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 and $\frac{y+3}{2}$ =4

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

$\Rightarrow$x =2 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.

$$\therefore P = \left(\frac{2\times5+3\times2}{2+3}, \frac{2\times2+3\times(-5)}{2+3}\right)$$

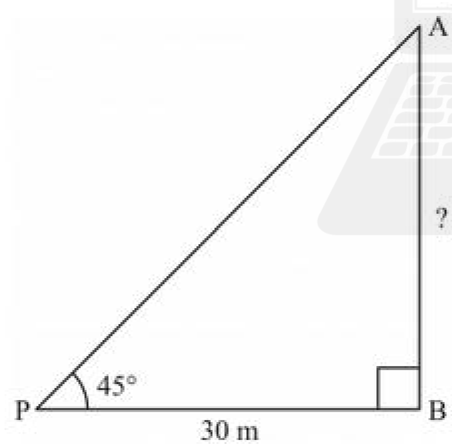
$$= \left(\frac{10+6}{5}, \frac{4-15}{5}\right)$$

$$= \left(\frac{16}{5}, \frac{-11}{5}\right)$$

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 m, ∠P = 45°

Now, $\frac{AB}{BP}$ = tan 45°

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

$\Rightarrow$AB = 30m

Thus, the height of the tower is 30m.

The correct answer is B.

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

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

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

$\Rightarrow h = \frac{4\times9\times9\times9}{3\times18\times18}$cm

$\Rightarrow$ h = 3cm

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

The correct answer is A.

Q6. It is given that $\angle$AOB = 100°

ΔAOB is isosceles because

OA = OB = radius

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

$\angle$AOB +$\angle$OAB +$\angle$OBA = 180° [Angle sum property of triangle]

$\Rightarrow$ 100° + $\angle$OAB + $\angle$OAB = 180°

$\Rightarrow$2 $\angle$OAB = 80°

$\Rightarrow \angle OAB = 40°$

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

Thus, $\angle BAT = \angle OAT - \angle OAB = 90° - 40° = 50°$

The correct answer is C.

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

Therefore, PA = PB

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

$\angle P + \angle PAB + \angle PBA = 180°$ [angle sum property of triangle]

$\Rightarrow 60° + 2\angle PAB = 180°$

$\Rightarrow 2\angle PAB = 180° - 60° = 120°$

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

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

$\therefore \angle OAP = 90°$

$\Rightarrow \angle PAB + \angle OAB = 90°$

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

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 $d = -3$

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× 10 cm = 20 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

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

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

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

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

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

$\Rightarrow m = 0$ or $m - 5 = 0$

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

Thus, the value of mi is 5.

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

Let $x_1 = x$, $y_1 = 4$, $x_2 = 9$, $y_2 = 10$

Applying distance formula, if 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.

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

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

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

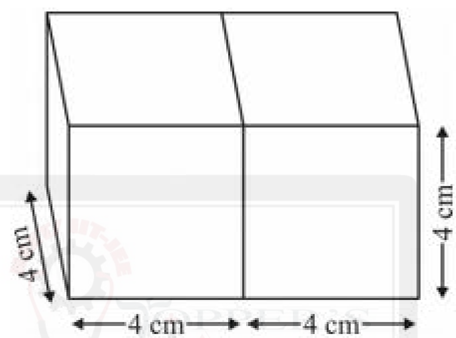
$\Rightarrow x\,(x - 17) - 1\,(x - 17) = 0$

$\Rightarrow$ (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.



∴ Surface area of the resulting cuboid = 2 (lb +bh + lh)

= 2 (8 cm × 4 cm + 4 × 4 cm = 8 cm ×4 cm)

= 2 × (32 + 16 +32) cm^2

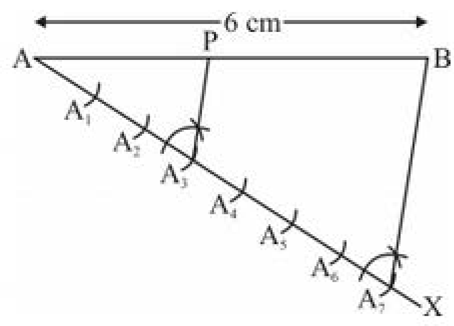
= 160 cm^2

Thus, the surface area of the resulting cuboid is 160 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.

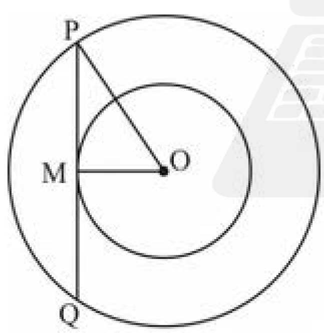
(1) Draw line segment AB of length 6 cm and draw a ray AX making an acute angle with line segment AB.
(2) Locate 7 (3+4) points, A_1. A_2, A_3, A_4 ………….A_7, on AX such that $AA_1 = A_1A_2 = A_2A_3$ and so on.
(3) Join BA_7.
(4) Through the point A_3, draw a line parallel to BA_7 (by making an angle 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 = $\frac{48}{2}$ cm = 24 cm

Now applying Pythagoras Theorem in ΔOPM

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

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

$\Rightarrow$ OP = 25 cm

∴ 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

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

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

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

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

∴ $2\pi r = 44$ cm

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

$\Rightarrow r = 7$ cm

Area of a quadrant of a circle

$= \frac{1}{4} \times \pi r^2 = \frac{1}{4} \times \frac{22}{7} \times (7\text{cm})^2$

$= \frac{1}{4} \times \frac{22}{7} \times 49\text{ cm}^2 = 38.5\text{ cm}^2$

Thus, the area of a quadrant of the given circle is 38.5 cm^2.

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)

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

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

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

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

$\Rightarrow -6x = -27$

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

Now, $y^2 + (x - 6)^2 = 9$

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

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

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

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

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

OR

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

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

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

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

$\Rightarrow 2\lambda = 2$

$\Rightarrow \lambda = 1$

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

$\Rightarrow k = \frac{-2\times1+4}{1+1}$

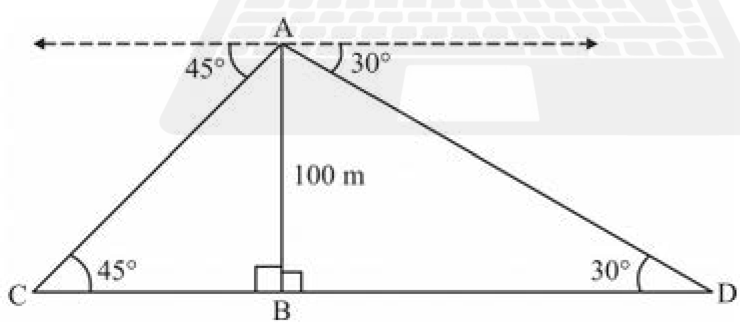
$\Rightarrow k = \frac{-2+4}{2}$

$\Rightarrow k = 1$

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 ΔACB,

$\tan 45° = \frac{AB}{BC}$

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

$\Rightarrow$ BC = 100 m

In right ΔABD

tan 30° = $\frac{AB}{BD}$

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

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

Distance between the two cars = CD

= BC +CD

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

= 100m +100×1.73m

= 100m + 173 m

= 273 m

Thus, the distance between two cars is 273 m.

Q21 The sample space of the given experiment is:

$$S = \begin{Bmatrix} (1,1), & (1,2), & (1,3), & (1,4), & (1,5), & (1,6) \\ (2,1), & (2,2), & (2,3), & (2,4), & (2,5), & (2,6) \\ (3,1), & (3,2), & (3,3), & (3,4), & (3,5), & (3,6) \\ (4,1), & (4,2), & (4,3), & (4,4), & (4,5), & (4,6) \\ (5,1), & (5,2), & (5,3), & (5,4), & (5,5), & (5,6) \\ (6,1), & (6,2), & (6,3), & (6,4), & (6,5), & (6,6) \end{Bmatrix}$$

∴ n (S)= 36

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

∴ E = {(1,1), (1,4), (2,2), (3,3), (4,1), (4,4), (5,5), (6,6)}

∴ 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.

∴E = {HHH, TTT}

∴ Probability of winning = P (E)

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

∴ 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 cm^3.

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

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

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

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

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

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

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

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

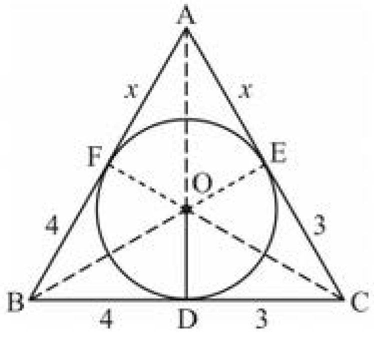
$\Rightarrow r - 7 = 0$ or $r + 21 = 0$

$\Rightarrow r = 7$ or $r = -21$

Since the radius cannot be a negative number, r= 7 cm

Thus, the value of r is 7 cm.

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



We have, OD =OF =OE = 2cm (radii)

BD = 4 cm and DC = 3 cm

∴ BC = BD + DC = 4 cm + 3 cm = 7 cm

Now, BF = BD = 4 cm [Tangents from the same point]

CE = DC = 3 cm

Let AF = AE = x cm

Then, AB = AF + BF = (4 + x) cm and AC = AE + CE = (3 + x) cm

It is given that

ar (ΔOBC) +ar (ΔOAB) +ar(ΔOAC) = ar (ΔABC)

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

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

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

$\Rightarrow 14+2x = 21$

$\Rightarrow 2x = 7$

$\Rightarrow x = 3.5$

Thus, AB = (4 + 3.5) cm = 7.5 cm and AC = (3 + 3.5) cm = 6.5 cm.

Q24. The given AP is -6, -2, 2, ….., 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. $\left(\frac{n+1}{2}\right)^{th}$ term = $\left(\frac{17+1}{2}\right)^{th}$ term = 9^{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'.

We have $a_4 = 18$

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

$\Rightarrow a + 3d = 18$ ....(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 from $ax^2 + bx + c = 0$

The value of a, b and c are

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

$\sqrt{D} = \sqrt{b^2 - 4ac} = \sqrt{25 - 4 \times 2\sqrt{3} \times \sqrt{3}}$

$= \sqrt{25 - 24} = \sqrt{1}$

$= 1$

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

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

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

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

$= \frac{\sqrt{3}}{2}$ 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 ΔAOB

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

$= \frac{90°}{360°}\times\frac{22}{7}\times (35\text{cm})^2$

$= \frac{1}{4}\times\frac{22}{7}\times 1225\ \text{cm}^2$

$= 962.5\ \text{cm}^2$

Area of ΔAOB = $\frac{1}{2}\times OA\times OB$

$= \frac{1}{2}\times 35\text{cm}\times 35\text{cm}^2$

$= 612.5\ \text{cm}^2$

∴ 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

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

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

Q27. A ΔPQ'R' whose sides are $\frac{3}{4}$ of the corresponding sides of ΔPQR can be drawn as follows.

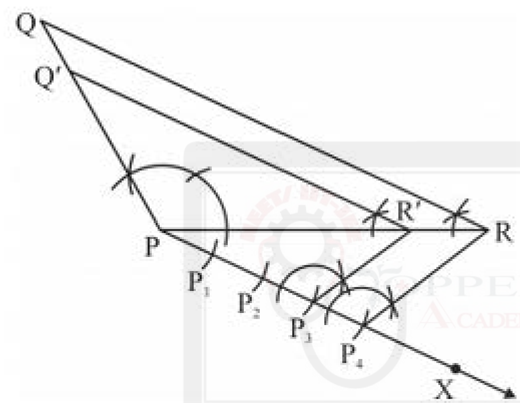
Step1. Draw a ΔPQR with side PQ = 5 cm, PR = 6 cm and ∠P = 120°

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'. ΔPQ'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

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

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

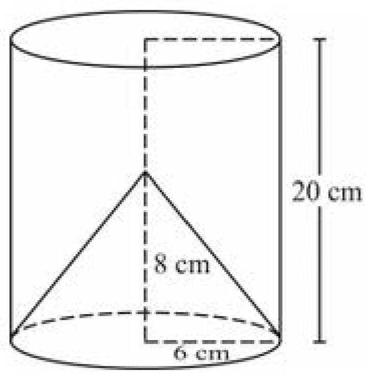
$\Rightarrow 25 + y^2 + 4y + 4 = 9 + y^2 - 4y + 4$

$\Rightarrow 8y = -16$

$\Rightarrow y = -2$

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

∴ 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

⇒ Areas of the top face of the cylinder + curved surface area of the cylinder + curved surface area of the cone

Slant height of the cone, l = $\sqrt{(8\text{cm})^2 + (6\text{cm})^2}$

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

= $\sqrt{100}$ cm

= 10 cm

Curved surface are of the cone = πrl = $\frac{22}{7}$ × 6cm × 10cm = $\frac{1320}{7}$cm^2

Curved surface are of the cylinder = 2πrh = 2 × $\frac{22}{7}$ × 6cm × 10cm = $\frac{5280}{7}$ cm^2

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

∴Total surface area of the remaining solid = $\left(\frac{1320}{7} + \frac{5280}{7} + \frac{792}{7}\right) cm^2$

$= \frac{7392}{7} cm^2$

$= 1056\ cm^2$

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

Breadth of the rectangular piece of paper = 14 cm

Area of the rectangular paper, A_1 = (28.14) cm^2 = 392 cm^2

Radius (r) of the removed semicircular portion

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

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

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

$= 77\ cm^2$

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

Area (A_3) of the added semicircular portion

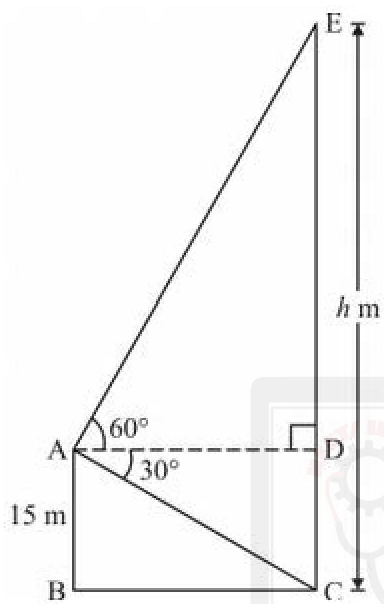
$= \frac{1}{2} \pi R^2$

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

$= 308\ cm^2$

∴ Area of the shaded region = $A_1 - A_2 + A_3$ = (392-77+308) cm^2 = 623 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 = 15m, DE = CE –CD = (h -15) m

In right ΔADE,

$\tan 60° = \frac{DE}{AD}$

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

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

In right ΔACD,

$\tan 30° = \frac{CD}{AD}$

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

$\Rightarrow$ AD = $15\sqrt{3}$m .... (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

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

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 or x-4 =0

$\Rightarrow$x = -100 pr x = 1

$\therefore$x = 4 [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

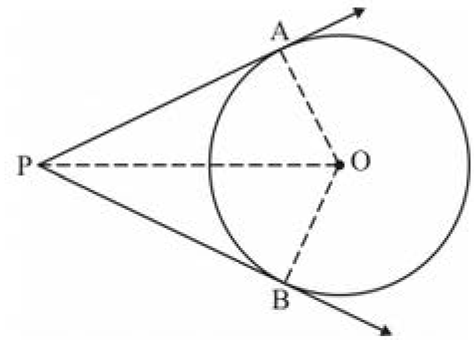
$\Rightarrow$ (x-1)(x-2) = 0

$\Rightarrow$x-1 = 0 or x-2 = 0

$\Rightarrow$ x = 1 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 ΔOAP and ΔOPB,

$\angle$OAP = $\angle$OPB (Each equal to 90°)

(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 (Radii of the circle)

OP = PO (Common side)

Therefore, by RHS congruency criterion,

ΔOPA $\cong$ ΔOPB

$\therefore$ 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 ……. (1)

The sum of first 14 terms

S_{14} = 280

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

$\Rightarrow$ 2a +13d = 40 ……… (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 +3×2 = 20

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

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

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

=$\frac{n}{2}$ {2×7+ (n-1) × 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 +…. + 180

$= \frac{30}{2}(6 + 180)$ $[S_{n=\frac{n}{2}(a+1)}]$

$= 15 \times 186$

= 2790