CBSE Board
Class X Mathematics
Sample Paper 2 (Standard) – Solution

Time: 3 hrs **Total Marks: 80**

Section A

1. Correct option: A

Explanation:-

If the denominator of a rational number is of the form 2^n5^m, then it will terminate

After n places if n>m or m places if m>n.

Now, $\frac{2^3}{2^2 5} = \frac{2}{5} = \frac{2}{2^\circ 5}$

will ternminator after 1 decimal place.

2. Correct option: D

Explanation:-

In the word "PROBABILITY", there are 11 letters out of which 4 are vowels (O, A, I, I).

P(getting a vowel) = $\frac{4}{11}$

3. Correct option: C

Explanation:-

A real number is an irrational number when it has a non-terminating non repeating decimal representation.

Thus, 0.101100101010……. is an irrational number.

4. Correct option : D

Explanation:-

$2x + 3y = 5$, $4x + ky = 10$

$a_1 = 2$, $b_1 = 3$, $a_2 = 4$ and $b_2 = k$

Conditions for infinitely many solutions is

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \Rightarrow \frac{2}{4} = \frac{3}{k} = \frac{1}{2} \Rightarrow k = 6$$

5. Correct option : C

Explanation:-

$\cos^2 17° - \sin^2 73°$

$= \sin^2 73 - \sin^2 73°$ $\quad \because \sin(90° - \theta) = \cos\theta$

$= 0$

6. Correct option : A

Explanation:-

$$\frac{2\tan 30^\circ}{1-\tan^2 30^\circ} = \frac{2\times\frac{1}{\sqrt{3}}}{1-\left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}}$$

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

$$= \sqrt{3}$$

Also, tan 60° = $\sqrt{3}$

7. Correct option : A

Explanation:-

sin θ = cos (2θ - 45°)

⇒ cos (90° - θ) = cos (2θ - 45°)

⇒ 90° - θ = 2θ - 45°

⇒ 3θ = 135°

⇒ θ = 45°

⇒ tan 45° = 1

8. Correct option: A

Explanation:-

Let R be the mid-point of PQ, then, the coordinates of mid-point of PQ, i.e., R are $\left[\frac{(-2-6)}{2}, \frac{(8-4)}{2}\right]$ = (−4, 2)

9. Correct option: B

Explanation:-

Area of a triangle = 0

$$\Rightarrow \frac{1}{2}\left|x(1-5)+2(5+1)+4(-1-1)\right| = 0$$

$$\Rightarrow \frac{1}{2}\left|-4x+12-8\right| = 0$$

$$\Rightarrow x = 1$$

10. Correct option: B

Explanation:-

Let the coordinates of the point be P(x, 2x). Let Q be the point (4, 3).

$PQ^2 = (4 - x)^2+(3 - 2x)^2 = 10$

$16 + x^2 - 8x + 9 + 4x^2 - 12x = 10$

$\Rightarrow 5x^2 - 20x + 15 = 0$

$\Rightarrow x^2 - 4x + 3=0$

$\Rightarrow (x - 3)(x - 1) = 0$

$\Rightarrow x = 1$ or $x = 3$

So, $2x = 2$ or 6

Hence, the coordinates of the required point are (1, 2) or (3, 6).

11. The maximum volume of a cone that can be carved out of a solid hemisphere of radius r is $\underline{\frac{\pi r^3}{3}}$.

12. If the sum of the zeros of the polynomial $f(x) = 2x^3 - 3kx^2 + 4x - 5$ is 6, then the value of k is $\underline{4}$

Explanation:-

$f(x) = 2x^3 - 3kx^2 + 4x - 5$

a = 2, b = -3k, c = 4 and d = -5

Let α,β,γ be the zeros of the given polynomial.

$$\alpha+\beta+\gamma=\frac{-b}{a}=\frac{3k}{2}$$

$$\frac{3k}{2}=6\Rightarrow k=4$$

13. $\Delta ABC \sim \Delta DEF$. If BC = 3 cm, EF = 4 cm and $ar(\Delta ABC) = 54\ cm^2$ then $ar(\Delta DEF) = \underline{96\ cm^2}$

Explanation:-

$\Delta ABC \sim \Delta DEF$, BC = 3 cm, EF = 4 cm and $ar(\Delta ABC) = 54\ cm^2$

The ratio of the areas of two similar triangles is equal to the ratio of the squares of any two corresponding sides.

$$\Rightarrow \frac{BC^2}{EF^2}=\frac{54}{ar(\Delta DEF)}$$

$$\Rightarrow \frac{3^2}{4^2}=\frac{54}{ar(\Delta DEF)}$$

$$\Rightarrow ar(\Delta DEF)=\frac{54\times 16}{9}=96\ cm^2$$

14. The first term of an A.P. is p and its common difference is q. Its 10^{th} term $\underline{p + 9q}$.

Explanation:-

$a = p$, $d = q$ and $n = 10$

$a_{10} = a + (n - 1)d = p + 9q$

OR

The value of x for which 2x, x + 10, and 3x + 2 are in A.P. is $\underline{6}$

Explanation:-

$\Rightarrow 2(x + 10) = 2x + 3x + 2$

$\Rightarrow 2x + 20 = 5x + 2$

$\Rightarrow 3x = 18$

$\Rightarrow x = 6$

15. For a given data with 70 observations the 'less than ogive' and the 'more than ogive' intersect at (20.5, 35). The median of the data is $\underline{20.5}$.

Explanation:-

Since, x-coordinate is the median while drawing graph.

16. LCM of $2^3 \times 3 \times 5$ and $2^4 \times 5 \times 7$ is $3 \times 5 \times 7 \times 2^4 = 1680$.

17. If the diagonals of a quadrilateral divide each other proportionally, then it is a rectangle.

18. Given, AR = 5 cm, BR = 4 cm and AC =11 cm

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

Therefore, AR = AQ = 5 cm, BR = BP = 4 cm and

PC = QC = AC – AQ = 11 cm – 5 cm = 6 cm

BC = BP + PC = 4 cm + 6 cm = 10 cm

19. 3, 8, 13, 18, …

$\Rightarrow a = 3, d = 5$ and $a_n = 88$

$\Rightarrow a + (n - 1)d = 88$

$\Rightarrow 3 + (n - 1) \times 5 = 88$

$\Rightarrow 5(n - 1) = 85$

$\Rightarrow n - 1 = 17$

$\Rightarrow n = 18$

OR

$(5a - x), 6a, (7a + x),\ldots$

Let A be the first term and D be the difference.

$A = 5a - x, D = 6a - 5a + x = a + x, n = 11$

$a_n = A + (n - 1)D$

$\Rightarrow a_{11} = 5a - x + 10(a + x)$

$\Rightarrow a_{11} = 5a - x + 10a + 10x$
$\Rightarrow a_{11} = 15a + 9x$

20. $2x^2 + px + 8 = 0$
$\Rightarrow a = 2, b = p$ and $c = 8$
The given quadratic equation has real and equal roots.
$\Rightarrow b^2 - 4ac = 0$
$\Rightarrow p^2 - 4 \times 2 \times 8 = 0$
$\Rightarrow p^2 = 64$
$\Rightarrow p = \pm 8$

Section B

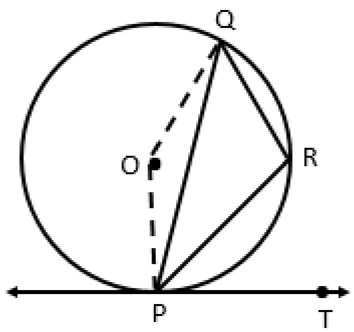
21. $455 = 84 \times 5 + 35$
$\Rightarrow 84 = 35 \times 2 + 14$
$\Rightarrow 35 = 14 \times 2 + 7$
$\Rightarrow 14 = 7 \times 2 + 0$
Therefore, H.C.F. = 7

OR

If 4^n ends with 0, then it must have 5 as a factor.
But, we know that the only prime factor of 4^n is 2.
Also, the fundamental theorem of arithmetic states that the prime factorization of each number is unique. Hence, 4^n can never end with 0.

22. Since the lengths of tangents from an exterior point to a circle are equal.
Therefore, XP = XQ (tangents from X) ....(i)
AP = AR (tangents from A) ....(ii)
BQ = BR (tangents from B) ....(iii)
Now, XP = XQ
$\Rightarrow$ XA + AP = XB + BQ
$\Rightarrow$ XA + AR = XB + BR [Using (ii) and (iii)]

OR



$m\angle OPT = 90°$ $(\because$ radius is perpendicular to the tangent$)$

So, $\angle OPQ = \angle OPT - \angle QPT$

$= 90° - 60°$

$= 30°$

$m\angle POQ = 2\angle QPT = 2 \times 60° = 120°$ $\because$ angle subtended by an arc

reflex $m\angle POQ = 360° - 120° = 240°$

$m\angle PRQ = \frac{1}{2}$ reflex $\angle POQ$

$= \frac{1}{2} \times 240°$

$= 120°$

$\therefore m\angle PRQ = 120°$

23. In right triangle ABC,

$\sin 45° = \frac{BC}{AC}$

$\Rightarrow \frac{1}{\sqrt{2}} = \frac{BC}{150}$

$\Rightarrow BC = \frac{150}{\sqrt{2}}$

$\Rightarrow BC = 75\sqrt{2}$ m

Thus, the width of the river is $75\sqrt{2}$ metres.

24. Total number of balls in the bag = 3 red + 5 black = 8 balls

Number of total outcomes when a ball is drawn at random = 3 + 5 = 8

Number of favourable outcomes for the red ball = 3

Probability of getting a red ball = P (E) = $\frac{3}{8}$

If $P\left(\bar{E}\right)$ is the probability of drawing no red ball, then

$P(E) + P\left(\bar{E}\right) = 1$

$P\left(\bar{E}\right) = 1 - P(E) = 1 - \frac{3}{8} = \frac{5}{8}$

25. According to the question,

Cone:

Radius = r, height = h and volume = V = $\frac{1}{3}\pi r^2 h$

Cylinder:

Radius = r, height = h and volume = V = $\pi r^2 h$

Ratio of volumes = $\dfrac{\pi r^2 h}{\frac{1}{3}\pi r^2 h} = \dfrac{3}{1}$

26. In ΔABC, DE ∥ BC.

Then, by Basic Proportionality Theorem,

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

$$\Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$$

$$\Rightarrow x(x-1) = (x-2)(x+2)$$

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

$$\Rightarrow x = 4$$

Section C

27. $\text{L.H.S.} = \dfrac{\sec A + \tan A}{\sec A - \tan A}$

$$= \frac{\sec A + \tan A}{\sec A - \tan A} \times \frac{\sec A + \tan A}{\sec A + \tan A}$$

$$= \frac{(\sec A + \tan A)^2}{\sec^2 A - \tan^2 A}$$

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

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

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

$$= \text{R.H.S.}$$

OR

$$\left(\frac{\sin 47^o}{\cos 43^o}\right)^2 + \left(\frac{\cos 43^o}{\sin 47^o}\right)^2 - 4\cos^2 45^o$$

$$= \left(\frac{\sin(90^o - 43^o)}{\cos 43^o}\right)^2 + \left(\frac{\cos(90^o - 47^o)}{\sin 47^o}\right) - 4\cos^2 45^o$$

$$= \left(\frac{\cos 43^o}{\cos 43^o}\right)^2 + \left(\frac{\sin 47^o}{\sin 47^o}\right)^2 - 4\left(\frac{1}{\sqrt{2}}\right)^2$$

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

$$= 2 - 2$$

$$= 0$$

28. Area of quadrilateral ABCD = Area of ΔABC + Area of ΔACD

Area of triangle $= \frac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right]$

Area(ΔABC) = $\frac{1}{2}$ [1(−3 − 2) + 7(2 − 1) + 12(1 + 3)] = $\frac{1}{2}$ [−5 + 7 + 48] = 25 sq. units

Area(ΔACD) = $\frac{1}{2}$ [1(2 − 21) + 12(21 − 1) + 7(1 − 2)] = $\frac{1}{2}$ [−19 + 240 − 7] = 107 sq. units

Therefore, area of quadrilateral ABCD = 25 + 107 = 132 sq. units.

29. $\frac{x}{a} + \frac{y}{b} = 2$

$\Rightarrow bx + ay = 2ab$ ....(1)

$ax - by = a^2 - b^2$ ....(2)

Multiplying (1) with a and (2) with b and subtracting, we get

$$\begin{array}{l} \cancel{abx} + a^2y = 2a^2b \\ \cancel{abx} - b^2y = a^2b - b^3 \\ - \quad\; + \qquad\quad - \quad\; + \\ \hline y(a^2 + b^2) = a^2b + b^3 \\ \Rightarrow y(a^2 + b^2) = b(a^2 + b^2) \\ \Rightarrow y = b \end{array}$$

From (1), $bx + ab = 2ab$

$\Rightarrow bx = ab$

$\Rightarrow x = a$

Hence, $x = a$ and $y = b$.

30. Let $\frac{3}{2\sqrt{5}}$ be a rational number.

$\Rightarrow \frac{3}{2\sqrt{5}} = \frac{a}{b}$, where a and b are co-prime integers and $b \neq 0$.

$\Rightarrow \sqrt{5} = \frac{3b}{2a}$

Now, a, b, 2 and 3 are integers.

Therefore, $\frac{3b}{2a}$ is a rational number.

$\Rightarrow \sqrt{5}$ is a rational number.

This is a contradiction as we know that $\sqrt{5}$ is an irrational.

Therefore, our assumption is wrong.

Hence, $\frac{3}{2\sqrt{5}}$ is an irrational number.

OR

We have $96 = 2^5 \times 3$ and $404 = 2^2 \times 101$

$HCF = 2^2 = 4$

$HCF \times LCM = 96 \times 404$

$LCM = \frac{96 \times 404}{HCF} = \frac{96 \times 404}{4} = 96 \times 101 = 9696$

31. Consider the following table:

Let A = 225

$$d_i = \frac{x_i - 225}{50}$$

C.I	f_i	x_i	d_i	$f_i d_i$
100 - 150	4	125	−2	−8
150 - 200	5	175	−1	−5
200 - 250	12	225	0	0
250 - 300	2	275	1	2
300 - 350	2	325	2	4
Total	25			−7

$$\text{Mean} = \bar{x} = A + \frac{\sum f_i d_i}{\sum f_i} \times h = 225 - \frac{7}{\cancel{25}} \times \cancel{50}^{2} = 225 - 14 = 211$$

OR

Total no. of cards = 18

$$P(E) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

i. No. of favourable outcomes = 7
(prime nos. in between 1 and 18 are 2, 3, 5, 7, 11, 13, and 17)

P(a prime no.) = $\frac{7}{18}$

ii. Factors of 18 are 1, 2, 3, 6, 9, and 18
No. of favourable outcomes = 6

P(a factor of 18) = $\frac{6}{18} = \frac{1}{3}$

iii. Numbers divisible by 2 and 3 are 6, 12 and 18
No. of favourable outcomes = 3 ∴

P(a no. divisible by 2 and 3) = $\frac{3}{18} = \frac{1}{6}$

32. Here it is given that,

$T_{14} = 2(T_8)$

$\Rightarrow a + (14 - 1)d = 2[a + (8 - 1)d]$

$\Rightarrow a + 13d = 2[a + 7d]$

$\Rightarrow a + 13d = 2a + 14d$

$\Rightarrow 13d - 14d = 2a - a$

$\Rightarrow -d = a \quad .... (1)$

Now, it is given that its 6^{th} term is -8.

$T_6 = -8$

$\Rightarrow a + (6 - 1)d = -8$

$\Rightarrow a + 5d = -8$

$\Rightarrow -d + 5d = -8 \qquad [\because \text{ Using } (1)]$

$\Rightarrow 4d = -8$

$\Rightarrow d = -2$

Subs. this in eq. (1), we get $a = 2$

Now, the sum of 20 terms,

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

$$S_{20} = \frac{20}{2}[2a + (20-1)d]$$

$$= 10[2(2) + 19(-2)]$$

$$= 10[4 - 38]$$

$$= -340$$

33.

Now $2 + \sqrt{3}$ and $2 - \sqrt{3}$ are the two zeroes of the given polynomial

So the product $\left[x - \left(2+\sqrt{3}\right)\right]\left[x - \left(2-\sqrt{3}\right)\right]$ will be a factor of the given polynomial

$$\therefore \left[x - \left(2+\sqrt{3}\right)\right]\left[x - \left(2-\sqrt{3}\right)\right] = (x-2)^2 - \left(\sqrt{3}\right)^2$$

$$= x^2 - 4x + 4 - 3$$

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

let $f(x) = 2x^4 - 9x^3 + 5x^2 + 3x - 1$

and $g(x) = x^2 - 4x + 1$

Find $\frac{f(x)}{g(x)}$.

$$
\begin{array}{r|l}
 & 2x^2 - x - 1 \\
x^2 - 4x + 1 & 2x^4 - 9x^3 + 5x^2 + 3x - 1 \\
 & 2x^4 - 8x^3 + 2x^2 \\
 & - \quad + \quad - \\
\hline
 & -x^3 + 3x^2 + 3x \\
 & -x^3 + 4x^2 - x \\
 & + \quad - \quad + \\
\hline
 & -x^2 + 4x - 1 \\
 & -x^2 + 4x - 1 \\
 & + \quad - \quad + \\
\hline
 & 0
\end{array}
$$

$\therefore f(x) = \left(x^2 - 4x + 1\right)\left(2x^2 - x - 1\right)$

$\therefore 2x^4 - 9x^3 + 5x^2 + 3x - 1 = \left(x^2 - 4x + 1\right)\left(2x^2 - x - 1\right)$

Hence, the other zeroes of f(x) are the zeroes of the Polynomial $2x^2 - x - 1$.

$\therefore 2x^2 - x - 1 = 2x^2 - 2x + x - 1 = (2x + 1)(x - 1)$

So, $2x^4 - 9x^3 + 5x^2 + 3x - 1 = \left(x^2 - 4x + 1\right)\left(2x^2 - x - 1\right)$

$$= \left[x - \left(2+\sqrt{3}\right)\right]\left[x - \left(2-\sqrt{3}\right)\right](2x + 1)(x - 1)$$

Hence the roots of the Polynomial f(x) are $\left(2+\sqrt{3}\right), \left(2-\sqrt{3}\right), \frac{-1}{2}$ and 1.

34. Radius of the circle = 14 cm

Central Angle, $\Theta = 60°$,

Area of the minor segment

$$= \frac{\theta}{360^\circ} \times \pi r^2 - \frac{1}{2} r^2 \sin\theta$$

$$= \frac{60^\circ}{360^\circ} \times \pi \times 14^2 - \frac{1}{2} \times 14^2 \times \sin 60^\circ$$

$$= \frac{1}{6} \times \frac{22}{7} \times 14 \times 14 - \frac{1}{2} \times 14 \times 14 \times \frac{\sqrt{3}}{2}$$

$$= \frac{22 \times 14}{3} - 49\sqrt{3}$$

$$= \frac{22 \times 14}{3} - \frac{147\sqrt{3}}{3}$$

$$= \frac{308 - 147\sqrt{3}}{3} \text{cm}^2$$

Area of the minor segment $= \dfrac{308 - 147\sqrt{3}}{3} \text{cm}^2$

Area of major segment

$$= \pi r^2 - \frac{308 - 147\sqrt{3}}{3} \text{cm}^2$$

$$= \frac{22}{7} \times 14 \times 14 - \frac{308 - 147\sqrt{3}}{3}$$

$$= 616 - \frac{308 - 147\sqrt{3}}{3} = 598.1 \text{ cm}^2$$

Section D

35. Steps of construction:-

(1) Draw a line segment AB of length 4.6 cm.

(2) At A draw an angle BAY of 60°.

(3) With centre B and radius 5.1 cm, draw an arc which intersects line AY at point C.

(4) Join BC.

(5) At A draw an acute angle BAX of any measure.

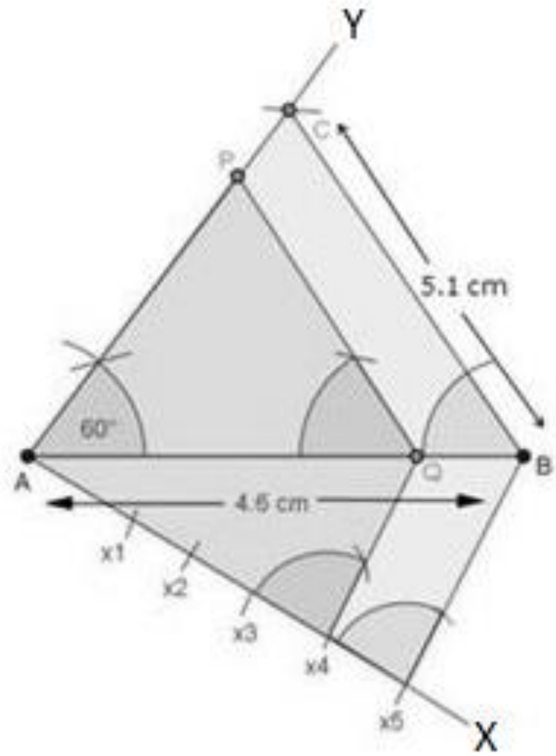
(6) Starting from A, cut 5 equal parts on AX.

(7) Join X_5B.

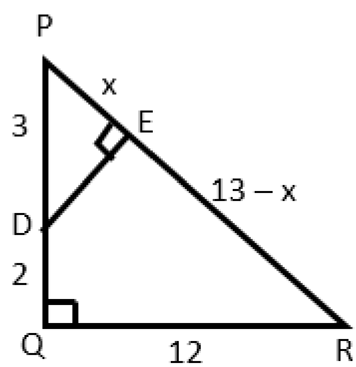
(8) Through X_4, Draw $X_4Q \parallel X_5B$.

(9) Through Q, Draw QP || BC

$\therefore \Delta PAQ \sim \Delta CAB$



36. In right ΔPQR,



$PR^2 = PQ^2 + QR^2 = 5^2 + 12^2 = 25 + 144 = 169$

$\therefore$ PR = 13 cm

Let PE = x, then ER = 13 – x

In ΔPQR and ΔPED,

$\angle PQR = \angle PED$ ….. right angles

$\angle QPR = \angle EPD$ ….. same angles

$\therefore$ ΔPQR ~ ΔPED [AA similarity]

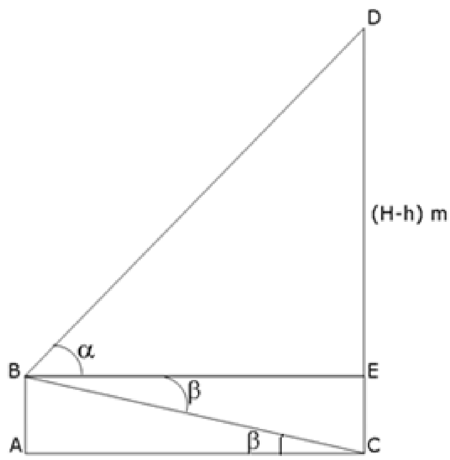
$$\therefore \frac{PQ}{PE} = \frac{QR}{ED} = \frac{PR}{PD}$$

$$\Rightarrow \frac{5}{x} = \frac{12}{ED} = \frac{13}{3}$$

$$\therefore PE = x = \frac{5 \times 3}{13} = \frac{15}{13} = 1\frac{2}{13} \text{ cm}$$

$$ED = \frac{12 \times 3}{13} = \frac{36}{13} = 2\frac{10}{13} \text{ cm}$$

37. Let B be the window of a house AB and let CD be the other house. Then, AB = EC = h metres.



Let CD = H metres.

Then, ED = (H − h) m

In ΔBED,

$\cot \alpha = \frac{BE}{ED}$

BE = (H − h) cot α ... (a)

In ΔACB,

$\frac{AC}{AB} = \cot \beta$

AC = h.cot β .... (b)

But BE = AC

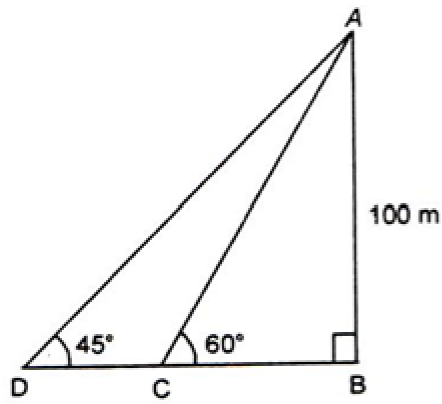
$\therefore$ (H − h) cot α = hcot β ....[From (a) and (b)]

$H = h \frac{(\cot \alpha + \cot \beta)}{\cot \alpha}$

H = h(1 + tanα cotβ)

Thus, the height of the opposite house is h(1 + tanα.cotβ) metres.

OR



Here, the man has covered the distance CD in 2 minutes.

Speed = $\dfrac{\text{Distance}}{\text{time}}$

Now, in ΔABC,

$$\frac{100}{BC} = \tan 60^o = \sqrt{3}$$

$$\Rightarrow \quad BC = \frac{100}{\sqrt{3}} = \frac{100\sqrt{3}}{3}$$

In ΔABD,

$$\frac{100}{BD} = \tan 45^o = 1$$

$$\Rightarrow \quad BD = 100$$

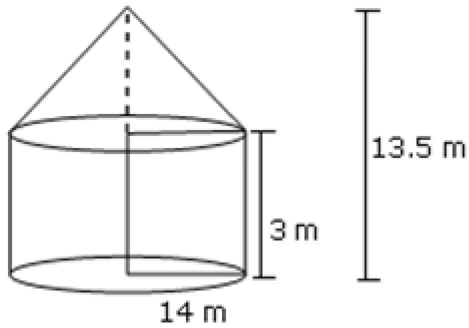
$$\therefore \quad CD = BD - BC$$

$$= \left(100 - \frac{100\sqrt{3}}{3}\right) = 100\left(\frac{3-\sqrt{3}}{3}\right)$$

$$\text{Thus, Speed} = \frac{100\left(\frac{3-\sqrt{3}}{3}\right)}{2}$$

$$= 50\left(\frac{3-\sqrt{3}}{3}\right) \text{m / min}$$

38. Radius of conical portion = Radius of cylindrical portion = 14 m
Height of cylindrical portion = 3 m
Height of conical portion = 13.5 m − 3 m = 10.5 m



C.S.A. of tent = C.S.A. of cylinder + C.S.A. of cone

$= 2\pi rh + \pi rl$

$= 2\pi(14)(3) + \pi(14)\sqrt{14^2 + 10.5^2}$

$= 264 + 44\sqrt{306.25}$

$= 264 + 44(17.5)$

$= 264 + 770$

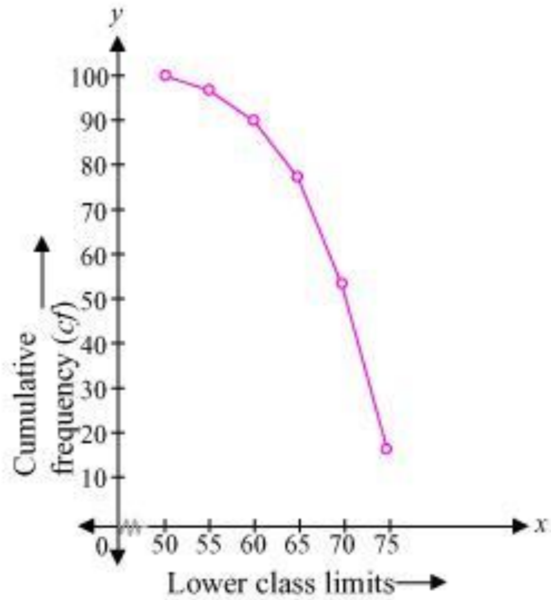
$= 1034 \text{ m}^2$

Cost of painting the inside of tent,
i.e. 1034 m^2 at the rate of Rs. 2 per sq. m = Rs. 1034 × 2 = Rs. 2068

39. We can obtain cumulative frequency distribution of more than type as following:

Production yield (lower class limits)	Cumulative frequency
More than or equal to 50	100
More than or equal to 55	100 – 2 = 98
More than or equal to 60	98 – 8 = 90
More than or equal to 65	90 – 12 = 78
More than or equal to 70	78 – 24 = 54
More than or equal to 75	54 – 38 = 16

Now, taking lower class limits on x-axis and their respective cumulative frequencies on y-axis, we can obtain the ogive as follows:



OR

Total outcomes = 50

(i) Favourable outcomes (divisible by 5) =5, 10, 15, 20, 25, 30, 35, 40, 45, 50

n(A) = 10

$$\text{Probability}=\frac{\text{Favourable outcomes}}{\text{Total outcomes}}=\frac{10}{50}=\frac{1}{5}$$

(ii) Favourable outcomes (a perfect cube) 1, 8, 27

n(B) = 3

$$\text{Probability} = \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{3}{50}$$

(iii) Favourable outcomes (a prime number) 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47

n(C) = 15 $\therefore$ $\text{Probability}=\frac{\text{Favourable outcomes}}{\text{Total outcomes}}=\frac{15}{50}=\frac{3}{10}$

40. Let list price of the book = Rs. x

So, number of books purchased = $\frac{1200}{x}$

And increased price of the book = Rs. (x + 10)

So, number of books purchased = $\frac{1200}{x+10}$

According to condition, if the list price of a book is increased by Rs. 10, then a person can buy 10 less books.

$$\therefore \frac{1200}{x} - \frac{1200}{x+10} = 10$$

$\therefore (1200)\left[\frac{1}{x} - \frac{1}{x+10}\right] = 10$

$\therefore (1200)\left[\frac{x+10-x}{x(x+10)}\right] = 10$

$\therefore 1200 = x(x + 10)$

$\therefore\ x^2 + 10x - 1200 = 0$

$\therefore (x + 40)(x - 30) = 0$

$\therefore x = -40$ or $x = 30$

But x is the list price of the book and hence can't be negative.

Therefore, the original list price of the book is Rs. 30.

OR

Let the speed of the stream be x km/ hr.

Here, the speed of the motor boat is 15km/ hr in still water.

$\therefore$ Speed downstream = (15 + x) km/hr and

Speed upstream = (15 – x) km/hr

A boat goes 30 km downstream and comes back,

$\therefore$ Distance downstream = 30 km and

Distance upstream = 30 km

Total time taken by A boat = 4 hrs 30 mins = $4\frac{30}{60}$ hrs $= \frac{9}{2}$ hrs

$\therefore \left(\frac{30}{15+x}\right) + \left(\frac{30}{15-x}\right) = \frac{9}{2}$

Taking L.C.M as (15 + x) (15 + x)

$\therefore \frac{30\,(15-x)+30(15+x)}{(15+x)\,(15-x)} = \frac{9}{2}$

$\therefore 30\ (15 - x + 15 + x\ ) = \frac{9}{2}\ (15+x)\ (15-x)$

$\therefore 30 \times 30 = \frac{9}{2}\,(\ 15^2 - x^2)$

$\therefore \frac{900 \times 2}{9} = 225 - x^2$

$\therefore\quad 200 \quad = 225 - x^2$

$\therefore x^2 = 25$

$\therefore x = 5$ or -5

Speed is always positive,

$\therefore x = 5$

Therefore, the speed of stream is 5 km/hr.