

## CBSE Class 10 Maths Paper Solution

**Q1** The probability of an event is always greater than or equal to zero and less than or equal to one.

Here,

$$\frac{3}{5} = 0.6$$

$$25\% = \frac{25}{100} = 0.25$$

Therefore, 0.6, 0.25 and 0.3 are greater than or equal to 0 and less than or equal to 1.

But 1.5 is greater than 1.

Thus, 1.5 cannot be the probability of an event.

The correct answer is A.

**Q2.** Let the coordinates of point A be ( X, Y).

It is given that P (0, 4) is the mid-point of AB.

$$\therefore (0, 4) = \left(\frac{x-2}{2}, \frac{y+3}{2}\right)$$

$$\Rightarrow \frac{x-2}{2} = 0 \text{ and } \frac{y+3}{2} = 4$$

$$\Rightarrow x - 2 = 0 \text{ and } y + 3 = 8$$

$$\Rightarrow x = 2 \text{ and } y = 5$$

Thus, the coordinates of point A are (2, 5).

The correct answer is A.

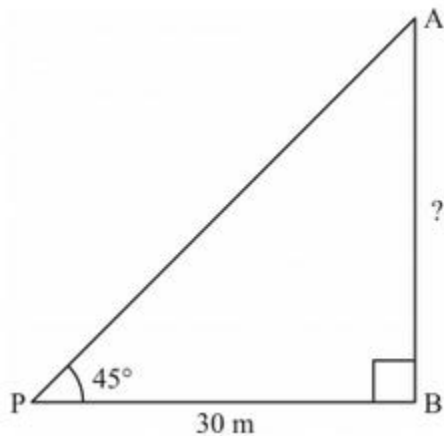
**Q3.** The point P divides the line segment joining the point A (2, -5) and (5, 2) in the ratio 2: 3.

$$\begin{aligned}\therefore P &= \left( \frac{2 \times 5 + 3 \times 2}{2 + 3}, \frac{2 \times 2 + 3 \times (-5)}{2 + 3} \right) \\ &= \left( \frac{10 + 6}{5}, \frac{4 - 15}{5} \right) \\ &= \left( \frac{16}{5}, \frac{-11}{5} \right)\end{aligned}$$

The point P  $\left(\frac{16}{5}, \frac{-11}{5}\right)$  lies in quadrant IV.

The correct answer is D.

**Q4.**



Let AB be the tower and P be the point on the ground.

It is given that  $BP = 30 \text{ m}$ ,  $\angle P = 45^\circ$

$$\text{Now, } \frac{AB}{BP} = \tan 45^\circ$$

$$\Rightarrow \frac{AB}{30 \text{ m}} = 1$$

$$\Rightarrow AB = 30\text{m}$$

Thus, the height of the tower is 30m.

The correct answer is B.

**Q5.** Radius of the sphere =  $\frac{18}{2}$  cm = 9 cm

$$\text{Radius of the cylinder} = \frac{36}{2} \text{ cm} = 18 \text{ cm}$$

Let the water level in the cylinder rises by h cm.

After the sphere is completely submerged.

Volume of the sphere = Volume of liquid raised in the cylinder

$$\Rightarrow \frac{4}{3} \pi (9\text{cm})^3 = \pi (18\text{cm})^2 \times h$$

$$\Rightarrow h = \frac{4 \times 9 \times 9 \times 9}{3 \times 18 \times 18} \text{cm}$$

$$\Rightarrow h = 3\text{cm}$$

Thus, the water level in the cylinder rises by 3 cm.

The correct answer is A.

**Q6.** It is given that  $\angle AOB = 100^\circ$

$\triangle AOB$  is isosceles because

$$OA = OB = \text{radius}$$

$$\therefore \angle OAB = \angle OBA$$

$$\angle AOB + \angle OAB + \angle OBA = 180^\circ \text{ [Angle sum property of triangle]}$$

$$\Rightarrow 100^\circ + \angle OAB + \angle OAB = 180^\circ$$

$$\Rightarrow 2 \angle OAB = 80^\circ$$

$$\Rightarrow \angle OAB = 40^\circ$$

Now,  $\angle OAT = 90^\circ$  [AT is tangent and OA is radius]

$$\text{Thus, } \angle BAT = \angle OAT - \angle OAB = 90^\circ - 40^\circ = 50^\circ$$

The correct answer is C.

**Q 7.** Since PA and PB are tangents to the circle from an external point O.

Therefore,  $PA = PB$

$\therefore \triangle PAB$  is an isosceles triangle where  $\angle PAB = \angle PBA$

$$\angle P + \angle PAB + \angle PBA = 180^\circ \text{ [angle sum property of triangle]}$$

$$\Rightarrow 60^\circ + 2\angle PAB = 180^\circ$$

$$\Rightarrow 2\angle PAB = 180^\circ - 60^\circ = 120^\circ$$

$$\Rightarrow \angle PAB = \frac{120}{2} = 60^\circ$$

It is known that the radius is perpendicular to the tangent at the point of contact.

$$\therefore \angle OAP = 90^\circ$$

$$\Rightarrow \angle PAB + \angle OAB = 90^\circ$$

$$\Rightarrow \angle OAB = 90^\circ - 60^\circ = 30^\circ$$

The correct answer is A.

**Q 8.** The roots of the equation is  $x^2 + x - p(p+1) = 0$ , where p is a constant.

Its solution can be solved by using quadratic formula  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .

This can be done as

On comparing the given equation with  $ax^2 + bx + c = 0$

$$a = 1, b = 1, c = -p(p+1)$$

$$\therefore x = \frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times \{-p(p+1)\}}}{2 \times 1}$$

$$x = \frac{-1 \pm \sqrt{1 - 4(-p^2 - p)}}{2}$$

$$= \frac{-1 \pm \sqrt{(2p+1)^2}}{2}$$

$$= \frac{-1 \pm (2p+1)}{2}$$

$$= \frac{-1 + (2p+1)}{2} \text{ or } \frac{-1 - (2p+1)}{2}$$

$$= \frac{-1 + (2p+1)}{2} = \frac{2p}{2} = p$$

$$= \frac{-1 - (2p+1)}{2} = \frac{-2 - 2p}{2} = -1 - p = -(p+1)$$

Therefore, the roots are given by  $x = p, -(p+1)$

The correct answer is C.

**Q9.** We have,  $a = 15$  and  $d = -3$

$$\text{Given } a_n = 0$$

$$\Rightarrow a + (n-1)d = 0$$

$$\Rightarrow 15 + (n-1)(-3) = 0$$

$$\Rightarrow 15 - 3n + 3 = 0$$

$$\Rightarrow -3n = -18$$

$$\Rightarrow n = 6$$

The correct answer is B.

**Q10.** Let the radius of the required circle be  $r$  cm.

Area of required circle = area of circle of radius 8 cm + area of circle of radius 6 cm

$$\Rightarrow \pi r^2 = \pi (8 \text{ cm})^2 + \pi (6 \text{ cm})^2$$

$$\Rightarrow r^2 = 64 \text{ cm}^2 + 36 \text{ cm}^2$$

$$\Rightarrow r^2 = 100 \text{ cm}^2$$

$$\Rightarrow r = 10 \text{ cm}$$

Thus, the diameter of the required circle is  $2 \times 10 \text{ cm} = 20 \text{ cm}$ .

The correct answer is C.

**Q11.** Let  $E$  be the event of getting both heads or both tails.

The sample space for the given experiment is  $\{(H, H), (H, T), (T, H), (T, T)\}$

Total number of outcomes = 4

Favorable outcomes =  $\{(H, H), (T, T)\}$

Favorable number of outcomes = 2

Required probability,  $P(E) = \frac{\text{Favorable number of outcomes}}{\text{Total number of outcomes}}$

$$= \frac{2}{4} = \frac{1}{2}$$

**Q12.** The given quadratic equation is  $mx(5x - 6) + 9 = 0$

$$\therefore 5mx^2 - 6mx + 9 = 0 \dots\dots(1)$$

For equation (1) to have equal roots, the discriminant of the equation D should be 0.

$$\Rightarrow (-6m)^2 - 4 \times 5m \times 9 = 0$$

$$\Rightarrow 36m^2 - 180m = 0$$

$$\Rightarrow 36m(m - 5) = 0$$

$$\Rightarrow m = 0 \text{ or } m - 5 = 0$$

$$\Rightarrow m = 5 \text{ (If } m = 0, \text{ then equation (1) will not be a quadratic equation)}$$

Thus, the value of  $m$  is 5.

**Q 13.** It is given that the distance between the points P (x, 4) and Q (9, 10) is 10 units.

$$\text{Let } x_1 = x, y_1 = 4, x_2 = 9, y_2 = 10$$

Applying distance formula, it is obtained.

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

$$10 = \sqrt{(9 - x)^2 + (10 - 4)^2}$$

$$10 = \sqrt{81 + x^2 - 18x + 36}$$

$$10 = \sqrt{x^2 - 18x + 117}$$

On squaring both sides, it is obtained.

$$100 = x^2 - 18x + 117$$

$$\Rightarrow x^2 - 18x + 17 = 0$$

$$\Rightarrow x^2 - 17x - x + 17 = 0$$

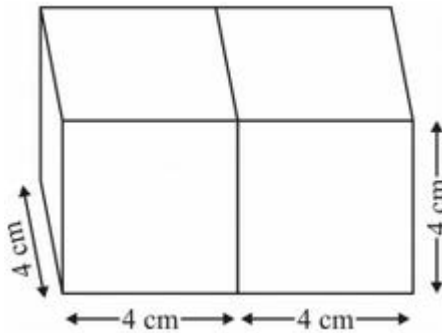
$$\Rightarrow x(x - 17) - 1(x - 17) = 0$$

$$\Rightarrow (x - 1)(x - 17) = 0$$

$$\Rightarrow x = 1, 17$$

Thus, the values of  $x$  are 1 and 17.

**Q14.** If two cubes of sides 4 cm are joined end to end, then the length ( $l$ ), breadth ( $b$ ) and height ( $h$ ) of the resulting cuboid are 8 cm, 4 cm, and 4 cm, respectively.



$$\therefore \text{Surface area of the resulting cuboid} = 2(lb + bh + lh)$$

$$= 2(8 \text{ cm} \times 4 \text{ cm} + 4 \times 4 \text{ cm} + 8 \text{ cm} \times 4 \text{ cm})$$

$$= 2 \times (32 + 16 + 32) \text{ cm}^2$$

$$= 160 \text{ cm}^2$$

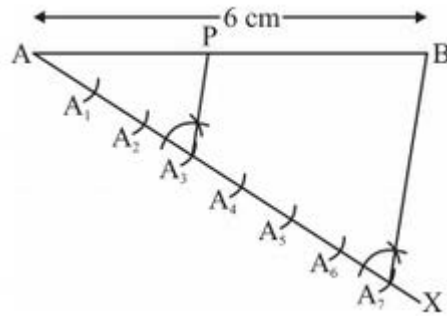
Thus, the surface area of the resulting cuboid is  $160 \text{ cm}^2$ .

**Q15.** A point  $P$  can be marked on a line segment of length 6 cm which divides the line segment in the ratio of 3:4 as follows.

- (1) Draw line segment  $AB$  of length 6 cm and draw a ray  $AX$  making an acute angle with line segment  $AB$ .
- (2) Locate 7 ( $3+4$ ) points,  $A_1, A_2, A_3, A_4, \dots, A_7$ , on  $AX$  such that  $AA_1 = A_1A_2 = A_2A_3$  and so on.
- (3) Join  $BA_7$ .
- (4) Through the point  $A_3$ , draw a line parallel to  $BA_7$  (by making an angle equal to  $\angle AA_7B$  at  $A_3$ ),

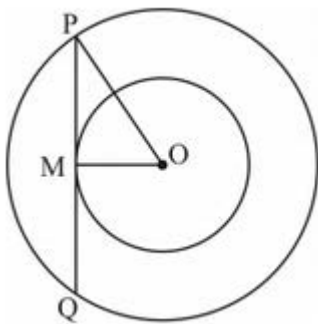


intersecting AB at point P.



P is the point that divides line segment AB of length 6 cm in the ratio of 3:4.

**Q16.** Let O be the centre of the two concentric circles. Let PQ be the chord of larger circle touching the smaller circle at M. This can be represented diagrammatically as:



We have  $PQ = 48$  cm.

Radius of the smaller circle,  $OM = 7$  cm

Let the radius of the larger circle be  $r$ , i.e.  $OP = r$

Since PQ is a tangent to the inner circle,  $OM \perp PQ$

Thus, OM bisects PQ.

$$\Rightarrow PM = MQ = \frac{48}{2} \text{ cm} = 24 \text{ cm}$$

Now applying Pythagoras Theorem in  $\Delta OPM$

$$OP^2 = OM^2 + PM^2$$

$$\Rightarrow OP^2 = (7 \text{ cm})^2 + (24 \text{ cm})^2 = (49+576) \text{ cm}^2 = 625 \text{ cm}^2 = (25 \text{ cm})^2$$

$$\Rightarrow OP = 25 \text{ cm}$$

$\therefore$  Radius of the larger circle is 25 cm.

Thus, the value of  $r$  is 25 cm.

**Q17.** The given A. P. is 17, 12, 7, 2, .....

First term,  $a = 17$

Common difference,  $d = 12 - 17 = -5$

If -150 is a term of the given A.P., then for a natural number  $n$ ,  $a_n = -150$

$$\Rightarrow a + (n-1)d = -150$$

$$\Rightarrow 17 + (n-1)(-5) = -150$$

$$\Rightarrow (-5)(n-1) = -150 - 17 = -167$$

$$\Rightarrow n-1 = \frac{167}{5}$$

$$\Rightarrow n = \frac{167}{5} + 1 = \frac{172}{5} = 34.4$$

Now, 34.4 is not a natural number.

Thus, -150 is not a term of the A.P, 17, 12, 7, 2 .....

**Q18.** Perimeter of the shaded region = Length of APB + Length of ARC + Length CQD + Length of DSB

$$\text{Now, perimeter of APB} = \frac{1}{2} \times 2\pi \left(\frac{7}{2}\right) \text{ cm} = \frac{22}{7} \times \frac{7}{2} \text{ cm} = 11 \text{ cm}$$

$$\text{Perimeter of ARC} = \frac{1}{2} \times 2\pi (7\text{cm}) = \frac{22}{7} \times 7\text{cm} = 22 \text{ cm}$$

$$\text{Perimeter of CQD} = \frac{1}{2} \times 2\pi \left(\frac{7}{2}\right) \text{ cm} = \frac{22}{7} \times \frac{7}{2} \text{ cm} = 11 \text{ cm}$$

$$\text{Perimeter of DSB} = \frac{1}{2} \times 2\pi (7\text{cm}) = \frac{22}{7} \times 7\text{cm} = 22 \text{ cm}$$

Thus, perimeter of the shaded region = 11 cm + 22 cm + 11 cm = 66 cm

OR

Let the radius of the circle be  $r$ .

It is given that perimeter of the circle is 44 cm.

$$\therefore 2\pi r = 44 \text{ cm}$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 44 \text{ cm}$$

$$\Rightarrow r = 7 \text{ cm}$$

Area of a quadrant of a circle

$$\begin{aligned} &= \frac{1}{4} \times \pi r^2 = \frac{1}{4} \times \frac{22}{7} \times (7\text{cm})^2 \\ &= \frac{1}{4} \times \frac{22}{7} \times 49 \text{ cm}^2 = 38.5 \text{ cm}^2 \end{aligned}$$

Thus, the area of a quadrant of the given circle is 38.5 cm<sup>2</sup>.

**Q19.** Let the two given vertices be A (3, 0) and B (6, 0).

Let the coordinates of the third vertex be C (x, y).

It is given that the triangle ABC is equilateral.

Therefore,  $AB = BC = CA$  (Sides of an equilateral triangle)

$$\Rightarrow \sqrt{(6-3)^2 + (0-0)^2} = \sqrt{(x-6)^2 + (y-0)^2} = \sqrt{(x-3)^2 + (y-0)^2}$$

$$\Rightarrow 9 = (x-6)^2 + y^2 = (x-3)^2 + y^2$$

$$\therefore (x-6)^2 + y^2 = (x-3)^2 + y^2$$

$$\Rightarrow -12x + 36 = -6x + 9$$

$$\Rightarrow -6x = -27$$

$$\Rightarrow x = \frac{9}{2}$$

$$\text{Now, } y^2 + (x-6)^2 = 9$$

$$\Rightarrow y^2 + \left(\frac{9}{2} - 6\right)^2 = 9 \quad (\because x = \frac{9}{2})$$

$$\Rightarrow y^2 = 9 - \frac{9}{4}$$

$$\Rightarrow y^2 = \frac{27}{4}$$

$$\Rightarrow y = \pm \sqrt{\frac{27}{4}} = \pm \frac{3\sqrt{3}}{2}$$

Thus, the coordinates' of the third vertex are  $\left(\frac{9}{2}, \frac{3\sqrt{3}}{2}\right)$  or  $\left(\frac{9}{2}, -\frac{3\sqrt{3}}{2}\right)$

OR

Let Q (7, k) divide the line segment joining P (5, 4) and (9, -2) in the ratio  $\lambda: 1$

$$\therefore \text{Coordinates of the Point Q} = \left(\frac{9\lambda+5}{\lambda+1}, \frac{-2\lambda+4}{\lambda+1}\right)$$

$$\therefore \frac{9\lambda+5}{\lambda+1} = 7 \text{ and } k = \frac{-2\lambda+4}{\lambda+1}$$

$$\Rightarrow 9\lambda + 5 = 7\lambda + 7$$

$$\Rightarrow 2\lambda = 2$$

$$\Rightarrow \lambda = 1$$

$$\text{Now, } k = \frac{-2\lambda + 4}{\lambda + 1}$$

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

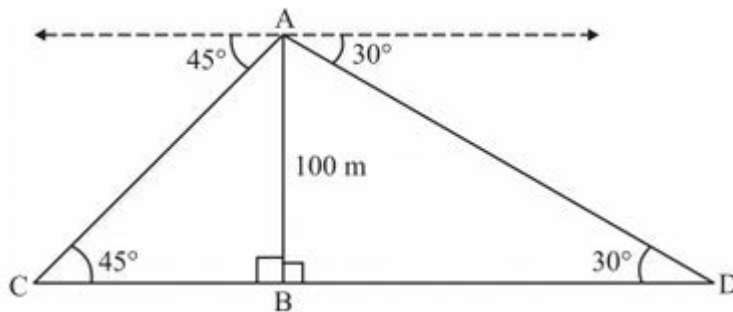
$$\Rightarrow k = \frac{-2 + 4}{2}$$

$$\Rightarrow k = 1$$

Thus, the value of k is 1.

**Q20.**

The given information can be diagrammatically represented as,



Here, AB is the tower of height 100 m. The Points C and D are the position of the two cars.

In right  $\Delta ACB$ ,

$$\tan 45^\circ = \frac{AB}{BC}$$

$$\Rightarrow 1 = \frac{100\text{m}}{BC}$$

$$\Rightarrow BC = 100 \text{ m}$$

In right  $\triangle ABD$

$$\tan 30^\circ = \frac{AB}{BD}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{100\text{m}}{BD}$$

$$\Rightarrow BD = 100\sqrt{3} \text{ m}$$

Distance between the two cars = CD

$$= BC + CD$$

$$= 100\text{m} + 100\sqrt{3}\text{m}$$

$$= 100\text{m} + 100 \times 1.73\text{m}$$

$$= 100\text{m} + 173 \text{ m}$$

$$= 273 \text{ m}$$

Thus, the distance between two cars is 273 m.

**Q21** The sample space of the given experiment is:

$$S = \left\{ \begin{array}{l} (1,1), (1,2), (1,3), (1,4), (1,5), (1,6) \\ (2,1), (2,2), (2,3), (2,4), (2,5), (2,6) \\ (3,1), (3,2), (3,3), (3,4), (3,5), (3,6) \\ (4,1), (4,2), (4,3), (4,4), (4,5), (4,6) \\ (5,1), (5,2), (5,3), (5,4), (5,5), (5,6) \\ (6,1), (6,2), (6,3), (6,4), (6,5), (6,6) \end{array} \right\}$$

$$\therefore n(S) = 36$$

Let E be the event that the product of numbers obtained on the upper face is a perfect square

$$\therefore E = \{(1,1), (1,4), (2,2), (3,3), (4,1), (4,4), (5,5), (6,6)\}$$

$$\therefore n(E) = 8$$

$$P(E) = \frac{n(E)}{n(S)} = \frac{8}{36} = \frac{2}{9}$$

OR

The set of possible outcomes of the given experiment are:

$$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$$

Let E be the event of getting three heads or three tails.

$$\therefore E = \{HHH, TTT\}$$

$$\therefore \text{Probability of winning} = P(E)$$

$$= \frac{n(E)}{n(S)} = \frac{2}{8} = \frac{1}{4}$$

$$\therefore \text{Probability of losing} = P(E')$$

$$= 1 - P(E)$$

$$= 1 - \frac{1}{4} = \frac{3}{4}$$

Therefore, the probability that Hanif will lose the game is  $\frac{3}{4}$ .

**Q22.**

Height of the bucket (which is in the shape of a frustum of a cone),  $h = 15$  cm

Radius of one end of bucket,  $R = 14$  cm

Radius of the other end of the bucket is  $r$ .

It is given that the volume of the bucket is  $5390 \text{ cm}^3$ .

$$\Rightarrow \frac{1}{3}\pi (R^2 + r^2 + Rr)h = 5390$$

$$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times [14^2 + r^2 + 14r] \times 5390$$

$$\Rightarrow 196 + r^2 + 14r = \frac{5390 \times 7}{22 \times 5} = 343$$

$$\Rightarrow r^2 + 14r + 196 - 343 = 0$$

$$\Rightarrow r^2 + 14r - 147 = 0$$

$$\Rightarrow r^2 + 21r - 7r - 147 = 0$$

$$\Rightarrow r(r+21) - 7(r+21) = 0$$

$$\Rightarrow (r+21)(r-7) = 0$$

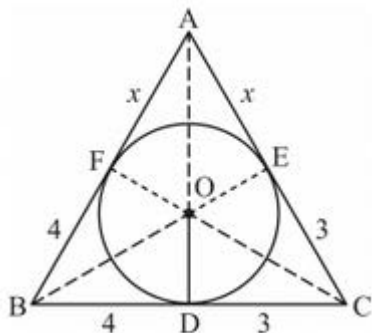
$$\Rightarrow r - 7 = 0 \text{ or } r + 21 = 0$$

$$\Rightarrow r = 7 \text{ or } r = -21$$

Since the radius cannot be a negative number,  $r = 7 \text{ cm}$

Thus, the value of  $r$  is  $7 \text{ cm}$ .

**Q23.** Join O with A, O with B, O with C, O with E, and O with F.





We have,  $OD = OF = OE = 2\text{ cm}$  (radii)

$BD = 4\text{ cm}$  and  $DC = 3\text{ cm}$

$\therefore BC = BD + DC = 4\text{ cm} + 3\text{ cm} = 7\text{ cm}$

Now,  $BF = BD = 4\text{ cm}$  [Tangents from the same point]

$CE = DC = 3\text{ cm}$

Let  $AF = AE = x\text{ cm}$

Then,  $AB = AF + BF = (4 + x)\text{ cm}$  and  $AC = AE + CE = (3 + x)\text{ cm}$

It is given that

$\text{ar}(\triangle OBC) + \text{ar}(\triangle OAB) + \text{ar}(\triangle OAC) = \text{ar}(\triangle ABC)$

$$\Rightarrow \frac{1}{2} \times BC \times OD + \frac{1}{2} \times AB \times OF + \frac{1}{2} \times AC \times OE = 21$$

$$\Rightarrow \frac{1}{2} \times 7 \times 2 + \frac{1}{2} \times (4 + x) \times 2 + \frac{1}{2} \times (3 + x) \times 2 = 21$$

$$\Rightarrow \frac{1}{2} \times 2(7 + 4 + x + 3 + x) = 21$$

$$\Rightarrow 14 + 2x = 21$$

$$\Rightarrow 2x = 7$$

$$\Rightarrow x = 3.5$$

Thus,  $AB = (4 + 3.5)\text{ cm} = 7.5\text{ cm}$  and  $AC = (3 + 3.5)\text{ cm} = 6.5\text{ cm}$ .

**Q24.** The given AP is  $-6, -2, 2, \dots, 58$

Here, first term  $a = -6$  and common difference  $d = -2 - (-6) = -2 + 6 = 4$

Last term,  $l = 58$

$$\Rightarrow a + (n - 1)d = 58$$

$$\Rightarrow -6 + (n - 1) \times 4 = 58$$

$$\Rightarrow (n - 1) \times 4 = 64$$

$$\Rightarrow (n - 1) = 16$$

$$\Rightarrow n = 17$$

Middle term of the A.P.  $\left(\frac{n + 1}{2}\right)^{\text{th}}$  term =  $\left(\frac{17 + 1}{2}\right)^{\text{th}}$  term =  $9^{\text{th}}$  term

$$a_9 = a + (9 - 1)d = -6 + 8 \times 4 = -6 + 32 = 26$$

Thus, the middle term of the given A.P. is 26.

OR

Let the first term of the given AP be 'a' and the common difference be 'd'.

$$\text{We have } a_4 = 18$$

$$\Rightarrow a + (4 - 1)d = 18$$

$$\Rightarrow a + 3d = 18 \quad \text{.....(i)}$$

Also, it is given that

$$a_{15} - a_9 = 30$$

$$\Rightarrow a + (15 - 1)d - \{a + (9 - 1)d\} = 30$$

$$\Rightarrow a + 14d - (a + 8d) = 30$$

$$\Rightarrow 6d = 30$$

$$\Rightarrow d = 5$$

Putting the value of d in (i):

$$a + 3 \times 5 = 18$$

$$\Rightarrow a + 15 = 18$$

$$\Rightarrow a = 18 - 15$$

$$\Rightarrow a = 3$$

Therefore, the first term and the common difference of the AP are 3 and 5 respectively

Thus, the A.P. is 3, 3+5, 3+ (2×5), 3+ (3×5) .....

That is 3, 8, 13, 18...

**Q25.** The given quadratic equation is  $2\sqrt{3}x^2 - 5x + \sqrt{3} = 0$

Comparing with the standard form  $ax^2 + bx + c = 0$

The value of a, b and c are

$$a = 2\sqrt{3}, b = -5, c = \sqrt{3}.$$

$$\begin{aligned}\sqrt{D} &= \sqrt{b^2 - 4ac} = \sqrt{25 - 4 \times 2\sqrt{3} \times \sqrt{3}} \\ &= \sqrt{25 - 24} = \sqrt{1} \\ &= 1\end{aligned}$$

$$\therefore x = \frac{-b \pm \sqrt{D}}{2a}$$

$$= \frac{5 \pm 1}{2 \times 2\sqrt{3}}$$

$$= \frac{6}{4\sqrt{3}} \text{ or } \frac{4}{4\sqrt{3}}$$

$$= \frac{3}{2\sqrt{3}} \text{ or } \frac{1}{\sqrt{3}}$$

$$= \frac{\sqrt{3}}{2} \text{ or } \frac{\sqrt{3}}{3}$$

Therefore, the roots of the given quadratic equation are  $\frac{\sqrt{3}}{2}$  and  $\frac{\sqrt{3}}{3}$ .

**Q26.** Radius of the given circle = 35 cm

Area of the minor segment = Area of sector OAB – area of  $\Delta$ AOB

$$\begin{aligned}\text{Area of section OAB} &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{90^\circ}{360^\circ} \times \frac{22}{7} \times (35\text{cm})^2 \\ &= \frac{1}{4} \times \frac{22}{7} \times 1225 \text{ cm}^2 \\ &= 962.5 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Area of } \Delta\text{AOB} &= \frac{1}{2} \times \text{OA} \times \text{OB} \\ &= \frac{1}{2} \times 35\text{cm} \times 35\text{cm}^2 \\ &= 612.5 \text{ cm}^2\end{aligned}$$

$$\therefore \text{Area of the minor segment} = 962.5 \text{ cm}^2 - 612.5 \text{ cm}^2 = 350 \text{ cm}^2$$

Area of the major segment = Area of the circle – area of the minor segment

$$\text{Area of the circle} = \pi r^2 = \frac{22}{7} \times (35 \text{ cm})^2 = 3850 \text{ cm}^2$$

$$\text{Thus, the area of the major segment APB} = 3850 \text{ cm}^2 - 350 \text{ cm}^2 = 3500 \text{ cm}^2$$

**Q27.** A  $\Delta$ PQ'R' whose sides are  $\frac{3}{4}$  of the corresponding sides of  $\Delta$ PQR can be drawn as follows.

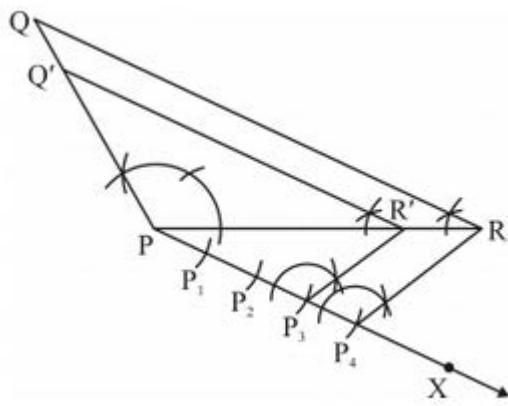
Step1. Draw a  $\Delta$ PQR with side PQ = 5 cm, PR = 6 cm and  $\angle$ P =  $120^\circ$

Step2. Draw a ray PX making an acute angle with PR on the opposite side of vertex Q.

Step3. Locate 4 points (as 4 is greater in 3 and 4),  $P_1, P_2, P_3, P_4$ , on line segment PX.

Step4. Join  $P_4R$  and draw a line through  $P_3$ , parallel to  $P_4R$  intersecting PR at  $R'$ .

Step5. Draw a line through  $R'$  parallel to QR intersecting PQ at  $Q'$ .  $\Delta PQ'R'$  is the required triangle.



**Q28.** Let the coordinates of the point on y-axis be P (0, y).

Let the given points be A (-5,-2) and B (3, 2).

It is given that  $PA = PB$

$$\Rightarrow \sqrt{(0 - (-5))^2 + (y - (-2))^2} = \sqrt{(0 - 3)^2 + (y - 2)^2}$$

$$\Rightarrow 25 + (y + 2)^2 = 9 + (y - 2)^2$$

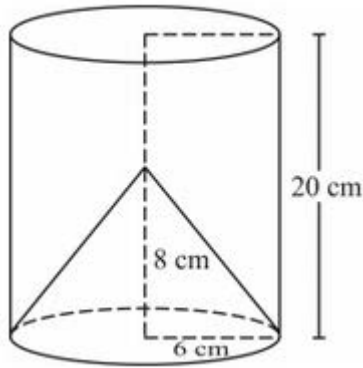
$$\Rightarrow 25 + y^2 + 4y + 4 = 9 + y^2 - 4y + 4$$

$$\Rightarrow 8y = -16$$

$$\Rightarrow y = -2$$

Thus, the coordinates of the required point is (0,-2)

**Q29.** The remaining solid, after removing the conical cavity, can be drawn as,



Height of the cylinder,  $h_1 = 20$  cm

$\therefore$  Radius of the cylinder,  $r = \frac{12 \text{ cm}}{2} = 6$  cm

Height of the cone,  $h_2 = 8$  cm

Radius of the cone,  $r = 6$  cm

Total surface area of the remaining solid

$\Rightarrow$  Areas of the top face of the cylinder + curved surface area of the cylinder + curved surface area of the cone

$$\begin{aligned}\text{Slant height of the cone, } l &= \sqrt{(8\text{cm})^2 + (6\text{cm})^2} \\ &= \sqrt{64\text{cm}^2 + 36\text{cm}^2} \\ &= \sqrt{100} \text{ cm} \\ &= 10 \text{ cm}\end{aligned}$$

$$\text{Curved surface area of the cone} = \pi r l = \frac{22}{7} \times 6\text{cm} \times 10\text{cm} = \frac{1320}{7} \text{cm}^2$$

$$\text{Curved surface area of the cylinder} = 2\pi r h = 2 \times \frac{22}{7} \times 6\text{cm} \times 10\text{cm} = \frac{5280}{7} \text{cm}^2$$

$$\text{Area of the top face of the cylinder} = \pi r^2 = \frac{22}{7} \times (6\text{cm})^2 = \frac{792}{7}\text{cm}^2$$

$$\begin{aligned}\therefore \text{Total surface area of the remaining solid} &= \left(\frac{1320}{7} + \frac{5280}{7} + \frac{792}{7}\right) \text{cm}^2 \\ &= \frac{7392}{7}\text{cm}^2 \\ &= 1056 \text{cm}^2\end{aligned}$$

**Q30.** Length of the rectangular piece of paper = 28 cm

Breadth of the rectangular piece of paper = 14 cm

$$\text{Area of the rectangular paper, } A_1 = (28 \cdot 14) \text{ cm}^2 = 392 \text{cm}^2$$

Radius (r) of the removed semicircular portion

$$= \frac{1}{2} \pi r^2$$

$$= \frac{1}{2} \times \frac{22}{7} \times (7)^2 \text{cm}^2$$

$$= \frac{11}{7} \times 49\text{cm}^2$$

$$= 77 \text{cm}^2$$

$$\text{Radius R of the semicircular portion added} = \frac{28}{2} \text{cm} = 14\text{cm}$$

Area ( $A_3$ ) of the added semicircular portion

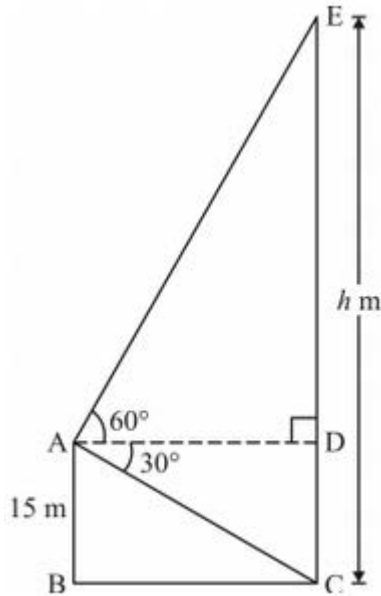
$$= \frac{1}{2} \pi R^2$$

$$= \frac{1}{2} \times \frac{22}{7} \times (14)^2 \text{cm}^2$$

$$= 308 \text{cm}^2$$

$$\therefore \text{Area of the shaded region} = A_1 - A_2 + A_3 = (392 - 77 + 308) \text{ cm}^2 = 623 \text{ cm}^2$$

**Q31** The given situation can be represented as:



Here, AB is the building of height 15 m and CE is the cable tower of height h m.

$$CD = AB = 15 \text{ m}, DE = CE - CD = (h - 15) \text{ m}$$

In right  $\triangle ADE$ ,

$$\tan 60^\circ = \frac{DE}{AD}$$

$$\Rightarrow \sqrt{3} = \frac{h - 15}{AD}$$

$$\Rightarrow AD = \frac{h - 15}{\sqrt{3}} \quad \dots\dots (1)$$

In right  $\triangle ACD$ ,

$$\tan 30^\circ = \frac{CD}{AD}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{15 \text{ m}}{AD}$$



$$\Rightarrow AD = 15\sqrt{3}m \quad \dots\dots\dots (2)$$

From (1) and (2)

$$\Rightarrow \frac{h-15}{\sqrt{3}} = 15\sqrt{3}$$

$$\Rightarrow h - 15 = 45$$

$$\Rightarrow h = 60$$

Thus, the height of the cable tower is 60 m.

**Q32.** Let the speed of the stream be  $x$  km/h

Speed of the boat while going upstream =  $(20 - x)$  km/h

Speed of the boat while going downstream =  $(20 + x)$  km/h

$$\text{Time taken for the upstream journey} = \frac{48km}{(20-x)km/h} = \frac{48}{20-x} h$$

$$\text{Time taken for the downstream journey} = \frac{48km}{(20+x)km/h} = \frac{48}{20+x} h$$

It is given that,

Time taken for the upstream Journey = Time taken for the downstream journey + 1 hour

$$\Rightarrow \frac{48}{20-x} - \frac{48}{20+x} = 1$$

$$\Rightarrow \frac{960+48x-960+48x}{(20-x)(20+x)} = 1$$

$$\Rightarrow \frac{96x}{400-x^2} = 1$$

$$\Rightarrow 400 - x^2 = 96x$$

$$\Rightarrow x^2 + 96x - 400 = 0$$

$$\Rightarrow x^2 + 100x - 4x - 400 = 0$$

$$\Rightarrow x(x+100) - 4(x+100) = 0$$

$$\Rightarrow (x+100)(x-4) = 0$$

$$\Rightarrow x+100 = 0 \text{ or } x-4 = 0$$

$$\Rightarrow x = -100 \text{ or } x = 4$$

$$\therefore x = 4 \quad [\text{Since speed cannot be negative}]$$

Thus, the speed of the stream is 4 km/h

OR

$$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$$

$$\Rightarrow \frac{(x-7) - (x+4)}{(x+4)(x-7)} = \frac{11}{30}$$

$$\Rightarrow \frac{-11}{x^2 - 3x - 28} = \frac{11}{30}$$

$$\Rightarrow x^2 - 3x - 28 = -30$$

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

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

$$\Rightarrow x(x-2) - 1(x-2) = 0$$

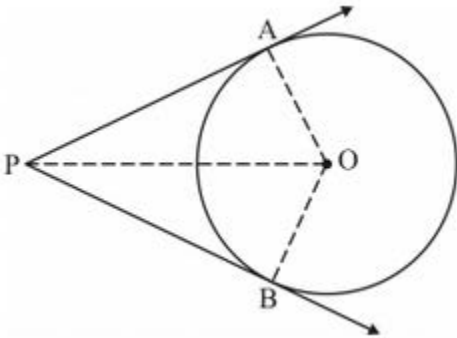
$$\Rightarrow (x-1)(x-2) = 0$$

$$\Rightarrow x-1 = 0 \text{ or } x-2 = 0$$

$$\Rightarrow x = 1 \text{ or } x = 2$$

Hence, the roots of the given equation are 1 and 2.

**Q33.**



Let O be the centre of a 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  $\triangle OAP$  and  $\triangle OPB$ ,

$$\angle OAP = \angle OPB \text{ (Each equal to } 90^\circ)$$

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

$$OA = OB \text{ (Radii of the circle)}$$

$$OP = PO \text{ (Common side)}$$

Therefore, by RHS congruency criterion,

$$\triangle OPA \cong \triangle OPB$$

$\therefore$  By CPCT,

$$PA = PB$$

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

**Q34.** Let  $a$  and  $d$  respectively be the first term and the common difference of the given A. P

The sum of first four terms

$$S_4 = 40$$

$$\Rightarrow \frac{4}{2} \{2a + (4-1)d\} = 40$$

$$\Rightarrow 2a + 3d = 20 \quad \dots\dots (1)$$

The sum of first 14 terms

$$S_{14} = 280$$

$$\Rightarrow \frac{14}{2} \{2a + (14-1)d\} = 280$$

$$\Rightarrow 2a + 13d = 40 \quad \dots\dots (2)$$

Subtracting equation (1) from equation (2)

$$(2a + 13d) - (2a + 3d) = 40 - 20$$

$$\Rightarrow 10d = 20$$

$$\Rightarrow d = 2$$

Substituting  $d = 2$  in equation (1),

$$2a + 3 \times 2 = 20$$

$$\Rightarrow 2a = 20 - 6 = 14$$

$$\Rightarrow a \frac{14}{2} = 7$$

$\therefore$  Sum of first  $n$  terms,  $S_n = \frac{n}{2} \{2a + (n-1)d\}$

$$= \frac{n}{2} \{2 \times 7 + (n-1) \times 2\}$$

$$= \frac{n}{2}\{14+2n-2\}$$

$$= \frac{n}{2}(2n+12)$$

$$= \frac{n}{2} \times 2(n+6)$$

$$= n(n+6)$$

$$= n^2 + 6n$$

OR

The first 30 integers divisible by 6 are 6 , 12, 18 .....180

Sum of first 30 integers

$$= 6 + 12 + 18 + \dots + 180$$

$$= \frac{30}{2}(6 + 180) \quad \left[ S_n = \frac{n}{2}(a+1) \right]$$

$$= 15 \times 186$$

$$= 2790$$