because a_n = a + (n - 1)d]$

$\Rightarrow \quad -4d = 300 \Rightarrow d = -75$, which is true.

Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

21. Here, $\dfrac{a_1}{a_2} = \dfrac{2}{4} = \dfrac{1}{2}, \dfrac{b_1}{b_2} = \dfrac{3}{6} = \dfrac{1}{2}$ and $\dfrac{c_1}{c_2} = \dfrac{5}{7}$

$\therefore \quad \dfrac{1}{2} = \dfrac{1}{2} \neq \dfrac{5}{7}$

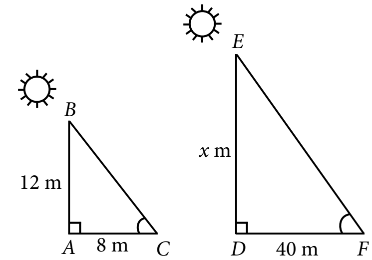
Now, $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$ is the condition for which the given system of equations will represent parallel lines.

So, the given system of linear equations will represent a pair of parallel lines.

22. Let AB be the vertical stick and AC be its shadow. Also, let DE be the vertical tower and DF be its shadow.

Join BC and EF.

Let $DE = x$ m



We have, $AB = 12$ m, $AC = 8$ m, and $DF = 40$ m.
In ΔABC and ΔDEF, we have

$\angle A = \angle D = 90°$

$\angle C = \angle F$ (Angular elevation of the sun)

$\therefore$ $\Delta ABC \sim \Delta DEF$ (By AA similarity criterion)

$$\Rightarrow \frac{AB}{DE} = \frac{AC}{DF} \Rightarrow \frac{12}{x} = \frac{8}{40} \Rightarrow \frac{12}{x} = \frac{1}{5} \Rightarrow x = 60$$

Hence, the height of the tower is 60 m.

23. Given, radius of cone $(r) = \frac{14}{2} = 7$ cm
Height of cone $(h) = 8$ cm

Slant height $l = \sqrt{r^2 + h^2} = \sqrt{7^2 + 8^2} = \sqrt{113}$ cm

CSA of cone $= \pi r l = \frac{22}{7} \times 7 \times \sqrt{113} = 22\sqrt{113}$ m^2

24. (a) Since, A and B lie on the circle having centre O.

$\therefore$ $OA = OB$ [Each equal to radius]

$$\Rightarrow \sqrt{(4-2)^2 + (3-3)^2} = \sqrt{(x-2)^2 + (5-3)^2}$$

$$\Rightarrow 2 = \sqrt{(x-2)^2 + 4} \Rightarrow 4 = (x-2)^2 + 4$$

(Squaring both sides)

$$\Rightarrow (x-2)^2 = 0 \Rightarrow x - 2 = 0 \Rightarrow x = 2$$

OR

(b) Let $P(x, y)$ be the required point.
Using section formula, we get

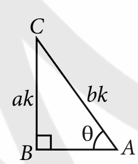
$$x = \frac{3(3) + 2(-4)}{3+2} = \frac{1}{5},\ y = \frac{3(-8) + 2(6)}{3+2} = \frac{-12}{5}$$

$\therefore$ $\left(\frac{1}{5}, \frac{-12}{5}\right)$ is the required point.

25. (a) Consider a ΔABC in which $\angle B = 90°$ and $\angle BAC = \theta$.

Given, $\sin\theta = \frac{a}{b} = \frac{BC}{AC}$

Let $BC = ak$ units and $AC = bk$ units
Using Pythagoras theorem, we have



$AC^2 = AB^2 + BC^2 \Rightarrow b^2k^2 = AB^2 + a^2k^2$

$$\Rightarrow AB^2 = b^2k^2 - a^2k^2$$

$$\Rightarrow AB = \sqrt{b^2 - a^2}\,k \text{ units}$$

$$\therefore \tan\theta = \frac{BC}{AB} = \frac{a}{\sqrt{b^2 - a^2}} \text{ and } \sec\theta = \frac{AC}{AB} = \frac{b}{\sqrt{b^2 - a^2}}$$

OR

(b) Given, $\cot\theta = 8/15$

$$\text{Now, } \frac{\sin^2\theta - \cos^2\theta}{2\sin\theta\cos\theta} = \frac{\frac{\sin^2\theta}{\sin^2\theta} - \frac{\cos^2\theta}{\sin^2\theta}}{\frac{2\sin\theta\cos\theta}{\sin^2\theta}}$$

(Dividing both numerator and denominator by $\sin^2\theta$)

$$= \frac{1 - \cot^2\theta}{2\cot\theta} \qquad \left(\because \frac{\cos\theta}{\sin\theta} = \cot\theta\right)$$

$$= \frac{1 - (8/15)^2}{2(8/15)} = \left(1 - \frac{64}{225}\right) \times \frac{15}{16} = \frac{161}{225} \times \frac{15}{16} = \frac{161}{240}$$

26. Let the required point be $P(x, 0)$
Since, point $P(x, 0)$ is equidistant from points $A(2, -5)$ and $B(-2, 9)$.

$\therefore$ $PA = PB \Rightarrow PA^2 = PB^2$

$\Rightarrow$ $(2 - x)^2 + (-5 - 0)^2 = (-2 - x)^2 + (9 - 0)^2$

$\Rightarrow$ $4 + x^2 - 4x + 25 = 4 + x^2 + 4x + 81$

$\Rightarrow$ $8x = -56 \Rightarrow x = -7$

Thus, the required point is $(-7, 0)$.
Now, the distance between $P(-7, 0)$

and the origin $= \sqrt{(0+7)^2 + (0-0)^2}$

$= \sqrt{49 + 0} = 7$ units

27. Since $DE \parallel BC$, we have $\angle AED = \angle ACB$

[Corresponding angles]

and $\angle ADE = \angle ABC$ [Corresponding angles]

$\therefore$ $\Delta ADE \sim \Delta ABC$ [By AA-Similarity]

So, the corresponding sides of ΔADE and ΔABC are proportional.

$$\therefore \frac{AD}{AB} = \frac{DE}{BC} = \frac{AE}{AC} \qquad \text{...(i)}$$

$$\text{Now, } \frac{AD}{AB} = \frac{DE}{BC} \Rightarrow \frac{2}{4.5} = \frac{4}{BC}$$

[$\because AB = (AD + BD) = 4.5$ cm]

$$\Rightarrow BC = \left(\frac{4 \times 4.5}{2}\right) \text{cm} = 9 \text{ cm}$$

$$\text{Again, } \frac{DE}{BC} = \frac{AE}{AC} \qquad \text{[From (i)]}$$

$$\Rightarrow \frac{4}{9} = \frac{3.2}{AC} \qquad [\because BC = 9 \text{ cm}]$$

$$\Rightarrow AC = \left(\frac{9 \times 3.2}{4}\right) \text{cm} = 7.2 \text{ cm}$$

Hence, $AC = 7.2$ cm and $BC = 9$ cm

28. (a) We have, $\sin(A + 2B) = \frac{\sqrt{3}}{2}$

$$\Rightarrow \sin(A + 2B) = \sin 60° \qquad \left[\because \sin 60° = \frac{\sqrt{3}}{2}\right]$$

$\Rightarrow$ $A + 2B = 60°$ ...(i)

And $\cos(A + 4B) = 0$

$\Rightarrow$ $\cos(A + 4B) = \cos 90°$ [$\because \cos 90° = 0$]

$\Rightarrow$ $A + 4B = 90°$ ...(ii)

Subtracting (i) from (ii), we get

$2B = 30° \Rightarrow B = 15°$

Putting the value of B in (i), we get

$A + 2(15°) = 60°$

$\Rightarrow A + 30° = 60° \Rightarrow A = 30°$

OR

$$\text{(b) L.H.S.} = \frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta}$$

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

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

$= \operatorname{cosec}\theta + \cot\theta - \operatorname{cosec}\theta$ [$\because \operatorname{cosec}^2\theta - \cot^2\theta = 1$]

$= \operatorname{cosec}\theta - (\operatorname{cosec}\theta - \cot\theta)$

$$= \frac{1}{\sin\theta} - \frac{(\text{cosec}\,\theta - \cot\theta)}{1} \times \frac{(\text{cosec}\,\theta + \cot\theta)}{(\text{cosec}\,\theta + \cot\theta)}$$

$$= \frac{1}{\sin\theta} - \frac{\text{cosec}^2\,\theta - \cot^2\theta}{\text{cosec}\,\theta + \cot\theta} = \frac{1}{\sin\theta} - \frac{1}{\text{cosec}\,\theta + \cot\theta}$$

= R.H.S.

29. Let $p(x) = 2x^2 + 3x - k$

Since, one of the zeroes of $p(x)$ is $\frac{1}{2}$. [Given]

$$\therefore \quad p\left(\frac{1}{2}\right) = 0 \Rightarrow 2\left(\frac{1}{2}\right)^2 + 3\left(\frac{1}{2}\right) - k = 0$$

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

Let the other zero be α.

Now, product of zeroes $= \dfrac{\text{Constant term}}{\text{Coefficient of } x^2}$

$$\Rightarrow \alpha \times \frac{1}{2} = -\frac{k}{2} = -\frac{2}{2} = -1 \Rightarrow \alpha = -2$$

$\therefore$ Sum of k and the other zero $= 2 + (-2) = 0$

30. (a) Seven years ago, let Swati's age be x years. Then, Varun's age was $5x^2$ years.

$\therefore$ Swati's present age $= (x + 7)$ years and

Varun's present age $= (5x^2 + 7)$ years

Three years hence, we have

Swati's age $= (x + 7 + 3)$ years $= (x + 10)$ years

Varun's age $= (5x^2 + 7 + 3)$ years $= (5x^2 + 10)$ years

According to question, $x + 10 = \frac{2}{5}(5x^2 + 10)$

$\Rightarrow x + 10 = 2x^2 + 4$

$\Rightarrow 2x^2 - x - 6 = 0 \Rightarrow 2x^2 - 4x + 3x - 6 = 0$

$\Rightarrow 2x(x - 2) + 3(x - 2) = 0 \Rightarrow (2x + 3)(x - 2) = 0$

$\Rightarrow x - 2 = 0$ $[\because 2x + 3 \neq 0 \text{ as } x > 0]$

$\Rightarrow x = 2$

Hence, Swati's present age $= (2 + 7)$ years $= 9$ years

Varun's present age $= (5 \times 2^2 + 7)$ years $= 27$ years

OR

(b) We have, $\dfrac{x+4}{x-4} + \dfrac{x-4}{x+4} = \dfrac{10}{3}$ ...(i)

Putting $\dfrac{x+4}{x-4} = y$ in (i), we get

$$y + \frac{1}{y} = \frac{10}{3} \Rightarrow \frac{y^2+1}{y} = \frac{10}{3} \Rightarrow 3y^2 + 3 = 10y$$

$\Rightarrow 3y^2 - 10y + 3 = 0 \Rightarrow 3y^2 - 9y - y + 3 = 0$

$\Rightarrow 3y(y - 3) - 1(y - 3) = 0 \Rightarrow (y - 3)(3y - 1) = 0$

$\Rightarrow y = 3$ or $y = 1/3$

Now, $\dfrac{x+4}{x-4} = 3 \Rightarrow x + 4 = 3x - 12$

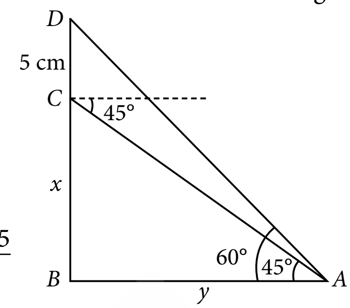
$\Rightarrow 2x = 16 \Rightarrow x = 8$

And $\dfrac{x+4}{x-4} = \dfrac{1}{3} \Rightarrow 3x + 12 = x - 4$

$\Rightarrow 2x = -16 \Rightarrow x = -8$

So, required roots are ± 8.

31. Let BC be the height of the tower and CD be the height of the pole. Let $BC = x$ m and $AB = y$ m



Now, in ΔABC,

$$\tan 45° = \frac{BC}{AB} \Rightarrow 1 = \frac{x}{y}$$

$\Rightarrow y = x$ ... (i)

Now, in ΔABD,

$$\tan 60° = \frac{BD}{AB} \Rightarrow \sqrt{3} = \frac{x+5}{y}$$

$$\Rightarrow x + 5 = \sqrt{3}y \Rightarrow \sqrt{3}x = x + 5 \qquad (\because x = y)$$

$$\Rightarrow (\sqrt{3} - 1)x = 5 \Rightarrow x = \frac{5}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{5(\sqrt{3}+1)}{2}$$

$$= \frac{5(2.732)}{2} = 6.83 \text{ m}$$

Hence, height of the tower = 6.83 m

32. Time taken by A to complete 1 round

$$= \frac{1980}{330} = 6 \text{ mins}$$

Time taken by B to complete 1 round

$$= \frac{1980}{198} = 10 \text{ mins}$$

Time taken by C to complete 1 round

$$= \frac{1980}{220} = 9 \text{ mins}$$

$\therefore$ Required number of minutes, when the three cyclists will meet at the starting point again is LCM (6, 10, 9) minutes.

$\because$ $6 = 2 \times 3$, $10 = 2 \times 5$ and $9 = 3 \times 3$

$\therefore$ LCM (6, 10, 9) $= 2 \times 5 \times 3^2 = 90$ minutes

So, they will meet after 90 minutes or 1 hour 30 mins.

33. (a) Let a_1, a_2 be the first term and d_1, d_2 be common difference of the two A.P.'s respectively.

Given, ratio of sum of first n terms $= \dfrac{7n+1}{4n+27}$

$$\therefore \quad \frac{\frac{n}{2}\{2a_1 + (n-1)d_1\}}{\frac{n}{2}\{2a_2 + (n-1)d_2\}} = \frac{7n+1}{4n+27} \qquad \text{...(i)}$$

$$\Rightarrow \frac{2a_1 + (n-1)d_1}{2a_2 + (n-1)d_2} = \frac{7n+1}{4n+27}$$

$$\Rightarrow \frac{a_1 + \left(\frac{n-1}{2}\right)d_1}{a_2 + \left(\frac{n-1}{2}\right)d_2} = \frac{7n+1}{4n+27}$$

Putting $\dfrac{n-1}{2} = 8$, we get

$$\frac{a_1 + 8d_1}{a_2 + 8d_2} = \frac{7(17)+1}{4(17)+27} \quad \left\{\because \frac{n-1}{2} = 8 \Rightarrow n = 17\right\}$$

$$\Rightarrow \frac{a_1 + 8d_1}{a_2 + 8d_2} = \frac{120}{95} = \frac{24}{19}$$

$\therefore$ Ratio of 9th terms $= \dfrac{a_1 + 8d_1}{a_2 + 8d_2} = \dfrac{24}{19}$

OR

(b) Let a be the first term and d be the common difference of given A.P.
According to the question,

Sara's expression, $S_1 = S_n = \dfrac{n}{2}[2a + (n-1)d]$ ...(i)

Lara's expression, $S_2 = S_{2n} = \dfrac{2n}{2}[2a + (2n-1)d]$ ...(ii)

and Maira's expression $S_3 = S_{3n} = \dfrac{3n}{2}[2a + (3n-1)d]$ ...(iii)

Now, $S_2 - S_1 = \dfrac{2n}{2}[2a + (2n-1)d] - \dfrac{n}{2}[2a + (n-1)d]$

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

$= \dfrac{n}{2}[2a + (3n-1)d]$

$\therefore\ 3(S_2 - S_1) = \dfrac{3n}{2}[2a + (3n-1)d]$

$\Rightarrow\ 3(S_2 - S_1) = S_3$ [Using (iii)]

or $S_3 = 3(S_2 - S_1)$

So, the relation Laira was asked to prove is true.

34. (a) If two circles touch externally, then the distance between their centres is equal to the sum of their radii. Let the radii of the two circles be r_1 cm and r_2 cm respectively. Let C_1 and C_2 be the centres of the given circles.

Then, $r_1 + r_2 = C_1C_2$

$\Rightarrow\ r_1 + r_2 = 14$ ...(i) [$\because C_1C_2 = 14$ cm (Given)]

It is given that the sum of the areas of two circles is equal to $130\,\pi$ cm^2.

$\therefore\ \pi r_1^2 + \pi r_2^2 = 130\pi$

$\Rightarrow\ r_1^2 + r_2^2 = 130$ ...(ii)

Now, $(r_1 + r_2)^2 = r_1^2 + r_2^2 + 2r_1r_2$

$\Rightarrow\ 14^2 = 130 + 2r_1r_2$ [Using (i) and (ii)]

$\Rightarrow\ 196 - 130 = 2r_1r_2$

$\Rightarrow\ 66 = 2r_1r_2$

$\Rightarrow\ r_1r_2 = 33$ ...(iii)

Now, $(r_1 - r_2)^2 = r_1^2 + r_2^2 - 2r_1r_2$

$\Rightarrow\ (r_1 - r_2)^2 = 130 - 2 \times 33$ [Using (ii) and (iii)]

$\Rightarrow\ (r_1 - r_2)^2 = 64$

$\Rightarrow\ r_1 - r_2 = \pm(8)$ ...(iv)

Solving (i) and (iv), we get $r_1 = 11$ and $r_2 = 3$

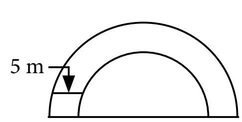
or $r_1 = 3$ and $r_2 = 11$

Hence, the radii of the two circles are 11 cm and 3 cm.

OR

(b) Let R m and r m be the radius of outer and inner semi-circular plot.

Given, perimeter of plot $= 163\dfrac{3}{7}$ m



$\Rightarrow\ (\pi + 2)r = \dfrac{1144}{7}$

$\Rightarrow\ \left(\dfrac{22}{7} + 2\right)r = \dfrac{1144}{7} \Rightarrow \dfrac{36}{7}r = \dfrac{1144}{7} \Rightarrow\ r = \dfrac{1144}{36} = \dfrac{286}{9}$

$\therefore\ R = \dfrac{286}{9} + 5 = \dfrac{286 + 45}{9} = \dfrac{331}{9}$

(i) Area of the path $= \dfrac{\pi}{2}(R^2 - r^2) = \dfrac{22}{2\times 7}(R + r)(R - r)$

$= \dfrac{11}{7}\left(\dfrac{331}{9} + \dfrac{286}{9}\right)\left(\dfrac{331}{9} - \dfrac{286}{9}\right) = \dfrac{11}{7} \times \dfrac{617}{9} \times \dfrac{45}{9} = 538.65\ \text{m}^2$

(ii) Cost of gravelling 1 m^2 path = ₹ 12

$\therefore$ Cost of gravelling 538.65 m^2 path = ₹(12 × 538.65)
= ₹ 6463.80

(iii) Area of the plot $= \pi r^2 = \left(\dfrac{22}{7} \times \dfrac{286}{9} \times \dfrac{286}{9}\right)\text{m}^2$
$= 3173.74\ \text{m}^2$

Now, cost of turfing 1 m^2 plot = ₹ $\dfrac{45}{100}$

$\therefore$ Cost of turfing 3173.74 m^2 plot = ₹ $\left(\dfrac{45}{100} \times 3173.74\right)$
= ₹ 1428.183

35. Let the missing frequency be f.

Class Interval	**Frequency (f_i)**	**Class Mark (x_i)**	$f_i x_i$
11-13	3	12	36
13-15	6	14	84
15-17	9	16	144
17-19	13	18	234
19-21	f	20	$20f$
21-23	5	22	110
23-25	4	24	96
	$n = \Sigma f_i = 40 + f$		$\Sigma f_i x_i = 704 + 20f$

Mean of the data = ₹ 18 [Given]

$\Rightarrow\ \dfrac{\Sigma f_i x_i}{n} = 18 \Rightarrow \dfrac{704 + 20f}{40 + f} = 18$

$\Rightarrow\ 704 + 20f = 18 \times (40 + f)$

$\Rightarrow\ 20f - 18f = 720 - 704 \Rightarrow 2f = 16 \Rightarrow f = 8$

36. **(i)** If ΔAED and ΔBEC, are similar by SAS similarity rule, then their corresponding sides are proportional.

$\therefore\ \dfrac{AE}{BE} = \dfrac{DE}{CE} = \dfrac{AD}{BC}$

(ii) $BC = \sqrt{CE^2 + EB^2} = \sqrt{8^2 + 6^2} = \sqrt{64 + 36}$

$= \sqrt{100} = 10$ cm

(iii) (a) Since ΔADE and ΔBCE are similar

$\therefore\ \dfrac{\text{Perimeter of } \Delta ADE}{\text{Perimeter of } \Delta BCE} = \dfrac{AD}{BC}$

$\Rightarrow\ \dfrac{1}{2} = \dfrac{AD}{10} \Rightarrow AD = 5$ cm

OR

(b) $\dfrac{\text{Perimeter of } \Delta ADE}{\text{Perimeter of } \Delta BCE} = \dfrac{ED}{CE}$

$\Rightarrow \dfrac{1}{2} = \dfrac{ED}{8} \Rightarrow ED = 4$ cm

37. Sample space (S) = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

$\Rightarrow$ $n(S) = 8$

(i) Let A be the event of getting atmost one tail.

$\therefore$ A = {HHH, HHT, HTH, THH}

$\Rightarrow$ $n(A) = 4$

$\therefore$ Required probability $= \dfrac{4}{8} = \dfrac{1}{2}$

(ii) Let B be the event of getting exactly 1 head.

$\therefore$ B = {HTT, THT, TTH}

$\Rightarrow$ $n(B) = 3$

$\therefore$ Required probability $= \dfrac{3}{8}$

(iii) (a) Let C be the event of getting exactly 3 tails.

$\therefore$ C = {TTT} $\Rightarrow n(C) = 1$

$\therefore$ Required probability $= \dfrac{1}{8}$

Let D be the event of getting atmost 3 heads.

$\therefore$ D = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

$\Rightarrow$ $n(D) = 8$

$\therefore$ Required probability $= \dfrac{8}{8} = 1$

OR

(b) Let E be the event of getting atleast two heads.

$\therefore$ E = {HHT, HTH, THH, HHH}

$\Rightarrow$ $n(E) = 4$

$\therefore$ Required probability $= \dfrac{n(E)}{n(S)} = \dfrac{4}{8} = \dfrac{1}{2}$

38. **(i)** The zeroes of the polynomial are the points which intersects x-axis *i.e.*, whose y co-ordinate is 0.

$\therefore$ Zeroes are -1 and -3.

(ii) Sum of zeroes of quadratic polynomial $ax^2 + bx + c$, $a \neq 0$ is $\dfrac{-b}{a}$.

(iii) (a) To have rational roots, discriminant ($D = b^2 - 4ac$) should be > 0 and also a perfect square.

Here, $D = (-5)^2 - 4(1)(6) = 25 - 24 = 1$, which is a perfect square. Thus given equation has rational roots.

Now, we have $x^2 - 5x + 6 = 0 \Rightarrow x^2 - 3x - 2x + 6 = 0$

$\Rightarrow$ $(x - 3)(x - 2) = 0 \Rightarrow x = 3, 2$

OR

(b) To have equal roots, discriminant ($D = b^2 - 4ac$) should be = 0.

Here, $D = 6^2 - 4(9)(1) = 36 - 36 = 0$

Given, $9x^2 + 6x + 1 = 0$

$\Rightarrow$ $9x^2 + 3x + 3x + 1 = 0 \Rightarrow 3x(3x + 1) + 1(3x + 1) = 0$

$\Rightarrow$ $(3x + 1)(3x + 1) = 0 \Rightarrow x = \dfrac{-1}{3}, \dfrac{-1}{3}$.

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