CBSE Class 10 Maths Paper Solution

General Instructions:

(i) All questions are compulsory.
(ii) The question paper consists of 34 questions divided into four sections A, B, C and D.
(iii) Sections A contains 8 questions of one mark each, which are multiple choice type questions, section B contains 6 questions of two marks each, section C contains 10 questions of three marks each, and section D
(iv) Use of calculations is not permitted.

Q1

The common difference of the AP $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}$,..... can be found out by finding the difference between the second term and first term i.e. $\frac{1-p}{p} - \frac{1}{p} = \frac{1-p-1}{p} = \frac{-p}{p} = -1$

The correct answer is -1 which is given by option C.

Q2

Since, AP $\perp$ PB, CA $\perp$ AP, CB $\perp$ BP and AC = CB = radius of the circle, therefore APBC is a square having side equal to 4 cm.

Therefore, length of each tangent is 4 cm.

The correct answer is 4 cm which is given by option B.

Q3

Given that AB, BC, CD and AD are tangents to the circle with centre O at Q,P,S and R respectively. AB = 29 cm, AD = 23, DS = 5 cm and $\angle B = 90^0$.

Join PQ .

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

DS = DR = 5 cm

∴ AR = AD – DR = 23 cm – 5 cm = 18 cm

AQ = AR = 18 cm

∴ QB = AB – AQ = 29 cm – 18 cm = 11 cm

QB = BP = 11 cm

In right △ PQB, $PQ^2 = QB^2 + BP^2 = (11\text{ cm})^2 + (11\text{ cm})^2 = 2 \times (11\text{ cm})^2$
PQ = $11\sqrt{2}$ cm…..(1)

In right △ PQB,

$PQ^2 = OQ^2 + OP^2 + r^2 + r^2 = 2r^2$

PQ = $\sqrt{2r}$ …..(2)

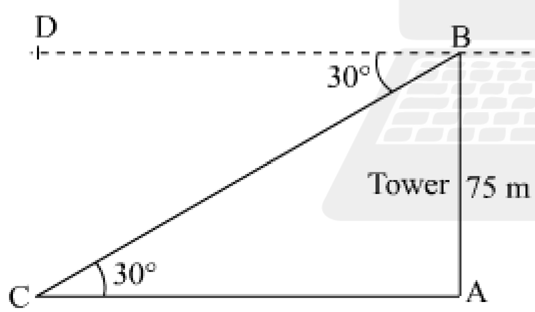
From (1) and (2), we get

r = 11 cm

thus, the radius of the circle is 11 cm.

The correct answer is **11** which is given by option **A**.

Q4



Let AB be the tower of height 75 m.

∠CBD =∠ ACB = 30^0

Suppose C be the position of the car from the base of the tower.

In right △ABC,

Cot 30^0 = $\frac{AC}{AB}$

- ⇨ AC = AB cot30^0
- ⇨ AC = 75 m x $\sqrt{3}$
- ⇨ AC = $75\sqrt{3}$m

Thus, the distance of the car from the base of the tower is 75 $\sqrt{3}$ m.

The correct answer is 7 5$\sqrt{3}$ which is given by option **C**.

Q5

When a die is thrown once, the sample space is given by, S = {1,2,3,4,5, and 6}

Then, the event, E of getting an ever number is given by, E = {2,4, and 6}

∴ Probability of getting an even number = P (E) ∴ P(E) = $\frac{\text{Number of favourable outcomes}}{\text{Number of all possible outcom es}} = \frac{3}{6} = \frac{1}{2}$

The correct answer is $\frac{1}{2}$ which is given by option **A.**

Q6

If the given that the box contains 90 discs, numbered from 1 to 90.

As one disc is drawn at random from the box, the sample space is given by, S = {1,2,3,...90}

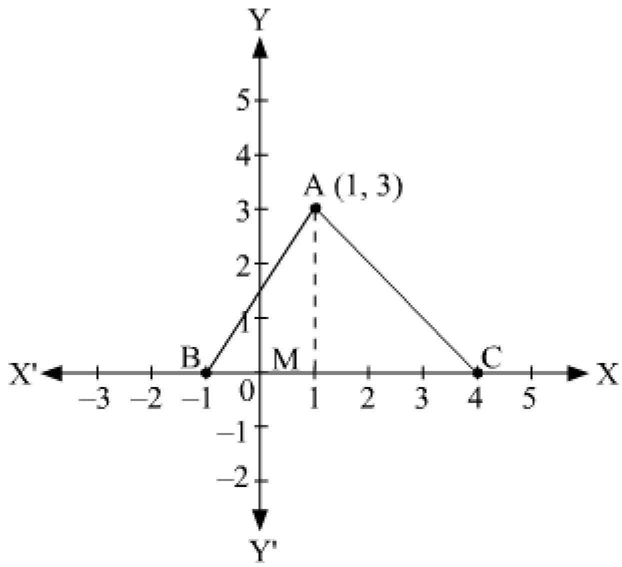
The prime number less than 23 are 2,3,5,7,11,13,17, and 19.

Then, the event, E of getting a prime number is given by, E = {2,3,5,7,11,13,17,19}

∴ P(E) = $\frac{\text{Number of favourable outcomes}}{\text{Number of all possible outcomes}} = \frac{8}{90} = \frac{4}{45}$

The correct answer is $\frac{4}{45}$ which is given by option **C.**

Q7



Construction : Draw AM ⊥ BC.

It can be observed from the given figure that BC = 5 unit and AM = 3 unit.

It △ABC, BC is the base and AM is the height.

Area of triangle ABC = $\frac{1}{2}$ x base x height

= $\frac{1}{2}$ x BC x AM

=$\frac{1}{2}$ x 5 x 3 sq.units

= 7.5 sq.units

The correct answer is **7.5** which is given by option **C.**

Q8

Difference between circumference and radius of the circle = 37 cm

Let r be the radius of the circle.

∴ $2\pi r - r = 37$ cm

- ⇨ r ($2\pi - 1$) = 37 cm
- ⇨ r $\left(2 \times \frac{22}{7} - 1\right)$ = 37 cm
- ⇨ r x $\frac{37}{7}$ = 37 cm
- ⇨ r = 7 cm

∴ Circumference of the circle = 2 πr = 2 x $\frac{22}{7}$ x 7 cm = 44 cm

The correct answer is **44** which is given by option **B.**

Q9

$4\sqrt{3x^2} + 5x - 2\sqrt{3} = 0$

- ⇨ $4\sqrt{3}\,x^2 + 8x - 3x - 2\sqrt{3} = 0$
- ⇨ $4x(\sqrt{3}x + 2) - \sqrt{3}(\sqrt{3} + 2) = 0$
- ⇨ $(4x - \sqrt{3})(\sqrt{3}x + 2) = 0$

  ∴ $x = \frac{\sqrt{3}}{4}$ or $x = -\frac{2}{\sqrt{3}}$

Q10

All the three-digit natural numbers that are divisible by 7 will be of the form 7n.

Therefore, 100≤7n≤999=> $14\frac{2}{7} \leq n \leq 142\frac{5}{7}$

Since, n is an integer, therefore, there will be 142 – 14 = 128 three-digit natural numbers that will be divisible by 7.

Therefore, there will be 128 three – digit natural numbers that will be divisible by 7.

Q11

Given that AB = 12 cm, BC = 8 cm and AC = 10 cm.

Let, AD = AF = p cm, BD = BE = q cm and CE = CF = r cm

(Tangents drawn from an external point to the circle are equal in length)

- ⇨ 2(p+ q +r) = AB+BC+AC = AD+DB+BE+EC+AF+FC = 30 cm
- ⇨ p +q +r = 15

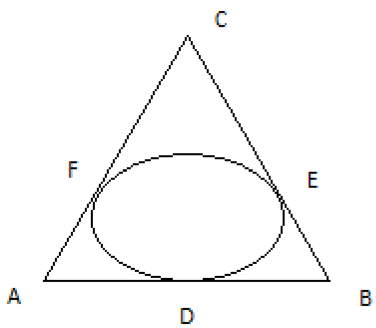
  AB = AD + DB = p + q = 12 cm

Therefore, r = CF = 15 – 12 = 3 cm.

AC = AF + FC = p + r = 10 cm

Therefore, q = BE = 15 – 10 = 5 cm.

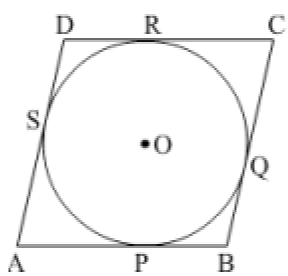
Therefore, p = AD = p + q + r – r – q = 15 – 3 – 5 = 7 cm.



Q12.

GIVEN : ABCD be a parallelogram circumscribing a circle with centre O.

TO PROVE : ABCD is a rhombus.



We know that the tangents drawn to a circle from an exterior point are equal in length.

Therefore, AP = AS, BP = BQ, CR = CQ and DR = DS.

AP + BP + CR + DR = AS + BQ + CQ + DS

(AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)

Therefore, AB + CD = AD + BC or 2AB = 2BC (Since, AB = DC and AD = BC)

Therefore, AB = BC = DC = AD.

Therefore, ABCD is a rhombus.

Hence, proved.

Q13

Let E denote the event that the drawn card is neither a king nor a queen.

Total number of possible cases = 52.

Total number of cards that are king and those that are queen in the pack of playing cards = 4 + 4 = 8.

Therefore, there are 52-8 = 44 cards that are neither a king nor a queen.

Total number of favorable cases = 44.

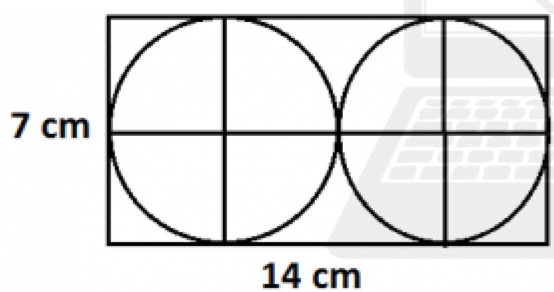
∴ Required probability = P (E) = $\frac{\text{Favourable number of cases}}{\text{Total number of cases}} = \frac{44}{52} = \frac{11}{13}$

Thus, the probability that the drawn card is neither a king nor a queen is $\frac{11}{13}$.

Q14

Dimension of the rectangular card board = 14 cm x 7 cm

Since, two circular pieces of equal radii and maximum area touching each other are cut from the rectangular card board, therefore, the diameter of each of each circular piece is 14/2 = 7 cm.



Radius of each circular piece = $\frac{7}{2}$ cm.

∴ Sum of area of two circular pieces = $2 \times \pi \left(\frac{7}{2}\right)^2 = 2 \times \frac{22}{7} \times \frac{49}{4} = 77\ cm^2$

Area of the remaining card board = Area of the card board – Area of two circular pieces

= 14 cm x 7 cm – 77 cm^2 = 98 cm^2 – 77 cm^2 = 21 cm^2

Thus, the area of the remaining card board is 21 cm^2.

Q15

The given quadratic equation is k x (x – 2) + 6 = 0.

This equation can be rewritten as $kx^2 - 2kx + 6 = 0$.

For equal roots, it discriminate, D = 0.

- ⇨ $b^2 - 4ac = 0$, where a = k, b = -2k and c = 6
- ⇨ $4k^2 - 24k = 0$
- ⇨ 4k (k – 6) = 0
- ⇨ K = 0 or k = 6

But k cannot be 0, so the value of k is **6.**

Q16

The AP is given as 18, $15\frac{1}{2}$, 13, …, $-49\frac{1}{2}$.

First term a = 18, common difference d = $15\frac{1}{2} - 18 = -2\frac{1}{2}$ and the last term of the AP = $-49\frac{1}{2}$.

Let the AP has n terms.

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

-(99/2) = 18 – (5/2)(n-1)

5(n-1) =135

n =27 +1

n =28

∴ n = 27 + 1 = 28

Thus, the given AP has **28** terms.

Now, the sum of all the terms (S_n) is given by,

$S_n = \frac{n}{2}$ [2a + (n-1)d] $= \frac{28}{2}$ [2 x 18 + (28 – 1) x $\left(-\frac{5}{2}\right)$] = 14 [36 – 27 x $\frac{5}{2}$] = - 441

Thus, the sum of all the terms of the AP is **– 441.**

Q17

Step 1

Draw a line segment AB = 4 cm. taking point A as centre, draw an arc of 5 cm radius.

Similarly, taking point B as its centre, draw an arc of 6 cm radius. These arcs will intersect each other at point C. Now, AC = 5 cm and BC = 6 cm and △ ABC is the required triangle.

Step 2

Draw a ray AX making an acute angle with line AB on the opposite side of vertex C.

Step 3

Locate 3 points A_1, A_2, A_3 (as 3 is greater between 2 and 3) on line AX such that

$AA_1 = A_1A_2 = A_2A_3$.

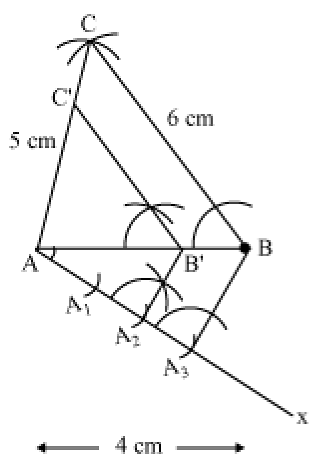
Step 4

Join BA_3 and draw a line through A_2 parallel to BA_3 to intersect AB at point B'.

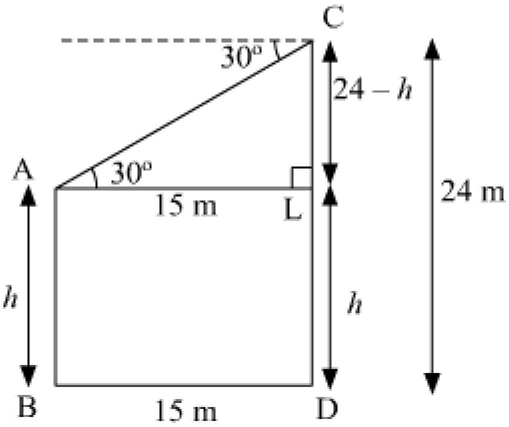
Step 5

Draw a line through B' parallel to the line BC to intersect AC at C'.

△AB'C' is the required triangle.



Q18



Let AB and CD be two poles, where CD = 24 m.

It is given that angle of depression of the top of the pole AB as seen from the top of the pole CD is 30^0 and horizontal distance between the two poles is 15 m.

∴ $\angle$CAL = 30^0 and BD = 15 m.

To find: height of pole AB

Let the height of pole AB be h m.

AL = BD = 15 m and AB = LD = h

Therefore, CL = CD – LD = 24 – h

Consider right $\triangle$ ACL:

tan $\angle$CAL = $\frac{\text{Perpendicular}}{\text{Base}} = \frac{\text{CL}}{\text{AL}}$

⇨ tan $30^0 = \frac{24-h}{15}$

⇨ $\frac{1}{\sqrt{3}} = \frac{24-h}{15}$

⇨ 24 – h = $\frac{15}{\sqrt{3}}$

⇨ 24 – h = $5\sqrt{3}$

⇨ h = 24 - $5\sqrt{3}$

⇨ h = 24 – 5 x 1.732 [Taking $\sqrt{3}$ = 1.732]

⇨ h = 15.34

Therefore, height of the pole AB = h m = **15.34 m.**

Q19

Let the given points be A (7,10) B(-2,5) and C(3,-4).

Using distance formula, we have

AB = $\sqrt{(7+2)^2+(10-5)^2}$ = $\sqrt{81+25}$ = $\sqrt{106}$

BC = $\sqrt{(-2-3)^2+(5+4)^2}$ = $\sqrt{25+81}$ = $\sqrt{106}$

CA = $\sqrt{(7-3)^2+(10+4)^2}$ = $\sqrt{16+196}$ = $\sqrt{212}$

Since AB = BC, therefore, $\triangle$ABC is an isosceles triangle.

Also, AB^2+BC^2 = 106 + 106 = 212 = AC^2

So, $\triangle$ ABC is a right triangle right angled at $\angle$B.

So, $\triangle$ ABC is an isosceles triangle as well as a right triangle.

Thus, the points (7, 10), (-2, 5) and (3,-4) are the vertices of an isosceles right triangle.

Q20

Let the y-axis divide the line segment joining the points (-4,-6) and (10,12) in the ratio λ :1 and the Point of the intersection be (0,y).

So, by section formula, we have:

$$\left(\frac{10\lambda+(-4)}{\lambda+1}, \frac{12\lambda+(-6)}{\lambda+1}\right) = (0,y)$$

$\therefore \frac{10\lambda-4}{\lambda+1}$ = 0 => $10\lambda - 4 = 0$

=> $\lambda = \frac{4}{10} = \frac{2}{5}$

Therefore, y = $\frac{12\lambda+(-6)}{\lambda+1} = \frac{12 \times \frac{2}{5} - 6}{\frac{2}{5}+1}$ = $\frac{(\frac{24-30}{5})}{(\frac{2+5}{5})}$ = $-\frac{6}{7}$

Thus, the y –axis divides the line segment joining the given points in the ratio 2 : 5 and the point of division is (0 , $-\frac{6}{7}$).

Q21

AB and CD are the diameters of a circle with centre O.

Therefore, OA = OB = OC = OD = 7 cm (Radius of the circle)

Area of the shaded region

= Area of the circle with diameter OB + (Area of the semi – circle ACDA – Area of $\triangle$ACD)

$= \pi \left(\frac{7}{2}\right)^2 + \left(\frac{1}{2} * \pi * (7)^2 - \frac{1}{2} * 14\ cm * 7\ cm\right)$

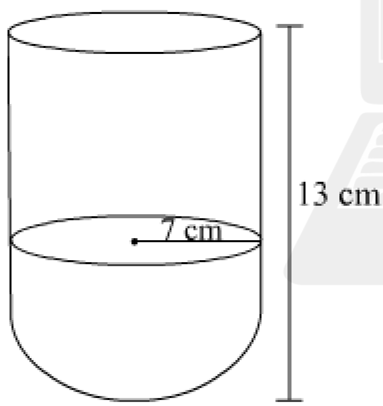
$= \frac{22}{7} \times \frac{49}{4} cm^2 + \frac{1}{2} * \frac{22}{7} * 49\ cm^2 - \frac{1}{2} * 14\ cm * 7\ cm$

$= \frac{77}{2} cm^2 + 77\ cm^2 - 49\ cm^2$

$= 66.5\ cm^2$

Thus, the area of the shaded region is 66.5 cm^2.

Q22



Let the radius and height of cylinder is r cm and h cm respectively.

Diameter of the hemisphere bowl = 14 cm

∴ Radius of the hemispherical bowl = Radius of the cylinder = r = $\frac{14}{2}$ cm = 7 cm

Total height of the vessel = 13 cm

∴ Height of the cylinder, h = Total height of the vessel – Radius of the hemispherical bowl

$= 13\ cm - 7\ cm = 6\ cm$

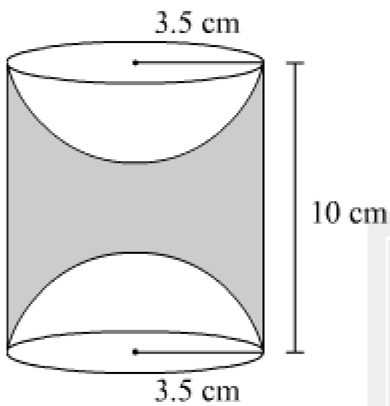
Total surface area of the vessel = 2 (curved surface area of the cylinder + curved surface area of the hemisphere) (Twice because the vessel is hollow)

$= 2(2\pi rh + 2\pi r^2) = 4\pi r(h+r) = 4 \times \frac{22}{7} \times 7 \times (6+7)cm^2$

$= 1144\ cm^2$

Thus, the total surface area of the vessel is 1144 cm^2.

Q23



Height of the cylinder, h = 10 cm

Radius of the cylinder = Radius of each hemisphere = r = 3.5 cm

Volume of wood in the toy = Volume of the cylinder – 2 x Volume of each hemisphere

$= \pi r^2 h - 2 \times \frac{2}{3}\ \pi r^3$

$= \frac{22}{7} \times (3.5\ cm)^2 \times 10\ cm - \frac{4}{3} \times \frac{22}{7} \times (3.5\ cm)^3$

$= 385\ cm^3 - \frac{539}{3}\ cm^3$

$= \frac{616}{3}\ cm^3$

$= 205.33\ cm^3$ (Approx)

Thus, the volume of the wood in the toy is approximately 205.33 cm^3.

Q24

It is given that, radius = 21 cm.

The Arc subtends an angle of 60^0.

(i) length (l) of the arc is given by : 360^0

l = $\frac{\theta}{360^0}$ x $2\pi r$, where r = 21 cm and θ = 60^0

= $\frac{60}{360} * 2 * \frac{22}{7} * 21$ cm

= 22 cm

(ii) Area, A of the sector formed by the arc is given by

A = $\frac{\theta}{360^0}$ x πr^2, where r = 21 cm and θ = 60^0

= $\frac{60^0}{360^0}$ x $\frac{22}{7}$ x 21 x 21 cm^2

= **231 cm^2**

Q25

The given equation is $\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$

$\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$

⇨ $\frac{1}{2a+b+2x} - \frac{1}{2x} = \frac{1}{2a} + \frac{1}{b}$

⇨ $\frac{2x-2a-b-2x}{2x\,(2a+b+2x\,)} = \frac{b+2a}{2\,ab}$

⇨ $\frac{-2a-b}{2x\,(2a+b+2x\,)} = \frac{b+2a}{2\,ab}$

⇨ $\frac{-(2a+b)}{2x\,(2a+b+2x\,)} = \frac{b+2a}{2\,ab}$

⇨ $\frac{-1}{x(2a+b+2x\,)} = \frac{1}{ab}$

⇨ $2x^2 + 2ax + bx + ab = 0$

⇨ 2x(x +a) + b (x+a) = 0

⇨ (x+a) (2x+b) = 0

⇨ x+a = 0 or 2x+b = 0

⇨ x = -a, or x = $\frac{-b}{2}$

Q26 let the sides of the two squares be x cm and y cm where x>y.

Then, their areas are x^2 and y^2 and their perimeters are 4x and 4y.

By the given condition, $x^2 + y^2 = 400$ and 4x – 4y = 16

4x – 4y = 16 => 4(x – y) = 16 => x – y = 4

⇨ x = y + 4 ….(1)

Substituting the value of y from (1) in $x^2 + y^2 = 400$, we get that $(y+4)^2 + y^2 = 400$

- ⇨ $y^2 + 16 + 8y + y^2 = 400$
- ⇨ $y^2 + 4y - 192 = 0$
- ⇨ $y^2 + 16y - 12y - 192 = 0$
- ⇨ $y(y+16) - 12(y+16) = 0$
- ⇨ $(y+16)(y-12) = 0$
- ⇨ $y = -16$ or $y = 12$

since, the value of y cannot be negative, the value of y = 12.

So, $x = y+4 = 12+4 = 16$

Thus, the sides of the two squares are 16 cm and 12 cm.

Q27

Given that, $S_7 = 49$ and $S_{17} = 289$

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

$\therefore S_7 = 49 = \frac{7}{2}[\,2a + (7-1)d\,] \Rightarrow 49 = \frac{7}{2} = (2a + 6d)$

- ⇨ $(a + 3d) = 7$ ……(i)

Similarly, $S_{17} = \frac{17}{2}[\,2a + (17-1)d\,]$

- ⇨ $289 = \frac{17}{2}[\,2a + 16d\,]$
- ⇨ $(a + 8d) = 17$ …..(ii)

Subtracting equation (i) from equation (ii), we get that 5d = 10.

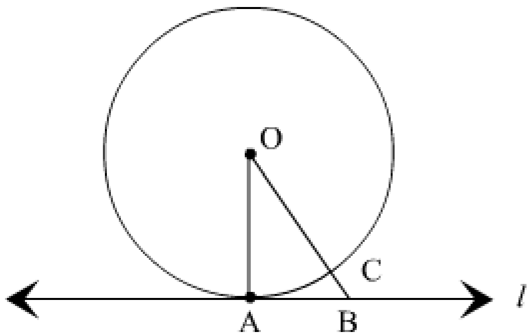
Therefore, the value of d = 2 and a = 7 – 3d = 1

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

$= \frac{n}{2}(2+2n-2) = \frac{n}{2}(2n) = n^2$

Therefore, the sum of n terms of the AP is n^2.

Q28



Given : A circle C (0,r) and a tangent / at point A.

To prove : OA $\perp$ l

Construction : take a point B, other than A, on the tangent l. Join OB. Suppose OB meets the circle in C.

Proof : we know that, among all line segment joining the point O to a point on l, the perpendicular is shortest to l.

OA = OC (Radius of the same circle)

Now, OB = OC + BC.

Therefore, OB > OC

- ⇨ OB > OA
- ⇨ OA > OB

B is an arbitrary point on the tangent l. thus, OA is shorter than any other line segment joining O to any point on l.

Hence, proved.

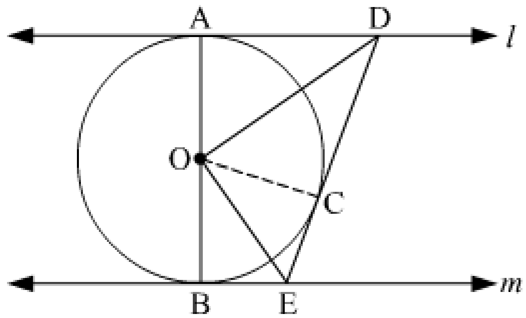
Q29

Given : l and m at are two parallel tangents to the circle with centre touching the circle at A and B respectively. DE is a tangent at the point C, which intersects l at D and m at E.

To prove : $\angle$ DOE = 90^0

Construction : Join OC.

Proof :



In $\triangle$ODA and $\triangle$ODC,

OA = OC (Radii of the same circle)

AD = DC (Length of tangents drawn from an external point to a circle are equal)

DO = OD (Common side)

$\triangle$ ODA $\cong$ $\triangle$ODC (SSS congruence criterion)

$\therefore$ $\angle$DOA = $\angle$COD ...(1) (C.P.C.T)

Similarly, $\triangle$ OEB $\cong$ $\triangle$ OEC

$\angle$EOB = $\angle$ COE ...(2)

AOB is a diameter of the circle. Hence, it is a straight line.

$\therefore$ $\angle DOA + \angle COD + \angle COE + \angle EOB = 180^0$

From (1) and (2), we have

$2\angle COD + 2\angle COE = 180^0$

⇨ $\angle COD + \angle COE = 90^0$

⇨ $\angle DOE = 90^0$

Hence, proved.

Q30

Let AB be the building and CD be the tower. Suppose the height of the building be h m.

Given, $\angle ACB = 30^0$, $\angle CBD = 60^0$ and CD = 60 m

In right $\triangle$BCD :

$\cot 60^0 = \frac{BC}{CD}$ => $BC = CD \cot 60^0$

⇨ BC = 60 m * $\frac{1}{\sqrt{3}}$ => BC = $\frac{60}{\sqrt{3}}$ m = $\frac{60\sqrt{3}}{3}$ m = $20\sqrt{3}$ m .....(1)

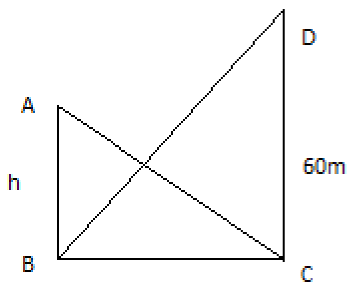
In right △ ACB :

tan 30^0 = $\frac{AB}{BC}$

⇨ $\frac{1}{\sqrt{3}}$ = $\frac{h}{20\sqrt{3}}$ (Using (1))

⇨ h = 20 m

Thus, the height of the building is 20 m.



Q31

Since the group consists of 12 persons, sample space consists of 12 persons.

∴ Total number of possible outcomes = 12

Let A denote event of selecting persons which are extremely patient

∴ Number of outcomes favorable to A is 3.

Let B denote event of selecting persons which are extremely kind or honest.

Number of persons which are extremely honest is 6.

Number of persons which are extremely kind is 12 – (6+3) = 3

∴ Number of outcomes favorable to B = 6+3 = 9.

(i) Probability of selecting a person who is extremely patient is given by P(A).

P(A) = $\frac{\text{Number of outcomes favourable to A}}{\text{Total number of possible outcomes}} = \frac{3}{12} = \frac{1}{4}$.

(ii) Probability of selecting a person who is extremely kind or honest is given by P(B)

P(B) = $\frac{\text{Number of outcomes favourable to B}}{\text{Total number of possible outcomes}} = \frac{9}{12} = \frac{3}{4}$

Q32

The three vertices of the parallelogram ABCD are A(3,-4), B(-1,-3) and C(-6,2).

Let the coordinates of the vertex D be (x,y)

It is known that in a parallelogram, the diagonals bisect each other.

∴ Mid point of AC = Mid point of BD

⇨ $\left(\frac{3-6}{2}, \frac{-4+2}{2}\right) = \left(\frac{-1+x}{2}, \frac{-3+y}{2}\right)$

⇨ $\left(-\frac{3}{2}, -\frac{2}{2}\right) = \left(\frac{-1+x}{2}, \frac{-3+y}{2}\right)$

⇨ $-\frac{3}{2} = \frac{-1+x}{2}, -\frac{2}{2} = \frac{-3+y}{2}$

⇨ x = -2, y = 1

So, the coordinates of the vertex D is (-2,1).

Now, area of parallelogram ABCD

= area of triangle ABC + area of triangle ACD

= 2 x area of triangle ABC [Diagonal divides the parallelogram into two triangles of equal area]

The area of a triangle whose vertices are (x_1,y_1), (x_2,y_2) and (x_3,y_3) is given by the numerical value of the expression $\frac{1}{2}$ [$x_1 (y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2)$]

Area of triangle ABC = $\frac{1}{2}$ [3(-3-2) + (-1) {2-(-4)} + (-6) {-4-(-3)}]

= $\frac{1}{2}$ [3 * (-5) + (-1) *6 + (-6)* (-1)] = $\frac{1}{2}$ [-15-6+6] = $-\frac{15}{2}$

∴ Area of triangle ABC = $\frac{15}{2}$ sq units (Area of the triangle cannot be negative)

Thus, the area of parallelogram ABCD = 2 * $\frac{15}{2}$ = 15 sq units.

Q33

Diameter of circular end of pipe = 2 cm

∴ Radius (r_1) of circular end of pipe = $\frac{2}{200}$ m = 0.01 m.

Area of cross –section = $\pi * r_1^2 = \pi$ x $(0.01)^2$ = 0.0001 π m^2

Speed of water = 0.4 m/s = 0.4 * 60 = 24 metre/min

Volume of water that flows in 1 minute from pipe = 24 x 0.0001 π m^3 = 0.0024 π m^3

Volume of water that flows in 30 minute from pipe = 30 x 0.0024 π m^3 = 0.072 π m^3

Radius (r_2) of base of cylindrical tank = 40 cm = 0.4 m

Let the cylindrical tank be filled up to h m in 30 minutes.

Volume of water filled in tank in 30 minutes is equal to the volume of water flowed in 30 minutes from the pipe.

$\therefore \pi * (r_2)^2 \times h = 0.072\,\pi$

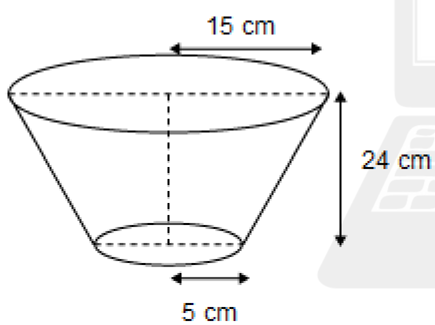
- ⇨ (0.4)2 * h = 0.072
- ⇨ 0.16 * h = 0.072

h = $\frac{0.072}{0.16}$

- ⇨ h = 0.45 m = 45 cm

Therefore, the rise in level of water in the tank in half an hour is 45 cm.

Q34



Diameter of upper end of bucket = 30 cm

∴ Radius (r_1) of upper end of bucket = 15 cm

Diameter of lower end of bucket = 10 cm

∴ Radius (r_2) of lower end of bucket = 5 cm

Height (h) of bucket = 24 cm

Slant height (l) of frustum = $\sqrt{(r_1 - r_2)^2 + h^2}$

=$\sqrt{(15-5)^2 + (24)^2}$ = $\sqrt{(10)^2 + (24)^2}$ = $\sqrt{100 + 576}$

=$\sqrt{676}$ = 26 cm

Area of metal sheet used to make the bucket = $\pi\ (r_1 + r_2)l + \pi r_2^2 = \pi\ (15 + 5)26 + \ \pi\ (5)^2$

= 520π + 25π = 545 π cm^2

Cost of 100 cm^2 metal sheet = Rs 10

Cost of 545 π cm^2 metal sheet = Rs $\frac{545 \text{ x } 3.14 \text{ x } 10}{100}$ = Rs. 171.13

Therefore, cost of metal sheet used to make the bucket is Rs 171.13.