CBSE Board
Class X Mathematics
Sample Paper 1 (Standard) – Solution

Part A
Section I

1.

$(2^3 \times 3 \times 5)$ and $(2^4 \times 5 \times 7)$

$\text{LCM} = 2^4 \times 3 \times 5 \times 7 = 1680$

OR

Prime factorization of 1152 = $2^7 \times 3^2$

Prime factorization of 1664 = $2^7 \times 13$

HCF(1152, 1664) = 2^7 = 128

Hence, the largest number is 128, which divides 1152 and 1664 exactly.

2.

$\frac{2x}{3} - \frac{y}{2} + \frac{1}{6} = 0$

Multiply by the LCM, 6.

$\Rightarrow 4x - 3y + 1 = 0$

$\Rightarrow 4x - 3y = -1 \quad ....(i)$

$\frac{x}{2} + \frac{2y}{3} = 3$

Multiply by the LCM, 6.

$\Rightarrow 3x + 4y = 18 \quad ....(ii)$

Multiply equation (i) and (ii) by 4 and 3 respectively.

$16x - 12y = -4 \quad ....(iii)$

$9x + 12y = 54 \quad ....(iv)$

Adding equations (iii) and (iv), we get

$25x = 50$

$\Rightarrow x = 2$

Substituting $x = 2$ in (ii), we get $y = 3$.

3.

$$\tan 5^\circ \tan 25^\circ \tan 30^\circ \tan 65^\circ \tan 85^\circ$$
$$= \tan 5^\circ \times \tan 25^\circ \times \frac{1}{\sqrt{3}} \times \tan(90^\circ - 25^\circ) \times \tan(90^\circ - 5^\circ)$$
$$= \tan 5^\circ \times \tan 25^\circ \times \frac{1}{\sqrt{3}} \times \cot 25^\circ \times \cot 5^\circ$$
$$= \tan 5^\circ \times \cot 5^\circ \times \tan 25^\circ \times \cot 25^\circ \times \frac{1}{\sqrt{3}}$$
$$= 1 \times 1 \times \frac{1}{\sqrt{3}}$$
$$= \frac{1}{\sqrt{3}}$$

4.

$\text{Since } \cos 90^\circ = 0$

$\cos 1^\circ \cos 2^\circ \cos 3^\circ ... \cos 90^\circ ... \cos 180^\circ = 0$

5.

The distance of the point $P(-3, 4)$ from the x-axis

$=$ y-coordinate of the point

$= 4$ units

6.

We know that all the sides of a square are equal.

Let each side of the square $= x$ m

Area of the square $= (\text{side})^2$

$\Rightarrow 6050 = x^2$

$\Rightarrow x = 77.78$

$\Rightarrow$ Each side of the square $= 77.8$ m

We know that,

Length of the diagonal $= \sqrt{2}\,x$

$= 1.414 \times 77.8$

$= 110$ m

7.

Let α and $\frac{1}{\alpha}$ be the zeros of $3x^2 + 8x + k$.

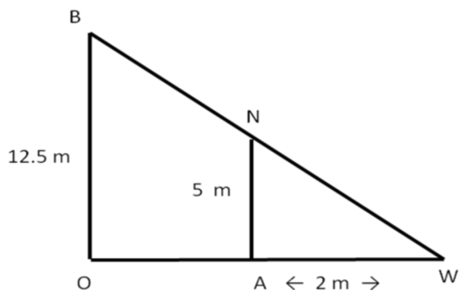
Then, we have

$$\alpha \times \frac{1}{\alpha} = \frac{k}{3}$$

$\Rightarrow 1 = \frac{k}{3}$

$\Rightarrow k = 3$

8.



Let AN be the long stick and AW be its shadow.

Let OB be the tree and OW be its shadow.

$AW = 2\text{ m}$

$AN = 5\text{ m}$

$OB = 12.5\text{ m}$

Ratio of actual lengths = Ratio of their shadows

$\Rightarrow \frac{OB}{AN} = \frac{OW}{AW}$

$\Rightarrow \frac{12.5}{5} = \frac{OW}{2}$

$\Rightarrow OW = \frac{12.5 \times 2}{5}$

$\Rightarrow OW = 5.0\text{ m}$

So, the length of the shadow is 5.0 m

9.

The sum of first n terms of an AP is $(3n^2 + 6n)$.

$S_n = 3n^2 + 6n$

$\Rightarrow S_{n-1} = 3(n-1)^2 + 6(n-1)$

$= 3(n^2 - 2n + 1) + 6(n-1)$

$= 3n^2 - 6n + 3 + 6n - 6$

$= 3n^2 - 3$

$a_n = S_n - S_{n-1}$

$= 3n^2 + 6n - 3n^2 + 3$

$= 6n + 3$

Let d be the common difference of the AP.

$d = a_n - a_{n-1}$

$= (6n+3) - [6(n-1)+3]$

$= (6n+3) - 6(n-1) - 3$

$= 6$

OR

The given AP is 21, 18, 15,...

$a = 21$ and $d = 18 - 21 = -3$

$a_n = a + (n-1)d$

$\Rightarrow -81 = 21 + (n-1)(-3)$

$\Rightarrow -81 = 21 + (n-1)(-3)$

$\Rightarrow -81 = 21 - 3n + 3$

$\Rightarrow 3n = 105$

$\Rightarrow n = 35$

So, -81 is the 35th term.

10.

$PT = 24$ cm

$OT = 7$ cm

Since PT is a tangent to the circle at T.

$\angle PTO = 90°$ ....(tangent is perpendicular to the radius of a circle)

In ΔPTO,

By Pythagoras theorem,

$OP^2 = PT^2 + OT^2$

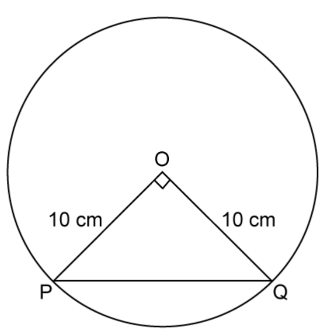
$\Rightarrow OP^2 = 24^2 + 7^2$

$\Rightarrow OP^2 = 576 + 49$

$\Rightarrow OP^2 = 625$

$\Rightarrow OP = 25$ cm

OR



In ΔPOQ,
By Pythagoras theorem,
$PQ^2 = PO^2 + OQ^2$
$\Rightarrow PQ^2 = 10^2 + 10^2$
$\Rightarrow PQ^2 = 100 + 100$
$\Rightarrow PQ^2 = 200$
$\Rightarrow PQ = 10\sqrt{2}$ cm
So, the length of the chord is $10\sqrt{2}$ cm.

11.
Let E be the event.
So, the probability of the event happening will be P(E).
Thus, the probability of the event not happening will be P(E').
Given that, $P(E) = p$
We know that, $P(E) + P(E') = 1$
$\Rightarrow p + P(E') = 1$
$\Rightarrow P(E') = 1 - p$

OR

Let A be the event of getting a number which is odd.
S = {1, 2, 3, 4, 5, 6, 7, 8, 9} and A = {1, 3, 5, 7, 9}
n(S) = 9 and n(A) = 5
P(A) = 5/9

12.
$x^2 - 2x - 3 = 0$
$\Rightarrow x^2 - 3x + x - 3 = 0$
$\Rightarrow x(x - 3) + (x - 3) = 0$
$\Rightarrow (x - 3)(x + 1) = 0$
$\Rightarrow x = 3$ or $x = -1$

13.
y = 0 is the x-axis.
y = –5 is the line parallel to x-axis at a distance of 5 units.
Both the lines are parallel to each other. So, they don't meet anywhere.
Hence, no solution exists.

14.
$2x^2 + px + 8 = 0$
$\Rightarrow a = 2, b = p$ and $c = 8$
The given quadratic equation has real and equal roots.
$\Rightarrow b^2 - 4ac = 0$
$\Rightarrow p^2 - 4 \times 2 \times 8 = 0$

$\Rightarrow p^2 = 64$

$\Rightarrow p = \pm 8$

OR

It is given that α and β are the zeros of the quadratic polynomial $f(x) = x^2 + 2x + 1$

$\therefore \alpha+\beta=-\frac{2}{1}=-2$ and $\alpha\beta=\frac{1}{1}=1$

Now, $\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\beta+\alpha}{\alpha\beta}=\frac{-2}{1}=-2$

15.

Let the numbers be a and 81.

$\text{HCF}\times\text{LCM}=$ product of the two numbers

$\Rightarrow 27\times162=81a$

$\Rightarrow a=54$

So, the other number is 54.

16.

$\Delta ABC \sim \Delta DEF$

$\Rightarrow \frac{AB}{DE}=\frac{BC}{EF}$

$\Rightarrow \frac{1}{2}=\frac{6}{EF}$

$\Rightarrow EF=12$ cm

Section II

17.

(a) Mid-point of J and I = $\left(\frac{6+9}{2},\frac{17+16}{2}\right)=\left(\frac{15}{2},\frac{33}{2}\right)$

(b) The distance of the point P from the y – axis is 4m.

(c) The distance between A and S is 16m.

(d) Coordinates of A are (1, 8) and that of B are (5, 10)
Coordinates of a point dividing AB in the ratio 1:3 is

$$\left(\frac{1\times5+3\times1}{1+3},\frac{1\times10+3\times8}{1+3}\right)=\left(2,\frac{17}{2}\right)=(2.0,8.5)$$

(e) (x, y) is equidistant from Q(9, 8) and S(17, 8).

$\Rightarrow (9-x)^2 + (8-y)^2 = (17-x)^2 + (8-y)^2$

$\Rightarrow 81 - 18x = 289 - 34x$

$\Longrightarrow 16x = 208$
$\Longrightarrow x = 13$
$\Longrightarrow x - 13 = 0$

18.

(a) Width of the scale model = $\frac{1}{4} \times$ width of the boat $= \frac{1}{4} \times 60 = 15\text{cm}$

(b) If any two polygons are not the mirror image of one another then there similarity will effect.

(c) We know that,

Scale factor = $\frac{\text{length in image}}{\text{corresponding length in object}}$

If two similar triangles have a scale factor of a: b then their altitudes have a ratio a: b

(d) This is an example of similarity.

$\Rightarrow \frac{5}{2} = \frac{12.5}{\text{Shadow of a tree}}$

$\Rightarrow \text{Shadow of a tree} = \frac{25}{5} = 5\text{m}$

(e) Here, ΔTEF and ΔTAB are similar triangles as they form the equal angles

Therefore, the ratio of their corresponding sides is same.

As E and F are the midpoints TA and TB, so TE = 6m and TF = 6m

$\frac{EF}{AB} = \frac{TE}{TA} = \frac{1}{2} \Rightarrow EF = 6\text{m}$

19.

(a) $x^2 - 2x - 8 = x^2 - 4x + 2x - 8 = x(x - 4) + 2(x - 4) = 0$

$\Longrightarrow (x - 4)(x + 2) = 0$

$\Longrightarrow x = 4$ or $x = -2$

(b) Zeroes of a polynomial can be expressed graphically. Number of zeroes of polynomial is equal to number of points where the graph of polynomial **Intersects x – axis.**

(c) Graph of a quadratic polynomial is a Parabola.

(d) A highway underpass is parabolic in shape and a parabola is the graph that results from $p(x)=ax^2+bx+c$ which has two zeroes. (As it is a quadratic polynomial)

Sum of zeroes = 0 and one of the zero = 6 $\Longrightarrow$ other zero = –6

x^2 – (sum of zeroes)x + product of zeroes

$= x^2 - 36$

(e) $f(x) = (x - 2)^2 + 4 = x^2 - 4x + 8$ is a Quadratic Polynomial.

The number of zeroes that f(x) can have is 2

20.

(a)

Time (in sec)	No. od students(f)	x	fx
0 – 20	8	10	80
20 – 40	10	30	300
40 – 60	13	50	650
60 – 80	6	70	420
80 – 100	3	90	270
	$\Sigma f = 40$		$\Sigma fx = 1720$

Mean time taken by a student to finish the race = 1720/40 = 43 seconds

(b) The modal class is 40 – 60 as it has the highest frequency i.e 13.
Upper limit of the modal class = 60

(c) The construction of cumulative frequency table is useful in determining the Median.

(d)

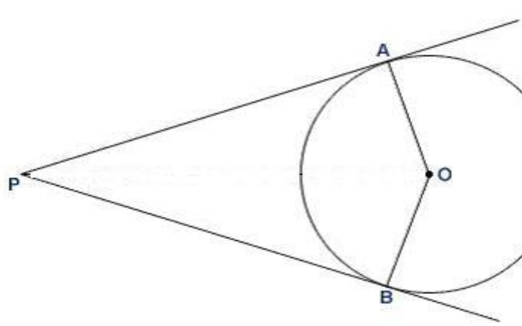
Time (in sec)	**No. od students(f)**	**cf**
0 – 20	8	8
20 – 40	10	18
40 – 60	13	31
60 – 80	6	37
80 – 100	3	40
	N= $\Sigma f = 40$	

Here N/2 = 40/2 = 20, Median Class = 40 – 60, Modal Class = 40 – 60
Sum of lower limits of median class and modal class = 40 + 40 = 80

(e) Number of students who finished the race within 1 minute
= 8 + 10 + 13 = 31

Part B
Section III

21.



Given: PA and PB are the tangents drawn from a point P to a circle with center O.

Also, the line segments OA and OB are drawn.
To prove: $\angle APB + \angle AOB = 180°$

Proof:

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

$\therefore PA \perp OA \Rightarrow \angle OAP = 90°$

$\therefore PB \perp OB \Rightarrow \angle OBP = 90°$

$\therefore \angle OAP + \angle OBP = 90° + 90° = 180°$ ....(i)

But, we know that the sum of all the angles of a quadrilateral is 360°.

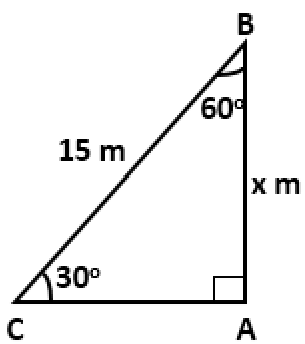
$\therefore \angle OAP + \angle OBP + \angle APB + \angle AOB = 360°$ ....(ii)

From (i) and (ii), we get

$\angle APB + \angle AOB = 180°$

Hence proved.

22.



Let BC be the ladder and AB be the wall.

Then, $BC = 15$ m

$\angle ABC = 60°$

$\Rightarrow \angle ACB = 90° - 60° = 30°$

Let the height of the wall $AB = x$ m

Now, $\sin 30° = \dfrac{AB}{BC}$

$\Rightarrow \dfrac{1}{2} = \dfrac{x}{15}$

$\Rightarrow x = \dfrac{15}{2}$ m

OR

$$\frac{2\sin^2 63^\circ + 1 + 2\sin^2 27^\circ}{3\cos^2 17^\circ - 2 + 3\cos^2 73^\circ}$$

$$= \frac{2\sin^2 63^\circ + 2\sin^2 27^\circ + 1}{3\cos^2 17^\circ + 3\cos^2 73^\circ - 2}$$

$$= \frac{2\sin^2 63^\circ + 2\cos^2 63^\circ + 1}{3\cos^2 17^\circ + 3\sin^2 17^\circ - 2}$$

$$= \frac{2(\sin^2 63^\circ + \cos^2 63^\circ) + 1}{3(\cos^2 17^\circ + \sin^2 17^\circ) - 2}$$
$$= \frac{2 \times 1 + 1}{3 \times 1 - 2}$$
$$= \frac{2 + 1}{3 - 2}$$
$$= 3$$

23.

Since the point lies on the x-axis, let the point be P and its coordinates be $(x,0)$.

Given that the point is equidistant from the points A and B.

$\Rightarrow PA = PB$

$\Rightarrow \sqrt{(x+1)^2} = \sqrt{(x-5)^2}$

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

$\Rightarrow x^2 + 2x + 1 = x^2 - 10x + 25$

$\Rightarrow 2x + 1 = -10x + 25$

$\Rightarrow 12x = 24$

$\Rightarrow x = 2$

Hence, the point is $(2,0)$.

OR

Given that R is the mid-point of the line segment AB.

The x $-$ coordinate of $R = \frac{x+4}{2}$ and the y-coordinate of $R = \frac{5+y}{2}$

$\Rightarrow 5 = \frac{x+4}{2}$ and $6 = \frac{5+y}{2}$

$\Rightarrow 10 = x + 4$ and $12 = 5 + y$

$\Rightarrow x = 6$ and $y = 7$

24.

Since -4 is a zero of $f(x) = (k-1)x^2 + kx + 1$, we have

$f(-4) = 0$

$\Rightarrow (k-1)(-4)^2 + k(-4) + 1 = 0$

$\Rightarrow (k-1)16 - 4k + 1 = 0$

$\Rightarrow 16k - 16 - 4k + 1 = 0$

$\Rightarrow 12k - 15 = 0$

$\Rightarrow 12k = 15$

$\Rightarrow k = \frac{15}{12} = \frac{5}{4}$

25.

i. a, a – 2, 3a are in A.P.

$\Rightarrow 2(a - 2) = a + 3a$

$\Rightarrow 2a - 4 = 4a$

$\Rightarrow 2a = -4$

$\Rightarrow a = -2$

ii. $a = 8$, $T_n = 62$ and $S_n = 210$

$S_n = 210$

$$\Rightarrow \frac{n}{2}(a + T_n) = 210$$

$$\Rightarrow \frac{n}{2}(8 + 62) = 210$$

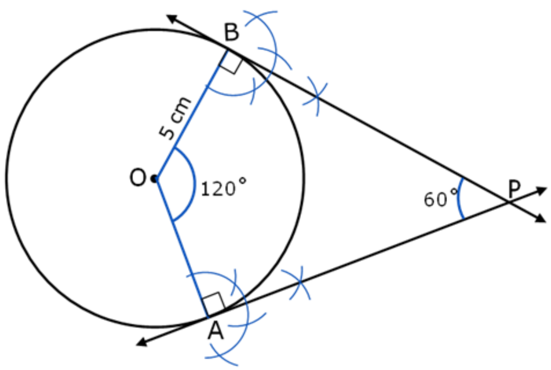
$$\Rightarrow 35n = 210 \Rightarrow n = 6$$

26.

i. Draw circle with centre O and radius OA = 5 cm. Mark B on the circle such that $\angle AOB = 120°$.

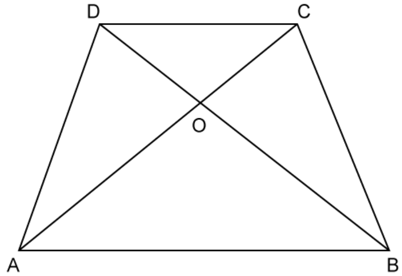
ii. Construct angles of 90° at A and B and extend the lines so as to intersect at point P.

iii. Thus, AP and BP are the required tangents to the circle.



Section IV

27.



The diagonals of a trapezium divide each other proportionally.

$\angle CDO = \angle OBA$ ....(alternate angles)

$\angle COD = \angle AOB$ ....(vertically opposite angles)

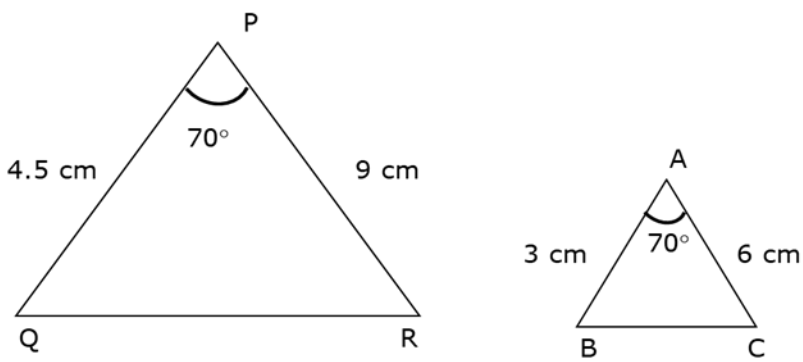
$\Rightarrow \Delta COD \sim \Delta AOB$ ...(AA criterion for similarity)

$$\Rightarrow \frac{ar(\Delta COD)}{ar(\Delta AOB)} = \frac{CD^2}{AB^2}$$

$$\Rightarrow \frac{ar(\Delta COD)}{84} = \frac{1^2}{2^2}$$

$$\Rightarrow ar(\Delta COD) = 21 \text{ cm}^2$$

OR



In ΔABC and ΔPQR,

$\angle A = \angle P = 70°$ ....(Given)

$$\frac{AB}{PQ} = \frac{3}{4.5} = \frac{2}{3}$$

$$\frac{AC}{PR} = \frac{6}{9} = \frac{2}{3}$$

$$\Rightarrow \frac{AB}{PQ} = \frac{AC}{PR}$$

So, $\Delta ABC \sim \Delta PQR$ ....(SAS criterion for similarity)

28.

Let the number of solid spheres be n.

Given Diameter of sphere $= 6$ cm $\Rightarrow$ radius $= 3$ cm

Diameter of cylinder $= 4$ cm

$\Rightarrow$ radius $= 2$ cm and height of the cylinder $= 45$ cm

Now,

Volume of the cylinder $=$ Volume of the sphere $\times$ n

$\Rightarrow \pi r^2 h = \frac{4}{3}\pi r^3 \times n$

$\Rightarrow \pi \times 2 \times 2 \times 45 = \frac{4}{3} \times \pi \times 3 \times 3 \times 3 \times n$

$\Rightarrow 45 = 9 \times n$

$\Rightarrow n = \frac{45}{9}$

$\Rightarrow n = 5$

Hence, number of solid spheres is 5.

29.

We have $\frac{2}{\sqrt{7}} = \frac{2}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{2\sqrt{7}}{7}$ ...(i)

Let $\frac{2}{\sqrt{7}}$ be rational.

Then, from (i), $\frac{2}{7}\sqrt{7}$ is rational.

Now, $\frac{7}{2}$ is rational, $\frac{2}{7}\sqrt{7}$ is rational.

$\Rightarrow \left(\frac{7}{2} \times \frac{2}{7}\sqrt{7}\right)$ is rational.

$\Rightarrow \sqrt{7}$ is rational.

Thus, from (i), it follows that $\sqrt{7}$ is rational.

This contradicts the fact that $\sqrt{7}$ is irrational.

The contradiction arises by assuming that $\frac{2\sqrt{7}}{7}$ is rational.

Hence, $\frac{2\sqrt{7}}{7}$ is irrational.

30.

We have,

Class interval	Frequency f_i	Mid-value x_i	$f_i \times x_i$
$0-10$	16	5	80
$10-20$	p	15	15p
$20-30$	30	25	750
$30-40$	32	35	1120
$40-50$	14	45	630
	$\sum f_i = 92 + p$		$\sum f_i x_i = 2580 + 15p$

$$\text{Now, Mean} = \frac{\sum f_i x_i}{\sum f_i}$$

$$\Rightarrow 25 = \frac{2580 + 15p}{92 + p}$$

$$\Rightarrow 25(92 + p) = 2580 + 15p$$

$$\Rightarrow 2300 + 25p = 2580 + 15p$$

$$\Rightarrow 10p = 280$$

$$\Rightarrow p = 28$$

31.

In right triangle ABC,

$$\sin 45^\circ = \frac{BC}{AC}$$

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

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

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

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

32.

Consider the following table:

Let A = 225

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

C.I.	fi	xi	di	fidi
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

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

33.

$23x + 29y = 98$ .....(i) and

$29x + 23y = 110$ .....(ii)

Adding (i) and (ii), we get

$52x + 52y = 208$

$\Rightarrow x + y = 4$ .....(iii)

Subtract (i) from (ii), we get

$6x - 6y = 12$

$\Rightarrow x - y = 2$ .....(iv)

Adding (iii) and (iv), we get

$2x = 6$

$\Rightarrow x = 3$

Substituting $x = 3$ in (iii), we get $y = 1$.

Hence, $x = 3$ and $y = 1$.

OR

$6x + 3y = 7xy$ and $3x + 9y = 11xy$

Dividing throughout by xy, we get

$\frac{6}{y} + \frac{3}{x} = 7$ and $\frac{3}{y} + \frac{9}{x} = 11$

$\frac{3}{x} + \frac{6}{y} = 7$ and $\frac{9}{x} + \frac{3}{y} = 11$

Put $\frac{1}{x} = u$ and $\frac{1}{y} = v$

So, we get

$3u + 6v = 7 \ldots (i)$ and $9u + 3v = 11 \ldots (ii)$

Multiply (i) by 3 and subtract (ii) from the resultant.

$\Rightarrow 9u + 18v = 21 \quad \text{and} \quad 9u + 3v = 11$

$\Rightarrow 15v = 10$

$\Rightarrow v = \frac{2}{3}$

Substituting $v = \frac{2}{3}$ in (i), we get $u = 1$.

$\Rightarrow \frac{1}{x} = 1 \text{ and } \frac{1}{y} = \frac{2}{3}$

$\Rightarrow x = 1 \text{ and } y = \frac{3}{2}$

Section V

34.

Let x hours be the time taken by the pipe to fill the tank.

$\because$ The water is flowing at the rate of 4 km/hr,

$\therefore$ Length of the water column in x hours is $4x \text{ km} = 4000x \text{ m}$.

$\therefore$ The length of the pipe is 4000x m

The diameter of the pipe $= 20$ cm

$\Rightarrow$ radius $= 10$ cm

$= \frac{10}{100}$ m

$= 0.1$ m

$\therefore$ Volume of the water flowing through the pipe in x hours $= V_1$

$$= \pi r^2 h$$
$$= \pi \times (0.1)^2 \times 4000x \quad ...(i)$$

Given Diameter of the cylindrical tank $= 10$ m

$\Rightarrow$ radius $= 5$ m and

Volume of the water that falls into the tank in x hours $= V_1$

$$= \pi r^2 h$$
$$= \pi \times (5)^2 \times 2 \quad ...(ii)$$

$\therefore$ Volume of the water flowing through the pipe in x hours

= Volume of the water that falls into the tank in x hours

$\Rightarrow \pi \times (0.1)^2 \times 4000x = \pi \times (5)^2 \times 2$

$\Rightarrow 40x = 50$

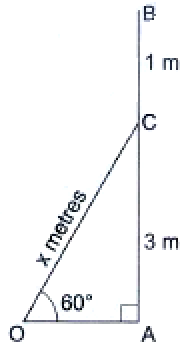
$\Rightarrow x = \frac{50}{40}$ hour

$\Rightarrow x = \frac{50}{40} \times 60$ minutes

$\Rightarrow x = 75$ minutes $= 1$ hour 15 mins

Thus, the water in the tank will be filled in 1 hour 15 minutes.

35.



Let AB be the electric pole such that $AB = 4$ m.

Let C be a point 1 m below B.

$\Rightarrow AC = 4\text{ m} - 1\text{ m} = 3\text{ m}$

Let OC be the ladder = x metres.

Then, $\angle AOC = 60°$.

In right ΔOAC,

$$\text{cosec}\,60° = \frac{OC}{AC}$$

$$\Rightarrow \frac{2}{\sqrt{3}} = \frac{x}{3}$$

$$\Rightarrow x = \frac{6}{\sqrt{3}}$$

On rationalising we get,

$$x = \frac{6}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$\Rightarrow x = \frac{6\sqrt{3}}{3}$$

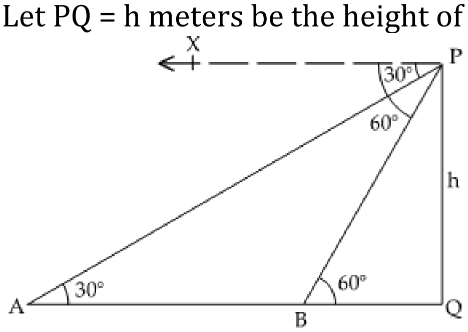
$$\Rightarrow x = 2\sqrt{3}$$

$$\Rightarrow x = 2 \times 1.73 = 3.46\text{ m}$$

Hence, the length of the ladder should be 3.46 m.

OR

Let PQ = h meters be the height of the tower. P is the top of the tower.



The first and second positions of the car are at A and B respectively.

$\angle APX = 30° \Rightarrow \angle PAQ = 30°$

$\angle BPX = 60° \Rightarrow \angle PBQ = 60°$

Let the speed of the car be x m/second

Then, distance AB = 6x meters

Let the time taken from B to Q be ‘n’ seconds

$\therefore$ BQ = nx metres

In $\triangle$ PAQ,

$$\frac{h}{6x+nx} = \tan 30^{o} = \frac{1}{\sqrt{3}}$$

$$\therefore h = \frac{(n+6)x}{\sqrt{3}} \quad ... (1)$$

In $\triangle$ PBQ,

$$\frac{h}{nx} = \tan 60^{o} = \sqrt{3}$$

$$\therefore h = nx\left(\sqrt{3}\right) \quad ... (2)$$

From (1) and (2),

$$\frac{(n+6)x}{\sqrt{3}} = nx\left(\sqrt{3}\right)$$

$$nx + 6x = 3nx \Rightarrow n = 3$$

Hence, the time taken by the car to reach the foot of the tower from B is 3 seconds.

36.

Suppose B alone takes x days to finish the work.

Then, A alone can finish it in $(x-10)$ days.

Now, $(\text{A's one day's work}) + (\text{B's one day work}) = \frac{1}{x-10} + \frac{1}{x}$

And, $(A+B)\text{'s one day's work} = \frac{1}{12}$

$$\therefore \frac{1}{x-10} + \frac{1}{x} = \frac{1}{12}$$

$$\Rightarrow \frac{x+x-10}{x(x-10)} = \frac{1}{12}$$

$$\Rightarrow 12(2x-10) = x(x-10)$$

$$\Rightarrow 24x - 120 = x^2 - 10x$$

$$\Rightarrow x^2 - 34x + 120 = 0$$

$$\Rightarrow x^2 - 30x - 4x + 120 = 0$$

$\Rightarrow x(x-30)-4(x-30)=0$

$\Rightarrow (x-30)(x-4)=0$

$\Rightarrow x-30=0 \text{ or } x-4=0$

$\Rightarrow x=30 \text{ or } x=4$

Since x cannot be less than 10, $x \neq 4$.

$\Rightarrow x=30$

Hence, B alone can finish the work in 30 days.