# CBSE Board
# Class X Mathematics
# Sample Paper 4 (Standard) – Solution

## Part A

### Section I

**1.** 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 terminator after 1 decimal place.

**OR**

Any number that can't be expressed in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is called an irrational number.

Examples: $\sqrt{2}$, $\sqrt{3}$ and $\sqrt{5}$.

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

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

Conditions for infinitely many solutions is

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

**OR**

The point (3, a) lies on the line $2x - 3y = 5$.

Substituting the values of x and y in the given equation:

$$2 \times 3 - 3 \times a = 5 \Rightarrow 6 - 3a = 5 \Rightarrow 3a = 1 \Rightarrow a = \frac{1}{3}$$

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

Also, $\tan 60^\circ = \sqrt{3}$

**5.** $\sin\theta = \cos(2\theta - 45^\circ)$

$\Rightarrow \cos(90^\circ - \theta) = \cos(2\theta - 45^\circ) \Rightarrow 90^\circ - \theta = 2\theta - 45^\circ \Rightarrow 3\theta = 135^\circ \Rightarrow \theta = 45^\circ$

$\Rightarrow \tan 45^\circ = 1$

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

**OR**

Area of a triangle = 0

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

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

$$\Rightarrow x = 1$$

**7.** 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).

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

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

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

Let $\alpha, \beta, \gamma$ be the zeros of the given polynomial.

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

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

**10.** $\Delta ABC \sim \Delta DEF$, 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.

$$\Rightarrow \frac{BC^2}{EF^2} = \frac{54}{ar(\Delta DEF)} \Rightarrow \frac{3^2}{4^2} = \frac{54}{ar(\Delta DEF)} \Rightarrow ar(\Delta DEF) = \frac{54 \times 16}{9} = 96\ cm^2$$

**OR**

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

**11.** $a = p$, $d = q$ and $n = 10$
$a_{10} = a + (n - 1)d = p + 9q$

**OR**

As $2x$, $x + 10$, and $3x + 2$ are in A.P.
$\Rightarrow 2(x + 10) = 2x + 3x + 2$
$\Rightarrow 2x + 20 = 5x + 2$
$\Rightarrow 3x = 18$
$\Rightarrow x = 6$

**12.** Let the required polynomial be $ax^2 + bx + c$, and let its zeroes be $\alpha$ and $\beta$.

$$\alpha + \beta = \frac{1}{4} = \frac{-b}{a} \text{ and } \alpha\beta = -1 = \frac{-4}{4} = \frac{c}{a}$$

If $a = 4k$, then $b = -k$, $c = -4k$
Therefore, the quadratic polynomial is $k(4x^2 - x - 4)$, where k is a real number

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

**14.** $x^2 + 4x + k = 0$
$\Rightarrow a = 1, b = 4, c = k$
The equation $x^2 + 4x + k = 0$ has real and distinct roots i.e. $b^2 - 4ac > 0$
$\Rightarrow b^2 - 4ac = 4^2 - 4k = 16 - 4k$
$\Rightarrow 16 - 4k > 0$
$\Rightarrow 4k < 16$
$\Rightarrow k < 4$

**15.** The graph of p(x) intersects the x-axis at only 1 point.
So, the number of zeroes is 1.

**16.** Given equation is $px^2 + 6x + 1 = 0$
Here, $a = p$, $b = 6$ and $c = 1$
The given equation will have real roots, if $b^2 - 4ac \geq 0$.
$\Rightarrow (6)^2 - 4(p)(1) \geq 0$
$\Rightarrow 36 - 4p \geq 0$
$\Rightarrow 36 \geq 4p$
$\Rightarrow p \leq 9$

## Section II

**17.**

(a) In the first round 1, 3, 5, 7 and 9 numbered triangles are removed.
This means, Rahul is the alternate removing triangles.
In the second round 4 and 8 numbered triangles are removed.
In the third round 6 numbered triangle is removed.
So, 2 numbered triangle will be left in the last.

(b) Removed triangles numbered in sequence are 3, 6, 9, 4, 8, 5, 2 and 7.
So, 1 numbered triangle will be left in the end.

(c) Removed triangles numbered in sequence are 8, 3, 9, 2, 6, 10, 11, 7, 4, 1
So, 5 numbered triangle will be left in the end.

(d) The perimeters of the triangle will follow the below pattern 3, 6, 9, 12, 15, 18, 21, 24 and 27
$\Longrightarrow$ They are multiples of 3.

(e) We know that, area of an equilateral triangle = $\frac{\sqrt{3}}{4}(\text{side})^2$

The ratio of the areas of first two triangles whose sides are 3 and 4 is 9: 16
The ratio of the areas of two triangles whose sides are 6 and 8 is 36: 64 = 9: 16.

Hence, they are in proportion as their ratio is same and that is 9: 16.

**18.**

(a) Angles $\angle LKM$ and $\angle JKL$ are called as Linear Pair of angles.

(b) $m\angle LKM + m\angle JKL = 180°$...... Linear Pair
$\Longrightarrow 2x - 15 + m\angle LKM = 180°$
$\Longrightarrow m\angle LKM = 195° - 2x$

(c) In $\triangle LKM$,
$m\angle LKM + m\angle LMK + m\angle KLM = 180°$ ...angle sum property of a triangle
$\Longrightarrow 195° - 2x + 50 + x = 180°$
$\Longrightarrow x = 65° = m\angle KLM$

(d) $m\angle LKM = 195° - 2x = 195 - 2(65) = 195 - 130 = 65°$
In $\triangle LKM$, $m\angle LKM = m\angle KLM = 65°$
$\Longrightarrow \triangle LKM$ is an isosceles triangle.

(e) $m\angle LKJ = 2x - 15 = 2(65) - 15 = 130 - 15 = 115°$

**19.**

(a) The coordinates of CAVE of DEATH is (5, 3).

(b) The coordinates of THREE PALMS is (6, 4).

(c) The coordinates FOUR CROSS CLIFF and CAVE of DEATH are (2, 3) and (5, 3) respectively.

Distance between them = $\sqrt{(5-2)^2 + (3-3)^2} = \sqrt{9} = 3$ units

(d) The distance of SKULL ROCK from x – axis is 5 units.

(e) The mid – point of CAVE of DEATH and THREE PALMS

$= \left(\frac{5+6}{2}, \frac{3+4}{2}\right) = (5.5, 3.5)$

**20.**

(a)

| Time (in sec) | No. of students(f) | X | fx |
|---|---|---|---|
| 20 – 40 | 7 | 30 | 210 |
| 40 – 60 | 10 | 50 | 500 |
| 60 – 80 | 15 | 70 | 1050 |
| 80 – 100 | 5 | 90 | 450 |
| 100 – 120 | 3 | 110 | 330 |
| | $\Sigma$f = 40 | | $\Sigma$fx = 2540 |

Mean time taken by a student to finish the race = 2540/40 = 63.5 seconds

(b) The modal class is 60 – 80 as it has the highest frequency i.e 15.
Lower limit of the modal class = 60

(c) Mean, Median and Mode are measures of central tendency.

(d)

| Time (in sec) | No. of students(f) | cf |
|---|---|---|
| 20 – 40 | 7 | 7 |
| 40 – 60 | 10 | 17 |
| 60 – 80 | 15 | 32 |
| 80 – 100 | 5 | 37 |
| 100 – 120 | 3 | 40 |
| | N= $\Sigma$f = 40 | |

Here N/2 = 40/2 = 20, Median Class = 60 – 80, Modal Class = 60 – 80

Sum of upper limits of median class and modal class = 80 + 80 = 160

(e) Number of students who finished the race within 1 min = 7 + 10 = 17

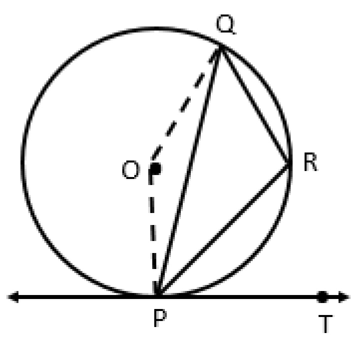
# Part B

## Section III

**21.** 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, $\angle OPQ = \angle OPT - \angle QPT = 90° - 60° = 30°$....(i)

In $\Delta POQ$, $OP = OQ$....radius of same circle

$m\angle OPQ = m\angle OQP$.....(angles opposite to equal sides)

$\Rightarrow m\angle OPQ = m\angle OQP = 30°$....from (i)

In $\Delta POQ$, $m\angle POQ = 180° - (m\angle OPQ + m\angle OQP) = 180° - 60° = 120°$

$2\angle QPT = 2 \times 60° = 120°$ $\because$ 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.** 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 $P(\overline{E})$ is the probability of drawing no red ball, then

$P(E) + P(\overline{E}) = 1$

$P(\overline{E}) = 1 - P(E) = 1 - \frac{3}{8} = \frac{5}{8}$

**24.** 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 = $\frac{\pi r^2 h}{\frac{1}{3}\pi r^2 h} = \frac{3}{1}$

**25.** In $\Delta ABC$, $DE \parallel BC$.

Then, by Basic Proportionality Theorem,

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

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

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

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

$$\Rightarrow x = 4$$

**OR**

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

Let 'a' be the area of smaller triangle and 'A' be the area of the larger triangle.

$$\frac{a}{A} = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$$

$\Rightarrow \frac{48}{A} = \frac{4}{9}$ $\qquad \because$ Area of smaller triangle = 48 $cm^2$

$\Rightarrow A = 108\ cm^2$

**26.** Radius of the cone = 12 cm and its height = 24 cm

Volume of the cone = $\frac{1}{3}\pi R^2 h = \left(\frac{1}{3} \times \pi \times 12 \times 12 \times 24\right) cm^3 = (48 \times 24)\pi\ cm^3$

Volume of each ball = $\frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times 3 \times 3 \times 3 = (36\pi)\,cm^3$

Number of balls formed = $\frac{\text{Volume of solid cone}}{\text{Volume of each ball}} = \frac{(48 \times 24)\pi}{36\pi} = 32$

## Section IV

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

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

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

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

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

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

= R.H.S.

**OR**

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

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

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

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

$= 2 - 2$

$= 0$

**28.** $\dfrac{x}{a} + \dfrac{y}{b} = 2$

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

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

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

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

$\Rightarrow y(a^2 + b^2) = b(a^2 + b^2)$

$\Rightarrow y = b$

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

$\Rightarrow bx = ab$

$\Rightarrow x = a$

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

**29.** 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 number.

Therefore, our assumption is wrong.

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

**OR**

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

$HCF = 2^2 = 4$

$HCF \times LCM = 96 \times 404$

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

**30.** 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(getting a prime no.) = $\frac{7}{18}$

ii. Factors of 18 are 1, 2, 3, 6, 9, and 18
No. of favourable outcomes = 6
P(getting 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(getting a no. divisible by 2 and 3) = $\frac{3}{18} = \frac{1}{6}$

**31.** Here it is given that,

$T_{14} = 2(T_8)$

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

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

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

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

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

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

$T_6 = -8$

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

$\Rightarrow a + 5d = -8$

$\Rightarrow -d + 5d = -8$ ... [Using (1)]

$\Rightarrow 4d = -8$

$\Rightarrow d = -2$

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

Now, the sum of 20 terms,

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

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

$$= 10\left[2(2) + 19(-2)\right]$$

$$= 10[4 - 38]$$

$$= -340$$

**32.** 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 $\dfrac{f(x)}{g(x)}$.

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

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

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

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.

**33.** Radius of the circle = 14 cm

Central Angle, θ = 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 $= \frac{308 - 147\sqrt{3}}{3} \text{cm}^2$

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 V

**34. 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.

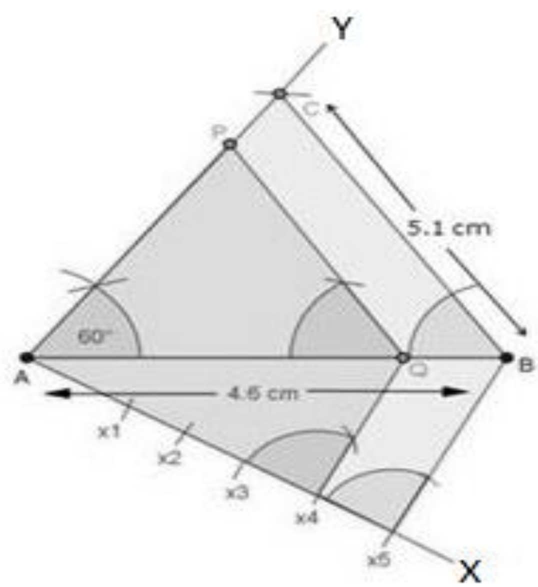
(6) Starting from A, cut 5 equal parts on AX.

(7) Join $X_5B$.

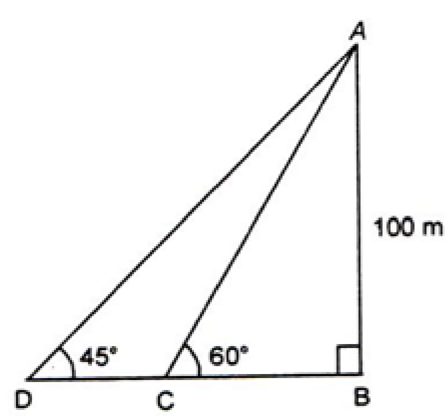
(8) Through $X_4$, Draw $X_4Q \parallel X_5B$.

(9) Through Q, Draw QP || BC

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




**35.**




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

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

Now, in $\Delta ABC$,

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

$$\text{In } \Delta ABD, \frac{100}{BD} = \tan 45^\circ = 1 \Rightarrow \quad BD = 100$$

$$\therefore CD = BD - BC = \left(100 - \frac{100\sqrt{3}}{3}\right) = 100\left(\frac{3-\sqrt{3}}{3}\right)$$

$$\text{Thus, Speed} = \frac{100\left(\frac{3-\sqrt{3}}{3}\right)}{2} = 50\left(\frac{3-\sqrt{3}}{3}\right) m / min$$

**36.** 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 covered in downstream = 30 km and

Distance covered in 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)

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

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

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

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

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

$\therefore\ x^2 = 25$

$\therefore\ x = 5$ or $-5$

Speed is always positive,

$\therefore\ x = 5$

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