Solutions to RMT–DS1/Set-1

1. (*b*) All Natural numbers.

2. (*c*) 2, As the graph of $y = p(x)$ intersects x-axis at two distinct points.

3. (*b*) $pq = 30$

4. (*c*) Given,

$$x^2 - 3x - (m+2)(m+5) = 0$$
$$x^2 - (m+5)x + (m+2)x - (m+2)(m+5) = 0$$
$$x[x-(m+5)] + (m+2)[x-(m+5)] = 0$$
$$[x-(m+5)][x+(m+2)] = 0$$

$\therefore$ $x = (m+5)$

and $x = -(m+2)$

5. (*d*) Write the AP in reverse order 119, ... – 4, – 7, –10, –13

Now,

First term $(a) = 119$

and Common different $(d) = -13 - (-10) = -3$

$\therefore$ $a_7 = a + 6d = 119 + 6(-3) = 119 - 18 = 101$

$\therefore$ 101 is 7th term from last for the given AP.

6. (*a*) $\dfrac{AB}{AD} = \dfrac{AC}{AE}$ [$\because$ By BPT]

7. (*c*) According to the question,

$$AB = AC$$

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

$$\sqrt{(5-0)^2 + (-3-1)^2} = \sqrt{(x-0)^2 + (6-1)^2}$$

Squaring both sides;

$\Rightarrow$ $(\sqrt{25+16})^2 = (\sqrt{x^2+25})^2$

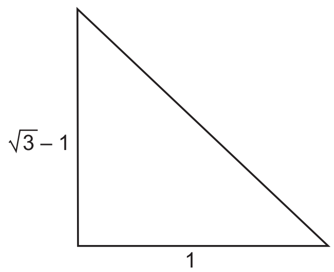
$\Rightarrow$ $25 + 16 = x^2 + 25$

$\Rightarrow$ $x^2 = 16$

$\therefore$ $x = \pm 4$

8. (*a*) $\sqrt{x^2 + y^2}$

9. (*c*) $\tan\theta = \dfrac{\sqrt{3}-1}{1}$ $\left[\because \tan\theta = \dfrac{\text{Perpendicular}}{\text{Base}}\right]$



$\therefore$ $P = \sqrt{3} - 1$

$B = 1$

By Pythagoras theorem;

$$H^2 = P^2 + B^2$$
$$H^2 = (\sqrt{3}-1)^2 + (1)^2$$
$$H^2 = 3 + 1 - 2\sqrt{3} + 1$$

$$H^2 = 5 - 2\sqrt{3}$$

$$H = \sqrt{5 - 2\sqrt{3}}$$

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

$\therefore$ $$\sin\theta = \frac{\sqrt{3} - 1}{\sqrt{5 - 2\sqrt{3}}}$$

10. (*c*) As, $$\theta = 30°$$

$\therefore$ $$4\cos^3\theta - 3\cos\theta = 4\cos^3 30° - 3\cos 30°$$

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

$$= 4 \times \frac{3\sqrt{3}}{8} - \frac{3\sqrt{3}}{2}$$

$$= \frac{3\sqrt{3}}{2} - \frac{3\sqrt{3}}{2}$$

$$= 0$$

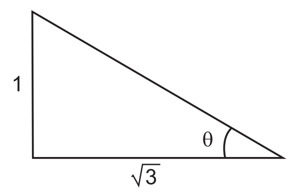
$$= \cos 90°$$

11. (*b*) Given

$$\cot\theta = \frac{B}{P}$$

$\Rightarrow$ $$\cot\theta = \frac{\sqrt{3}}{1}$$

$\therefore$ $$\theta = 30°$$



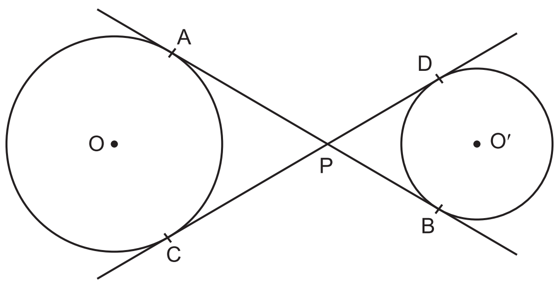
12. (*b*) The opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

$\therefore$ $$\angle POQ + \angle ROS = 180°$$

$\therefore$ $$\angle POQ + 110° = 180°$$

$\therefore$ $$\angle POQ = 70°$$

13. (*b*) Given,



$\because$ The length of tangents drawn from an external point to a circle are equal.

$\therefore$ $$PA = PC \quad ...(i)$$

and $$PB = PD \quad ...(ii)$$

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

$$PA + PB = PC + PD$$

$$AB = CD$$

14. (*b*)

$$\text{Area of sector} = 231 \text{ cm}^2$$

$$\frac{\pi r^2\theta}{360°} = 231$$

$$\therefore \quad \frac{\pi r\theta}{180°} \times \frac{r}{2} = 231$$

$$\text{Length of arc} \times \frac{21}{2} = 231 \qquad \left[\because \text{Length of arc} = \frac{\pi r\theta}{180°}\right]$$

$$\text{Length of arc} = \frac{231 \times 2}{21}$$

$$\text{Length of arc} = 22 \text{ cm}$$

15. (*d*)

$$\text{Perimeter of PQRS} = \text{Length of arc PS + length of arc QR + length of PQ + length of RS}$$

$$= \frac{\pi r\theta}{180°} + \frac{\pi R\theta}{180°} + (14 - 7) + (14 - 7)$$

$$= \frac{22}{7} \times \frac{7 \times 40°}{180°} + \frac{22}{7} \times \frac{14 \times 40°}{180°} + 7 + 7$$

$$= \frac{22 \times 40°}{180°}(1 + 2) + 14$$

$$= \frac{22 \times 2}{9} \times 3 + 14$$

$$= \frac{44}{3} + \frac{14}{1}$$

$$= \frac{44 + 42}{3} = \frac{86}{3} \text{ cm}$$

16. (*b*)

$$\text{Lower limit} = \text{Class mark} - \frac{1}{2} \times \text{Class size}$$

$$= 45 - \frac{1}{2} \times 10$$

$$= 45 - 5 = 40$$

17. (*b*) $\frac{1}{2}$

18. (*d*) $\frac{4}{11}$

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

20. (*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not correct explanation of Assertion (A).

21.

$$7 \times 11 \times 17 \times 19 + 19 = 19(7 \times 11 \times 17 + 1)$$

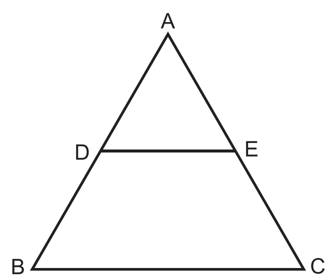
$$= 19 \times 1310 = 2 \times 5 \times 19 \times 131$$

Clearly there are more than 2 factors of the above number.

$\therefore$ $7 \times 11 \times 17 \times 19 + 19$ is a composite number.

22. In ΔABC, $DE \parallel BC$ (Given)

By BPT



$$\frac{AD}{DB} = \frac{AE}{EC}$$

Add 1 both sides

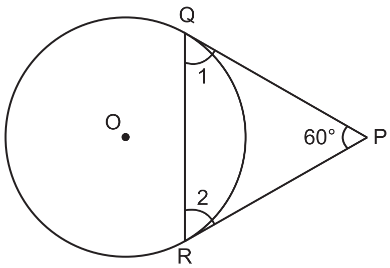
$$\frac{AD}{DB} + 1 = \frac{AE}{EC} + 1$$

$$\frac{AD + DB}{DB} = \frac{AE + EC}{EC}$$

$$\therefore \quad \frac{AB}{DB} = \frac{AC}{EC}$$

Hence proved

23. Given,



We know that the lengths of tangents drawn from an external point to a circle are equal.

$\therefore$ $PQ = PR$

i.e. $\angle 1 = \angle 2$ [Angles opposite to equal sides of a Δ are equal]

In ΔPQR

$$\angle P + \angle 1 + \angle 2 = 180°$$

$\Rightarrow$ $60° + \angle 1 + \angle 1 = 180°$ [$\because \angle 1 = \angle 2$]

$\Rightarrow$ $2\angle 1 = 120°$

$\Rightarrow$ $\angle 1 = 60°$

$\therefore$ $\angle 1 = \angle 2 = 60°$

i.e. All the 3 angles of this Δ are equal to 60°. Hence, ΔPQR is an equilateral triangle.

24. $$\frac{1}{\sec\theta - 1} - \frac{1}{\sec\theta + 1} = \frac{2}{3}$$

$\Rightarrow$ $$\frac{(\sec\theta + 1) - (\sec\theta - 1)}{(\sec\theta - 1)(\sec\theta + 1)} = \frac{2}{3}$$

$\Rightarrow$ $$\frac{\sec\theta + 1 - \sec\theta + 1}{\sec^2\theta - 1^2} = \frac{2}{3}$$

$\Rightarrow$ $$\frac{2}{\tan^2\theta} = \frac{2}{3}$$

$\Rightarrow$ $\tan^2\theta = 3$

$\Rightarrow$ $\tan\theta = \sqrt{3} = \tan 60°$

$\therefore$ $\theta = 60°$ ($\because 0° \le \theta \le 90°$)

OR

$$\frac{(1 - \text{cosec}^2\theta)(1 - \cos\theta)(1 + \cos\theta)}{1 - \sin^2\theta} = \frac{-(\text{cosec}^2\theta - 1)(1^2 - \cos^2\theta)}{\cos^2\theta}$$

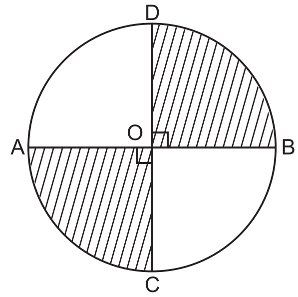
$$= \frac{-\cot^2\theta \times \sin^2\theta}{\cos^2\theta}$$

$$= -\frac{\cos^2\theta}{\sin^2\theta} \times \frac{\sin^2\theta}{\cos^2\theta}$$

$$= -1$$

25. Sector radius $(r) = \frac{14}{2} = 7$ cm

$\theta = 90°$ [As AB $\perp$ CD]



Total area of opposite sectors $= 2 \times$ area of one sector

$$= 2 \times \frac{\pi r^2 \theta}{360°}$$

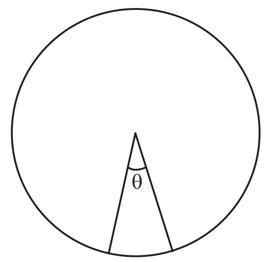
$$= 2 \times \frac{22}{7} \times \frac{7 \times 7 \times 90°}{360°}$$

$$= 11 \times 7 = 77 \text{ cm}^2$$

OR

Given, radius of circle $(r) = 21$ cm

Central angle $\theta = 30°$



$\therefore$ Length of arc $= \frac{\pi r \theta}{180°}$

$$= \frac{22}{7} \times \frac{21 \times 30°}{180°}$$

$$= 11 \text{ cm}$$

26. Milk in given 3 containers = 54 litres, 84 litres and 108 litres

We have to find HCF of 54, 84 and 108 for measurement of larger cup that can measure the milk of above containers.

2	54
3	27
3	9
3	3
	1

2	84
2	42
3	21
7	7
	1

2	108
2	54
3	27
3	9
3	3
	1

$54 = 2 \times 3 \times 3 \times 3$

$84 = 2 \times 2 \times 3 \times 7$

$108 = 2 \times 2 \times 3 \times 3 \times 3$

HCF $= 2 \times 3 = 6$ litres

$\therefore$ Measurement of required cup is 6 litres.

27. $3x^2 + 5x + 7$ having zeroes $\frac{m}{2}, \frac{n}{2}$ i.e. $\alpha = \frac{m}{2}$ and $\beta = \frac{n}{2}$

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

$$\frac{m+n}{2} = \frac{-5}{3}$$

$$m + n = \frac{-10}{3} \quad ...(i)$$

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

$$\frac{m}{2} \times \frac{n}{2} = \frac{7}{3}$$

$$\frac{mn}{4} = \frac{7}{3}$$

$$mn = \frac{28}{3} \qquad ...(ii)$$

Now, find the polynomial whose zeroes are $(2m + 3n)$ and $(3m + 2n)$

$$\text{Sum of zeroes} = 2m + 3n + 3m + 2n$$
$$= 5m + 5n$$
$$= 5(m + n)$$
$$= 5\left(\frac{-10}{3}\right) \qquad [\because \text{ from } (i)]$$

$$\text{Sum of zeroes} = \frac{-50}{3}$$

$$\text{Product of zeroes} = (2m + 3n) \times (3m + 2n)$$
$$= 6m^2 + 4mn + 9mn + 6n^2$$
$$= 6m^2 + 6n^2 + 13mn$$
$$= 6m^2 + 6n^2 + 12mn + mn$$
$$= 6(m^2 + n^2 + 2mn) + mn$$
$$= 6(m + n)^2 + mn$$
$$= 6\left(\frac{-10}{3}\right)^2 + \frac{28}{3} \qquad [\because \text{ from } (i) \text{ and } (ii)]$$
$$= 6 \times \frac{100}{9} + \frac{28}{3}$$
$$= \frac{200}{3} + \frac{28}{3}$$

$$\text{Product of zeroes} = \frac{228}{3}$$

$\therefore$ Required polynomial $P(x) = k\{x^2 - (\text{Sum of zeroes})x + \text{Product of zeroes}\}$

$$= k\left\{x^2 - \left(\frac{-50}{3}\right)x + \left(\frac{228}{3}\right)\right\}$$
$$= \frac{k}{3}\{3x^2 + 50x + 228\} = 3x^2 + 50x + 228.$$

28. $(5k - 9)x + (2k - 3)y = 1 \qquad ...(i)$

$(2k + 1)x + (4k - 3)y = 5 \qquad ...(ii)$

For infinite many solutions

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\frac{5k-9}{2k+1} = \frac{2k-3}{4k-3} = \frac{1}{5}$$

$\therefore \quad \frac{5k-9}{2k+1} = \frac{1}{5}$	$\frac{2k-3}{4k-3} = \frac{1}{5}$
$\Rightarrow \quad 5(5k - 9) = 1(2k + 1)$	$\Rightarrow \quad 5(2k - 3) = 1(4k - 3)$
$\Rightarrow \quad 25k - 45 = 2k + 1$	$\Rightarrow \quad 10k - 15 = 4k - 3$
$\Rightarrow \quad 25k - 2k = 1 + 45$	$\Rightarrow \quad 10k - 4k = 15 - 3$
$\Rightarrow \quad 23k = 46$	$\Rightarrow \quad 6k = 12$
$\Rightarrow \quad k = 2$	$\Rightarrow \quad k = 2$

$\therefore$ The value of k is 2.

OR

Let usual speed of the train be x km/h and time taken be y hours

$$\text{Distance} = \text{speed} \times \text{time}$$

$$\text{Distance} = xy \text{ km}$$

Case (I)

$$\text{Now, speed of train} = (x - 20) \text{ km/h}$$

$$\text{Time taken} = (y + 2) \text{ hours}$$

$$\text{Distance} = (x - 20)(y + 2)$$

$$= (xy - 20y + 2x - 40) \text{ km}$$

$\therefore$ $$xy - 20y + 2x - 40 = xy$$

$$2x - 20y = 40$$

$$x - 10y = 20 \qquad ...(i)$$

Case (II)

$$\text{Now, speed the train} = (x + 10)\text{km/h}$$

$$\text{and time taken} = \left(y - \frac{1}{2}\right) \text{ hours}$$

$$\text{Distance} = (x + 10) \times \left(y - \frac{1}{2}\right)$$

$$= \left(xy - \frac{1}{2}x + 10y - 5\right)\text{km}$$

$\therefore$ $$xy = xy - \frac{1}{2}x + 10y - 5$$

$\Rightarrow$ $$-x + 20y = 10 \qquad ...(ii)$$

Add equations (i) and (ii)

$$x - 10y = 20$$

$$-x + 20y = 10$$

$$10y = 30$$

$\Rightarrow$ $$y = \frac{30}{10} = 3$$

Put the value of y in equation (i)

$$x - 10 \times (3) = 20$$

$$x - 30 = 20$$

$$x = 50$$

$\therefore$ $$\text{Length of the journey} = xy$$

$$= 50 \times 3 = 150 \text{ km}$$

29. $\angle C = 90°$

$$\tan(C - B - A) = 0$$

$\Rightarrow$ $$\tan(C - B - A) = \tan 0$$

$\Rightarrow$ $$C - B - A = 0$$

$\Rightarrow$ $$90° - B - A = 0$$

$\therefore$ $$A + B = 90° \qquad ...(i)$$

and $$\tan(B + C - A) = \sqrt{3}$$

$$\tan (B + C - A) = \tan 60°$$

$\therefore$ $B + C - A = 60°$

$B + 90° - A = 60°$

$B - A = -30°$

$\therefore$ $A - B = 30°$ ...(*ii*)

Add equations (*i*) and (*ii*)

$$A + B = 90°$$
$$A - B = 30°$$
$$2A = 120°$$

$\Rightarrow$ $A = 60°$

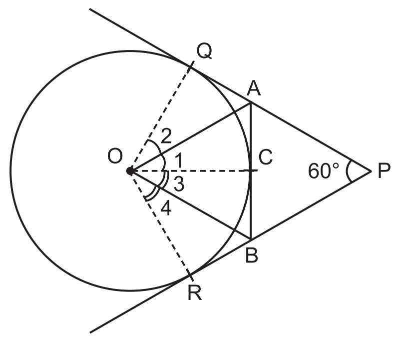
Put the value of A in equation (*i*)

$$60° + B = 90°$$

$\Rightarrow$ $B = 30°$

$\therefore$ $A = 60°, B = 30°$

30. **Given:** A circle with centre O, PR and PQ are the tangents from an external point P, with point of contact R and Q respectively. Tangent AB with point of contact C where A and B are the points on PQ and PR respectively.



Construction: Join QO, RO, and CO.

Proof: In quadrilateral PQOR

$\angle PQO = \angle PRO = 90°$ (The tangent is $\perp$ to radius drawn through the point of contact)

$\therefore$ $\angle P + \angle PQO + \angle PRO + \angle QOR = 360°$ (Angle sum property of a quadrilateral)

$\Rightarrow$ $60° + 90° + 90° + \angle QOR = 360°$

$\Rightarrow$ $240° + \angle QOR = 360°$

$\Rightarrow$ $240° + \angle QOR = 360°$

$\Rightarrow$ $\angle QOR = 120°$

In ΔAQO and ΔACO

$AQ = AC$ (Tangents drawn from an external point)

$AO = AO$ (Common)

$QO = CO$ (Radii)

$\therefore$ $\Delta AQO \cong \Delta ACO$ (SSS congruent Rule)

$\angle 1 = \angle 2$ (CPCT)

Similarly $\angle 3 = \angle 4$

$\because$ $\angle QOR = 120°$ (Proved above)

$\therefore \quad \angle 1 + \angle 2 + \angle 3 + \angle 4 = 120°$

$\Rightarrow \quad \angle 1 + \angle 1 + \angle 3 + \angle 3 = 120°$ $\quad [\because \angle 1 = \angle 2 \text{ and } \angle 3 = \angle 4]$

$\Rightarrow \quad 2\angle 1 + 2\angle 3 = 120°$

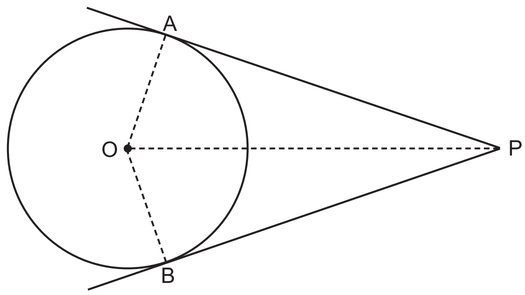
$\Rightarrow \quad 2[\angle 1 + \angle 3] = 120°$

$\Rightarrow \quad 2[\angle AOB] = 120°$

$\therefore \quad \angle AOB = 60°$

OR

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



To prove: PA = PB

Construct: Join AO, BO and PO

Proof: In ΔPAO and ΔPBO

PO = PO [common]

∠PAO = ∠PBO (Each 90° as tangent is ⊥ to radius drawn through the point of contact)

AO = BO (Radii)

∴ ΔPAO ≅ ΔPBO (RHS Congruent Rule)

Hence, PA = PB (CPCT)

31.

Life time (in hours)	x_i	f_i	$d_i = x_i - A$	$f_i d_i$
1000 – 1100	1050	12	–500	–6000
1100 – 1200	1150	17	–400	–6800
1200 – 1300	1250	9	–300	–2700
1300 – 1400	1350	18	–200	–3600
1400 – 1500	1450	6	–100	–600
1500 – 1600	1550 = A	10	0	0
1600 – 1700	1650	7	100	700
1700 – 1800	1750	3	200	600
1800 – 1900	1850	16	300	4800
1900 – 2000	1950	2	400	800
		$\Sigma f_i = 100$		–12800

Let the assumed mean (A) = 1550

$\therefore$ Required mean $\bar{x} = A + \dfrac{\Sigma f_i d_i}{\Sigma f_i}$

$$= 1550 + \left(\frac{-12800}{100}\right)$$

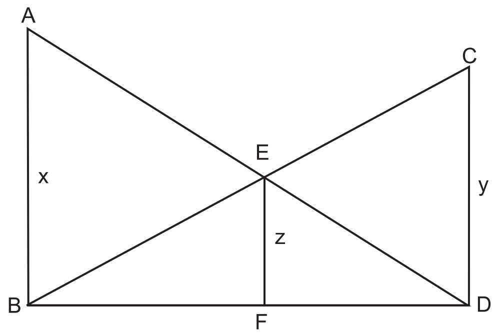
$$= 1550 - 128$$

$$= 1422 \text{ hours}$$

32. **Given:** In figure AB || CD || EF, AB = x units

CD = y units, EF = z units

To prove: $\dfrac{1}{z} = \dfrac{1}{x} + \dfrac{1}{y}$



Proof:

In ΔABD and ΔEFD

$$AB \parallel EF \quad \text{(Given)}$$

$$\angle ABD = \angle EFD \quad \text{(Corresponding angles)}$$

$$\angle ADB = \angle EDF \quad \text{(Common)}$$

$$\therefore \quad \Delta ADB \sim \Delta EDF \quad \text{(AA similarity Rule)}$$

$$\therefore \quad \frac{AB}{EF} = \frac{BD}{FD} \quad \text{(Corresponding sides of similar triangles)}$$

$$\therefore \quad \frac{BD}{FD} = \frac{x}{z} \Rightarrow \frac{FD}{BD} = \frac{z}{x} \quad ...(i)$$

Similarly ΔCDB $\sim$ ΔEFB

$$\frac{CD}{EF} = \frac{BD}{BF}$$

$$\therefore \quad \frac{BD}{BF} = \frac{y}{z} \Rightarrow \frac{BF}{BD} = \frac{z}{y} \quad ...(ii)$$

Now add equation (*i*) and (*ii*)

$$\frac{FD}{BD} + \frac{BF}{BD} = \frac{z}{x} + \frac{z}{y}$$

$$\frac{FD + BF}{BD} = z\left[\frac{1}{x} + \frac{1}{y}\right]$$

$$\frac{BD}{BD} = z\left[\frac{1}{x} + \frac{1}{y}\right]$$

$$\therefore \quad \frac{1}{z} = \frac{1}{x} + \frac{1}{y} \quad \text{Hence proved}$$

33. $$25x^2 - 15(a-b)x + 2(a-b)^2 - ab = 0$$

$\Rightarrow$ $$25x^2 - 15(a-b)x + 2(a^2 + b^2 - 2ab) - ab = 0$$

$\Rightarrow$ $$25x^2 - 15(a-b)x + 2a^2 + 2b^2 - 4ab - ab = 0$$

$\Rightarrow$ $$25x^2 - 15(a-b)x + 2a^2 - 4ab + 2b^2 - ab = 0$$

$\Rightarrow$ $$25x^2 - 15(a-b)x + 2a(a-2b) - b(a-2b) = 0$$

$\Rightarrow$ $$25x^2 - 15(a-b)x + (a-2b)(2a-b) = 0$$

$\Rightarrow$ $$25x^2 - 5(a-2b)x - 5(2a-b)x + (a-2b)(2a-b) = 0$$

$\Rightarrow$ $$5x[5x-(a-2b)] - (2a-b)[5x-(a-2b)] = 0$$

$\Rightarrow$ $$[5x-(a-2b)][5x-(2a-b)] = 0$$

$\Rightarrow$ $5x - (a-2b) = 0$ | $5x - (2a-b) = 0$

$5x = a - 2b$ | $5x = 2a - b$

$x = \dfrac{a-2b}{5}$ | $x = \dfrac{2a-b}{5}$

OR

$$\frac{1}{2a+b+x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{x}$$

$$\frac{1}{2a+b+x} - \frac{1}{x} = \frac{1}{2a} + \frac{1}{b}$$

$\therefore$ $$\frac{x-2a-b-x}{x(2a+b+x)} = \frac{b+2a}{2ab}$$

$$\frac{-(2a+b)}{x(2a+b+x)} = \frac{(2a+b)}{2ab}$$

$\therefore$ $$x(2a+b+x) = -2ab$$

$$2ax + bx + x^2 = -2ab$$

$\Rightarrow$ $$x^2 + 2ax + bx + 2ab = 0$$

$\Rightarrow$ $$x(x+2a) + b(x+2a) = 0$$

$\Rightarrow$ $$(x+2a)(x+b) = 0$$

$\therefore$ $$x = -2a \text{ or } x = -b$$

34.

Monthly Income (in ₹)	**Monthly Income (in ₹) Class-interval**	**Number of Workers**	***f***	***cf***
Income more than ₹ 12000	12000 – 15000	60	13	13
Income more than ₹ 15000	15000 – 18000	47	8	21
Income more than ₹ 18000	18000 – 21000	39	18	39
Income more than ₹ 21000	21000 – 24000	21	17	56
Income more than ₹ 24000	24000 – 27000	4	3	59
Income more than ₹ 27000	27000 – 30000	1	1	60
Income more than ₹ 30000	30000 – 33000	0	0	60

Now, $\frac{n}{2} = \frac{60}{2} = 30$

$\therefore$ 18000 – 21000 is the median class.

$$f = 18,\ h = 3000$$

$$cf = 21$$

$$l = 18000$$

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

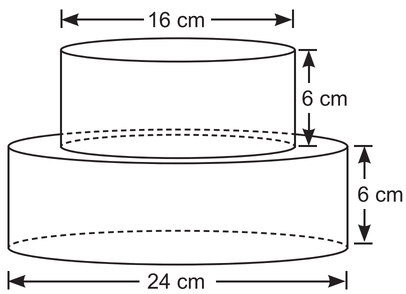
$$= 18000 + \left(\frac{30 - 21}{18}\right) \times 3000$$

$$= 18000 + \frac{9}{18} \times 3000$$

$$= 18000 + 1500$$

$$= ₹\ 19500$$

35. Radius of large cylindrical cake $(R) = 12$ cm



Radius of small cylindrical cake $(r) = 8$ cm

Height of both cylindrical cake $(h) = 6$ cm

Area of cake covered with cream = CSA of larger cylindrical cake + CSA of smaller cylindrical cake + Area of top of smaller cylinder + Area of top ring of larger cylinder

$$= 2\pi Rh + 2\pi rh + \pi r^2 + \pi(R^2 - r^2)$$

$$= 2\pi h(R + r) + \pi r^2 + \pi R^2 - \pi r^2$$

$$= 2\pi h(R + r) + \pi R^2$$

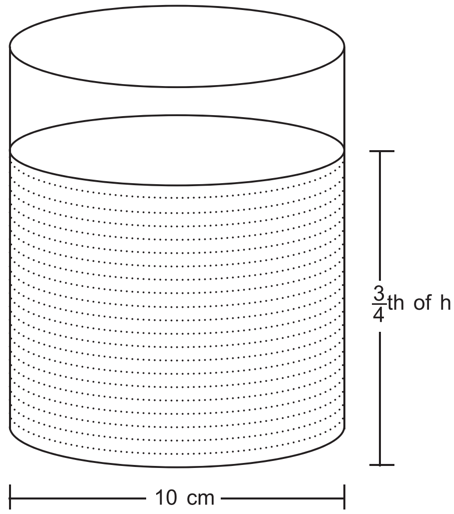
$$= 2 \times \frac{22}{7} \times 6 \times (12 + 8) + \frac{22}{7} \times 12 \times 12$$

$$= \frac{22}{7}[12 \times 20 + 144]$$

$$= \frac{22}{7} \times 384$$

$$= 1206.86 \text{ cm}^2$$

OR



Radius of cylindrical vessel (R) $= \frac{10}{2} = 5$ cm

Let the height of cylindrical vessel $= h$ cm

Radius of spherical stone $(r) = \frac{2}{2} = 1$ cm

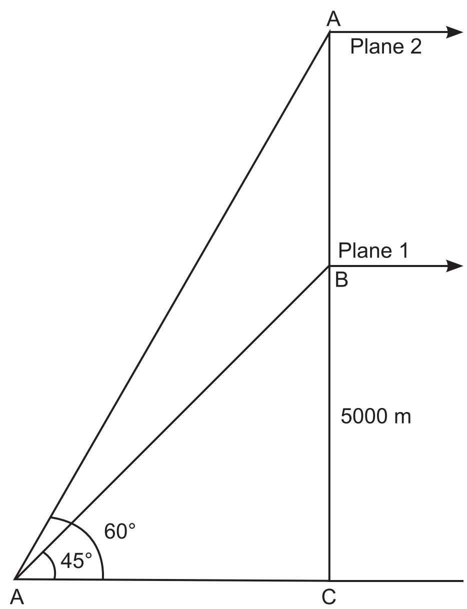
$\therefore$ ATQ, $\frac{1}{4}$(volume of cylinder) = 50 × volume of each spherical stone

$$\frac{1}{4}\pi R^2 h = 50 \times \frac{4}{3}\pi r^3$$

$$\Rightarrow \quad \frac{1}{4} \times 5 \times 5 \times h = 50 \times \frac{4}{3} \times (1)^3$$

$$\Rightarrow \quad h = \frac{32}{3} \text{ cm}$$

36.



There are two planes, plane 1 and plane 2 and plane 2 is flying above plane 1 at 20 m/s.

(*i*) Speed of plane 1 = 10 m/s

time = 20 sec.

Distance covered by plane 1 = speed × time

$= 10 \times 20 = 200$ m

Speed of plane 2 = 20m/s

time = 20 sec.

Distance covered by plane 2 = 20×20

$= 400$ m

(*ii*) AE = 400 m

BG = 200 m

GF = AE – BG [$\because$ AE = BF]

$= 400 - 200 = 200$ m

AB = EF = 3650 m

$\therefore$ $GE = EF^2 + GF^2$

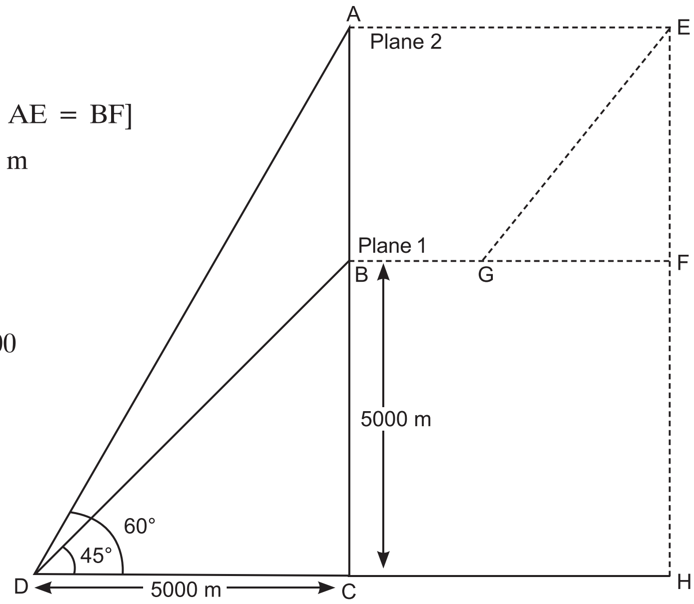
$= (3650)^2 + (200)^2$

$= 13322500 + 40000$

$\Rightarrow$ $GE^2 = 13362500$

$\therefore$ GE = 3655.47 m

Distance between both planes = 3655.47 m



(*iii*) In ΔBCD,

$$\frac{BC}{DC} = \tan 45°$$

$$\Rightarrow \quad \frac{5000}{DC} = 1$$

$$\therefore \quad DC = 5000 \text{ m}$$

In ΔACD,

$$\frac{AC}{DC} = \tan 60°$$

$$\Rightarrow \quad \frac{AC}{5000} = \sqrt{3}$$

$$\Rightarrow \quad AC = 5000\sqrt{3} \text{ m} = 8650 \text{ m}$$

$\therefore$ Height of above plane from ground = 8650 m

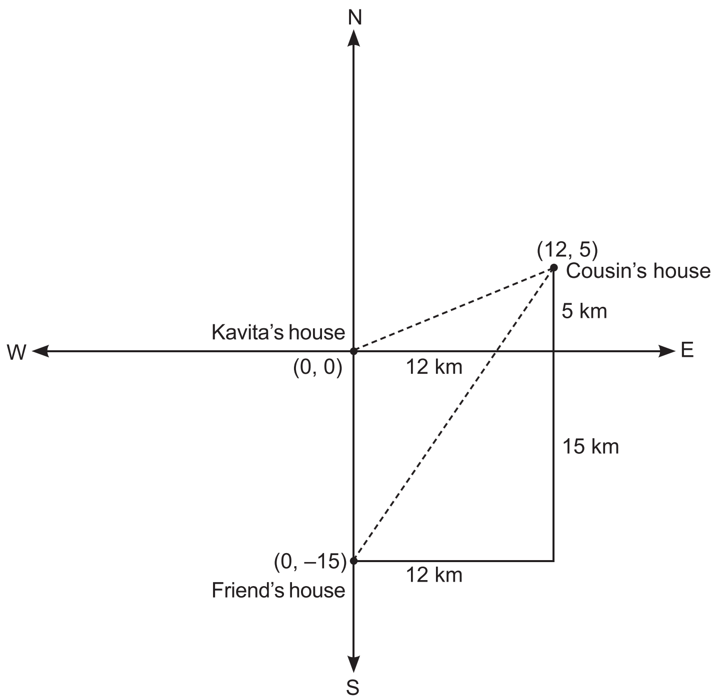
OR

Distance between both planes

AB = AC – BC

$= 8650 - 5000 = 3650$ m

37.



(*i*) Co-ordinates of cousin's house = (12, 5)

Co-ordinates of friend's house = (0, – 15)

(*ii*) Distance between Kavita's house and friend's house = 15 km

(*iii*) Distance between Kavita's house and cousin's house

$$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad [\because \text{ Distance formula}]$$

$$= \sqrt{(12-0)^2 + (5-0)^2}$$

$$= \sqrt{144 + 25}$$

$$= \sqrt{169}$$

$$= 13 \text{ km}$$

OR

Distance between cousin's house and friend's house

$$= \sqrt{(12-0)^2 + [5-(-15)]^2}$$

$$= \sqrt{12^2 + 20^2}$$

$$= \sqrt{144 + 400}$$

$$= \sqrt{544}$$

$$= 23.32 \text{ km}$$

38. (*i*) From the given sequence of pearls and glasses, Arithmetic progression series is obtained.

(*ii*) Number of glass in 1st string (a_1) = 1

Number of glass in 2nd string (a_2) = 2

$$d = a_2 - a_1$$

$$= 2 - 1 = 1$$

Number of glasses used in 9th string from last = Number of glasses used in 9th string from first

$= a + 8d$

$= 1 + 8 \times 1$

$= 1 + 8$

$= 9$

(*iii*) Total glasses used in all the strings = Number of glasses used in 1st 9 strings

+ Number of glasses used in last 9 strings

+ Number of glasses used in 10th string

$= 2 \times \frac{n}{2} [2a + (n - 1)d] + 10$

[$\because$ Number of glasses in 1st 9 strings = Number of glasses in last 9 strings]

$= 2 \times \frac{9}{2} [2 \times 1 + (9 - 1)1] + 10$

$= 9[2 + 8] + 10 = 90 + 10 = 100$ glasses

OR

Total number of pearls in strings = Number of pearls used in 1st 9 strings

+ Number of pearls used in last 9 strings + Number of pearls in 10th string

Number of pearls in 1st string = 100

Number of pearls in 2nd string = 98

$\therefore$ $d = -2$ till 9th string [$\because$ Number of pearls in 1st 9 strings = Number of pearls in last 9 strings]

Number of pearl in 10th string (a_{10}) $= a + 9d$

$= 100 + 9(-2)$

$= 100 - 18$

$= 82$

$\therefore$ Total number of pearls used in all strings $= 2\left[\frac{n}{2}(2a + (n-1)d\right]$ + Number of pearls in 10th string

$= 2\left[\frac{9}{2}(2 \times 100 + (9-1)(-2)\right] + 82$

$= 9[200 - 16] + 82$

$= 1656 + 82$

$= 1738$