SAMPLE QUESTION PAPER-10

MATHEMATICS
CLASS-10
SECTION - A

1. (*c*) (2, –1)

[Since diagonals of a parallelogram bisect each other

$\therefore \quad \left(\frac{3-3}{2}, \frac{4-2}{2}\right) = \left(\frac{-2+x}{2}, \frac{3+y}{2}\right)$, where coordinates of S are S(x, y)

$0 = -2 + x \Rightarrow x = 2$ and $2 = 3 + y \Rightarrow y = -1$

Hence, S(2, –1)]

2. (*c*) $p = 8$, $k = 2$

[Here, $px^2 + px + k = 0$ has equal roots

$\therefore \quad b^2 - 4ac = 0 \Rightarrow p^2 - 4pk = 0$

And $2x^2 + px + 8 = 0$ has equal roots

$\therefore \quad b^2 - 4ac = 0 \Rightarrow p^2 - 4(2)(8) = 0 \Rightarrow p = 8$

Now, $\quad p^2 - 4pk = 0 \Rightarrow 64 - 32k = 0$ or $k = \frac{64}{32} = 2$]

3. (*c*) 35

[$a = p^3q^4$ and $b = p^2q^3 \Rightarrow$ HCF of $a, b = p^2q^3$ and LCM of $a, b = p^3q^4$

Now, $\quad p^mq^n = p^2q^3 \Rightarrow m = 2$ and $n = 3$

and $\quad p^rq^s = p^3q^4 \Rightarrow r = 3$ and $s = 4$

$\therefore \quad (m + n)(r + s) = (5)(7) = 35$]

4. (*b*) 25

[Here, 15 – 20 is the modal class and 10 –15 is the median class

∴ Required sum = 15 + 10 = 25]

5. (*d*) 1

[Here, $a_2 - a_1$ = common difference (d) and $b_2 - b_1$ = common difference (d)

$\therefore \quad \frac{a_2 - a_1}{b_2 - b_1} = 1$]

6. (*a*) –15

[Mid-point of (p, 12) and (6, 8) = $\left(\frac{p+6}{2}, 10\right)$, lies on $2x + y - 1 = 0$

$\therefore \quad 2 \times \left(\frac{p+6}{2}\right) + 10 - 1 = 0$

$\Rightarrow \quad p + 6 + 9 = 0 \Rightarrow p = -15$]

7. (*b*) 9 cm

[In rt. ∠ed ΔPBO, ∠B = 90°

$\therefore \quad \text{OB} = \sqrt{\text{OP}^2 - \text{PB}^2} = \sqrt{15^2 - 12^2} = \sqrt{225 - 144} = \sqrt{81} = 9$

Since OA = OB = radii of same circle

$\therefore \quad$ OA = 9 cm]

8. (*c*) 96 cm^2

[Here, $l + b + h = 6\sqrt{3}$ cm and length of diagonal = $2\sqrt{3}$ cm

Since diagonal of a cuboid = $\sqrt{l^2 + b^2 + h^2}$

$\therefore \quad 2\sqrt{3} = \sqrt{l^2 + b^2 + h^2} \Rightarrow l^2 + b^2 + h^2 = 12$

Now, $\quad (l + b + h)^2 = l^2 + b^2 + h^2 + 2(lb + bh + hl)$

$\therefore \quad (6\sqrt{3})^2 = 12 +$ Total surface area

Hence, total surface area = 108 – 12 = 96 cm^2]

9. (*d*) $3\sqrt{3}$ cm

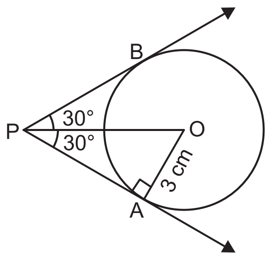
[Since PO bisects $\angle$APB

$\therefore$ $\angle APO = 30°$ and OP = 3 cm

Now, in rt. $\angle$ed ΔPAO, $\angle A = 90°$

$\therefore$ $\frac{OA}{PA} = \tan 30° = \frac{1}{\sqrt{3}}$

$PA = OA\sqrt{3} = 3\sqrt{3}$ cm



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10. (*c*) $\frac{1}{6}$

[Factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, 36

Since 5 is not a factor of 36

Hence, required probability = $\frac{1}{6}$]

11. (*a*) $\frac{1}{3}$

$$\left[\frac{5\sin\beta - 2\cos\beta}{5\sin\beta + 2\cos\beta} = \frac{5\tan\beta - 2}{5\tan\beta + 2} = \frac{5\times\frac{4}{5} - 2}{5\times\frac{4}{5} + 2} = \frac{2}{6} = \frac{1}{3}. \quad (\because \tan\beta = \frac{4}{5})\right]$$

12. (*b*) The distance between (9 sin θ, 0) and (0, 9 cos θ) is 1.

[$\because$ Distance between (9 sin θ, 0) and (0, 9 cos θ)

$$= \sqrt{(0 - 9\sin\theta)^2 + (9\cos\theta - 0)^2}$$

$$= \sqrt{81(\sin^2\theta + \cos^2\theta)} = \sqrt{81\times 1} = 9 \text{ units}]$$

13. (*b*) $x^2 - (p + 1)x + p = 0$

[Since p is prime

$\therefore$ Factors of p are p and 1.

So, the required quadratic equation, is $x^2 - Sx + P = 0$ *i.e.*, $x^2 - (p + 1)x + p = 0$]

14. (*b*) 2

[Given that : $\sin\theta + \cos\theta = \sqrt{2}$

$\Rightarrow \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 2$ or $2\sin\theta\cos\theta = 2 - 1$ or $\sin\theta\cos\theta = \frac{1}{2}$

Now, $\tan\theta + \cot\theta = \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = \frac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta} = \frac{1}{\sin\theta\cos\theta} = 2$]

15. (*d*) 2

[Given equations are : $3x + y = 1$ and $(2k - 1)x + (k - 1)y = 2k + 1$

For inconsistent (no solution), we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ *i.e.*, $\frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{1}{2k+1} \Rightarrow 3k - 3 = 2k - 1 \Rightarrow k = 3 - 1 = 2$]

16. (*c*) $\frac{11}{36}$

[Sample space = 6 × 6 = 36 outcomes

Favourable outcomes = {(1, 6), (2, 6), (3, 6), (4, 6), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)} = 11 outcomes

$\therefore$ Required probability $\frac{11}{36}$]

17. (*b*) $\frac{2}{3}$

[Here, $\alpha + \beta = \frac{2}{p}$ and $\alpha\beta = 3$

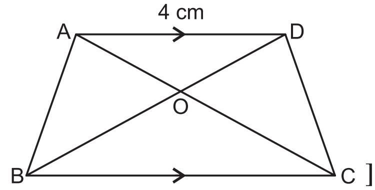
Given that : $\alpha + \beta = \alpha\beta \Rightarrow \frac{2}{p} = 3 \Rightarrow p = \frac{2}{3}$]

18. (*c*) 8 cm

[By AA similarity axiom, ΔBOC ~ ΔDOA

$\therefore \quad \frac{AD}{BC} = \frac{AO}{OC} = \frac{DO}{OB} = \frac{1}{2}$ (given)

$\Rightarrow \quad \frac{4}{BC} = \frac{1}{2}$ or BC = 8 cm



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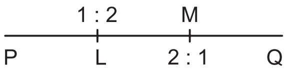
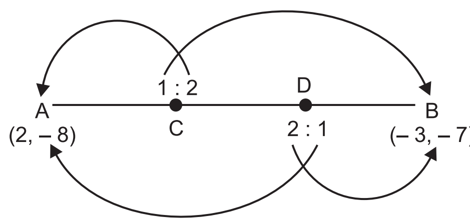
19. (*a*) is the correct option

[Reason (R) is true – a standard result



$\Rightarrow$ PL = LM = MQ

i.e., L and M divide the line segment PQ in three equal parts.



For assertion (A), we have coordinates of C, as :

$C\left(\frac{-3+4}{1+2}, \frac{-7-16}{1+2}\right)$ *i.e.*, $C\left(\frac{1}{3}, \frac{-23}{3}\right)$

Coordinates of D, are :

$D\left(\frac{-6+2}{2+1}, \frac{-14-8}{2+1}\right)$ *i.e.*, $D\left(\frac{-4}{3}, \frac{-22}{3}\right)$

$\Rightarrow$ Assertion (A) is true

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

20. (*d*) is the correct option

[Reason (R) is true – a standard formula

For assertion (A), we have

Let breadth of the hall be x cm

$\therefore$ Height of the hall = $5x$ cm and length of the hall = $\frac{5}{8}x$ cm

Volume of the hall = 12.8 m^3

$$\frac{5}{8}x \times x \times 5x = 12.8 \times 100 \times 100 \times 100$$

$$x^3 = \frac{1280 \times 100 \times 100 \times 8}{25} = 8^3 \times 8 \times 10^3 = 8^3 \times 2^3 \times 10^3$$

$$x = 8 \times 2 \times 10 = 160 \text{ cm}$$

$\Rightarrow$ Assertion (A) is false

So, assertion (A) is false and reason (R) is true]

21. $\sin(A + B) = 1 = \sin 90° \Rightarrow A + B = 90°$ …(*i*)

$\cos(A - B) = \frac{\sqrt{3}}{2} = \cos 30° \Rightarrow A - B = 30°$ …(*ii*)

From (*i*) and (*ii*), we obtain

$$2A = 120° \Rightarrow A = 60° \text{ and } B = 90° - A = 90° - 60° = 30°$$

Hence, A = 60° and B = 30°

Or

$$\frac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$$

$$\frac{\frac{\cos\theta - \sin\theta}{\cos\theta}}{\frac{\cos\theta + \sin\theta}{\cos\theta}} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$$

$$\frac{1-\tan\theta}{1+\tan\theta} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$$

Since θ is acute, therefore, $\tan\theta = \sqrt{3} = \tan 60° \Rightarrow \theta = 60°$

Hence, $\theta = 60°$

22. $\angle APB + \angle AOB = 180°$

$\angle AOB = 180° - \angle APB = 180° - 75° = 105°$

Now, $\angle AQB = \frac{1}{2}\angle AOB$

$= \frac{1}{2} \times 105° = (52.5)°$

23. In ΔALB and ΔCLN

$\angle ALB = \angle CLN$ and $\angle LCN = \angle LAB$

By AA similarity axiom, $\Delta ALB \sim \Delta CLN$

$\therefore \quad \frac{AB}{CN} = \frac{LA}{CL}$

$\frac{AB}{AB+DN} = \frac{LA}{3LA} = \frac{1}{3}$

$3AB = AB + DN$

$2AB = DN$

$\frac{AB}{DN} = \frac{1}{2}$ or $AB : DN = 1 : 2$

Or

In ΔABC, $DE \parallel BC$

$\therefore \quad \frac{AD}{AB} = \frac{AE}{AC}$ …(*i*)

In ΔADC, $FE \parallel DC$

$\therefore \quad \frac{AF}{AD} = \frac{AE}{AC}$ …(*ii*)

From (*i*) and (*ii*)

$\frac{AD}{AB} = \frac{AF}{AD}$

$AD^2 = AB \times AF$

24. Let A(–1, –2), B(4, –1), C(5, 4) and D(0, 3) be the vertices of a rhombus ABCD

Diagonal AC $= \sqrt{(5+1)^2+(4+2)^2} = \sqrt{36+36} = 6\sqrt{2}$ units

Diagonal BD $= \sqrt{(0-4)^2+(3+1)^2} = \sqrt{16+16} = 4\sqrt{2}$ units

Now, area of rhombus ABCD $= \frac{1}{2} \times AC \times BD = \frac{1}{2} \times 6\sqrt{2} \times 4\sqrt{2} = 24$ sq. units.

25. ***In the statement, sum of HCF and LCM is 1140.**

Let HCF of two numbers be x, then LCM of two numbers is $56x$

Also, $56x + x = 1140 \Rightarrow 57x = 1140 \Rightarrow x = 1140 \div 57 = 20$

Let the other number be n

Now, product of two numbers = product of HCF and LCM

$\therefore \quad 160 \times n = 20 \times (56 \times 20)$

$n = \frac{20 \times 56 \times 20}{160} = 140$

Hence, the other number is 140.

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SECTION - C

26. Let us assume, to contrary that $5 + 2\sqrt{5}$ be a rational number.

$$\therefore \quad 5 + 2\sqrt{5} = \frac{p}{q}, \; q \neq 0 \text{ and } p, q \in Z$$

$$\frac{p}{q} - 5 = 2\sqrt{5}$$

$$\frac{p - 5q}{2q} = \sqrt{5}$$

$$\frac{\text{Integer}}{\text{Integer}} = \sqrt{5}$$

$$\text{Integer} = \sqrt{5}$$

But this contradicts the given fact that $\sqrt{5}$ is irrational.

Hence, $5 + 2\sqrt{5}$ is an irrational.

27. Here, $2x^2 - 5x - 3 = 2x^2 - 6x + x - 3$

$$= 2x(x - 3) + 1\,(x - 3)$$

$$= (x - 3)\,(2x + 1)$$

$\therefore$ Zeroes of the polynomial $2x^2 - 5x - 3$ are 3 and $-\frac{1}{2}$

Given that zeroes of the polynomial $x^2 + px + q$ are double the zeroes 3 and $-\frac{1}{2}$ *i.e.*, 6 and –1

$\therefore$ $-p = 6 - 1 \Rightarrow p = -5$

And $q = (6)\,(-1) = -6.$

28. Let 'D' be the length of the journey and x km/h be the uniform speed of the train

$\therefore$ Scheduled time taken $= \frac{D}{x}$ hours

According to the first condition, we have

$$\frac{D}{x+6} = \frac{D}{x} - 4 \quad \Rightarrow \quad Dx = (x + 6)\,(D - 4x) = Dx - 4x^2 + 6D - 24x$$

$$\text{or} \quad 6D = 4x^2 + 24x \qquad \ldots(i)$$

According to the second condition, we have

$$\frac{D}{x-6} = \frac{D}{x} + 6 \quad \Rightarrow \quad Dx = (x - 6)\,(D + 6x) = Dx + 6x^2 - 6D - 36x$$

$$\text{or} \quad 6D = 6x^2 - 36x \qquad \ldots(ii)$$

From (*i*) and (*ii*), we obtain

$$6x^2 - 36x = 4x^2 + 24x$$

or $2x^2 - 60x = 0$ or $2x(x - 30) = 0 \Rightarrow x = 0$ or 30

Rejecting $x = 0$, which is not possible, we have $x = 30$

Now, again using (*i*), we obtain

$$6D = 4(30)^2 + 24(30) = 120\,(30 + 6) = 120 \times 36$$

$$D = 20 \times 36 = 720$$

Hence, the length of the journey is 720 km.

Or

Let x and y be the number of chocolates in lot A and lot B respectively.

According to first condition of the statement, we have

$$\frac{2x}{3} + y = 400 \quad \text{or} \quad 2x + 3y = 1200 \qquad \ldots(i)$$

According to second condition of the statement, we have

$$x + \frac{4}{5}y = 460 \quad \text{or} \quad 5x + 4y = 2300 \qquad \ldots(ii)$$

From (*i*) and (*ii*), we have

$$5(2x + 3y) - 2(5x + 4y) = 5 \times 1200 - 2(2300)$$
$$10x + 15y - 10x - 8y = 6000 - 4600$$
$$7y = 1400 \Rightarrow y = 200$$

From (*i*), we have

$$2x + 3(200) = 1200 \Rightarrow 2x = 600 \Rightarrow x = 300$$

Hence, the total number of chocolates are 300 + 200 = 500.

29.
$$\text{L.H.S.} = \frac{\tan^3\theta}{1+\tan^2\theta} + \frac{\cot^3\theta}{1+\cot^2\theta}$$
$$= \frac{\dfrac{\sin^3\theta}{\cos^3\theta}}{\sec^2\theta} + \frac{\dfrac{\cos^3\theta}{\sin^3\theta}}{\text{cosec}^2\theta}$$
$$= \frac{\sin^3\theta}{\cos\theta} + \frac{\cos^3\theta}{\sin\theta}$$
$$= \frac{\sin^4\theta + \cos^4\theta}{\cos\theta\sin\theta}$$
$$= \frac{(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta\cos^2\theta}{\cos\theta\sin\theta}$$
$$= \frac{1 - 2\sin^2\theta\cos^2\theta}{\cos\theta\sin\theta}$$
$$= \frac{1}{\cos\theta\sin\theta} - 2\sin\theta\cos\theta$$
$$= \sec\theta\,\text{cosec}\,\theta - 2\sin\theta\cos\theta$$
$$= \text{R.H.S.}$$

30. Given, AB = 10 cm

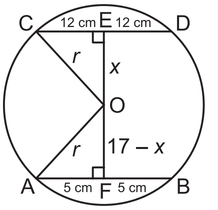
CD = 24 cm

EF (distance between two chords) = 17 cm

Let OE = x, then OF = EF – OE = 17 – x

and OC = OA = r [radii of the circle]

In ΔOCE right-angled at E



$$OC^2 = CE^2 + OE^2$$
$$\Rightarrow \quad r^2 = 12^2 + x^2$$
$$\Rightarrow \quad r^2 = 144 + x^2 \quad \ldots(i)$$

In ΔOAF right-angled at F

$$OA^2 = AF^2 + OF^2$$
$$\Rightarrow \quad r^2 = 5^2 + (17 - x)^2$$
$$\Rightarrow \quad r^2 = 25 + 289 - 34x + x^2 \quad \ldots(ii)$$

From (*i*) and (*ii*), we have

$$144 + x^2 = 25 + 289 - 34x + x^2$$
$$\Rightarrow \quad 34x = 170 \Rightarrow x = 5 \text{ cm}$$

Now, from eq. (*i*), we have

$$r^2 = 12^2 + x^2 = 144 + 25 = 169$$
$$\Rightarrow \quad r = 13 \text{ cm}$$

Hence, radius of the circle is 13 cm.

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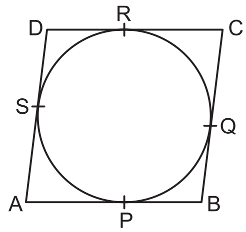
Or

Given : A parallelogram ABCD, circumscribes a circle.



To Prove : ABCD is a rhombus i.e.,

$$AB = BC = CD = DA.$$

Proof : Since ABCD is a parallelogram

$\therefore$ $AB = DC$ and $BC = AD$ ...(i)

AP and AS are two tangents from an external point A to the circle.

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

[$\because$ tangents drawn from an external point to the circle are equal]

Similarly, we have

$BP = BQ$ ...(*iii*)

$CR = CQ$ ...(*iv*)

And $DR = DS$ ...(*v*)

Adding (*ii*), (*iii*), (*iv*) and (*v*), we have

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

$$AB + CD = AD + BC$$

$$AB + AB = AD + AD \quad \text{[using (i)]}$$

$$2AB = 2AD \Rightarrow AB = AD$$

i.e., adjacent sides of the parallelogram are equal.

Thus, all the sides are equal.

Hence, ABCD is a rhombus.

31.

Weight (in grams)	*No. of Birds*	*c.f.*
140 – 150	6	6
150 – 160	28	34
160 – 170	48	82
170 – 180	30	112
180 – 190	8	120
Total	120	

Here, $n = 120$ and $\frac{n}{2} = 60$

c.f. 60 lies in the 160 – 170, therefore, the median class is 160 – 170

$\therefore$ $l = 160, \frac{n}{2} = 60, \ c.f. = 34, f = 48$ and $h = 10$

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

$$= 160 + \left(\frac{60 - 34}{48}\right) \times 10$$

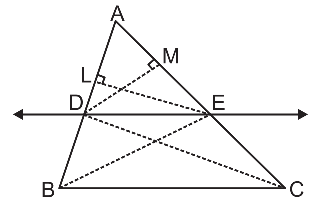
$$= 160 + \frac{260}{48}$$

$$= 160 + 5.42$$

$$= 165.42$$

Hence, the median weight is 165.42 grams.

32. Given : ΔABC and a line 'l' parallel to BC intersects AB at D and AC at E as shown in figure.



To Prove : $\dfrac{AD}{DB} = \dfrac{AE}{EC}$.

Const. : Join BE and CD.

Draw EL ⊥ AB and DM ⊥ AC.

Proof : $\text{Area of } \Delta ADE = \dfrac{1}{2} \times AD \times EL$ ...(*i*)

[∵ Area of a $\Delta = \dfrac{1}{2} \times$ base × corresponding altitude]

$\text{Area of } \Delta BDE = \dfrac{1}{2} \times DB \times EL$ ...(*ii*)

Dividing (*i*) and (*ii*), we have

$$\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta BDE} = \frac{\frac{1}{2} \times AD \times EL}{\frac{1}{2} \times DB \times EL}$$

$$= \frac{AD}{BD} \quad ...(iii)$$

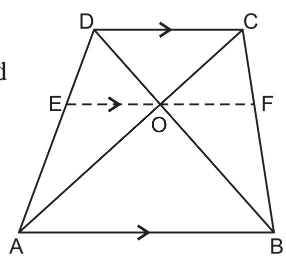
Similarly, $$\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta CDE} = \frac{\frac{1}{2} \times AE \times DM}{\frac{1}{2} \times EC \times DM}$$

$$= \frac{AE}{EC} \quad ...(iv)$$

Since ΔBDE and ΔCDE are triangles on the same base DE and between the same parallels DE and BC.

∴ $\text{Area of } \Delta BDE = \text{Area of } \Delta CDE$ ...(*v*)

From (*iii*), (*iv*) and (*v*), we have $\dfrac{AD}{DB} = \dfrac{AE}{EC}$



In trapezium ABCD, AB || DC. O is the point of intersection of the diagonals and EOF || AB.

Now, in ΔABD, EO || AB

∴ $\dfrac{AE}{ED} = \dfrac{BO}{OD}$ ...(*i*)

Again, in ΔCBD, FO || CD

∴ $\dfrac{BF}{FC} = \dfrac{BO}{OD}$ ...(*ii*)

From (*i*) and (*ii*), we have

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

33. Let a and d be the first term and common difference respectively of the given A.P.

Let a_k denote the k^{th} terms of the given A.P. Then,

$a_k = a + (k - 1)\, d$

Now, S_1 = Sum of odd terms

⇒ $S_1 = a_1 + a_3 + a_5 + \ldots + a_{2n+1}$

⇒ $S_1 = \dfrac{n+1}{2}\{a_1 + a_{2n+1}\}$

⇒ $S_1 = \dfrac{n+1}{2}\{a + a + (2n+1-1)d\}$ [∵ $a_{2n+1} = a + (2n + 1 - 1)\, d$]

⇒ $S_1 = (n + 1)(a + nd)$

and, S_2 = Sum of even terms

⇒ $S_2 = a_2 + a_4 + a_6 + \ldots + a_{2n}$

⇒ $S_2 = \dfrac{n}{2}[a_2 + a_{2n}]$

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$\Rightarrow \quad S_2 = \frac{n}{2}[(a+d)+\{a+(2n-1)d\}] \quad [\because a_{2n} = a + (2n-1)d]$

$\Rightarrow \quad S_2 = n(a + nd)$

Hence, $S_1 : S_2 = (n+1)(a+nd) : n(a+nd) = (n+1) : n$

Or

Here, first day, 150 workers were engaged, second day, 150 – 4 *i.e.,* 146 workers were engaged, third day 146 – 4 *i.e.,* 142 workers were engaged and so on. Clearly, 150, 146, 142, 138, ... is an A.P., with 150 as first term and – 4 as common difference

$\therefore \quad S_n = \frac{n}{2}[2(150) + (n-1)(-4)]$

$= \frac{n}{2}[300 - 4n + 4]$

$= \frac{n}{2}[304 - 4n] = 152n - 2n^2$

According to the statement of the question, we have

$150(n-8) = 152n - 2n^2$

$\Rightarrow \quad 2n^2 - 152n + 150n - 1200 = 0$

$\Rightarrow \quad n^2 - n - 600 = 0$

$\Rightarrow \quad n^2 - 25n + 24n - 600 = 0$

$\Rightarrow \quad (n-25)(n+24) = 0$

$\Rightarrow \quad n = 25 \quad \text{or} \quad n = -24$

Rejecting negative value of n, because number of days cannot be negative

$n = 25$

Hence, in 25 days the work was concluded.

34.

Class interval	*Frequency (f)*	*Cumulative frequency (c.f.)*
0 – 100	2	2
100 – 200	5	7
200 – 300	x	$7 + x$
300 – 400	12	$19 + x$
400 – 500	17	$36 + x$
500 – 600	20	$56 + x$
600 – 700	y	$56 + x + y$
700 – 800	9	$65 + x + y$
800 – 900	7	$72 + x + y$
900 – 1000	4	$76 + x + y$
Total	$x + y + 76$	100

We have,

$N = \Sigma f_i = 100$

$\Rightarrow \quad 76 + x + y = 100 \Rightarrow x + y = 24$

It is given that the median is 525. Clearly, it lies in the class 500 – 600

$\therefore \quad l = 500, h = 100, f = 20, c.f. = 36 + x$ and $N = 100$

Now, $\text{Median} = l + \left(\frac{\frac{N}{2} - c.f.}{f}\right) \times h$

$\Rightarrow \quad 525 = 500 + \left(\frac{50-(36+x)}{20}\right) \times 100$

$\Rightarrow \quad 525 - 500 = (14 - x) \times 5$

$\Rightarrow \quad 25 = 70 - 5x \Rightarrow 5x = 45 \Rightarrow x = 9$

Putting $x = 9$ in $x + y = 24$, we obtain $y = 15$.

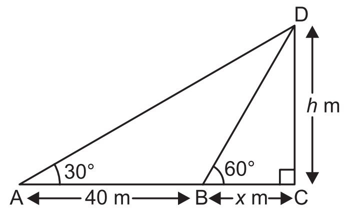
Hence, the values of x and y are $x = 9$ and $y = 15$.

35. Let DC be the tree of height h m and BC be the river of width x m and A be position of man after moving 40 m.

$$\angle CAD = 30° \text{ and } \angle CBD = 60°$$

In rt. ∠ed ΔBCD, $\frac{DC}{BC} = \tan 60°$

$$\frac{h}{x} = \sqrt{3} \Rightarrow h = \sqrt{3}x \qquad \ldots(i)$$



In rt. ∠ed ΔACD, $\frac{DC}{AC} = \tan 30°$

$$\therefore \quad \frac{h}{x+40} = \frac{1}{\sqrt{3}}$$

$$\sqrt{3}h = x + 40 \qquad \ldots(ii)$$

Put $h = \sqrt{3}x$ from (i) into (ii), we have

$$\sqrt{3} \times \sqrt{3}x = x + 40$$

$$3x - x = 40 \Rightarrow 2x = 40 \Rightarrow x = 20$$

From (i), $h = \sqrt{3} \times 20 = 20\sqrt{3}$

$$= 20 \times 1.732 = 34.64$$

Hence, Height of tree = 34.64 m and Width of the river = 20 m

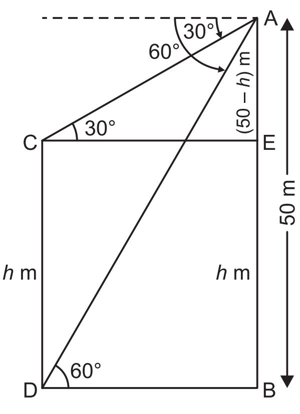
Or

Let AB and CD be the two temples, such that, AB = 50 m, ∠ACE = 30°, ∠ADB = 60°, CD = BE = h m and AE = $(50 - h)$ m.

In rt. ∠ed ΔDBA

$$\frac{AB}{DB} = \tan 60° = \sqrt{3}$$

$$\frac{50}{DB} = \sqrt{3} \text{ or } DB = \frac{50}{\sqrt{3}} = \frac{50\sqrt{3}}{3} = 28.87 \text{ m}$$



In rt. ∠ed ΔCEA

$$\frac{AE}{CE} = \tan 30° = \frac{1}{\sqrt{3}}$$

$$\frac{50-h}{\frac{50}{\sqrt{3}}} = \frac{1}{\sqrt{3}} \qquad [\because CE = DB]$$

$$3(50 - h) = 50 \quad \text{or} \quad 3h = 150 - 50 = 100$$

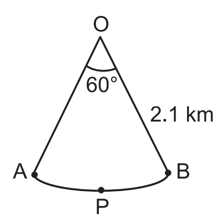
$$\text{or} \quad h = \frac{100}{3} = 33.33$$

Hence, the width of the river is 28.87 m and height of the other temple is 33.33 m.

36. (i) Radius of the circle = 2.1 km, $\theta = 60°$

Total distance travelled in a week $= 3 \times 2 \times \frac{2\pi r \times \theta}{360°}$

$$= \frac{12 \times 22 \times 2.1 \times 60°}{7 \times 360°} = 13.2 \text{ km}$$



(ii) Radius of the circle = 2.1 km

Total distance travelled in a week along AOB = 3 × 2 × (2.1 + 2.1) = 25.2 km

(iii) Area of the sector AOB $= \frac{\theta}{360°} \times \pi r^2 = \frac{60°}{360°} \times \frac{22}{7} \times 2.1 \times 2.1 = 2.31 \text{ km}^2$

Or

Area of the sector AOB $= \frac{\theta}{360°} \times \pi r^2 = \frac{90°}{360°} \times \frac{22}{7} \times 2.1 \times 2.1 = 3.465 \text{ or } 3.47 \text{ km}^2$

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37. (*i*) Dimensions of the cuboid are 2 m by 2 m by 7 m

$\therefore$ Volume of the well (cuboid) $= l \times b \times h = 2 \times 2 \times 7 = 28$ m^3.

(*ii*) Radius of the cylindrical well $(r) = 1$ m

Depth of the cylindrical well $(h) = 7$ m

$\therefore$ Volume of the cylindrical well $= \pi r^2 h = \frac{22}{7} \times 1 \times 1 \times 7 = 22$ m^3

(*iii*) Curved surface area of cuboidal well $= 2(l + b)h$

$= 2 \times 4 \times 7 = 56$ m^2

Or

Curved surface area of cylindrical well $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 1 \times 7 = 44$ m^2

38. (*i*) Sides of the square plots are x m and y m

$\therefore$ According to the given conditions, we have

$4x - 4y = 60$ or $x - y = 15$

and $x^2 + y^2 = 15425$

(*ii*) From $x - y = 15$, we have $x = 15 + y$ or $x - 15 = y$

$\therefore$ $(15 + y)^2 + y^2 = 15425$

$225 + 30y + 2y^2 = 15425$

$y^2 + 15y - 7600 = 0$

Or

$x^2 + (x - 15)^2 = 15425$

$2x^2 - 30x + 225 = 15425$ or $x^2 - 15x - 7600 = 0$

(*iii*) Now, $x^2 - 15x - 7600 = 0$

$x^2 - 95x + 80x - 7600 = 0$

$(x - 95)(x + 80) = 0 \Rightarrow x = 95, x = -80$ (rejecting)

Hence, the sides of the two square plots are 95 m and 80 m.

Or

Areas of the two plots are $(95)^2$ and $(80)^2$ *i.e.*, 9025 m^2 and 6400 m^2

Perimeters of the two square plots are 4×95 and 4×80 *i.e.,* 380 m and 320 m.

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