Solutions to RMT/Set-3

1. (*a*) Give equations of lines are $ax + by - c = 0$ and $lx + my - n = 0$

Since, $am \neq bl \Rightarrow \frac{a}{l} \neq \frac{b}{m}$

$\therefore$ The pair of equations has a unique solution.

2. (*c*) Given equations are $2x - 5y - 6 = 0$ and $6x - 15y - 18 = 0$

Here, $\frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{-5}{-15} = \frac{1}{3}, \frac{c_1}{c_2} = \frac{-6}{-18} = \frac{1}{3}$

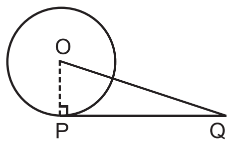
$\Rightarrow \quad \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow$ lines are coincident.

3. (*c*) $PQ^2 = OQ^2 - OP^2$

$= 25^2 - 7^2$

$\Rightarrow \quad PQ = 24$ cm.



4. (*c*) The given AP is 18, 13, 8, 3 ...

Here $a = 18, d = 13 - 18 = -5$

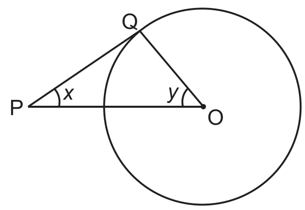
$S_{35} = \frac{35}{2}[2 \times 18 + 34 \times (-5)] = -2345$

5. (*c*) The radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. The ratio of their volume is 27 : 20.

6. (*a*) $\sec\theta = \sqrt{2} \Rightarrow \theta = 45°$

Now $\frac{1+\tan\theta}{\sin\theta} = \frac{1+\tan 45°}{\sin 45°} = 2\sqrt{2}$

7. (*b*) As OQ is radius and PQ is a tangent to the circle at the point of contact Q $\Rightarrow$ OQ perpendicular to PQ



$\Rightarrow \quad \angle OQP = 90°$

Now, in ΔOQP, $x + y + \angle OQP = 180°$

$\Rightarrow \quad x + y + 90° = 180°$

$\Rightarrow \quad x + y = 90°$

8. (*d*) Since polynomial is $-3x^2 + 0x + k$

Here, $a = -3, b = 0, c = k$

Sum of zeroes $= \frac{-b}{a}$

$= \frac{0}{-3} = 0$

9. (*b*)

C.I.	*f*	*cf*
0–5	3	3
5–10	9	12
10–15	2	14 ← Median class
15–20	5	19
20–25	7	26

$$\frac{N}{2} = \frac{26}{2} = 13$$

10. (*a*) $\Delta APQ \sim \Delta ABC$

$$\Rightarrow \quad \frac{BC}{PQ} = \frac{AB}{AP} = \frac{6}{2} = 3$$

$$\lambda = 3$$

11. (*b*) $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$

$$\Rightarrow \quad \sqrt{3}x^2 + 7x + 3x + 7\sqrt{3} = 0$$

$$\Rightarrow \quad x(\sqrt{3}x + 7) + \sqrt{3}(\sqrt{3}x + 7) = 0$$

$$\Rightarrow \quad (\sqrt{3}x + 7)(x + \sqrt{3}) = 0$$

$$\Rightarrow \quad x = \frac{-7}{\sqrt{3}} \text{ or } x = -\sqrt{3}$$

12. (*c*) $\sin\theta - \cos\theta = 0$

$$\Rightarrow \quad (\sin\theta - \cos\theta)^2 = 0$$

$$\Rightarrow \quad \sin^2\theta + \cos^2\theta - 2\sin\theta\cos\theta = 0$$

$$\Rightarrow \quad -2\sin\theta\cos\theta = -1$$

$$\Rightarrow \quad \sin^2\theta\cos^2\theta = \frac{1}{4}$$

$$(\sin^4\theta + \cos^4\theta) = (\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta\cos^2\theta$$

$$= 1^2 - 2 \times \frac{1}{4} = 1 - \frac{1}{2} = \frac{1}{2}$$

13. (*c*) Radius of quadrant = 14 cm

$$\text{Area of a quadrant} = \frac{\pi(14)^2 \times 90°}{360°}$$

$$= \frac{22}{7} \times \frac{14 \times 14 \times 90°}{360°} = 154 \text{ cm}^2$$

$$\text{Area of four quadrants} = 4 \times 154 \text{ cm}^2 = 616 \text{ cm}^2$$

$$\text{Area of square} = (100)^2 \text{ cm}^2 = 10000 \text{ cm}^2$$

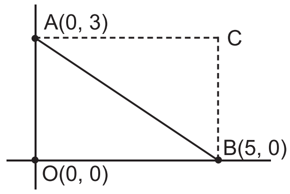
Area of shaded region = area of square – area of four quadrants

$$= 10000 \text{ cm}^2 - 616 \text{ cm}^2 = 9384 \text{ cm}^2$$

14. (*d*) $\because \quad P(E) + P(\bar{E}) = 1$

$$\therefore \quad q = 1$$

15. (*c*)



$$AB = \sqrt{(5-0)^2 + (0-3)^2}$$

$$= \sqrt{25+9} = \sqrt{34} \text{ units}$$

16. (*a*) Given, difference of mode and median = 26

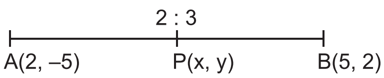
We know, $\quad$ mode = 3 median – 2 mean

$\therefore \quad$ 26 + median = 3 median – 2 mean

$\Rightarrow \quad$ 2 × (median – mean) = 26

$\therefore \quad$ Median – mean $= \frac{26}{2} = 13$

17. (*d*)



$$x = \frac{2 \times 5 + 3 \times 2}{2+3} \Rightarrow x = \frac{10+6}{5} = \frac{16}{5} = 3.2$$

and $$y = \frac{2 \times 2 + 3(-5)}{2+3} \Rightarrow y = \frac{4-15}{5} = \frac{-11}{5} = -2.2$$

Point P(3.2, – 2.2) lies in IV quadrant.

18. (*d*) Total number of ways = 6

Number of ways to get a number less than 3 = 2

$\therefore$ Required probability $= \frac{2}{6} = \frac{1}{3}$

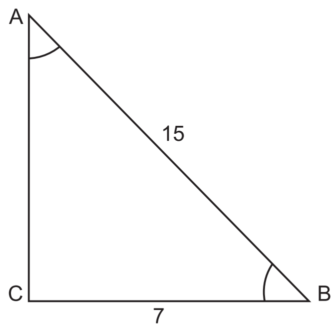
19. (*a*) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

20. (*b*) $6^n = 2^n \times 3^n$

A number ends with zero has 5 as its prime factor but 6^n has only 2 and 3 as its prime factors. So 6^n can not ends with 0.

Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A).

21. (*a*) In ΔABC,



Since, cosec A = $\frac{AB}{BC} = \frac{15}{7}$ and A + B = 90°

$\therefore$ ΔABC is right-angled at $\angle C$.

$\therefore$ sec B = $\frac{AB}{BC} = \frac{15}{7}$

OR

(*b*) $\tan 3x = \sin 45° \cdot \cos 45° + \sin 30°$

$\Rightarrow$ $\tan 3x = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2} = \frac{1}{2} + \frac{1}{2}$

$\Rightarrow$ $\tan 3x = 1 = \tan 45°$

$\Rightarrow$ $3x = 45° \Rightarrow x = 15°$

22. (*a*) Let us assume, that $\sqrt{2}$ is rational.

So, we can find integers a and b such that $\sqrt{2} = \frac{a}{b}$, where a and b are coprime.

So, $b\sqrt{2} = a$.

Squaring both sides, we get $2b^2 = a^2$.

Therefore, 2 divides a^2 and so 2 divides a.

So, we can write $a = 2c$ for some integer c.

Substituting for a, we get $2b^2 = 4c^2$, that is, $b^2 = 2c^2$.

This means that 2 divides b^2, and so 2 divides b.

Therefore, a and b have at least 2 as a common factor.

But this contradicts the fact that a and b have no common factors other than 1.

This contradiction has arisen because of our incorrect assumption that $\sqrt{2}$ is rational.

So, we conclude that $\sqrt{2}$ is an irrational.

OR

(*b*) Let numbers be $2x$, $5x$ and $7x$.

$\therefore$ LCM of $2x$, $5x$ and $7x$ = $2 \times 5 \times 7 \times x$

Also LCM = 490

$\Rightarrow$ $2 \times 5 \times 7 \times x = 490$

$\Rightarrow$ $x = 7$

So, numbers are 2×7, 5×7, 7×7 i.e. 14, 35 and 49

Largest number = 49

$\therefore$ The square root of the largest number = $\sqrt{49} = 7$

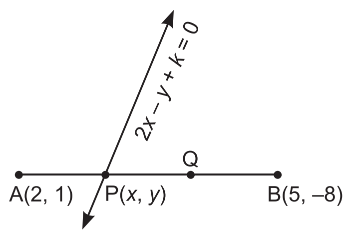
23. For a die, number of possible outcomes = 6

Prime numbers are 2, 3 and 5.

(*i*) Probability of getting a prime number = $\frac{3}{6} = \frac{1}{2}$

(*ii*) Probability of getting a number lies between 2 and 6 = $\frac{3}{6} = \frac{1}{2}$

24.



AP : PB = 1 : 2

$x = \frac{4+5}{3} = 3$ and $y = \frac{2-8}{3} = -2$

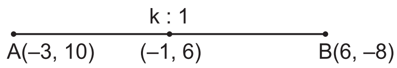
Thus point P is (3, – 2).

Point (3, – 2) lies on $2x - y + k = 0$, then

$6 + 2 + k = 0$

$\Rightarrow \quad k = -8$

25. Let the required ratio be $k : 1$.



$$x = \frac{m_2x_1 + m_1x_2}{m_1 + m_2}$$

$$\Rightarrow \quad -1 = \frac{k \times 6 + 1 \times (-3)}{k+1}$$

$$\Rightarrow \quad -k - 1 = 6k - 3 \quad \Rightarrow \quad 7k = 2 \quad \Rightarrow \quad k = \frac{2}{7}$$

$$y = \frac{m_2y_1 + m_1y_2}{m_1 + m_2} \quad \Rightarrow \quad 6 = \frac{k \times (-8) + 1 \times (10)}{k+1}$$

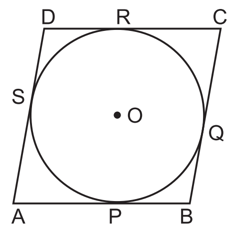
$$\Rightarrow \quad 6k + 6 = -8k + 10 \Rightarrow 14k = 4$$

$$\Rightarrow \quad k = \frac{4}{14} = \frac{2}{7},$$

$\therefore$ The required ratio is 2 : 7.

26. (*a*) Let ABCD be a parallelogram circumscribing the circle with centre O, such that AB, BC, CD and DA touch the circle at points P, Q, R and S respectively.

We know that the tangents drawn to a circle from an exterior point are equal in length.



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

BP = BQ ...(*ii*)

CR = CQ ...(*iii*)

DR = DS ...(*iv*)

Adding (*i*), (*ii*), (*iii*) and (*iv*), we get

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

$\Rightarrow$ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)

$\Rightarrow$ AB + CD = AD + BC ...(*v*)

Since AB = DC and AD = BC (Opposite sides of parallelogram ABCD)

Putting in (*v*) we get, 2AB = 2AD

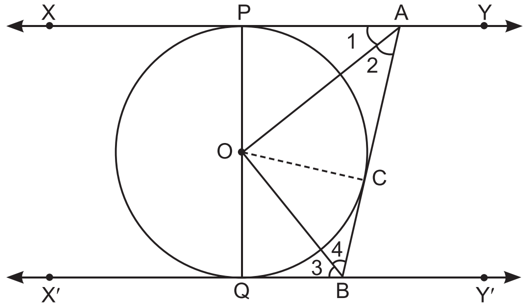
or AB = AD.

$\therefore$ AB = BC = DC = AD

Since a parallelogram with equal adjacent sides is a rhombus. So ABCD is a rhombus.

OR

(*b*) Join OC.



In ΔOPA and ΔOCA

$$OP = OC \quad \text{(Radii of same circle)}$$
$$PA = CA \quad \text{(Length of two tangents from an external point)}$$
$$AO = AO \quad \text{(Common)}$$

Therefore, $\Delta OPA \cong \Delta OCA$ (By SSS congruency criterion)

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

Similarly $\angle 3 = \angle 4$

$$\angle PAB + \angle QBA = 180° \quad \text{(Co-interior angles are supplementary as XY || X'Y')}$$
$$\Rightarrow \quad 2\angle 2 + 2\angle 4 = 180°$$
$$\Rightarrow \quad \angle 2 + \angle 4 = 90° \quad ...(i)$$

In ΔAOB

$$\angle 2 + \angle 4 + \angle AOB = 180° \quad \text{(Angle sum property of triangle)}$$
$$\Rightarrow \quad \angle AOB = 180° - 90° = 90° \quad \text{[Using (i)]}$$

27. Given, $S_7 = 49$ and $S_{17} = 289$

Since $S_7 = 49$

$$\therefore \quad \frac{7}{2}[2a + (7-1)d] = 49$$
$$\Rightarrow \quad 2a + 6d = 49 \times \frac{2}{7}$$
$$\Rightarrow \quad 2a + 6d = 14$$
$$\Rightarrow \quad a + 3d = 7 \quad ...(i)$$

Also, $S_{17} = 289$

$$\Rightarrow \frac{17}{2}[2a + (17-1)d] = 289$$
$$\Rightarrow \quad 2a + 16d = 289 \times \frac{2}{17}$$
$$\Rightarrow \quad 2a + 16d = 34$$

or $a + 8d = 17$ ...(*ii*)

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

$$a + 8d - a - 3d = 17 - 7$$
$$\Rightarrow \quad 5d = 10$$
$$\Rightarrow \quad d = \frac{10}{5} = 2$$
$$a + 3d = 7$$
$$\Rightarrow \quad a + 3 \times 2 = 7 \quad \Rightarrow \quad a = 7 - 6 = 1$$
$$\therefore \quad S_n = \frac{n}{2}[2a + (n-1)d]$$
$$= \frac{n}{2}[2 \times 1 + (n-1)2]$$
$$= \frac{n}{2}(2 + 2n - 2)$$
$$= \frac{n}{2} \times 2n = n^2$$

28. $9x^2 - 9(a+b)x + (2a^2 + 5ab + 2b^2) = 0$

Here, $A = 9$, $B = -9(a+b)$, $C = 2a^2 + 5ab + 2b^2$

$$D = B^2 - 4AC$$
$$= [-9(a+b)]^2 - 4 \times 9(2a^2 + 5ab + 2b^2)$$
$$= 81(a+b)^2 - 36(2a^2 + 5ab + 2b^2)$$

$= 81(a^2 + b^2 + 2ab) - 72a^2 - 180\,ab - 72b^2$

$= 9a^2 + 9b^2 - 18ab$

$= 9(a^2 + b^2 - 2ab) = 9(a - b)^2$

$$x = \frac{-B \pm \sqrt{D}}{2A}$$

$$= \frac{9(a+b) \pm 3(a-b)}{18} = \frac{2a+b}{3}, \frac{a+2b}{3}$$

29. $(3 \sin \theta + 4 \cos \theta)^2 = 5^2$

$\Rightarrow$ $9 \sin^2 \theta + 16 \cos^2 \theta + 24 \sin \theta \cos \theta = 25$

$\Rightarrow$ $9(1 - \cos^2 \theta) + 16(1 - \sin^2 \theta) + 24 \sin \theta \cos \theta = 25$

$\Rightarrow$ $9 - 9 \cos^2 \theta + 16 - 16 \sin^2 \theta + 24 \sin \theta \cos \theta = 25$

$\Rightarrow$ $9 \cos^2 \theta + 16 \sin^2 \theta - 24 \sin \theta \cos \theta = 0 \Rightarrow (3 \cos \theta - 4 \sin \theta)^2 = 0$

$\Rightarrow$ $3 \cos \theta - 4 \sin \theta = 0$

30. (*a*) Volume of the granary = $10 \times 8 \times 4 = 320$ m^3

Volume occupied by one bag = 0.80 m^3

Let number of bags be x.

$\therefore$ Volume occupied by x bags = Volume of the granary

$\Rightarrow$ $0.80 \times x = 320$

$$x = \frac{320}{0.80} = 400 \text{ bags}$$

So, 400 bags can be stored in the granary.

OR

(*b*) Circumference of the base = 44 m

$\Rightarrow 2\pi r = 44$ m $\Rightarrow r = 7$ m

$h = 10$ m, $l = \sqrt{r^2 + h^2} = \sqrt{7^2 + 10^2} = \sqrt{49 + 100} = \sqrt{149}$ m

Area of canvas required = $\pi rl = \frac{22}{7} \times 7 \times \sqrt{149}$ m^2 = $22\sqrt{149}$ m^2

Length of canvas required = $\frac{\text{area of canvas}}{\text{width of canvas}} = \frac{22\sqrt{149}}{2}$ m = $11\sqrt{149}$ m = 11×12.206 m = 134.27 m

31. Let $\sqrt{p}$ be rational so that it can be written in the form of $\frac{a}{b}$.

$\sqrt{p} = \frac{a}{b}$ (where a and b are coprimes)

Squaring both sides, we get $p = \frac{a^2}{b^2}$

$\Rightarrow$ $pb^2 = a^2$ ...(*i*)

a^2 has a factor p.

so, a also has a factor p.

Let $a = pc \Rightarrow a^2 = p^2c^2$

Put the value of a^2 in equation (*i*).

$pb^2 = p^2c^2 \Rightarrow b^2 = pc^2$

b^2 has a factor p, $\therefore$ b has a factor p.

But a and b have common factor p.

But as stated earlier a, b are coprimes.

So, our supposition is wrong.

$\sqrt{p}$ must be an irrational number. (where p is a prime number.)

We can prove $\sqrt{q}$ is also an irrational number (where q is a prime number.)

Sum of two irrational numbers is irrational if both are prime numbers.

So, $\sqrt{p}+\sqrt{q}$ is irrational number.

32. (*a*) Let number of mangoes with A be x and number of mangoes with B be y.

According to 1st condition

$$x + 30 = 2(y - 30)$$

$$\Rightarrow \quad x + 30 = 2y - 60$$

$$\text{or} \quad x - 2y = -90 \qquad ...(i)$$

According to 2nd condition

$$3(x - 10) = y + 10$$

$$\Rightarrow \quad 3x - 30 = y + 10$$

$$\text{or} \quad 3x - y = 40 \qquad ...(ii)$$

On multiplying equation (*ii*) by 2 and subtracting from (*i*), we get

$$x - 2y = -90 \qquad ...(i)$$

$$\begin{array}{r} 6x - 2y = 80 \\ - \quad + \qquad - \\ \hline -5x = -170 \end{array} \qquad ...(ii)$$

$$\Rightarrow \quad x = 34$$

From (*i*),

$$34 - 2y = -90$$

$$\Rightarrow \quad 2y = 124$$

$$\Rightarrow \quad y = 62$$

$\therefore$ Number of mangoes with $A = 34$

Number of mangoes with $B = 62$

OR

(*b*) Consider the equation

$$3x - 2y - 1 = 0$$

Some points on graph are

x	1	3	–1
y	1	4	–2

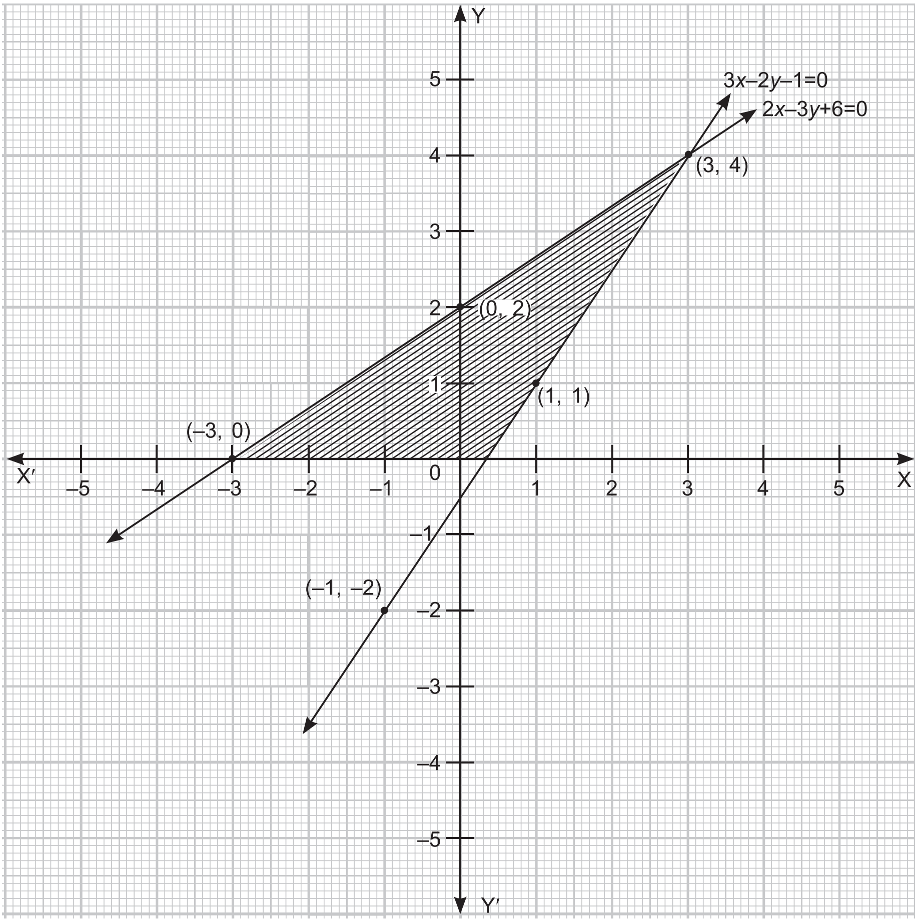
Consider equation

$$2x - 3y + 6 = 0$$

Some points on graph are

x	–3	0	3
y	0	2	4

Plotting the points on graph, we get

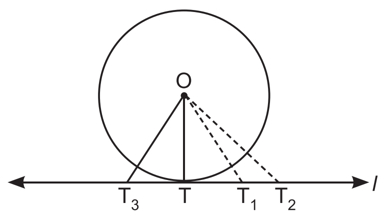


Solution is point (3, 4), *i.e.,* $x = 3, y = 4$.

The region bounded by the lines and the x-axis is shown as shaded.

33. Given: A line 'l' tangent to the circle at point T and O is the centre of circle.

To prove: $OT \perp l$



Construction: Take points T_1, T_2 and T_3 on line l and join OT_1, OT_2, OT_3.

Proof: We observe that points T_1, T_2, T_3 lie outside the circle, whereas point T lies on the circle.

Hence $OT_1 > OT$

$OT_2 > OT$

$OT_3 > OT$

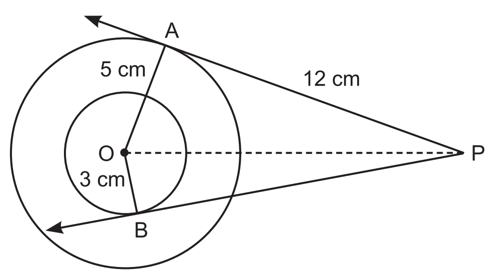
All distances OT_1, OT_2, OT_3 are greater than OT.

Only OT is the shortest distance.

Also $OT = r$

Hence r is the shortest distance from tangent l of the circle to the centre as we know that shortest distance between the point on line is perpendicular distance.

So, $OT \perp l$.



$$OP^2 = 25 + 144 = 169$$

$$OP = 13 \text{ cm}$$

$$BP^2 = OP^2 - OB^2$$

$$= 169 - 9$$

$$= 160$$

$$BP = \sqrt{160} = 4\sqrt{10} \text{ cm.}$$

34. (*a*)

Marks obtained	Number of students	Cumulative frequency
20 – 30	p	p
30 – 40	15	$p + 15$
40 – 50	25	$p + 40$
50 – 60	20	$p + 60$
60 – 70	q	$p + q + 60$
70 – 80	8	$p + q + 68$
80 – 90	10	$p + q + 78$
	90	

$$p + q + 78 = 90$$

$$\Rightarrow \quad p + q = 12 \quad \text{...}(i)$$

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

$$\Rightarrow \quad 50 = 50 + \left[\frac{45 - (p + 40)}{20}\right] \times 10$$

$$\Rightarrow \quad \left[\frac{45 - (p + 40)}{20}\right] \times 10 = 0$$

$$\Rightarrow \quad 45 - (p + 40) = 0$$

$$\Rightarrow \quad p = 5$$

Now, $\quad 5 + q = 12$ $\quad$ {Using (*i*)}

$$\Rightarrow \quad q = 7$$

Now, $\quad \text{mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \cdot h$

$$= 40 + \left(\frac{25 - 15}{2 \times 25 - 15 - 20}\right) \times 10$$

$$= 40 + \frac{100}{15} = 40 + 6.67 = 46.67$$

OR

(*b*) Here, maximum frequency = 40

$\therefore$ Modal class = 1500 – 2000 and $l = 1500, f_0 = 24, \ f_1 = 40, f_2 = 33$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 1500 + \left(\frac{40 - 24}{80 - 24 - 33}\right) \times 500 = 1500 + \frac{16}{23} \times 500 = 1500 + 347.83 = ₹\ 1847.83$$

For Mean

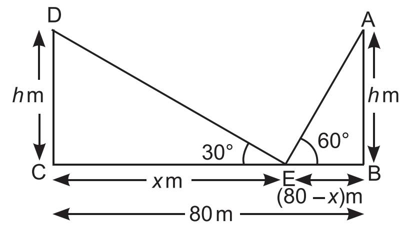
Expenditure (in ₹)	Class mark (x_i)	Number of families (f_i)	$u_i = \frac{x_i - 2750}{500}$	f_iu_i
1000 – 1500	1250	24	–3	–72
1500 – 2000	1750	40	–2	–80
2000 – 2500	2250	33	–1	–33
2500 – 3000	2750 = a (Let)	28	0	0
3000 – 3500	3250	30	1	30
3500 – 4000	3750	22	2	44
4000 – 4500	4250	16	3	48
4500 – 5000	4750	7	4	28
Total		$\Sigma f_i = 200$		$\Sigma f_iu_i = -35$

Here, $a = 2750$, $\Sigma f_i = 200$, $\Sigma f_iu_i = -35$, $h = 500$

$$\therefore \quad \text{Mean} = a + \frac{\Sigma f_iu_i}{\Sigma f_i} \times h = 2750 + \frac{(-35)}{200} \times 500 = 2750 - \frac{175}{2} = 2750 - 87.50 = ₹\ 2662.50$$

35. Let AB = CD = h m [Height of the poles]

Given: BC = 80 m [Width of the road]



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Let $\text{CE} = x$ m

$\therefore$ $\text{BE} = (80 - x)$ m

In ΔDCE, $\frac{\text{CD}}{\text{CE}} = \frac{h}{x} = \tan 30°$ 1

$\Rightarrow \quad \frac{h}{x} = \frac{1}{\sqrt{3}} \Rightarrow x = \sqrt{3}h$ ... (*i*)

In ΔABE, $\frac{\text{AB}}{\text{BE}} = \tan 60° \Rightarrow \frac{h}{80 - x} = \sqrt{3}$ 1

$\Rightarrow \quad h = 80\sqrt{3} - \sqrt{3}x$

$\Rightarrow \quad \sqrt{3}x = 80\sqrt{3} - h$

$\Rightarrow \quad x = \frac{80\sqrt{3} - h}{\sqrt{3}}$ ... (*ii*)

From equation (*i*) and (*ii*), we get

$$\sqrt{3}h = \frac{80\sqrt{3} - h}{\sqrt{3}}$$

$\Rightarrow \quad 3h = 80\sqrt{3} - h$

$\Rightarrow \quad 4h = 80\sqrt{3} \Rightarrow h = 20\sqrt{3}$

Substituting h in equation (i),

$$x = h\sqrt{3} = 20\sqrt{3} \times \sqrt{3} = 60 \text{ m}$$ 1

Hence, position of the point is at a distance of 60 m from pole CD and 20 m from pole AB.

36. (i) Here $a_n = 9 - 5n$

and $a_1 = 9 - 5(1) = 4$

$a_2 = 9 - 5(2) = -1$

$d = a_2 - a_1$

$= -1 - 4 = -5$

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

$\therefore$ $S_{20} = \frac{20}{2}[2 \times 4 + (20-1)(-5)]$

$= 10[8 + (19)(-5)] = -870$

(ii) $S_p = 2p^2 + 3p$

$\therefore$ $S_2 = 2(2)^2 + 3(2) = 2(4) + (6) = 14$

(iii) (a) Here $a = 7$ and $d = 7$

Highest number less than 100 which is divisible by 7 is 98.

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

$\Rightarrow$ $98 = 7 + (n-1)7$ [Let $a_n = 98$]

$\Rightarrow$ $98 = 7 + 7n - 7$

$\Rightarrow$ $7n = 98$

$\Rightarrow$ $n = 14$

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

$\therefore$ $S_{14} = \frac{14}{2}[2 \times 7 + (14-1)7] = 735$

OR

(b) Here $a = -12$ and $a_6 = 8$

$a_6 = a + 5d$

$\Rightarrow$ $8 = -12 + 5d$

$\Rightarrow$ $5d = 20$

$\Rightarrow$ $d = 4$

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

$= \frac{n}{2}[2 \times (-12) + (n-1)(4)]$

$= \frac{n}{2}(-24 + 4n - 4)$

$= \frac{n}{2}(-28 + 4n) = \frac{n}{2}[4(-7 + n)] = 2n(n-7)$

37. (*i*) Radius of semicircle = $\frac{7}{2}$ units

Perimeter of parking area $= \pi r + 2r = \frac{22}{7} \times \frac{7}{2} + 2 \times \frac{7}{2} = 18$ units

(*ii*) Perimeter $= \pi r + 2 \times$ (length + breadth)

$$= \frac{22}{7} \times \frac{7}{2} + 2 \times (14 + 7) = 53 \text{ units}$$

$\therefore$ Total cost of fencing = ₹ (2 × 53) = ₹ 106.00

(*iii*) (*a*) Area of parking $= \frac{1}{2}\pi r^2 = \frac{1}{2} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{4}$ sq units

Area of 2 quadrants $= 2 \times \frac{1}{4}\pi R^2 = \frac{1}{2} \times \frac{22}{7} \times 2^2 = \frac{44}{7}$ sq units

$\therefore$ Area of parking + area of two quadrants $= \frac{77}{4} + \frac{44}{7} = \frac{715}{28}$ sq units

OR

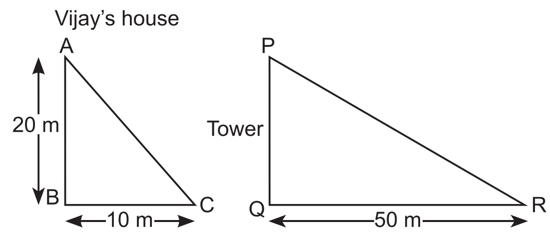
(*iii*) (*b*) Area of playground, $A_1 = 14 \times 7 = 98$ sq units

Area of parking, $A_2 = \frac{77}{4}$ sq units

Now, $$\frac{A_1}{A_2} = \frac{98 \times 4}{77 \times 1} = \frac{56}{11}$$

So, required ratio = 56:11

38. (*i*) ΔABC and ΔPQR are similar triangles



$\therefore \frac{AB}{PQ} = \frac{BC}{QR} \Rightarrow \frac{20}{PQ} = \frac{10}{50}$

$\Rightarrow PQ = 100$ m

Hence, the height of tower is 100 m.

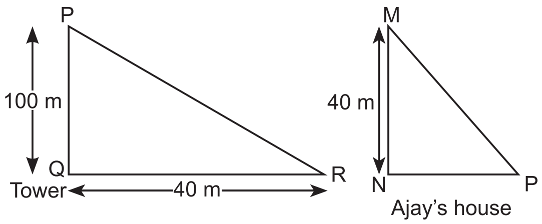
(*ii*) Since $\Delta ABC \sim \Delta PQR$

$\Rightarrow \frac{AB}{PQ} = \frac{BC}{QR}$

$\Rightarrow \frac{20}{100} = \frac{12}{QR} \Rightarrow QR = 60$ m

Hence, the length of the shadow of the tower is 60 m.

(*iii*) (*a*)



$\Delta PQR \sim \Delta MNP$ $\left\{ \text{As } \dfrac{\text{height of vijay's house}}{\text{height of Ajay's house}} = \dfrac{\text{cast of shadow of vijay's house}}{\text{cast of shadow of Ajay's house}} \right.$

$$\Rightarrow \frac{20}{\text{Height of Ajay's house}} = \frac{10}{20}$$

$\Rightarrow$ Height of Ajay's house = 40 m}

$$\Rightarrow \frac{PQ}{MN} = \frac{QR}{NP}$$

$$\Rightarrow \frac{100}{40} = \frac{40}{NP}$$

$\Rightarrow$ $NP = 16$ m

Hence, the length of the shadow of Ajay's house = 16 m.

OR

(*iii*) (*b*) $\dfrac{\text{Height of Vijay's house}}{\text{Height of tower}} = \dfrac{\text{Length of shadow of Vijay's house}}{\text{Length of the shadow of tower}}$

$$\Rightarrow \frac{20}{100} = \frac{\text{Length of the shadow of Vijay's house}}{40}$$

$\Rightarrow$ Length of the shadow of Vijay's house = 8 m.