Std.: 10th CBSE
Sub: Maths

Rathi's Aspire Academy
Preparing You For Tomorrow

Pre-board Solution

Date : 26/12/2022

SECTION - A

1. *(b) 1680*

Explanation: LCM of $(2^3 \times 3 \times 5)$ and $(2^4 \times 5 \times 7)$

LCM $= 2^4 \times 3 \times 5 \times 7$

$= 1,680$

Caution

While calculating LCM, take the highest power of each multiple from the given numbers.

2. *(c) $x^2 - x - 12$*

Explanation: A quadratic polynomial with zeros −3 and 4 is:

$(x + 3)(x - 4)$

i.e. $x^2 - x - 12$

Caution

Remember that a quadratic polynomial cannot have more than two zeros

3. *(a) $21\sqrt{2}$*

Explanation: Here, 11^{th} term, $a_{11} = a + 10d$

$= \sqrt{2} + 10(2\sqrt{2}) = 21\sqrt{2}$

4. *(a) no real roots*

Explanation: For the equation $2x^2 + x + 4 = 0$

$D = b^2 - 4ac$

$= 1 - 32 = -31 < 0$

∴ The given equation has no real roots.

5. *(d) 5*

Explanation: Here, $a_2 = S_2 - S_1 = (2^2 + 2 \times 2) - (1^2 + 2 \times 1)$

$= (4 + 4) - (1 + 2) = 5$

6. *(c) 1, 1*

Explanation: The equation is, $x + \frac{1}{x} = 2$

$x^2 - 2x + 1 = 0, (x - 1)^2 = 0$

So, roots are 1, 1.

7. *(a) $x - y = -4$, $x + 2y = 5$*

Explanation: As $x = -1$, $y = 3$ is a point.

So many lines can pass through a point. Therefore, infinitely many pairs are possible in (a)

$x - y = -4$ | $x + 2y = 5$
$-1 - 3 = -4$ | $-1 + 2 \times 3 = 5$
$-4 = -4$ | $-1 + 6 = 5$
 | $5 = 5$

8. *(b) ± 4*

Explanation:

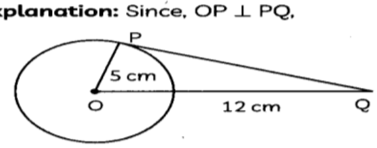
Here, $\sqrt{(4 - 1)^2 + (p - 0)^2} = 5$

$\Rightarrow$ $9 + p^2 = 25$

$\Rightarrow$ $p = \pm 4$

9. *(a) $\sqrt{119}$ cm*

Explanation: Since, OP ⊥ PQ,



$PQ = \sqrt{OQ^2 - OP^2} = \sqrt{12^2 - 5^2}$

$= \sqrt{144 - 25} = \sqrt{119}$ cm

10. *(c) 8 units*

Explanation:

Given, points are P(0, 6) and Q(0, −2)

By distance formula, distance between PQ is

$PQ = \sqrt{(0 - 0)^2 + (-2 - 6)^2}$

$= \sqrt{0^2 + (-8)^2}$

$= \sqrt{0 + 64}$

$= 8$ units

11. *(c) 30 – 40*

Explanation: Here, $\frac{N}{2} = \frac{80}{2} = 40$

Then, median class is 30-40.

12. *(c) 1*

Explanation: Here,

$(1 + \cos A)(1 - \cos A) \operatorname{cosec}^2 A$

$= (1 - \cos^2 A) \operatorname{cosec}^2 A$

$= \sin^2 A \operatorname{cosec}^2 A$

$[\sin^2 A + \cos^2 A = 1]$

$= 1$ $\left[\because \sin A = \frac{1}{\operatorname{cosec} A}\right]$

Caution

Use trigonometric identities wherever necessary.

13. *(d) $\frac{6}{11}$*

Explanation: Total number of fishes = 10 + 12 = 22

Probability (female fish)

$= \frac{\text{Total number of female fishes}}{\text{Total number of fishes}}$

$= \frac{12}{22}$

$= \frac{6}{11}$

14. *(a) $l + \frac{\frac{N}{2} - cf}{f} \times h$*

Explanation: Median $= l + \frac{\frac{N}{2} - cf}{f} \times h$

15. *(d) 1*

Explanation: Since, $\frac{1}{\operatorname{cosec} \theta} = \sin\theta$

And maximum value of $\sin\theta$ is 1 *i.e.* when

$$\theta = 90°$$

16. *(a)* –4

Explanation: Let the number be x

Then, according to the question

$$8x + x^2 = -16$$

$\Rightarrow$ $x^2 + 8x + 16 = 0$

$\Rightarrow$ $x^2 + 4x + 4x + 16 = 0$

$\Rightarrow$ $(x + 4)(x + 4) = 0$

$\Rightarrow$ $x = -4, -4$

Hence, the number is –4.

17. *(d)* $l+\left(\frac{f_1-f_2}{2f_1-f_0-f_2}\right)\times h$

Explanation:

$$\text{Median} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

18. *(a)* 2

Explanation: Given, $\tan\theta + \cot\theta = 2$

Then, on squaring both sides, we get

$\tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta = 4$

$\Rightarrow$ $\tan^2\theta + \cot^2\theta = 4 - 2\tan\theta\cot\theta$

$\Rightarrow$ $\tan^2\theta + \cot^2\theta = 4 - 2\tan\theta \times \frac{1}{\tan\theta}$

$= 4 - 2 = 2$

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

Explanation: The probability of getting a number less than 3 and greater than 2 is 0. Event given in Assertion is an impossible event.

20. *(d)* *Assertion (A) is false but reason (R) is true.*

Explanation: Ratio of volume

$$= \frac{\frac{1}{3}\pi\times(2x)^2\times h_1}{\frac{1}{3}\pi\times(3x)^2\times h_2}$$

$$\frac{1}{3} = \frac{4}{9}\times\frac{h_1}{h_2}$$

$$\frac{h_1}{h_2} = \frac{3}{4}$$

$$h_1 : h_2 = 3 : 4$$

Caution

➥ *Students should learn the formulae of all 3-D shapes.*

SECTION - B

21. Let $5\sqrt{2}$ be rational. Then,

$5\sqrt{2} = \frac{p}{q}$, where p and q are co-prime.

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

Here, $\frac{p}{5q}$ is rational, which implies $\sqrt{2}$ is rational, which is a contradiction, as $\sqrt{2}$ is irrational.

$\therefore$ $5\sqrt{2}$ is an irrational number.

22. Since 338 and 59 divided by the required number leave remainder of 2 and 5 respectively.

$$338 - 2 = 336;\ 59 - 5 = 54$$

are completely divisible by the number

Now, we have to find HCF of 336 and 54.

3	336
2	112
2	56
2	28
2	14
7	7
	1

2	54
3	27
3	9
3	3
	1

$$336 = 2^4 \times 3 \times 7$$

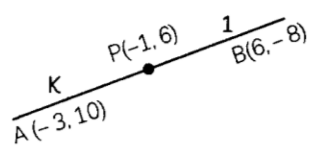
$$54 = 2 \times 3^3$$

$$\text{HCF} = 2 \times 3 = 6$$

Hence, the required number is 6.

OR

Let P(–1, 6) divide the join of A(–3, 10) and B(6, –8) in the ratio K : 1.



Then,

$$P(-1, 6) = \left(\frac{6K - 3}{K + 1}, \frac{-8K + 10}{K + 1}\right)$$

$\Rightarrow$ $\frac{6K - 3}{K + 1} = -1$; $\frac{-8K + 10}{K + 1} = 6$

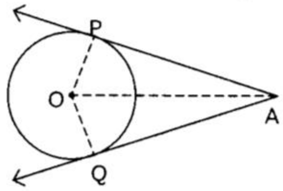
$\Rightarrow$ $6K - 3 = -K - 1$; $-8K + 10 = 6K + 6$

$\Rightarrow$ $7K = 2$; $14K = 4$

$\Rightarrow$ $K = \frac{2}{7}$

Thus, the required ratio is 2 : 7.

23. Let AP and AQ be the two tangents drawn to the circle from the external point A.



We need to show that AP = AQ.

Join OA, OP and OQ.

Consider ΔOPA and ΔOQA.

Here, OQ = OP (radii of the circle)

OA = OA (common)

∠OPA = ∠OQA [Each 90°]

So, ΔOPA ≅ ΔOQA

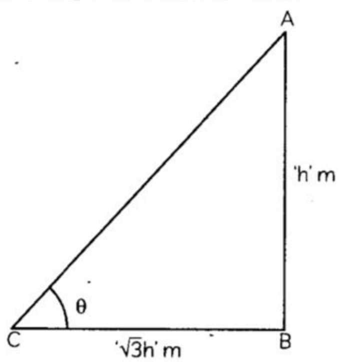
⇒ PA = QA or AP = AQ

⚠ Caution

➥ *Remember that the point, where tangent touches the circle, is perpendicular to the radius.*

24. Here, AB is a pole of height 'h' m and its shadow BC of length '$\sqrt{3}h$' m

Let, the angle of elevation be θ.



Then, $\tan\theta = \frac{AB}{BC} = \frac{h}{\sqrt{3}h}$

⇒ $\tan\theta = \frac{1}{\sqrt{3}}$

⇒ $\tan\theta = \tan 30°$

∴ $\theta = 30°$

⚠ Caution

➥ *Draw the figure, after reading the question keenly and carefully.*

25. Let n term of the given AP make the sum zero.

Then,

$$\frac{n}{2}[18\times 2+(n-1)(-2] = 0$$

⇒ $36 - 2(n - 1) = 0$

⇒ $2n - 2 = 36$

⇒ $2n = 38$

⇒ $n = 19$

OR

The base radius and the vertical height of the largest cone that can be carved out of a cube are $\frac{7}{2}$ cm and 7 cm respectively.

So, volume $= \frac{1}{3}\pi\left(\frac{7}{2}\right)^2 (7)$ cm^2

$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 7$ cm^2

$= 89.83$ cm^2

SECTION - C

26.

$$(x^2 + 1)^2 - x^2 = 0$$

$$x^4 + 2x^2 + 1 - x^2 = 0$$

$$x^4 + x^2 + 1 = 0$$

Put $t = x^2$. Then

$$t^2 + t + 1 = 0$$

Comparing this equation with $ax^2 + bx + c = 0$, we get,

$$a = 1, b = 1, c = 1$$

So, $D = b^2 - 4ac = 1 - 4 = -3 < 0$

which shows that given equation has no real roots.

27. Let the number of children be 'x'. Then,

amount received by each child = ₹ $\left(\frac{250}{x}\right)$

When there are $(x + 25)$ children,

amount received by each child = ₹ $\left(\frac{250}{x+25}\right)$

As per the question,

$$\frac{250}{x} - \frac{250}{x + 25} = \frac{1}{2}$$

[∵ 50 paise = ₹ $\frac{1}{2}$]

$$250\left[\frac{x + 25 - x}{x(x + 25)}\right] = \frac{1}{2}$$

$\Rightarrow \quad x(x + 25) = 12500$

$\Rightarrow \quad x^2 + 25x - 12500 = 0$

$\Rightarrow \quad x^2 + 125x - 100x - 12500 = 0$

$\Rightarrow \quad x(x + 125) - 100(x + 125) = 0$

$\Rightarrow \quad (x + 125)(x - 100) = 0$

$\Rightarrow \quad x + 125 = 0 \quad \text{or} \quad x - 100 = 0$

$\Rightarrow \quad x = 100$

$(\because \; x \neq -125)$

Hence, there were 100 children in all.

OR

Let, the given point $P(x_1, y_1) = (11, -9)$ lie on a circle with centre $C(x_2, y_2) = (2a, a - 7)$ and radius 'r'.

Then, $\quad PC = r \quad$ .... (i)

Given, that the diameter of circle is $10\sqrt{2}$ units.

$$r = \frac{\text{diameter}}{2}$$

$$= \frac{10\sqrt{2}}{2} = 5\sqrt{2} \text{ units} \quad .....(ii)$$

By distance formula,

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

$$P = r = \sqrt{(11 - 2a)^2 + (-9 - a + 7)^2}$$

$$= \sqrt{5a^2 - 40a + 125}$$

From (i) and (ii), we have

$$5a^2 - 40a + 125 = \left(5\sqrt{2}\right)^2$$

$\Rightarrow 5a^2 - 40a + 75 = 0$

$\Rightarrow \quad (a - 5)(5a - 3) = 0$

$\Rightarrow \quad a = 5, \; 3$

Hence, the value of 'a' are 5 and 3

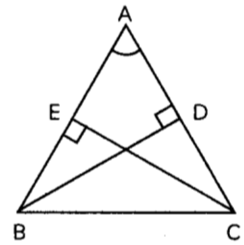
28. From the figure, OP = OR and OS = OQ

$\Rightarrow \quad PQ = PO + OQ$

$= OR + OS$

$= RS$

29. In Δs AEC and ADB,



$\angle A = \angle A$ [common angle]

$\angle AEC = \angle ADB$ [each 90°]

So, by AA similarity criterion, $\Delta AEC \sim \Delta ADB$

$$\Rightarrow \quad \frac{AE}{AD} = \frac{AC}{AB}$$

$\Rightarrow \quad AB \times AE = AC \times AD$

30. $$\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = \left(\frac{a\cos^3\theta}{a}\right)^{\frac{2}{3}} + \left(\frac{b\cos^3\theta}{b}\right)^{\frac{2}{3}}$$

$$= \cos^2\theta + \sin^2\theta$$

$$= 1$$

31.

Marks	Number of Students (f_s)	C.f.
0-20	7	7
20-40	12	19
40-60	23	42
60-80	18	60
80-100	10	70
Total	70	

Median class (40-60)

Here, $\quad N = 70$

Then, $\quad \frac{N}{2} = 35$

median class is 40-60

Then, $$M_e = l + \frac{\left(\frac{N}{2} - cf\right)}{f} \times h$$

$$= 40 + \left(\frac{35 - 19}{23}\right) \times 20$$

$$= 40 + \frac{16}{23} \times 20$$

$$= 40 + 13.91$$

$$= 53.91$$

$$\simeq 54$$

Hence, the median of the given data is 54.

OR

Number 'x' can be selected in 3 ways and corresponding to each, such way there are 3 ways of selecting 'y'.

Therefore, 2 numbers can be selected in 9 ways as listed below :

(1, 1) (1, 4) (1, 9) (2, 1) (2, 4) (2, 9) (3, 1) (3, 4) (3, 9)

Total numbers of outcomes = 9

The product xy will be less than 9, if x and y are chosen in one of the following ways.

(1, 1) (1, 4) (2, 1) (2, 4) (3, 1)

Number of favourable outcomes = 5

$\therefore$ P(product less than 9) = $\frac{5}{9}$

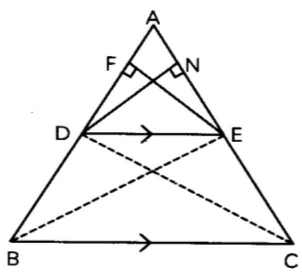
and remaining 3 heads = $1 - \frac{1}{8} - \frac{3}{8} - \frac{3}{8}$

$= \frac{1}{8}$

So, probability of getting no heads is $\frac{1}{8}$ not $\frac{1}{4}$

SECTION - D

32. ABC is a triangle and DE is a line parallel to side BC which cuts AB at D and AC at E.



We need to prove that:

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

Join BE and CD and draw EF $\perp$ AB and DN $\perp$ AC.

Now, $\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2} \times AD \times EF}{\frac{1}{2} \times BD \times EF} = \frac{AD}{BD}$ ...(i)

$\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{\frac{1}{2} \times AE \times DN}{\frac{1}{2} \times EC \times DN} = \frac{AE}{EC}$ ...(ii)

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

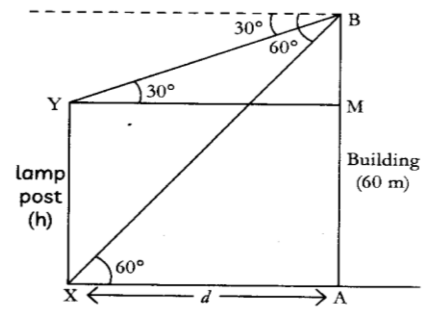
So, $ar(\Delta BDE) = ar(\Delta CDE)$ ...(iii)

$\Rightarrow \frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{ar(\Delta ADE)}{ar(\Delta CDE)}$

Hence, by (i) and (ii), we have $\frac{AD}{BD} = \frac{AE}{EC}$, or

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

33. Let 'h' metres be the height of the lamp-post and 'd' metres be the distance between feet of the lamp post and the building.



Then,

From right ΔBMY, we have:

$\frac{BM}{YM} = \tan 30°$

$\Rightarrow \frac{60 - h}{d} = \frac{1}{\sqrt{3}}$

$\Rightarrow d = \sqrt{3}(60 - h)$ ...(i)

From right ΔBAX, we have:

$\frac{BA}{XA} = \tan 60°$

$\Rightarrow \frac{60}{d} = \sqrt{3}$

$\Rightarrow d = 20\sqrt{3}$ ...(ii)

From (i) and (ii),

$20\sqrt{3} = \sqrt{3}(60 - h)$

$\Rightarrow h = 40$ m and $d = 20\sqrt{3}$ m

Now: $BY = \sqrt{YM^2 + BM^2} = \sqrt{d^2 + 20^2}$

$= \sqrt{1200 + 400} = \sqrt{1600}$

$= 40$ m

Thus, the distance between the top of the building and the top of lamp-post is 40 m.

OR

$$LHS = \frac{1 + \sec A - \tan A}{1 + \sec A + \tan A}$$

$$= \frac{1 + \frac{1}{\cos A} - \frac{\sin A}{\cos A}}{1 + \frac{1}{\cos A} + \frac{\sin A}{\cos A}} = \frac{\frac{\cos A + 1 - \sin A}{\cos A}}{\frac{\cos A + 1 + \sin A}{\cos A}}$$

$$= \frac{(\cos A + 1) - \sin A}{(\cos A + 1) + \sin A} \times \frac{\cos A + 1 - \sin A}{\cos A + 1 - \sin A}$$

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

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

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

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

$$= \frac{(1 + \cos A)\, 2(1 - \sin A)}{2\cos A(1 + \cos A)}$$

$$= \frac{1 - \sin A}{\cos A} = \text{RHS}$$ Hence, Proved

34. (A)

$$x + y = 14 \quad \text{...(i)}$$
$$x - y = 4 \quad \text{...(ii)}$$
$$x = 4 + y \text{ from equation (ii)}$$

Putting this in equation (i), we get

$$4 + y + y = 14$$
$$\Rightarrow 2y = 10$$
$$\Rightarrow y = 5$$

Putting value of y in equation (i), we get

$$\Rightarrow x + 5 = 14$$
$$\Rightarrow x = 14 - 5 = 9$$

Therefore, $x = 9$ and $y = 5$

(B)

$$s - t = 3 \quad \text{...(i)}$$
$$\frac{s}{3} + \frac{t}{2} = 6 \quad \text{...(ii)}$$

Putting $s = 3 + t$ in equation (ii), we get

$$\frac{3+t}{3} + \frac{t}{2} = 6$$
$$\Rightarrow \frac{6 + 2t + 3t}{6} = 6$$
$$\Rightarrow 5t + 6 = 36$$
$$\Rightarrow 5t = 30$$
$$\Rightarrow t = 6$$

Putting value of t in equation (i), we get

$$\Rightarrow s - 6 = 3$$
$$\Rightarrow s = 3 + 6 = 9$$

Therefore, $t = 6$ and $s = 9$

(C)

$$3x - y = 3 \quad \text{...(i)}$$
$$9x - 3y = 9 \quad \text{...(ii)}$$

Comparing equation $3x - y = 3$ with $a_1x + b_1y + c_1 = 0$ and equation $9x - 3y = 9$ with $a_2x + b_2y + c_2 = 0$,

We get $a_1 = 3$, $b_1 = -1$, $c_2 = -3$, $a_2 = 9$, $b_2 = -3$ and $c_2 = -9$

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

Therefore, we have infinite many solutions of x and y.

(D)

$$0.2x + 0.3y = 1.3 \quad \text{...(i)}$$
$$0.4x + 0.5y = 2.3 \quad \text{...(ii)}$$

Using equation (i), we can say that

$$0.2x = 1.3 - 0.3y$$
$$\Rightarrow x = \frac{1.3 - 0.3y}{0.2}$$

Putting this in equation (ii), we get

$$0.4\left(\frac{1.3 - 0.3y}{0.2}\right) + 0.5y = 2.3$$
$$\Rightarrow 2.6 - 0.6y + 0.5y = 2.3$$
$$\Rightarrow -0.1y = -0.3$$
$$\Rightarrow y = 3$$

Putting value of y in (i), we get

$$\Rightarrow 0.2x + 0.3(3) = 1.3$$
$$\Rightarrow 0.2x + 0.9 = 1.3$$
$$\Rightarrow 0.2x = 0.4$$
$$\Rightarrow x = 2$$

Therefore, $x = 2$ and $y = 3$

(E)

$$\sqrt{2}x + \sqrt{3}y = 0 \quad \text{...(i)}$$
$$\sqrt{3}x - \sqrt{8}y = 0 \quad \text{...(ii)}$$

Using equation (i), we can say that

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

Putting this in equation (ii), we get

$$\sqrt{3}\left(\frac{-\sqrt{3}y}{\sqrt{2}}\right) - \sqrt{8}y = 0$$
$$\Rightarrow \frac{-3y}{\sqrt{2}} - \sqrt{8}y = 0$$
$$\Rightarrow y\left(\frac{-3}{\sqrt{2}} - \sqrt{8}\right) = 0$$
$$\Rightarrow y = 0$$

Putting value of y in (i), we get $x = 0$

Therefore, $x = 0$ and $y = 0$

OR

Mode: Here, modal class is 125 – 145

For this class,

$$l = 125,\ f_1 = 20,\ f_0 = 13,\ f_2 = 14,\ h = 20$$

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

So, $$\text{Mode} = 125 + \frac{20 - 13}{40 - 13 - 14} \times 20$$

$$= 135.77$$

Mean:

Monthly consumption	No. of consumers (f_i)	Class mark (x_i)	$u_i = \frac{x_i - A}{h}$ where A = 135; h = 20	$f_i u_i$
65–85	4	75	–3	–12
85–105	5	95	–2	–10
105–125	13	115	–1	–13
125–145	20	135	0	0
145–165	14	155	1	14
165–185	8	175	2	16
185–205	4	195	3	12
	$\Sigma f_i = 68$			$\Sigma f_i u_i = 7$

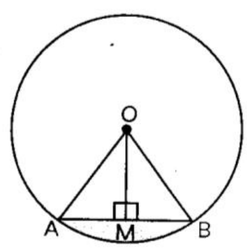
$$\text{Mean} = 135 + \frac{7}{68} \times 20$$

$$= 135 + \frac{140}{68}$$

$$= 135 + 2.06$$

$$= 137.06$$

35.



Given, r = 21 cm and $\theta = 60°$

(A) Length of arc $= \frac{\theta}{360°} \times 2\pi r$

$$= \frac{60°}{360°} \times 2 \times \frac{22}{7} \times 21$$

$$= 22 \text{ cm}$$

(B) Area of the sector $= \frac{\theta}{360°} \times \pi r^2$

$$= \frac{60°}{360°} \times \frac{22}{7} \times 21 \times 21$$

$$= 231 \text{ cm}^2$$

(C) Area of segment by corresponding chord

$$= \frac{\theta}{360°} \times \pi r^2 - \text{Area of } \Delta OAB$$

$\Rightarrow$Area of segment = 231 – Area of ΔOAB ...(i)

In right angled triangle OMA and OMB,

OM = OB [Radii of the same circle]

OM = OM [Common]

$\therefore$ $\Delta OMA \cong \Delta OMB$ [RHS congrüency]

$\therefore$ $AM \cong BM$ [By CPCT]

$\therefore$ M is the mid-point of AB and $\angle AOM = \angle BOM$

$\Rightarrow \angle AOM = \angle BOM = \frac{1}{2} \angle AOB = \frac{1}{2} \times 60° = 30°$

Therefore, in right angled triangle OMA,

$$\cos 30° = \frac{OM}{OA}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{OM}{21}$$

$$\Rightarrow OM = \frac{21\sqrt{3}}{2} \text{cm}$$

Also, $$\sin 30° = \frac{AM}{OA}$$

$$\Rightarrow \frac{1}{2} = \frac{AM}{21}$$

$$\Rightarrow AM = \frac{21}{2} \text{cm}$$

$$\therefore AB = 2\,AM = 2 \times \frac{21}{2} = 21 \text{ cm}$$

$$\therefore \text{Area of } \Delta OAB = \frac{1}{2} \times AB \times OM$$

$$= \frac{1}{2} \times 21 \times \frac{21\sqrt{3}}{2}$$

$$= \frac{441\sqrt{3}}{4}$$

Using eq. (i),

Area of segment formed by corresponding chord $= \left(231 - \frac{441\sqrt{3}}{4}\right) \text{cm}^2$

SECTION - E

36. (A) On Calculating the volume of the boxes given in the options. The box with dimension $14 \times 14 \times 3$ has maximum volume as 588.

(B) On Calculating the volume of the boxes given in the option. The box with dimensions $18 \times 18 \times 1$ has minimum volume.

(C) Let the width of square of each side be 'x'

Then, sides of box are $20 - 2x$, $20 - 2x$ and x

$$\text{Volume} = lbh$$
$$= (20 - 2x)(20 - 2x)x$$
$$= (400 - 40x - 40x + 4x^2)x$$
$$= 4x^3 - 80x^2 + 400x$$

OR

Different size of squares are = $18 \times 18 \times 1$, $16 \times 16 \times 2$, $14 \times 14 \times 3$, $12 \times 12 \times 4$, $10 \times 10 \times 5$, $8 \times 8 \times 6$....

As the side length of any value could be cut out from the square and it could be infinite in number.

37. (A)

There are 27 flags. So the middle most flag is 14th flag.

(B) Total distance travelled = 13 flags on left side + 13 flags on right side

$$= 364 + 364$$
$$= 728 \text{ m}$$

(C) For placing first placing she go 2 m and come back 2 m. Then for second flag, she goes 4 m and come back 4 m and so one ....

Distance travelled = 4 , 8 , 12, ...

Then it forms an A.P. with $a = 4$, $d = 4$ and $n = 13$

$$\text{Then} \quad S_{13} = \frac{13}{2}[8 + 12 \times 4]$$
$$= \frac{13}{2}(56) = 364 \text{ m}$$

Caution

➥ *Read such types of questions which are based on situation atleast twice and match it with the figure before attempting it. It helps to understand, what is being asked.*

OR

The maximum distance that she covered in placing will be the 13th flag on both side

Then, $a_{13} = a + (n - 1)d$
$$= 4 + (13 - 1) \times 4$$
$$= 4 + 48 = 52$$

∴ From carrying the flag to its position,

$$\text{the covered distance} = \frac{52}{2}$$
$$= 26 \text{ m}$$

38. (A) On the basis of given equation,

$h = -16t^2 + 64t + 80$

when, $t = 1$ second

$h = -16(1)^2 + 64(1) + 80$

$= -16 + 144 = 128$ m

(B) Rearrange the given equation, by completing the square, we get

$h = -16(t^2 - 4t - 5)$

$= -16[(t - 2)2 - 9]$

$= -16(t - 2)2 + 144$

Height is maximum, when $t = 2$

∴ Maximum height = 144 m

(C) Since, $h = -16t^2 + 16t^2 + 80$

$\Rightarrow \quad 128 = -16t^2 + 64t^2 + 80$

$\Rightarrow \quad 16t^2 + 64t + 80 - 128 = 0$

$\Rightarrow \quad 16t^2 + 64t - 48 = 0$

$\Rightarrow \quad t^2 - 4t + 3 = 0$

$\Rightarrow \quad t^2 + 3t - t + 3 = 0$

$\Rightarrow \quad (t - 3)(t - 1) = 0$

$\Rightarrow \quad t = 3, 1$

OR

When ball hits the ground, $h = 0$

$-16t^2 + 64t + 80 = 0$

$\therefore \quad t^2 - 4t - 5 = 0$

$(t - 5)(t + 1) = 0$

$t = 5$ or $t = -1$

Since, time cannot be negative, so the time = 5 seconds.

$$= \frac{1}{2} \times 21 \times \frac{21\sqrt{3}}{2}$$

▲▲▲