Solutions to RMT–DS1/Set-3

1. (*d*) LCM $(A, B) = p^3q^4$

2. (*a*) Sum of zeroes $(\alpha + \beta) = \frac{-b}{a}$

$\therefore \quad \alpha + \beta = 7$

and product of zeroes $(\alpha\beta) = \frac{c}{a}$

$\alpha\beta = 10$

$\therefore \quad \frac{1}{\alpha^2} + \frac{1}{\beta^2} = \frac{\beta^2 + \alpha^2}{(\alpha\beta)^2}$

$= \frac{(\alpha+\beta)^2 - 2\alpha\beta}{(\alpha\beta)^2} = \frac{7^2 - 2 \times 10}{10^2} = \frac{49 - 20}{100} = \frac{29}{100}$

3. (*b*) Parallel to *y*-axis.

4. (*c*) $(2x - 7)^2 = 2x + 3$

$\Rightarrow \quad 4x^2 + 49 - 28x - 2x - 3 = 0$

$\Rightarrow \quad 4x^2 - 30x + 46 = 0$

$\Rightarrow \quad 2x^2 - 15x + 23 = 0$

$\therefore$ Discriminant (D) $= b^2 - 4ac$

$= (-15)^2 - 4 \times 2 \times 23$

$= 225 - 184$

$= 41$

5. (*a*) Given, first term $(a) = \sqrt{3}$, common difference $(d) = 2\sqrt{3}$

$\therefore$ 14th term $(a_{14}) = a + 13d$

$= \sqrt{3} + 13(2\sqrt{3})$

$= \sqrt{3} + 26\sqrt{3}$

$= 27\sqrt{3}$

6. (*b*) $(x, y) = \left(\frac{2+8}{2}, \frac{6+0}{2}\right) = (5, 3)$

7. (*d*) Similar but not congruent.

8. (*c*) Required distance $(OP) = \sqrt{(36-0)^2 + (15-0)^2}$

$= \sqrt{1296 + 225}$

$= \sqrt{1521}$

$= 39$ units

9. (*d*) Given, $3 \sin\theta = 2$

$\sin\theta = \frac{2}{3}$

$\sin\theta = \frac{P}{H}$

$\therefore \quad H^2 = P^2 + B^2$ [$\because$ Pythagoras]

$\Rightarrow \quad 3^2 = 2^2 + B^2$

$\Rightarrow \quad B = \sqrt{5}$

Now, $\tan\theta = \dfrac{P}{B} = \dfrac{2}{\sqrt{5}}$

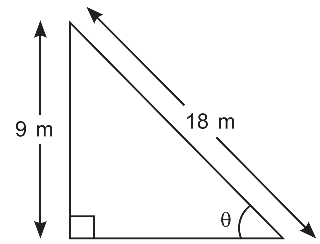
$\therefore$ The value of $5\tan^2\theta + 2 = 5\left(\dfrac{2}{\sqrt{5}}\right)^2 + 2 = 4 + 2 = 6$

10. (*c*) $\cot\theta = \dfrac{1}{\sqrt{3}} = \cos 60°$

$\Rightarrow \quad \theta = 60°$

$$\therefore \quad \frac{1-\cos^2\theta}{2-\sin^2\theta} = \frac{1-\cos^2 60°}{2-\sin^2 60°} = \frac{1-\left(\frac{1}{2}\right)^2}{2-\left(\frac{\sqrt{3}}{2}\right)^2} = \frac{1-\frac{1}{4}}{2-\frac{3}{4}} = \frac{\frac{3}{4}}{\frac{5}{4}} = \frac{3}{5}$$

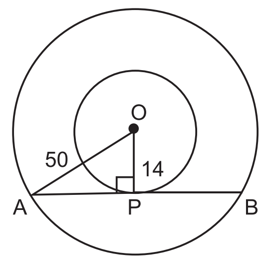
11. (*a*) $\dfrac{9}{18} = \sin\theta$



$\Rightarrow \quad \sin\theta = \dfrac{1}{2} = \sin 30°$

$\Rightarrow \quad \theta = 30°$

12. (*c*) Let AB be the chord and OP and OA be the radii of inner and outer circles respectively.



$\therefore$ By Pythagoras; $AO^2 = AP^2 + OP^2$

$\Rightarrow \quad 50^2 = AP^2 + 14^2$

$\Rightarrow \quad 2500 = AP^2 + 196$

$\Rightarrow \quad AP^2 = 2304$

$\Rightarrow \quad AP = 48$ cm

$\therefore$ Length of the chord; $AB = 48 \times 2 = 96$ cm

13. (*a*) In ΔBOP;

$x + 90° + 15° = 180°$

$\Rightarrow \quad x = 75°$

14. (*b*) Area of the shaded region $= \dfrac{1}{2}\pi r^2$

$= \dfrac{1}{2} \times \dfrac{22}{7} \times 7 \times 7$

$= 77 \text{ cm}^2$

15. (*b*) Perimeter of the top of the table $= \pi r + 2r$

$$= \frac{22}{7} \times 63 + 2 \times 63$$

$$= 324 \text{ cm}$$

16. (*a*) $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$

17. (*d*) $\frac{1}{3}$

18. (*b*) $\frac{1}{26}$

19. (*a*) Both assertion (A) and reason (R) are true and Reason (R) is correct explanation of assertion (A).

20. (*a*) Both assertion (A) and reason (R) are true and reason (R) is correct explanation of assertion (A).

21. Yes, $\Delta ABC \sim \Delta PQR$ [AA similarity rule]

As $\angle B = \angle Q$ [Each 60°]

$\angle C = \angle R$ [Each 35°]

22. As we know, every natural number ends with the digit 0 is divisible by both 2 and 5.

$\therefore$ If 5^n ends with the digit 0, it must be divisible by 2 and 5 both i.e prime factor of 5^n contain primes 2 and 5.

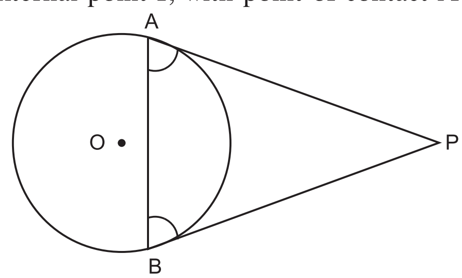
$5^n = (1 \times 5)^n$

But prime factors of 5^n not contain 2.

Fundamental theorem of Arithmetic guarantees, there is no other prime factors of 5^n.

Hence, for any natural number n, 5^n never ends with the digit zero.

23. **Given:** A circle with centre O, PA and PB are two tangents drawn from external point P, with point of contact A and B respectively.



To prove: $\angle PAB = \angle PBA$

Proof: The length of tangents drawn from an external point to a circle are equal

$\therefore$ $PA = PB$

In ΔPAB, if $PA = PB$

then $\angle PBA = \angle PAB$ [Angles opposite to equal sides of a Δ are equal]

24. If $\tan \theta = \frac{a}{b}$

$$\therefore \quad \frac{2\tan\theta}{1+\tan^2\theta} = \frac{2 \times \frac{a}{b}}{1 + \frac{a^2}{b^2}} = \frac{\frac{2a}{b}}{\frac{b^2+a^2}{b^2}} = \frac{2ab}{a^2+b^2}$$

OR

$$\frac{3 - \sin^2 60°}{\sin^2 30° + \cos^2 30°} - 2\tan^2 30° + \sec 30° \operatorname{cosec} 60°$$

On putting the values of trigonometric identities;

$$= \frac{3 - \left(\frac{\sqrt{3}}{2}\right)^2}{1} - 2 \times \left(\frac{1}{\sqrt{3}}\right)^2 + \frac{2}{\sqrt{3}} \times \frac{2}{\sqrt{3}} \qquad [\because \sin^2\theta + \cos^2\theta = 1]$$

$$= \frac{3 - \frac{3}{4}}{1} - 2 \times \frac{1}{3} + \frac{4}{3}$$

$$= \frac{\frac{12-3}{4}}{1} - \frac{2}{3} + \frac{4}{3} = \frac{9}{4} - \frac{2}{3} + \frac{4}{3} = \frac{27 - 8 + 16}{12} = \frac{35}{12}$$

25. Area of shaded region = Area of ΔAOB – Area of sector

$$= \frac{1}{2} \times BO \times AB - \frac{\pi r^2 \theta}{360°}$$

$$= \frac{1}{2} \times 5 \times 12 - \frac{22}{7} \times \frac{5 \times 5 \times 60°}{360°}$$

$$= 30 - \frac{275}{21} = 30 - 13.1 = 16.9 \text{ cm}^2 \text{ (approx)}$$

OR

Angle formed by minute hand in 60 minutes = 360°

∴ Angle formed by minute hand in 1 minute = $\frac{360°}{60} = 6°$

∴ Angle formed by minute hand in 25 minutes = 25 × 6° = 150°

Now, Area swept by minute hand in 25 minutes

$$= \frac{\pi r^2 \theta}{360°}$$

$$= \frac{22}{7} \times \frac{7 \times 7 \times 150}{360°}$$

$$= \frac{385}{6} \text{ cm}^2$$

26.

5	175
5	35
7	7
	1

3	255
5	85
17	17
	1

Prime factors of 175 = 5 × 5 × 7

and Prime factors of 255 = 3 × 5 × 17

∴ HCF = 5

and LCM = 3 × 5 × 5 × 7 × 17 = 8925

∴ HCF × LCM = 5 × 8925 = 44625

and Product of these 2 numbers = 175 × 255 = 44625

∴ HCF × LCM = Product of 2 numbers. (verified)

27. $P(x) = 6x^2 - 3x + 10$

Sum of zeroes; $\alpha + \beta = \frac{-b}{a}$

$$= \frac{-(-3)}{6}$$

$$\alpha + \beta = \frac{1}{2}$$

Product of zeroes; $\alpha\beta = \frac{c}{a}$

$$\alpha\beta = \frac{10}{6}$$

$$\alpha\beta = \frac{5}{3}$$

For polynomial whose zeroes are $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$.

Sum of zeroes $= \frac{1}{\alpha^2} + \frac{1}{\beta^2}$

$$= \frac{\beta^2 + \alpha^2}{(\alpha\,\beta)^2}$$

$$= \frac{(\alpha + \beta)^2 - 2\alpha\beta}{(\alpha\beta)^2}$$

$$= \frac{\left(\frac{1}{2}\right)^2 - 2 \times \frac{5}{3}}{\left(\frac{5}{3}\right)^2}$$

$$= \frac{\frac{1}{4} - \frac{10}{3}}{\frac{25}{9}}$$

$$= \left(\frac{3-40}{12}\right) \times \frac{9}{25} = \frac{-37}{4} \times \frac{3}{25} = -\frac{111}{100}$$

Product of zeroes $= \frac{1}{\alpha^2} \times \frac{1}{\beta^2} = \frac{1}{(\alpha\beta)^2} = \frac{1}{\left(\frac{5}{3}\right)^2} = \frac{9}{25}$

$\therefore$ Required polynomial; $g(x) = k\left\{x^2 - (\text{sum of zeroes})\, x + \text{Product of zeroes}\right\}$

$$= k\left\{x^2 + \frac{111}{100}x + \frac{9}{25}\right\}$$

$\Rightarrow$ $g(x) = \frac{k}{100}\left\{100x^2 + 111x + 36\right\}$

$\Rightarrow$ $g(x) = 100x^2 + 111x + 36$ [taken $k = 100$]

28. L.H.S. $= \frac{\cos\theta - \sin\theta + 1}{\cos\theta + \sin\theta - 1}$

Divide both numerator and denominator by $\sin\theta$ $= \frac{\frac{\cos\theta}{\sin\theta} - \frac{\sin\theta}{\sin\theta} + \frac{1}{\sin\theta}}{\frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\sin\theta} - \frac{1}{\sin\theta}}$

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

$$= \frac{\cot\theta - 1 + \operatorname{cosec}\theta}{\cot\theta - \operatorname{cosec}\theta + \left(\operatorname{cosec}^2\theta - \cot^2\theta\right)} \quad [\because \operatorname{cosec}^2\theta - \cot^2\theta = 1]$$

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

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

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

$$= \frac{1}{\operatorname{cosec}\theta - \cot\theta} = \text{RHS}$$

$\therefore$ LHS = RHS

29.

$$401x - 577y = 1027 \quad ...(i)$$
$$-577x + 401y = -1907 \quad ...(ii)$$

Add equation (*i*) and (*ii*)

$$-176x - 176y = -880$$
$$\Rightarrow \quad -176(x + y) = -880$$
$$\Rightarrow \quad x + y = 5 \quad ...(iii)$$

Now, subtract equation (*ii*) from (*i*)

$$978x - 978y = 2934$$
$$\Rightarrow \quad x - y = 3 \quad ...(iv)$$

Now, add equations (*iii*) and (*iv*)

$$x + y = 5$$
$$x - y = 3$$
$$2x = 8$$
$$\Rightarrow \quad x = 4$$

Put the value of x in equation (*iii*)

$$\Rightarrow \quad 4 + y = 5 \Rightarrow y = 1$$
$$\therefore \quad x = 4 \text{ and } y = 1$$

OR

$2x - y = 1$

$y = 2x - 1$

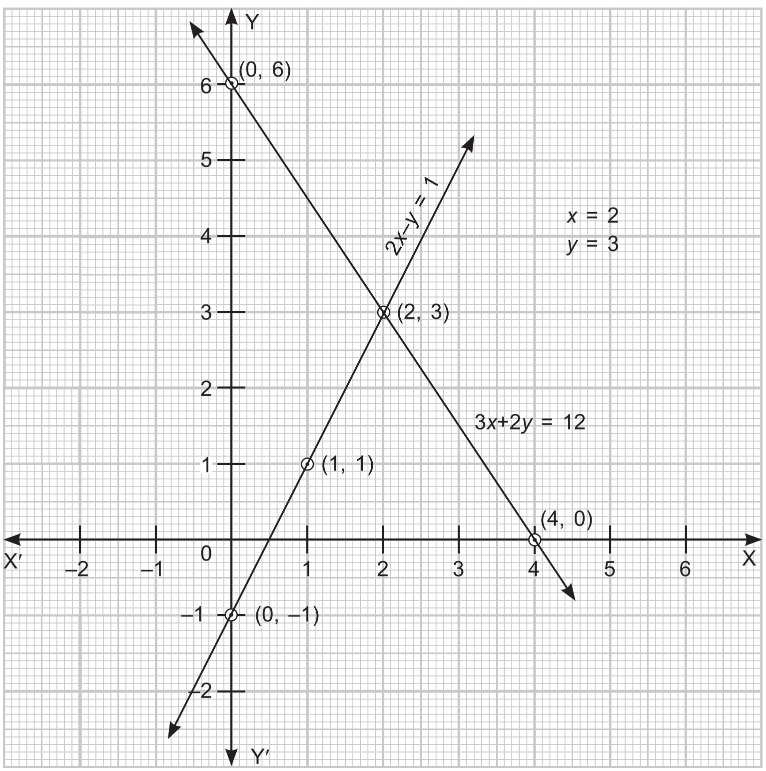
x	0	1	2
y	–1	1	3

$3x + 2y = 12$

$2y = 12 - 3x$

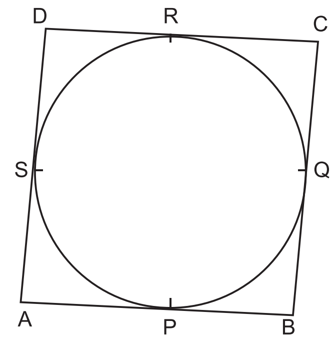
$$y = \frac{3(4-x)}{2}$$

x	0	2	4
y	6	3	0



30. Given: ABCD is *a* ||gm circumscribed a circle.

To prove: ||gm ABCD is a rhombus



Proof:

The lengths of tangents drawn from an external point are equal

$\therefore \quad AP = AS \quad ...(i)$

$BP = BQ \quad ...(ii)$

$CR = CQ \quad ...(iii)$

$DR = DS \quad ...(iv)$

Add equations (*i*), (*ii*), (*iii*) and (*iv*)

$$AP + BP + CR + DR = AS + DS + CQ + BQ$$

$\therefore \quad AB + DC = AD + BC$

Since, $\quad AB = DC$ [opposite sides of a ||gm are equal]

and $\quad AD = BC$

$\therefore \quad AB + AB = AD + AD$

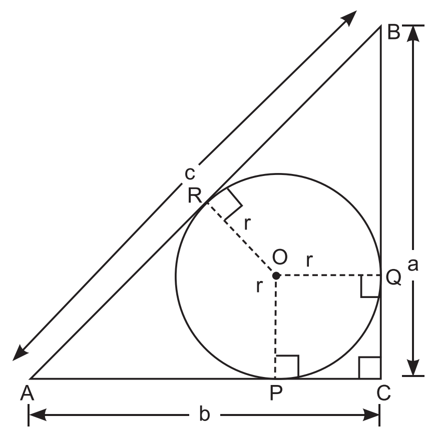
$2AB = 2AD$

i.e. $\quad AB = AD$

if adjacent sides of *a* ||gm are equal then it becomes rhombus.

Hence, ||gm ABCD is a rhombus.

OR



Given: A ΔABC, in which

$\angle C = 90°$

$AB = c$ units

$BC = a$ units

$AC = b$ units

and *a* circle with radius *r*, touches the sides of the triangle.

To prove: $\quad r = \dfrac{a+b-c}{2}$

Proof: $\quad PC = QC$ [The lengths of tangents drawn from an external point are equal]

$PO = QO$ [radii]

$\angle Q = \angle C = \angle P = 90°$

$\therefore$ □PCQO is a square

$\therefore \quad PC = QC = r$

$BQ = BR = BC - QC = a - r$

$AP = AR = b - r$

$\therefore \quad BR + AR = a - r + b - r$

$\Rightarrow \quad AB = a + b - 2r$

$\Rightarrow \quad c = a + b - 2r$

$\Rightarrow \quad 2r = a + b - c$

$\therefore \quad r = \dfrac{a+b-c}{2}$ Hence proved

31.

Rainfall (in cm)	**No. of days (*f*)**	***cf***
0 – 10	23	23
10 – 20	22	45
20 – 30	16	61
30 – 40	12	73
40 – 50	8	81
50 – 60	9	90
	90	

Since, $\frac{n}{2} = \frac{90}{2} = 45$, therefore 10–20 is the median class.

$\therefore f = 22, l = 10, cf = 23$ and $h = 10$

$$\therefore \quad \text{Median rainfall} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$$

$$= 10 + \left(\frac{45 - 23}{22}\right) \times 10$$

$$= 10 + \frac{22}{22} \times 10$$

$$= 10 + 10$$

$$= 20 \text{ cm}$$

32. $(k + 1)x^2 - 6(k + 1)x + 3(k + 9) = 0$

For equal roots $\quad D = b^2 - 4ac = 0$

$$[-6(k + 1)]^2 - 4(k + 1) \times 3\,(k + 9) = 0$$

$$36(k + 1)^2 - 12(k + 1)\,(k + 9) = 0$$

$$\Rightarrow \quad 12(k + 1)\,[3(k + 1) - (k + 9)] = 0$$

$$\Rightarrow \quad 12(k + 1)\,(3k + 3 - k - 9) = 0$$

$$\Rightarrow \quad 12(k + 1)\,(2k - 6) = 0$$

$$\Rightarrow \quad 24(k + 1)\,(k - 3) = 0$$

$$\Rightarrow \quad (k + 1)\,(k - 3) = 0$$

$k + 1 = 0$ | $k - 3 = 0$

$k = -1$ | $k = 3$

$k = -1$ is not possible

Now, quadratic equation obtains when $k = 3$

$$4x^2 - 24x + 36 = 0$$

$$\Rightarrow \quad x^2 - 6x + 9 = 0$$

$$\Rightarrow \quad x^2 - 3x - 3x + 9 = 0$$

$$\Rightarrow \quad x(x - 3) - 3(x - 3) = 0$$

$$\therefore \quad (x - 3)\,(x - 3) = 0$$

$$x = 3 \text{ or } 3$$

$\therefore$ one root $(\alpha) = 3$ and other root $(\beta) = 3$

Now, let zeroes of the required quadratic equation be α' and β'

$\alpha' = 2\alpha$ and $\beta' = 2\beta$

$\alpha' = 6$ and $\beta' = 6$

Sum of zeroes $= (\alpha' + \beta') = 12$

Product of zeroes $= \alpha'\beta' = 6 \times 6 = 36$

$\therefore$ Required polynomial $g(x) = k\{x^2 - 12x + 36\} = x^2 - 12x + 36$ (taken $k = 1$)

OR

Let the speed of the train be x km/h

Distance = 200 km

Time taken by train $(T_1) = \frac{\text{Distance}}{\text{speed}} = \frac{200}{x}$ hrs

Now, speed of train = $(x - 10)$ km/h

Now, Time taken $(T_2) = \frac{200}{x-10}$ hrs

ATQ, $T_2 - T_1 = 1$

$\Rightarrow \frac{200}{x-10} - \frac{200}{x} = 1$

$\Rightarrow \frac{200x - 200(x-10)}{(x-10)x} = 1$

$\Rightarrow 200x - 200x + 2000 = x^2 - 10x$

$\therefore x^2 - 10x - 2000 = 0$

$\Rightarrow x^2 - 50x + 40x - 2000 = 0$

$\Rightarrow x(x - 50) + 40(x - 50) = 0$

$\Rightarrow (x - 50)(x + 40) = 0$

$\Rightarrow x = 50$ or $x = -40$

Since, speed is not possible in (–)ve

$\therefore$ Speed of train = 50 km/h

33.

Marks	**No. of Students (*cf*)**	**Class interval**	f_i	x_i	$d_i = x_i - A$	$f_i d_i$
Below 10	2	0 – 10	2	5	–40	–80
Below 20	8	10 – 20	6	15	–30	–180
Below 30	10	20 – 30	2	25	–20	–40
Below 40	12	30 – 40	2	35	–10	–20
Below 50	26	40 – 50	14	45=A	0	0
Below 60	30	50 – 60	4	55	10	40
Below 70	39	60 – 70	9	65	20	180
Below 80	44	70 – 80	5	75	30	150
			$\Sigma f_i = 44$			$\Sigma f_i d_i = 50$

Let assumed mean $(A) = 45$

$\therefore$ Mean marks $(\bar{x}) = A + \frac{\Sigma f_i d_i}{\Sigma fi}$

$= 45 + \frac{50}{44} = 45 + 1.14 = 46.14$

34. Height of cylindrical vessel (h) = 20 cm

Radius of the base (r) = 7 cm

Volume of cylindrical vessel $= \pi r^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 20 = 3080 \text{ cm}^3$$

Now, Radius of hemisphere(r) = 7 cm

Volume of hemisphere portion $= \frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7 = \frac{2156}{3} = 718.67 \text{ cm}^3$

$\therefore$ Required volume = volume of cylinder – volume of spherical portion

= 3080 – 718.67

= 2361.33 cm^3

OR

Radius of ice-cream cone (r) = 3.5 cm

Height of ice-cream cone (h) = 13 cm

ATQ,

Total volume of ice-cream in 20 cones = 20(Volume of one cone – Volume of part left (unfilled))

$$= 20\left(\frac{1}{3}\pi r^2 h - \frac{1}{6} \times \frac{1}{3}\pi r^2 h\right)$$

$$= 20 \times \frac{1}{3}\pi r^2 h\left(1 - \frac{1}{6}\right)$$

$$= 20 \times \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 13 \times \left(\frac{6-1}{6}\right)$$

$$= 20 \times \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 13 \times \frac{5}{6}$$

$$= 2780.56 \text{ cm}^3$$

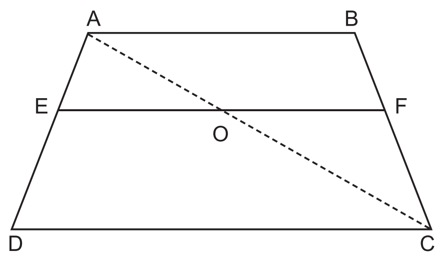
35. (a) **Thales theorem**

Statement: If a line drawn parallel to one side of a triangle intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Converse of thales theorem

Statement: If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

(b) In trapezium $ABCD$, Draw a diagonal AC and O is the point where line EF intersects diagonal AC.



In ΔADC

$EO \parallel DC$ [Given]

$\therefore \quad \frac{AE}{ED} = \frac{AO}{CO}$ [By BPT] ...(i)

In trapezium $ABCD$

$AB \parallel DC$ [Given]

and $EF \parallel DC$

$\therefore \quad EF \parallel AB$

In ΔABC

if $FO \,||\, AB$

then $\frac{AO}{CO} = \frac{BF}{FC}$ [By BPT] ...(*ii*)

from equation (*i*) and (*ii*)

$$\frac{AE}{ED} = \frac{BF}{FC}$$ Hence proved

36. Given, $a_{10} = 109 \Rightarrow a + 9d = 109$ ...(*i*)

$a_{15} = 149 \Rightarrow a + 14d = 149$ ...(*ii*)

from equation (*i*) and (*ii*)

$$\begin{array}{r} a + 9d = 109 \\ a + 14d = 149 \\ - \quad - \quad\quad - \\ \hline -5d = -40 \end{array}$$

$\Rightarrow$ $d = 8$

Put the value of d in equation (*i*);

$$a + 9(8) = 109$$

$\Rightarrow$ $a + 72 = 109$

$\Rightarrow$ $a = 37$

(*i*) Ist term $(a) = 37$

(*ii*) Yes, the given series is an A.P.

Common difference $(d) = 8$

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

$\Rightarrow$ $S_{20} = \frac{20}{2}[2 \times 37 + (20-1)8]$

$= 10\,[74 + 152] = 2260$

OR

Sum of last 10 terms $= S_{25} - S_{15} = \frac{25}{2}[2a + (25-1)d] - \frac{15}{2}[2a + (15-1)d]$

$= \frac{25}{2}[2a + 24d] - \frac{15}{2}[2a + 14d] = \frac{25}{2} \times 2(a + 12d) - \frac{15}{2} \times 2(a + 7d)$

$= 25a + 300d - 15a - 105d = 10a + 195d$

$= 10 \times 37 + 195 \times 8 = 370 + 1560 = 1930$

37. (*i*) Co-ordinates of $A = (-2, -4)$

(*ii*) B lies in IV quadrant.

C lies in I quadrant.

D lies in II quadrant.

(*iii*) Since, $A = (-2, -4)$, $B = (4, -3)$ and $D = (-3, 2)$

$\therefore$ $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(4+2)^2 + (-3+4)^2} = \sqrt{37}$ units

and $AD = \sqrt{(-3+2)^2 + (2+4)^2} = \sqrt{1 + 36} = \sqrt{37}$ units

$\therefore$ Both the locations B and D are equidistant from medical store A.

OR

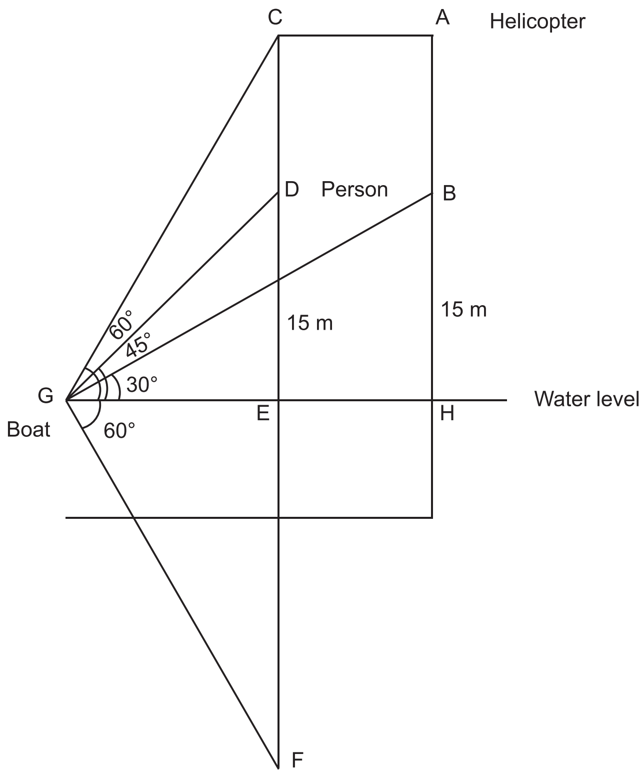
Since, $A = (-2, -4)$, $D = (-3, 2)$ and $C = (4, 3)$

$\therefore$ $AD = \sqrt{(-3+2)^2+(2+4)^2} = \sqrt{1+36} = \sqrt{37}$ units

and $DC = \sqrt{(4+3)^2+(3-2)^2} = \sqrt{7^2+1^2} = \sqrt{49+1} = \sqrt{50}$ units

$\therefore$ Total distance covered $= AD + DC = \sqrt{37}+\sqrt{50} \approx 6.1 + 7.1 = 13.2$ units

38. Given,



(*i*) In ΔDEG;

$$\frac{DE}{EG} = \tan 45°$$

$\Rightarrow$ $$\frac{15}{EG} = 1 \Rightarrow EG = 15 \text{ m}$$

Now, in ΔCEG

$$\frac{CE}{EG} = \tan 60°$$

$$\frac{CE}{15} = \sqrt{3} \Rightarrow CE = 15\sqrt{3} \text{ m}$$

(*ii*) length of rope (CD) $= CE - DE = 15\sqrt{3} - 15 = 15(\sqrt{3}-1)$ m

(*iii*) In ΔFEG;

$$\frac{FE}{EG} = \tan 60°$$

$\Rightarrow$ $$\frac{FE}{15} = \sqrt{3} \Rightarrow FE = 15\sqrt{3} \text{ m}$$

Distance between person and his image

$$DF = DE + FE = 15 + 15\sqrt{3} = 15(\sqrt{3}+1) \text{ m}$$

OR

In ΔBHG

$$\frac{BH}{GH} = \tan 30°$$

$$\frac{15}{GH} = \frac{1}{\sqrt{3}} \Rightarrow GH = 15\sqrt{3} \text{ m}$$

and $EG = 15$ m [from Part (*i*)]

Distance covered by helicopter $(AC) = HE = GH - EG$

$$= 15\sqrt{3} - 15 = 15\left(\sqrt{3} - 1\right) \text{ m}$$

$\therefore$ $$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{15\left(\sqrt{3}-1\right)}{5} = 3\left(\sqrt{3}-1\right) \text{ m/sec}$$