Board Paper of Class 10 2023 Maths (Basic) Delhi(Set 1) - Solutions

Total Time: 180

Total Marks: 80.0

Section A

Solution 1

Let the polynomial be $p(x)$.
Sum of the zeroes of $p(x) = -3$
Product of the zeroes of $p(x) = 2$
We know that the quadratic polynomial $p(x)$ in terms of sum and product of zeroes is given by:
$p(x) = x^2$ – (sum of zeroes)x + product of zeroes
so, we have
$p(x) = x^2 - (-3)x + 2$

$\Rightarrow p(x) = x^2 + 3x + 2$
Therefore, $x^2 + 3x + 2$ is the quadratic polynomial whose sum and the product of zeroes are -3 and 2 respectively.

Hence, the correct answer is option (a).

Solution 2

We know that,

HCF × LCM = Product of numbers

$\Rightarrow$ HCF × LCM = 70 × 40

$\Rightarrow$ HCF × LCM = 2800

Hence, the correct answer is option (c).

Solution 3

Given: The radius of a semi-circular protractor is 7 cm.

The perimeter of the semicircle of radius r is given by:

Perimeter = $\pi r + 2r$

$$\therefore \text{Perimeter} = \frac{22}{7} \times 7 + 2 \times 7$$
$$\Rightarrow \text{Perimeter} = 22 + 14$$
$$\Rightarrow \text{Perimeter} = 36 \text{ cm}$$

Hence, the correct answer is option (d).

Solution 4

Given: $\left(5 - 3\sqrt{5} + \sqrt{5}\right) = 5 - 2\sqrt{5}$

Addition or subtraction of a rational and an irrational number gives an irrational number.

Hence, the correct answer is option (c).

Solution 5

Given: $p(x) = x^2 + 5x + 6$

$\therefore p(-2) = (-2)^2 + 5(-2) + 6$

$\Rightarrow p(-2) = 4 - 10 + 6$

$\Rightarrow p(-2) = 0$

Hence, the correct answer is option (b).

Solution 6

The probability of an event cannot be greater than 1.

Here, $\frac{5}{3}$ is greater than 1.

Hence, the correct answer is option (b).

Solution 7

Given: $x + 2y + 5 = 0$

$\Rightarrow x + 2y = -5$ .....(1)

and $-3x - 6y + 1 = 0$

$\Rightarrow 3x + 6y = 1$ .....(2)

Here, $a_1 = 1$, $b_1 = 2$ $c_1 = -5$
$a_2 = 3$, $b_2 = 6$, $c_2 = 1$

$\therefore \frac{a_1}{a_2} = \frac{1}{3}$,
$\frac{b_1}{b_2} = \frac{2}{6} = \frac{1}{3}$
$\frac{c_1}{c_2} = \frac{-5}{1} = -5$
Here, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
Therefore, this system of equations has no solutions.

It is represented by parallel lines.

Hence, the correct answer is option (d).

Solution 8

Given: ΔABC ~ ΔDEF

$\angle A = \angle D = 47^\circ$
$\angle B = \angle E = 83^\circ$
$\angle C = \angle F$
Using triangle sum property, we get
$\angle A + \angle B + \angle C = 180^\circ$
$\Rightarrow 47^\circ + 83^\circ + \angle C = 180^\circ$
$\Rightarrow \angle C = 180^\circ - 130^\circ$
$\Rightarrow \angle C = 50^\circ$

Hence, the correct answer is option (b).

Solution 9

Substitute the value of $x = 2$ and $y = 1$ in equation $x + ky = 5$, we get
$\Rightarrow 2 + k(1) = 5$
$\Rightarrow k = 5 - 2$
$\Rightarrow k = 3$

Hence, the correct answer is option (c).

Solution 10

We have,
$5\ \sin^2 90^\circ - 2\ \cos^2\ 0^\circ$ =

$$5 \times (1)^2 - 2 \times (1)^2$$

= 5 − 2
= 3

Hence, the correct answer is option (c).

Solution 11

$$\text{Arc length} = \frac{\text{angle subtended}}{360^\circ} \times (\text{Circumference of the circle})$$

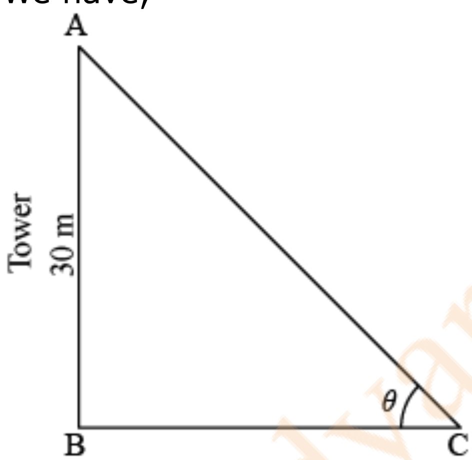
$$= \frac{60^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 14$$

$$= \frac{44}{3} \text{ cm}$$

Hence, the correct answer is option (a).

Solution 12

We have,



$$\tan\theta = \frac{AB}{BC}$$

$$= \frac{30}{30}$$

$$= 1$$

$$= \tan 45^\circ$$

$$\Rightarrow \theta = 45^\circ$$

Thus, the angle of elevation of the tower is 45°.

Hence, the correct answer is option (b).

Solution 13

The value that occurs most frequently is 4, which appears four times.
Therefore, the mode of the given set of numbers is 4.

Hence, the correct answer is option (c).

Solution 14

Number of red queens in a well-shuffled deck of 52 cards = 2
$\therefore$ Probability of getting a red queen = $\frac{2}{52}$
= $\frac{1}{26}$

Hence, the correct answer is option (b).

Solution 15

Let α and β be the roots of the quadratic equation, such that $\alpha = 2$.

$$\therefore \ \alpha + \beta = 0 \qquad (Given)$$

$$\Rightarrow 2 + \beta = 0$$

$$\Rightarrow \beta = -2$$

Therefore, the required equation will be

$$x^2 - (\alpha + \beta)x + \alpha\beta = 0$$

$$\Rightarrow x^2 - (0)x + (-4) = 0$$

$$\Rightarrow x^2 - 4 = 0$$

Hence, the correct answer is option (d).

Solution 16

We know the standard form of a quadratic equation is $ax^2 + bx + c = 0$,
where $a, b\ and\ c$ are real numbers and $a \neq 0$.

Considering $\left(\sqrt{2}x + \sqrt{3}\right)^2 + x^2 = 3x^2 - 5x$, we have

$$\Rightarrow 2x^2 + 3 + 2\sqrt{6}x + x^2 = 3x^2 - 5x$$

$$\Rightarrow 3x^2 + 3 + 2\sqrt{6}x = 3x^2 - 5x$$

$$\Rightarrow \left(5 + 2\sqrt{6}\right)x + 3 = 0$$

which is a linear equation.

Hence, the correct answer is option (c).

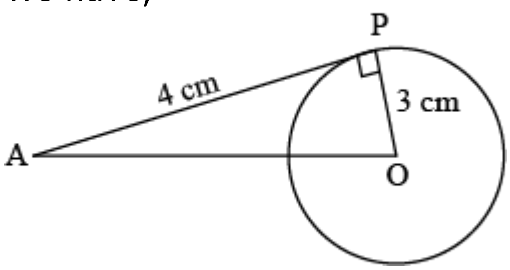
Solution 17

One and only one tangent can be drawn to a circle from a point on the same circle.

Hence, the correct answer is option (a).

Solution 18

We have,



Distance of A from the center of the circle = $\sqrt{4^2+3^2}$
= 5 cm

Hence, the correct answer is option (b).

Solution 19

We know that, a tangent to a circle is perpendicular to the radius through the point of contact.

So, Assertion (A) is true.

The lengths of tangents drawn from an external point to a circle are equal.

So, Reason (R) is true.

Both Assertion (A) and Reason (R) are true but Reason (R) does not give the correct explanation of Assertion (A).

Hence, the correct answer is option (b).

Solution 20

Let *a* be the first root of the quadratic equation then the other zero will be $\frac{1}{a}$.

$\therefore \text{Product of zeroes} = \frac{(k-4)}{4}$

$\Rightarrow a \times \frac{1}{a} = \frac{(k-4)}{4}$

$\Rightarrow k-4=4$

$\Rightarrow k=8$

So, Assertion(A) is true.

The given quadratic equation is $x^2 - x + 1 = 0$.

Here, $a = 1$, $b = -1$ and $c = 1$

$\therefore b^2 - 4ac = (-1)^2 - 4(1)(1) = 1 - 4 = -3 < 0.$

Thus, $x^2 - x + 1 = 0$ has no equal roots.

So, Reason(R) is false.

Assertion (A) is true but Reason (R) is false.

Hence, the correct answer is option (c).

Section B

Solution 21

$$\sin\alpha = \frac{1}{2}$$

$$\sin\alpha = \sin 30^\circ \qquad \left(\because \ \sin 30^\circ = \frac{1}{2}\right)$$

$$\Rightarrow \alpha = 30^\circ$$

Now,

$$3\cos\alpha - 4\cos^3\alpha$$

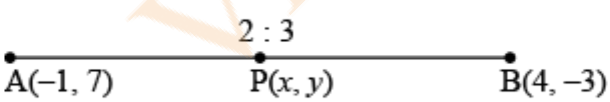
$$= 3\cos 30^\circ - 4\cos^3\left(30^\circ\right)$$

$$= 3\left(\frac{\sqrt{3}}{2}\right) - 4\left(\frac{\sqrt{3}}{2}\right)^3 \qquad \left(\because \ \cos 30^\circ = \frac{\sqrt{3}}{2}\right)$$

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

$$= 0$$

Solution 22



$$x = \frac{mx_2 + nx_1}{m+n}, \quad y = \frac{my_2 + ny_1}{m+n}$$

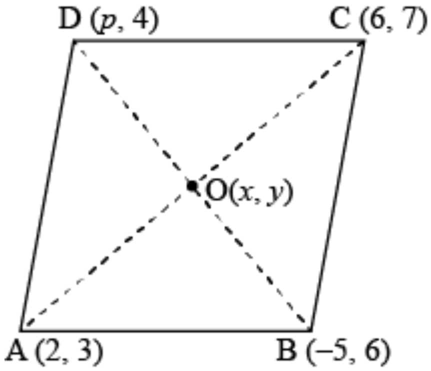
$$x = \frac{2(4) + 3(-1)}{5}, \quad y = \frac{2(-3) + 3(7)}{5}$$

$$x = \frac{8-3}{5}, \quad y = \frac{-6+21}{5}$$

$$x = 1, \quad y = 3$$

Coordinates of a required point is (1, 3).

OR



Diagonals of parallelogram bisect each other.

$\therefore$ O is the the mid point of AC and BD both.

by mid point formula on AC, coordinates of O(x, y) will be,

$x = \frac{2+6}{2}$, $y = \frac{3+7}{2}$

$\Rightarrow x = 4, \;\; y = \; 5$

O(4, 5) is the mid point of BD

$\therefore \;\; x = \frac{x_1+x_2}{2}$

$4 = \frac{p-5}{2}$

$\Rightarrow 8 + 5 = p$

$\Rightarrow 13 = p$

$\therefore \;\; \boxed{p = 13}$

Solution 23

$x^2 - x - 2 = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$b = -1 \qquad\qquad a = 1 \qquad\qquad c = -2$

$x = \frac{1 \pm \sqrt{1-4\times1\times(-2)}}{2\times1}$

$x = \frac{1 \pm \sqrt{1+8}}{2}$

$x = \frac{1 \pm 3}{2}$

$x = -1, \; 2 \qquad\qquad \left(\text{Roots of equation}\right)$

OR

$3x^2 - 2x + \frac{1}{3} = 0$

$a = 3,\ b = -2,\ c = \frac{1}{3}$

$\mathrm{D} = b^2 - 4ac$

$= (-2)^2 - 4 \times 3 \times \frac{1}{3}$

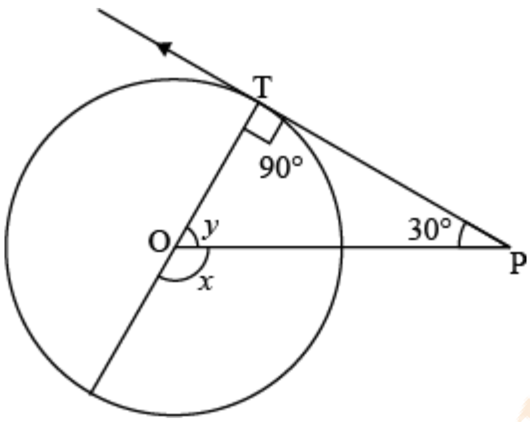
$= 4 - 4$

$= 0$

$\mathrm{D} = 0$

$\therefore$ Roots are Real and Equal.

Solution 24



Given, a circle with centre O and PT is a tangent at T to the circle with ∠TPO = 30°.

Let ∠TOP = *y*

also ∠OTP = 90° [tangent is perpendicular to the radius through the point of contact]

Now, in ΔPTO, using angle sum property,

$\Rightarrow \angle\mathrm{PTO} + \angle\mathrm{TOP} + \angle\mathrm{OPT} = 180^\circ$

$\Rightarrow 90^\circ + y + 30^\circ = 180^\circ$

$\Rightarrow y = 60^\circ$

Using linear pair,

$x + y = 180^\circ$

$\Rightarrow x + 60^\circ = 180^\circ$

$\Rightarrow x = 120^\circ$

Solution 25

In ΔPOQ, AB || PQ

$\therefore \frac{\mathrm{OA}}{\mathrm{AP}} = \frac{\mathrm{OB}}{\mathrm{BQ}}$ [Using basic proportionality theorem] ...(1)

In ΔPOR, AC || PR

$\therefore \frac{\mathrm{OA}}{\mathrm{AP}} = \frac{\mathrm{OC}}{\mathrm{CR}}$ [Using basic proportionality theorem] ...(2)

from equation (1) and (2), we get

$\frac{\mathrm{OB}}{\mathrm{BQ}} = \frac{\mathrm{OC}}{\mathrm{CR}}$

∴ by converse of basic proportionality theorem BC || QR.

Section C

Solution 26

Given, $p(x) = x^2 + 6x + 8$
Put $p(x) = 0$
i.e. $x^2 + 6x + 8 = 0$
⇒ $x^2 + 4x + 2x + 8 = 0$
⇒ $x(x + 4) + 2(x + 4) = 0$
⇒ $(x + 4)(x + 2) = 0$
⇒ $x = -4$ or $x = -2$
Using zeroes i.e. $x = -4$ and $x = -2$,
Sum of zeroes = $(-4) + (-2) = -6$
Product of zeroes = $(-4)(-2) = 8$
On comparing $x^2 + 6x + 8$ with $ax^2 + bx + c$
we get $a = 1$, $b = 6$ and $c = 8$
Using coefficients,
Sum of zeroes = $\left[\frac{b}{a}\right] = -\left[\frac{6}{1}\right] = -6$
Product of zeroes = $\left[\frac{c}{a}\right] = -\left[\frac{8}{1}\right] = 8$
Thus, the relationship between the zeroes and the coefficient is verified.

Solution 27

$\frac{1+\tan^2 \mathrm{A}}{1+\cot^2 \mathrm{A}} = \sec^2 \mathrm{A} - 1$

Take LHS

$$\Rightarrow \frac{1+\tan^2 A}{1+\cot^2 A}$$

$$= \frac{1+\frac{\sin^2 A}{\cos^2 A}}{1+\frac{\cos^2 A}{\sin^2 A}}$$

$$= \frac{\cancel{\left(\cos^2 A+\sin^2 A\right)}\times\sin^2 A}{\left(\cos^2 A\right)\cancel{\left(\cos^2 A+\sin^2 A\right)}}$$

$$= \frac{\sin^2 A}{\cos^2 A}$$

$$= \tan^2 A$$

$$= -1+\sec^2 A \qquad \left(\tan^2 A = \sec^2 A - 1\right)$$

$$= \text{RHS}$$

Hence proved.

Solution 28

Let the fixed charges be ₹x and the charges for each extra day be ₹y.
According to questions,
Ritik paid ₹27 for a book kept for 7 days
i.e. $x + 4y = 27$ .....(1)
Manmohan paid ₹21 for a book kept for 5 days
i.e. $x + 2y = 21$ .....(2)
On subtracting equation (2) from equation (1), we get $y = 3$
On substituting value of 'y' is equation (1), we get $x = 15$
Hence, the fixed charge is ₹15 and the charge for each extra days is ₹3.

OR

The given system of equations can be written as $3x + 4y - 12 = 0$
.....(1)
and $(a + b)x + 2(a - b)y - 24 = 0$ .....(2)
These equations are of the following form :
$a_1 x + b_1 y + c_1 = 0$
$a_2 x + b_2 y + c_2 = 0$
where, $a_1 = 3$, $b_1 = 4$, $c_1 = -12$ and $a_2 = (a + b)$, $b_2 = 2(a - b)$, $c_2 = -24$
For infinite number of solutions,

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

$$\Rightarrow \frac{3}{a+b} = \frac{4}{2(a-b)} = \frac{-12}{-24}$$

$$\Rightarrow \frac{3}{a+b} = \frac{2}{a-b} = \frac{1}{2}$$

We have,

$$\frac{3}{a+b} = \frac{1}{2} \text{ and } \frac{2}{a-b} = \frac{1}{2}$$

$a + b = 3$ .....(3) and $a - b = 4$ .....(4)
On solving equation (3) and equation (4) we get $a = 3.5$ and $b = -0.5$.

Solution 29

Possible outcomes = 1, 2, 3, 4, 5, 6

(i) Favourable outcomes = even prime numbers = 2

$$\begin{aligned} \mathrm{P}\,(\text{even prime number}) &= \frac{\text{number of favourable outcomes}}{\text{total possible outcomes}} \\ &= \frac{1}{6} \end{aligned}$$

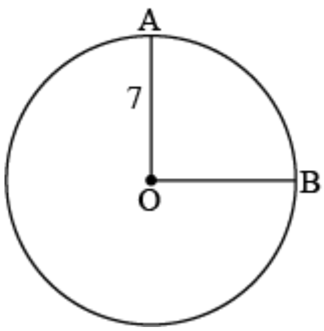
(ii) Favourable outcomes = a number greater then 4 = 5, 6

P(a number greater than 4) = $\frac{2}{6}$ = $\frac{1}{3}$

(iii) Favourable outcomes = an odd number = 1, 3, 5

P(an odd number) = $\frac{3}{6}$ = $\frac{1}{2}$

Solution 30



Area of minor sector

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

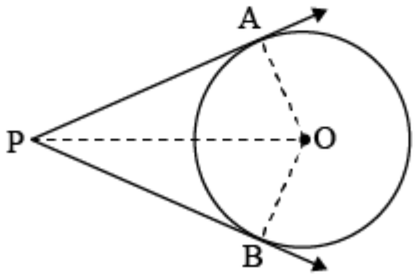
$= \frac{90^{\circ}}{360^{\circ}} \times \pi r^2$

$= \frac{1}{4} \times \pi r^2 \qquad .....(\mathrm{i})$

$= \frac{1}{4} \times \frac{22}{7} \times 7 \times 7 = \frac{77}{2} = 38.5\ \mathrm{cm}^2$

$$\begin{aligned} \text{Area of major sector} &= \mathrm{A}_{\text{circle}} - \mathrm{A}_{\text{minor sector}} \\ &= \pi \mathrm{r}^2 - \frac{1}{4}\pi \mathrm{r}^2 \quad (\text{from (i)}) \\ &= \frac{3\pi \mathrm{r}^2}{4} \\ &= 3 \times \frac{77}{2} \\ &= 115.5\ \mathrm{cm}^2 \end{aligned}$$

Solution 31



Let O be the center of circle.

Let PA and PB are two tangents drawn from a point P, lying outside the circle.

Join OA, OB and OP. We have to prove that PA = PB.

In ΔOPA and ΔOPB,

$\angle \mathrm{OAP} = \angle \mathrm{OBP}$ (Each equal to 90°)

(Since we know that a tangent at any point of a circle is perpendicular to the radius through the point of contact and hence, OA ⊥ PA and
OB ⊥ PB).

OA = OB (Radii of the circle)
OP = PO (Common side)

Therefore, by RHS congruency criterion,

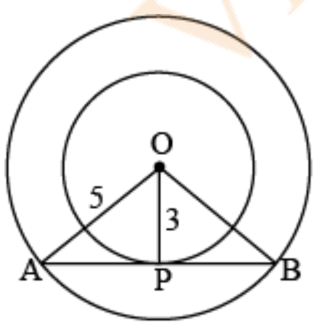
ΔOPA ≅ OPB

∴ By CPCT,

PA = PB

Thus, the lengths of the two tangents drawn from an external point to a circle are equal.

OR



Let the two concentric circle with centre O.

AB be the chord of the larger circle which touches the smaller circle at point P.

∴ AB is tangent to the smaller circle to the point P.

$\Rightarrow \mathrm{OP} \perp \mathrm{AB}$

By Pythagoras theorem in ΔOPA,

$$\mathrm{OA}^2 = \mathrm{AP}^2 + \mathrm{OP}^2$$
$$\Rightarrow 5^2 = \mathrm{AP}^2 + 3^2$$
$$= \mathrm{AP}^2 = 25 - 9$$
$$= \mathrm{AP} = 4 \text{ cm}$$

In ΔOPB,

Since $\mathrm{OP} \perp \mathrm{AB}$,

AP = PB (Perpendicular from the centre of the circle bisects the chord)

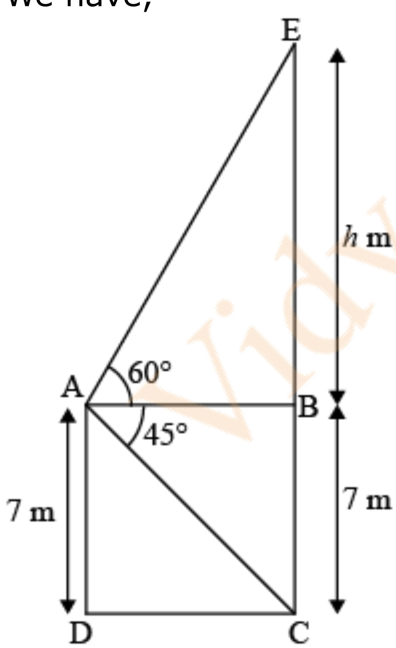
AB = 2AP = 2 × 4 = 8 cm

Hence, the length of the chord of the larger circle is 8 cm.

Section D

Solution 32

We have,



In $\triangle$ ABE

$\tan 60^\circ = \frac{h}{AB}$

$\Rightarrow h = AB\sqrt{3} \qquad .....(1)$

In $\triangle$ ABC

$\tan 45^\circ = \frac{7}{\mathrm{AB}}$

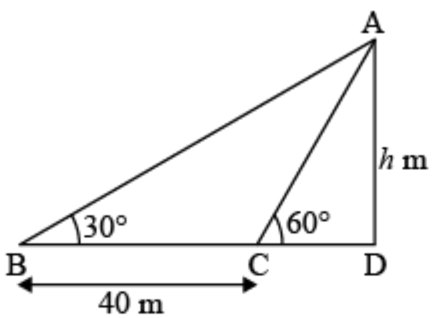
$\Rightarrow \mathrm{AB} = 7 \qquad .....(2)$

From (1) and (2), we get

$h = 7$

So, height of tower $= 7\left(\sqrt{3}+1\right)m$

OR



Let the height of the tower be *h* m.

Now, tan 60º = $\frac{h}{\mathrm{CD}}$

$\Rightarrow \sqrt{3} = \frac{h}{\mathrm{CD}}$

$\Rightarrow \mathrm{CD} = \frac{h}{\sqrt{3}} \qquad .....\left(1\right)$

Also tan $30º = \frac{h}{40+\mathrm{CD}}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{40+\mathrm{CD}}$

$\Rightarrow 40 + \frac{h}{\sqrt{3}} = \sqrt{3}\mathrm{h}$

$\Rightarrow 40 + \frac{h}{\sqrt{3}} = \sqrt{3}h$

$\Rightarrow 40 = h\left(\frac{3-1}{\sqrt{3}}\right)$

$\Rightarrow 40 = \frac{2}{\sqrt{3}}h$

$\Rightarrow h = 20\sqrt{3}$

Thus, the height of tower is $20\sqrt{3}\,m$.

Solution 33

We have, $a_n = 5 + 6n$

$a_1 = 5 + 6(1) = 11$

$a_{25} = 5 + 6 \times 25 = 155$

$$\begin{aligned}\text{Sum of 25 terms} &= \frac{25}{2}(11+155)\\ &= \frac{25}{2} \times 166\\ &= 25 \times 83\\ &= 2075\end{aligned}$$

Now,

20^{th} term, $a_{20} = 5 + 6 \times 20 = 125$

45^{th} term, $a_{45} = 5 + 6 \times 45 = 275$

$\therefore \frac{a_{20}}{a_{45}} = \frac{125}{275} = \frac{5}{11}$

OR

Given, the expression for the sum of series is $S_n = 3n^2 + 5n$
Last term, l is $a_k = 164$
We have to find the value of k.
Put $n = 1$, $S_1 = 3(1)^2 + 5(1) = 3 + 5 = 8$
$S_2 = 3(2)^2 + 5(2) = 3(4) + 10 = 12 + 10 = 22$
The AP in terms of common difference is given by
$a, a + d, a + 2d, a + 3d, \ldots, a + (n - 1)d$
So, $S_1 = a$
First term, $a = 8$
S_2 = sum of first two terms of an AP
$= a + a + d$
$= 2a + d$
To find the common difference d,
$2a + d = 22$
$\Rightarrow 2(8) + d = 22$
$\Rightarrow 16 + d = 22$
$\Rightarrow d = 22 - 16$
$\Rightarrow d = 6$

The k^{th} term of the series in AP is 164.
164 = 8 + (k − 1)(6)
⇒ 164 − 8 = 6(k − 1)

⇒ 156 = 6(k − 1)
⇒ k − 1 = 26
⇒ k = 26 + 1
⇒ k = 27
Therefore, the value of k is 27.

Solution 34

Monthly Consuption	x_i	f_i	$x_i f_i$	$c.f.$
130-140	135	5	675	5
140-150	145	9	1305	14
150-160	155	17	2635	31
160-170	165	28	4620	59
170-180	175	24	4200	83
180-190	185	10	1850	93
190-200	195	7	1365	100
		$\Sigma f_i = 100$	$\Sigma x_i f_i = 16,650$	

Now,
$n = 100\ and\ \frac{n}{2} = 50$

$\text{Therefore, median class} = 160 - 170$

$We\ have,\ l = 160,\ c.f. = 31,\ f = 28\ and\ h = 10$

$\Rightarrow Median = l + \frac{\frac{n}{2} - c.f.}{f} \times h$

$= 160 + \frac{50-31}{28} \times 10$

$= 160 + 6.785$

$= 166.785$

Solution 35

Given: Length of the cylindrical part, h = 7 m.

Radius of cylindrical part is $r = \frac{7}{2}$ m

Radius of hemispherical part, $r = \frac{7}{2}$ m

$$\text{Total surface area} = \text{CSA of cylinder} + 2 \times \text{CSA of Hemispere}$$
$$= 2\pi r h + 2 \times 2\pi r^2$$
$$= 2 \times \frac{22}{7} \times \frac{7}{2} \times 7 + 2 \times 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$$
$$= 22 \times 7 + 22 \times 7$$
$$= 308 \text{ cm}^2$$

$$\text{Volume of the boiler} = \text{volume of cylinder} + 2 \times \text{volume of Hemispere}$$
$$= \pi r^2 h + 2 \times \frac{2}{3}\pi r^3$$
$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 7 + 2 \times \frac{2}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$$
$$= 269.5 + 179.67$$
$$= 449.17 \text{ cm}^3$$

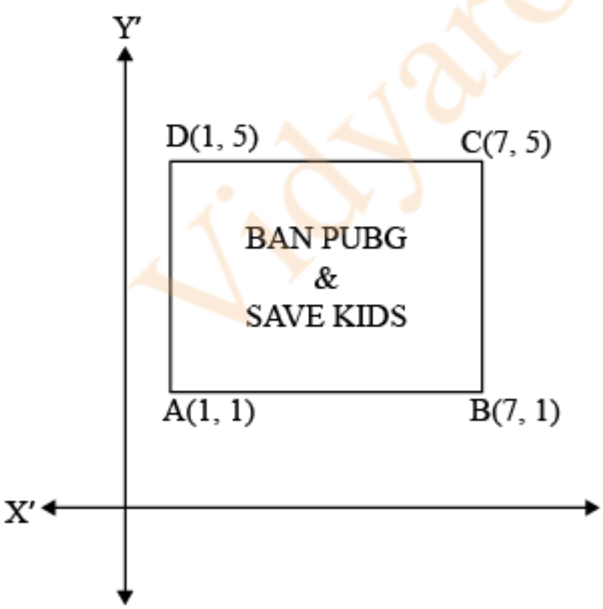
Now, $\frac{\text{Volume of cylinder}}{\text{Volume of Hemispere}} = \frac{\pi r^2 h}{\frac{2}{3}\pi r^3}$

$\Rightarrow \frac{\text{Volume of cylinder}}{\text{Volume of Hemispere}} = \frac{3h}{2r}$

$\Rightarrow \frac{\text{Volume of cylinder}}{\text{Volume of Hemispere}} = \frac{3 \times 7}{2 \times \frac{7}{2}}$

$\Rightarrow \frac{\text{Volume of cylinder}}{\text{Volume of Hemispere}} = 3$

Solution 36



(i)

$$AB = \sqrt{(7-1)^2 + (1-1)^2} = 6 \text{ units}$$

$$BC = \sqrt{(7-7)^2 + (5-1)^2} = 4 \text{ units}$$

$$CD = \sqrt{(1-7)^2 + (5-5)^2} = 6 \text{ units}$$

$$DA = \sqrt{(1-1)^2 + (1-5)^2} = 4 \text{ units}$$

$\therefore$ ABCD is a rectangle
Diagonals of rectangle bisect each other.
$\therefore$ Mid point of AC is point of intersection of AC and BD

$$\text{Mid point of AC} = \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}$$
$$= \left(\frac{7+1}{2}, \frac{5+1}{2}\right)$$
$$= \left(\frac{8}{2}, \frac{6}{2}\right)$$

Point of intersection (4, 3) of AC and BD.

(ii) Length of diagonal AC

$$AC = \sqrt{(7-1)^2 + (5-1)^2}$$
$$= \sqrt{6^2 + 4^2}$$
$$= \sqrt{36 + 16}$$
$$= \sqrt{52}$$
$$= 2\sqrt{13} \text{ units}$$

(iii) (a) Area of campaign board ABCD
= AB × BC
= 6 × 4
= 24 units^2

OR

(b) Length of AB = 6 units
Length of AC = $2\sqrt{3}$ units

$$\text{Ratio } \left(\frac{AB}{AC}\right) = \frac{6}{2\sqrt{3}} = 3 : \sqrt{13}$$

Solution 37

(i) To find maximum guests Khushi can invite we need to find HCF.
Factors of 36 and 60 are
36 = 2 × 2 × 3 × 3
60 = 2 × 2 × 3 × 5

HCF = 2 × 2 × 3 = 12
∴ Maximum guests she can invite. = 12.

(ii) Number of guests = 12
Number of apples = 36
Number of apple each guest will get $= \frac{36}{12}$ = 3
Number of bananas = 60
Number of bananas each guest will get $= \frac{60}{12}$ = 5
Hence, each guest will get 3 apples and 5 bananas.

(iii) (a) If Khushi adds 42 mangoes.
Factor of 42 = 2 × 3 × 7
∴ HCF (36, 60, 42) = 6
∴ She can invite maximum 6 guests.

OR

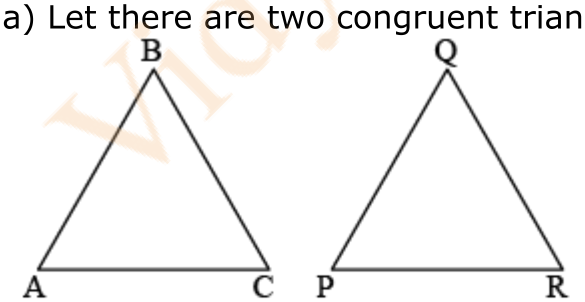
(b) Cost of 1 dozen bananas = ₹60
Cost of 60 bananas = $\frac{60}{12} \times 60$ = ₹300
Cost of 1 apple = Rs 15
Cost of 36 apples = 15 × 36 = ₹540
Cost of 1 mango = Rs 20
Cost of 42 mangoes = 42 × 20 = ₹840

Total amount spent = 300 + 540 + 840 = ₹1,680.

Solution 38

(i) **In Figure A,** quadrilaterals are similar as the corresponding sides are proportional and the corresponding angles are equal
In Figure C, triangles are similar as, all the corresponding sides are equal hence proportional.
(ii) **In Figure C,** triangles are congruent as all corresponding sides are equal.

(iii) (a) Let there are two congruent triangles ABC and PQR



Given, ΔABC ≅ ΔPQR
Hence, by CPCT

$$\mathrm{AB} = \mathrm{PQ} \Rightarrow \frac{\mathrm{AB}}{\mathrm{PQ}} = \frac{1}{1} \qquad \ldots(\mathrm{i})$$

$$\mathrm{BC} = \mathrm{QR} \Rightarrow \frac{\mathrm{BC}}{\mathrm{QR}} = \frac{1}{1} \qquad \ldots(\mathrm{ii})$$

$$\mathrm{AC} = \mathrm{PR} \Rightarrow \frac{\mathrm{AC}}{\mathrm{PR}} = \frac{1}{1} \qquad \ldots(\mathrm{iii})$$

From (i), (ii) and (iii)
All three corresponding sides are proportional
$\therefore \Delta ABC \sim \Delta PQR$
But the converse is not true, as similar triangles can be of different sizes and this is not possible in congruent triangles

OR

(b) If two similar triangles are of the same size, then the triangles are also be congruent.
In other words, if the corresponding angles of two similar triangles are equal then triangle will be congruent.