

WITH GRAPH PAPER

केन्द्रीय माध्यमिक शिक्षा बोर्ड, दिल्ली
माध्यमिक स्कूल परीक्षा (कक्षा दसवीं)
परीक्षार्थी प्रवेश-पत्र के अनुसार भरे

Subject: Mathematics

Subject Code: 041

Day & Date of the Examination: Monday, 16.03.15

Medium of answering the paper: English

Code No. as written on the top of the question paper:

Code Number
30/2

Set Number
① ② ③ ④

Supplementary answer-book(s) used

Yes / No

Person with Disabilities

हाँ / नहीं
Yes / No

NO

If physically challenged, tick the category

B D H S C A

B = Visually Impaired, D = Deaf, H = Hearing Impaired, S = Speech Impaired, C = Cerebral Palsy, A = Autistic

Whether writer provided: Yes / No

NO

Physically challenged, name of software used:

*एक खाने में एक अक्षर लिखें। नाम के प्रत्येक भाग के बीच एक खाना रिक्त छोड़ दें। यदि परीक्षार्थी का नाम 24 अक्षरों से अधिक है, तो केवल नाम के प्रथम 24 अक्षर ही लिखें।
Each letter be written in one box and one box be left blank between each part of the name. In case Candidate's Name exceeds 24 letters, write first 24 letters.

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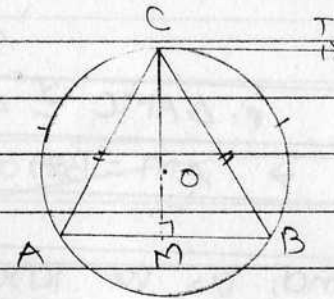
Section-D.

Given, an circle with centre O .

C is the mid-point of the arc AB

Now, CT is a tangent to the circle at point C .

Hence, AB is a chord.



To prove:- $CT \parallel AB$

Const:- we join AC and BC

we draw $CM \perp AB$

Proof:- Since, C is the mid-point of arc $\widehat{ACB}$

so, $\angle(\widehat{AC}) = \angle(\widehat{BC})$

$\Rightarrow AC = BC$ (chords subtended by equal arcs are equal)

Now, $\triangle ACB$ is isosceles $\triangle$.

Now, In right $\triangle CMA$ and $\triangle CMB$

$CM = CM$ (common)

$\angle M = \angle M = 90^\circ$ (by const)

$AC = BC$ (as proved)

$$\therefore \triangle AMC \cong \triangle BMC \text{ (RHS)}$$

$$\Rightarrow AM = BM \text{ (CPCT)}$$

And, as we know that a perpendicular that bisects the chord passes through the centre.

$\therefore$ CM passes through O.

And, we know that a tangent is perpendicular to the radius through the point of contact.

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

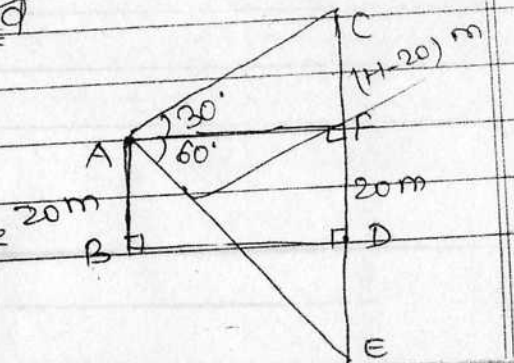
$$\text{And, } \angle CMA = 90^\circ$$

But these are alternate $\angle$ s.

$\therefore CT \parallel AB$ proved

22. Let A' be the required point of observation above the lake.

Let C be the position of cloud & E be



its reflection in the lake.

Then, $AF \perp CD$

Given, $\Rightarrow AB = DF = 20\text{ m}$

$\angle CAF = 30^\circ$

$\angle FAE = 60^\circ$

Now, let the height of cloud = $(H)\text{ m}$

i.e. $CD = DE = (H)\text{ m}$

Then, $CF = CD - DF = (H - 20)\text{ m}$

And; $EF = ED + DF$

$= (H + 20)\text{ m}$

Now, in right $\triangle AFC$,

$$\tan 30^\circ = \frac{CF}{AF} \Rightarrow \frac{1}{\sqrt{3}} = \frac{H-20}{AF}$$

$$\Rightarrow AF = \sqrt{3}(H-20) \quad \text{--- (i)}$$

Similarly, in right $\triangle AFE$,

$$\tan 60^\circ = \frac{EF}{AF} \Rightarrow \sqrt{3} = \frac{H+20}{AF}$$

$$\Rightarrow AF = \frac{H+20}{\sqrt{3}} \quad \text{--- (ii)}$$

From (i) & (ii) we get

$$\text{or, } \sqrt{3}(H-20) = \frac{H+20}{\sqrt{3}}$$

$$\text{or, } 3(H-20) = H+20$$

$$\text{or, } 3H-60 = H+20$$

$$\text{or, } 3H-H = 20+60$$

$$\text{or, } 2H = 80$$

$$\text{or, } H = 40 \text{ m}$$

$$\begin{aligned} \text{Now, } CF &= (H-20) \text{ m} \\ &= (40-20) \text{ m} = 20 \text{ m} \end{aligned}$$

Here, in right $\triangle AFC$,

$$\sin 30^\circ = \frac{CF}{AC} \Rightarrow \frac{1}{2} = \frac{20}{AC}$$

$$\Rightarrow AC = 40 \text{ m}$$

$\therefore$ Dist. of cloud from point A = 40 m

23. Total no. of cards in a deck = 52

(i) Let E_1 be the event of getting a card of spade or an ace.

No. of favourable events = $13 + 3 = 16$

$$\text{Now, } P(\text{a spade or an ace}) = P(E_1) = \frac{16}{52} = \frac{4}{13}$$

(ii) Let E_2 be the event of getting a black king.
No. of black kings = 2

$$\therefore P(\text{black king}) = P(E_2) = \frac{2}{52} = \frac{1}{26}$$

(iii) Let E_3 be the event of getting either a jack or a king.

No. of favourable events = $4 + 4 = 8$

$$\text{Now, } P(\text{either jack or king}) = P(E_3) = \frac{8}{52} = \frac{2}{13}$$

$$\text{Hence, } P(\text{neither jack nor king}) = P(\bar{E}_3) = 1 - P(E_3)$$

$$= 1 - \frac{2}{13} = \frac{13-2}{13} = \frac{11}{13}$$

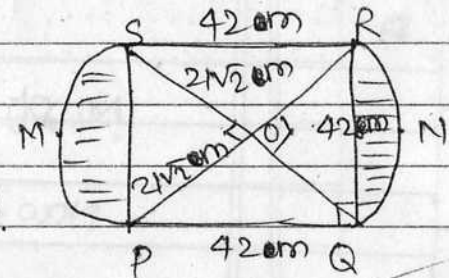
(iv) Let E_4 be the event of getting either a king or a queen.

No. of favourable events = 8

$$\therefore P(\text{either king or queen}) = P(E_4) = \frac{8}{52} = \frac{2}{13}$$

24. Given, PQRS is a square lawn of side, $PQ = 42 \text{ cm}$

Here, Two circular flower beds are drawn on sides PS and QR with O as centre.



Diagonals of sq. bisect each other at O.

Now, In right $\triangle RQP$, By pythagoras theorem

$$\begin{aligned} PR &= \sqrt{(RQ)^2 + (PQ)^2} = \sqrt{(42)^2 + (42)^2} \\ &= \sqrt{2(42)^2} \\ &= 42\sqrt{2} \text{ cm} \end{aligned}$$

And, as we know that diagonals of a square bisect each other at 90° .

$$\therefore OS = OP = \frac{42\sqrt{2}}{2} = 21\sqrt{2} \text{ cm}$$

And, $\angle POS = \angle ROQ = 90^\circ$

Now, Req. Shaded area = Area of 2 segments

with $r = 21\sqrt{2} \text{ cm}$ & $\theta = 90^\circ$

$$= 2 \times \frac{r^2}{2} \left[\frac{\pi \theta}{180} - \sin \theta \right]$$

$$= r^2 \left[\frac{\pi \times 90}{180} - \sin 90 \right]$$

$$= (21\sqrt{2})^2 \left[\frac{22}{14} - 1 \right]$$

$$= 441 \times 2 \left[\frac{22-14}{14} \right] = 441 \times 2 \left[\frac{8}{14} \right]$$

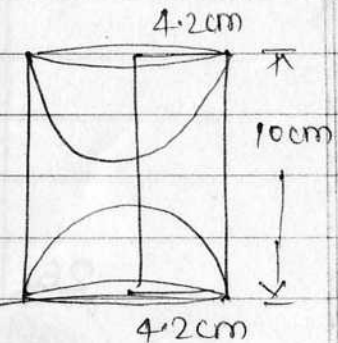
$$= 63 \times 8$$

$$= 504 \text{ m}^2$$

25. Here, Height of cylinder (H) = 10 cm

Base radius = 4.2 cm

Now, Hemispheres of radius 4.2 cm are scooped out from each end.



Now,

Vol^m of remaining solid

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

$$= \pi r^2 \times 10 - \frac{4}{3} \pi r^3$$

$$= \pi r^2 \left[10 - \frac{4r}{3} \right]$$

$$= \pi r^2 \left[\frac{30 - 4r}{3} \right] = \frac{22}{7} \times \frac{4.2}{5} \times 4.2 \left[\frac{30 - 4(4.2)}{3} \right]$$

$$= \frac{22 \times 4.2 \times (30 - 16.8)}{5}$$

$$= \frac{22 \times 4.2 \times 13.2}{5 \times 10 \times 10} = \frac{924 \times 13.2}{5 \times 100} \text{ cm}^3$$

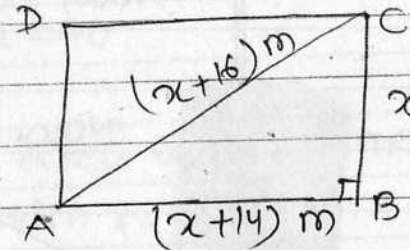
Now, the remaining solid is melted to form a wire of thickness 1.4 cm

$$\text{Now, radius of wire} = \frac{1.4}{2} \text{ cm} = 0.7 \text{ cm}$$

$$\text{Now, length of wire} = \frac{924 \times 13.2 \times 7 \times 100}{5 \times 100 \times 22 \times 0.7 \times 0.7}$$

$$= \frac{792}{5} = 158.4 \text{ cm Ans}$$

26. Let ABCD be a rectangle.
 Let the shorter side, BC = x cm
 Then, AC = (x + 16) cm
 And, AB = (x + 14) cm



Now, in right $\triangle ABC$, By Pythagoras theorem

$$AC^2 = AB^2 + BC^2$$

$$\text{or, } (x+16)^2 = (x+14)^2 + x^2$$

$$\text{or, } x^2 + 256 + 32x = x^2 + 196 + 28x + x^2$$

$$\text{or, } 2x^2 + 28x + 196 - x^2 - 32x - 256 = 0$$

$$\text{or, } x^2 - 4x - 60 = 0, \text{ which is a Quad. eqn.}$$

$$\text{or, } x^2 - 10x + 6x - 60 = 0$$

$$\text{or, } x(x-10) + 6(x-10) = 0$$

$$\text{or, } (x-10)(x+6) = 0$$

$$\text{or, } x-10 = 0 \quad \text{or, } x+6 = 0$$

$$\text{or, } x = 10 \quad \text{or, } x = -6 \text{ (invalid)}$$

$$\text{Now, } BC = x = 10 \text{ m}$$

$$AB = x+14 = (10+14) \text{ m} = 24 \text{ m}$$

27. Given, A.P. is 8, 10, 12, ...

$$\text{Here, } a = 8, d = 10 - 8 = 2$$

$$\text{Now, } a_{60} = a + (60-1)d$$

$$= 8 + (59 \times 2)$$

$$= 8 + 118 = 126$$

Now, sum of the last 10 terms = sum of terms from 51st to 60th

$$\text{i.e. } a_{51} + a_{52} + \dots + a_{60}$$

$$\text{Now, } n = 10$$

$$\text{or, } a_{51} = 8 + (51-1)2 \\ = 8 + (50 \times 2) = 100 + 8 = 108 = (\text{first term})$$

$$a_{60} = l = 126$$

Now,

$$\text{sum of last 10 term} = S_{10}$$

$$= \frac{10}{2} [a_{51} + a_{60}]$$

$$= 5 [108 + 126]$$

$$= 5 [234] = 1170 \text{ Ans}$$

28. Let the avg. speed for a dist. of 75 km = x km/hr

$$\text{Then, time taken to cover 75 km} = \left[\frac{75}{x} \right] \text{ hrs}$$

$$\text{Now, speed for the next 90 km} = (x+10) \text{ km/hr}$$

$$\text{Time taken to cover 90 km} = \left[\frac{90}{x+10} \right] \text{ hrs}$$

A/Q

$$\frac{75}{x} + \frac{90}{x+10} = 3$$

$$\text{or, } \frac{5}{18} \left[\frac{5}{x} + \frac{6}{x+10} \right] = 3$$

$$\text{or, } \frac{5(x+10) + 6x}{x^2 + 10x} = \frac{1}{5}$$

$$\text{or, } 5x + 50 + 6x = \frac{x^2 + 10x}{5}$$

$$\text{or, } (11x + 50)5 = x^2 + 10x$$

$$\text{or, } x^2 + 10x - 55x - 250 = 0$$

$$\text{or, } x^2 - 45x - 250 = 0, \text{ which is a Quad. eqn}$$

$$\text{or, } x^2 - 50x + 5x - 250 = 0$$

$$\text{or, } x(x-50) + 5(x-50) = 0$$

$$\text{or, } (x-50)(x+5) = 0$$

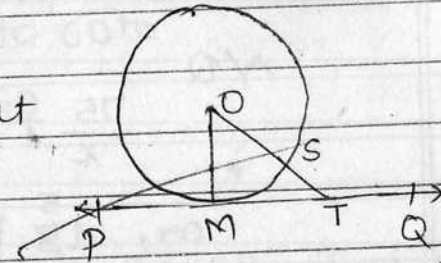
$$\text{or, } x - 50 = 0 \quad | \quad \text{or, } x + 5 = 0$$

$$\text{or, } x = 50 \quad | \quad \text{or, } x = -5$$

(invalid)

∴ ^{first} speed ~~for~~ = $x = 50 \text{ km/hr}$

29. (Giv) On circle $C(O, r)$
 PQ is a tangent to the circle at M .



To prove:- $OM \perp PQ$

Const:- we take another point on PQ i.e. T and joined it with O .

The line intersects the circle at S .

Proof:- Here, $OM = OS = r$

$$\Rightarrow OT > OM \quad (\text{Whole is greater than a part})$$

$$\text{or, } OM < OT$$

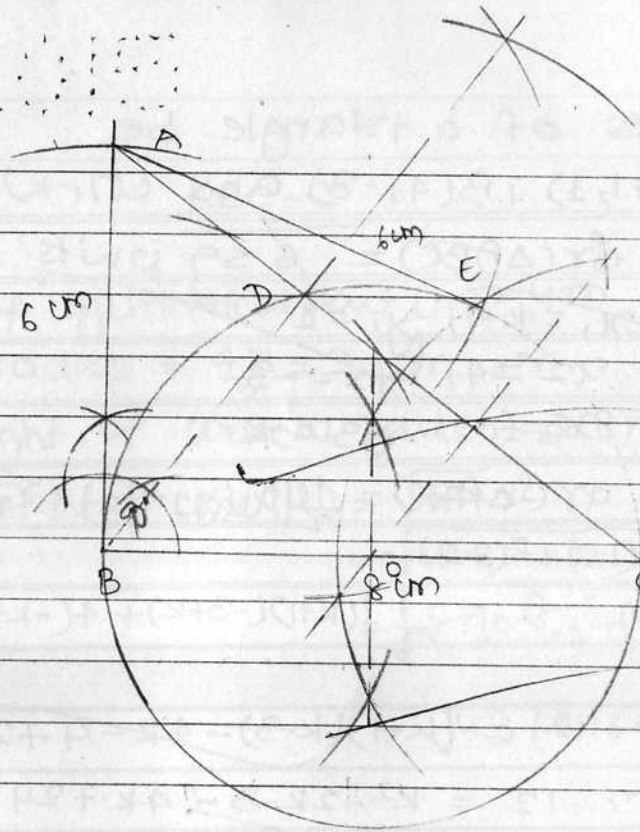
$\therefore OM$ is the shortest dist.

And, as we know that the shortest dist from a point to a line is the perpendicular dist.

$$\therefore OM \perp PQ$$

So, A tangent is perpendicular to the radius through the point of contact.

(30)



Steps:-

1. We draw $\triangle ABC$ with the given dimensions.
2. We draw a perpendicular to AC at D from B.
3. We draw a circle passing through B, C & D.
4. We draw tangent to the circle from A at B & E.
 $\therefore AB$ & AE are required tangents.

31. Given, ^{let} vertices of a triangle be

$$A(k+1, 1), B(4, -3) \text{ and } C(7, -k)$$

$$\text{Given, } \text{ar}(\triangle ABC) = 6 \text{ sq. units.}$$

$$\text{Here, } x_1 = k+1, y_1 = 1$$

$$x_2 = 4, y_2 = -3$$

$$x_3 = 7, y_3 = -k$$

$$\text{Now, } \text{ar}(\triangle ABC) = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

$$\text{or, } 6 = \frac{1}{2} |(k+1)(-3+k) + 4(-k-1) + 7(1+3)|$$

$$\text{or, } 12 = (k+1)(k-3) - 4k - 4 + 28$$

$$\text{or, } 12 = k^2 - 2k - 3 - 4k + 24$$

$$\text{or, } k^2 - 6k + 21 - 12 = 0$$

$$\text{or, } k^2 - 6k + 9 = 0, \text{ which is a Quad. eqn.}$$

$$\text{or, } k^2 - 3k - 3k + 9 = 0$$

$$\text{or, } k(k-3) - 3(k-3) = 0$$

$$\text{or, } (k-3)(k-3) = 0$$

$$\text{or, } k-3 = 0 \quad \text{or, } k-3 = 0$$

$$\text{or, } k = 3 \quad \text{or, } k = 3$$

$$\therefore k = 3$$

Sec-C.

11. Here, Height of cylindrical part (H) = 4m

$$\text{Base radius} = \frac{4.2}{2} = 2.1 \text{ m} = r$$

Now, Height of conical part (h) = 2.8m

Now, ~~slant~~ height of cone (l) = $\sqrt{h^2 + r^2}$

$$= \sqrt{(2.8)^2 + (2.1)^2}$$

$$= \sqrt{\{7(0.4)\}^2 + \{7(0.3)\}^2}$$

$$= \sqrt{49(0.16 + 0.09)} = 7\sqrt{0.25}$$

$$= 7 \times 0.5$$

$$= 3.5 \text{ m}$$

Req. area of canvas for making 1 tent

$$= \text{C.S.A of cone} + \text{C.S.A of cylinder}$$

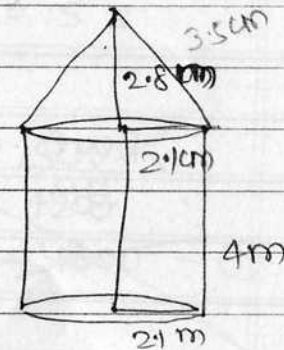
$$= \pi r l + 2\pi r H$$

$$= \pi r [l + 2H] = \pi \times 2.1 [3.5 + 2 \times 4]$$

$$= \frac{22}{7} \times \frac{21}{10} [3.5 + 8]$$

$$= \frac{33}{10} \times \frac{115}{5}$$

$$= \frac{33}{5} [4.8] \text{ m}^2 = \frac{33 \times 23}{10} \text{ m}^2$$



Req. area of ^{Canvas} tent for making 100 tents = $\frac{20}{100} \times 33 \times \frac{9.3}{10}$
 $= \frac{100 \times 33 \times 23}{10}$
 $= (33 \times 230) \text{ m}^2 = (66 \times 23) \text{ m}^2$

∴ Rate of canvas = ₹ 100 / m²

∴ Cost " " = ₹ 100 × 66 × 23
 $= ₹ 6600 \times 23 = ₹ 283800$
 $= ₹ (3300 \times 230)$

Since, the welfare association will contribute 50%.

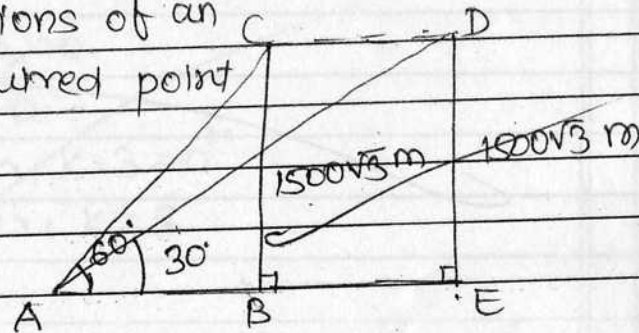
∴ Its contribution = $\frac{50}{100} \times 283800$
 $= ₹ 141900$
 $= ₹ 16500 \times 23$
 $= ₹ 379500$

The associations are very social, helpful, generous & kind.

12. Let C & D be the two positions of an aeroplane & A be the required point on the ground.

Here, CB ⊥ AE & DE ⊥ AE

Given, ∠CAB = 60°, ∠DAE = 30°



$$BC = DE = 1500\sqrt{3} \text{ m}$$

Now, Time taken to reach D from C = 15 s

Now, In right $\triangle DEA$,

$$\tan 30^\circ = \frac{DE}{AE} \Rightarrow \frac{1}{\sqrt{3}} = \frac{1500\sqrt{3}}{AE}$$

$$\Rightarrow AE = 4500 - \text{①}$$

Similarly, In right $\triangle ABC$,

$$\tan 60^\circ = \frac{BC}{AB} \Rightarrow \sqrt{3} = \frac{1500\sqrt{3}}{AB}$$

$$\Rightarrow AB = 1500 - \text{②}$$

Subtracting ② from ①, we get

$$\text{or, } AE - AB = 4500 - 1500 = 3000$$

$$\text{or, } BE = 3000 \text{ m}$$

$$\text{so, } CD = 3000 \text{ m} = 3 \text{ km}$$

$$\therefore \text{Time taken to cover } CD = 15 \text{ s} = \frac{15}{3600} \text{ hrs}$$

$$= \frac{1}{240} \text{ hrs}$$

$$\therefore \text{Speed of aeroplane} = \frac{3 \times 240}{1} \text{ km/hr}$$

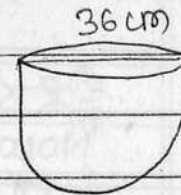
$$= 720 \text{ km/hr}$$

$$\begin{array}{r} 66 \\ 43 \\ \hline 198 \\ 264 \\ \hline 253 \end{array}$$

$$\begin{array}{r} 165 \\ 23 \\ \hline 495 \\ 330 \\ \hline 315 \end{array}$$

13. Here, internal diameter of a hemispherical bowl = 36 cm

$$\Rightarrow \text{radius} = R = 18 \text{ cm}$$



A/Q

The liquid of the bowl is filled into cylindrical bottles of diameter 6 cm i.e. of radius 3 cm

Also, 10% liquid is wasted.

$$\begin{aligned} \text{Now, vol.}^m \text{ of the bowl} &= \frac{2}{3} \times \pi \times (18)^3 = \frac{2 \times \pi \times 18 \times 18 \times 18}{3} \\ &= (12 \times 324 \pi) \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Liquid wasted} &= \frac{10}{100} \times 12 \times 324 \pi \\ &= \frac{1944 \pi}{5} \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Now, liquid used to fill the bottles} &= (3888 \pi - \frac{1944 \pi}{5}) \text{ cm}^3 \\ &= (\frac{19440 \pi - 1944 \pi}{5}) \text{ cm}^3 \\ &= \frac{17496 \pi}{5} \text{ cm}^3 \end{aligned}$$

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Now, height of each bottle = $\frac{1944 \times 243 \times 27}{5 \times 7 \times 8 \times 8 \times 12}$

$$= \frac{27}{5} \text{ cm}$$

$$= 5.4 \text{ cm}$$

14. No. of orange balls in a jar = 10
 let the no. of red balls = x
 " " " blue " = y
 Total no. of balls = $10 + x + y$

Now,

let E be the event of getting a red ball.

$$P(\text{red}) = \frac{1}{4} \Rightarrow \frac{x}{x+y+10} = \frac{1}{4}$$

$$\Rightarrow 4x = x + y + 10$$

$$\text{or, } 3x - y - 10 = 0 \quad \text{--- (i)}$$

Again, $P(\text{blue}) = \frac{1}{3} \Rightarrow \frac{y}{x+y+10} = \frac{1}{3}$

$$\Rightarrow 3y = x + y + 10$$

$$\Rightarrow 2y - x - 10 = 0 \quad \text{--- (ii)}$$

Subtracting (ii) from (i) we get

$$\text{or, } 3x - y - 10 = 0$$

$$\text{or, } -x + 2y - 10 = 0$$

$$\begin{array}{r} (+) \quad (-) \quad (+) \\ \hline 4x - 3y = 0 \end{array}$$

$$\text{or, } 4x = 3y$$

$$\text{or, } x = \frac{3y}{4} \quad \text{--- (iii)}$$

Putting the value of x in (i) we get

$$\text{or, } 3\left(\frac{3y}{4}\right) - y = 10$$

$$\text{or, } 9y - 4y = 40$$

$$\text{or, } 5y = 40 \Rightarrow y = 8$$

Putting $y = 8$ in (iii) we get

$$x = \frac{3 \times 8}{4} = 6$$

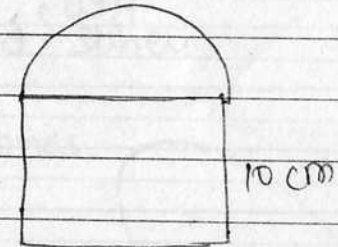
$$\therefore \text{Total no. of balls} = 6 + 8 + 10 = 24$$

15. Here, side of a cubical block = $a = 10$ cm

A hemisphere surmounts the cube.

$\therefore$ Diameter (largest) of hemisphere = 10 cm

$\Rightarrow$ radius (r) = 5 cm



Now, T.S.A of solid = (T.S.A of cube - area of base of hemisphere) + C.S.A of hemisphere

$$= 6a^2 - \pi r^2 + 2\pi r^2$$

$$= 6a^2 + \pi r^2 = 6(10)^2 + \pi(5)^2$$

$$= 600 + 25 \times 3.14$$

$$= 600 + 25 \times 3.14157$$

$$= \frac{1200 + 157}{2} = \frac{1357}{2} \text{ cm}^2$$

Now, Rate of painting = Rs 5/100 cm²

$$\therefore \text{Cost} = \text{Rs } \frac{5}{100} \times \frac{1357}{2}$$

$$= \text{Rs } 33.925$$

$$= \text{Rs } \frac{1357}{40} = \text{Rs } 33.925$$

$$= \text{Rs } 33.93$$

16. Here, coordinates of points A & B are A(-2, -2) and B(2, -4)

Here, P divides AB such that

$$\frac{AP}{AB} = \frac{3}{7} \Rightarrow \frac{AB}{AP} = \frac{7}{3}$$

$$\Rightarrow \frac{AB - AP}{AP} = \frac{7 - 3}{3}$$

$$\text{or, } \frac{BP}{AP} = \frac{4}{3}$$

$$\Rightarrow AP : BP = 3 : 4$$

$\therefore$ Point P divides AB in the ratio 3:4

Now, Coordinates of P are

$$P \left[\frac{3 \times 2 + 4(-2)}{3+4}, \frac{3(-4) + 4(-2)}{3+4} \right]$$

$$= P \left[\frac{6-8}{7}, \frac{-12-8}{7} \right] = P \left(-\frac{2}{7}, -\frac{20}{7} \right)$$

Ans

(17)

Diameter of a cone = 3.5 cm

$$\Rightarrow \text{radius}(R) = \frac{3.5}{2} \text{ cm}$$

Height of cone = $H = 3$ cm

Now, 504 cones are melted to form a sphere.

Let the radius of sphere = R

Now, Vol^m of sphere = Vol^m of 504 cones

$$\text{or, Vol^m of } \frac{4}{3} \pi R^3 = \frac{126}{504} \times \frac{1}{3} \times \pi \times 3 \times \frac{3.5}{2} \times \frac{3.5}{2} \times \pi$$

$$\text{or, } R^3 = \frac{126 \times 3 \times 3.5 \times 3.5}{4 \times 1000} = \frac{7 \times 7 \times 7 \times 18 \times 3}{16 \times 8}$$

$$\text{or, } R = \sqrt[3]{\frac{7 \times 7 \times 7 \times 3 \times 3 \times 3}{2 \times 2 \times 2}} = \frac{7 \times 3}{2} = \frac{21}{2} \text{ cm}$$

$$\therefore \text{Diameter} = 2R = 2 \times \frac{21}{2} = 21 \text{ cm}$$

$$\begin{aligned} \text{S.A of hemisphere} &= 4\pi R^2 \\ &= 4\pi \times \frac{21}{2} \times \frac{21}{2} = \frac{22}{7} \times 21 \times 21 \\ &= 66 \times 21 \\ &= 1386 \text{ cm}^2 \end{aligned}$$

$$\begin{array}{r} 66 \\ \times 21 \\ \hline 132 \\ 1320 \\ \hline 1386 \end{array}$$

18. In circle with centre O.

ABCD is a rhombus.

As we know that diagonals of a rhombus are perpendicular to each other.

So, AC and BD intersect each other at O.

Now, ar (circle) = 1256 cm²

$$\text{or, } \pi r^2 = 1256$$

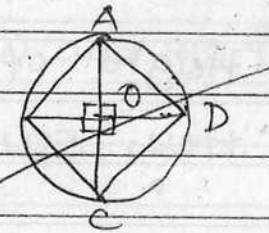
$$\text{or, } 3.14 \times r^2 = 1256 \Rightarrow r^2 = \frac{1256 \times 100}{314}$$

$$\Rightarrow r = 20 \text{ cm}$$

Now, diagonals of rhombus = $(2 \times 20) \text{ cm}$
= 40 cm

$$\therefore \text{area of rhombus ABCD} = \frac{1}{2} \times 40 \times 40$$

$$= 800 \text{ cm}^2$$



19. $2x^2 + 6\sqrt{3}x - 60 = 0$

or, $x^2 + 3\sqrt{3}x - 30 = 0$

or, Here, $a = 1$, $b = 3\sqrt{3}$, $c = -30$

Now $D = b^2 - 4ac$

$= (3\sqrt{3})^2 - 4 \times 1 \times (-30)$

$= 27 + 120 = 147$

$D > 0$. So, roots are real and distinct.

Now, $X = \frac{-b \pm \sqrt{D}}{2a} = \frac{-3\sqrt{3} \pm \sqrt{147}}{2}$

$\alpha = \frac{-3\sqrt{3} + \sqrt{147}}{2} = \frac{-3\sqrt{3} + 7\sqrt{3}}{2} = \frac{\sqrt{3}(7-3)}{2} = \frac{4\sqrt{3}}{2} = 2\sqrt{3}$

$\beta = \frac{-3\sqrt{3} - \sqrt{147}}{2} = \frac{-3\sqrt{3} - 7\sqrt{3}}{2} = \frac{-\sqrt{3}(7+3)}{2} = \frac{-10\sqrt{3}}{2} = -5\sqrt{3}$

20. Let a be the first term and d be the common diff. of the given A.P.

Then, $a_{16} = 5 \times a_3$

or, $a + 15d = 5(a + 2d)$

or, $a + 15d = 5a + 10d$

or, $4a - 5d = 0 \Rightarrow 4a = 5d$ — (4)

$\Rightarrow a = \frac{5d}{4}$ — (1)

$$\text{Given, } a_{10} = 41$$

$$\text{or, } a + 9d = 41$$

$$\text{or, } \frac{5d}{4} + 9d = 41$$

$$\text{or, } 36d + 5d = 176 \quad 164$$

$$\text{or, } 41d = 176 \quad 164$$

$$\text{or, } d = \frac{176 \quad 164}{41} = 4$$

Now, Putting $d = 4$ in (1), we get

$$\text{or, } a = \frac{5 \times 4}{4} = 5$$

$$\text{Now, } S_{15} = \frac{15}{2} [2 \times 5 + 14 \times 4]$$

$$= 15 [5 + 28] = 15 \times 33$$

$$= 495 \quad \underline{\text{Ans}}$$

Sec-B.

5. Given, points $A(x, y)$, $B(-5, 7)$ and $C(-4, 5)$ are collinear.

Now, $x_1 = x, y_1 = y, x_2 = -5, y_2 = 7, x_3 = -4, y_3 = 5$

or, $\Delta ABC = 0$

or, $\frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)| = 0$

or, $x(7 - 5) + (-5)(5 - y) + (-4)(y - 7) = 0$

or, $2x - 25 + 5y - 4y + 28 = 0$

or, $2x + y + 3 = 0$, which is the required relation between x & y .

6. Let a be the first term and d be the common diff. of the given A.P.

Then, Given, $S_5 + S_7 = 167$

$S_{10} = 235$

or, $\frac{10}{2} [2a + 9d] = 235$

or, $2a + 9d = 47$ — (1)

~~$dJ = 167$~~

21010-2000

0.010

25

1990

570

$$= 60 -$$

$$= 5$$

60-11

60-

is a

in (11), we set

XS

$$\frac{55}{5} = 11$$

$$1, a+d, a+2d, \dots$$

— — —

1

7. Given, RQ and RP are tangents to the circle C(O, r) at R & Q respectively.
 $\angle PRQ = 120^\circ$

To prove:- $OR = PR + RQ$

Const:- We draw $OP \perp PR$

Proof:- As we know that tangents subtend equal $\angle$ s to the line segment joining the point and the centre of the circle.

$$\therefore \angle ORP = 60^\circ$$

Now, in right $\triangle OPR$,

$$\cos 60^\circ = \frac{PR}{OR} \Rightarrow \frac{1}{2} = \frac{PR}{OR}$$

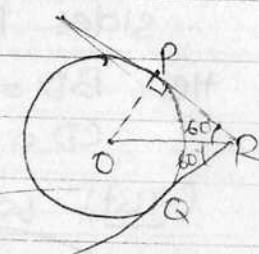
$$\Rightarrow 2PR = OR$$

$$\Rightarrow PR + RQ = OR$$

$$(\because PR = RQ$$

tangents from R)

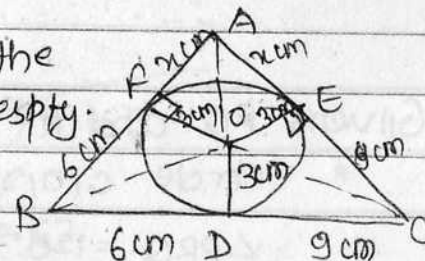
proved



8. Given, Circle with centre O touches the sides BC, AC & AB at D, E & F respty.

Hence, $BD = 6 \text{ cm}$

$CD = 9 \text{ cm}$, $\text{ar}(\triangle ABC) = 54 \text{ cm}^2$



Const: We draw $OE \perp AC$ & $OF \perp AB$

We join OA, OB & OC

To find: AB & AC

Sol:

Hence, $BF = BD = 6 \text{ cm}$ (tangents from B)

$CD = CE = 9 \text{ cm}$ (tangents from C)

Let $AE = AF = x \text{ cm}$ (tangents from A)

Now, $AB = (x + 6) \text{ cm}$, $BC = 15 \text{ cm}$

$AC = (9 + x) \text{ cm}$

or, $\text{ar}(\triangle ABC) = \text{ar}(\triangle AOB) + \text{ar}(\triangle BOC) + \text{ar}(\triangle AOC)$

or, $54 = \frac{1}{2} \times OD \times (x + 6) + \frac{1}{2} \times OD \times 15 + \frac{1}{2} \times OD \times (x + 9)$

or, $54 = \frac{18}{2} [x + 6 + 15 + x + 9]$

or, $36 = 30 + 2x$

or, $2x = 6$
or, $x = 3$

$$AB = (x+6) \text{ cm} = (3+6) \text{ cm} = 9 \text{ cm}$$

$$AC = (x+9) \text{ cm} = (3+9) \text{ cm} = 12 \text{ cm}$$

9. $4x^2 + 4bx - (a^2 - b^2) = 0$

Here, $a = 4$, $b = 4b$, $c = -(a^2 - b^2)$

$$D = b^2 - 4ac$$

$$= (4b)^2 + 4 \times 4(a^2 - b^2)$$

$$= 16b^2 + 16a^2 - 16b^2 = 16a^2 = (4a)^2$$

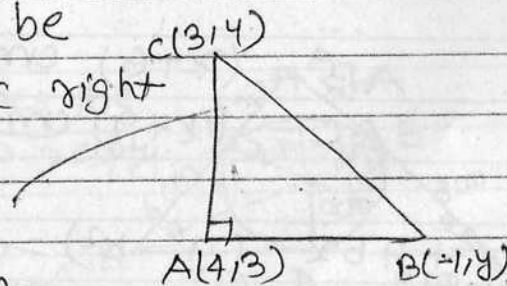
$\therefore D > 0$. So, roots are real & distinct.

Now, $x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-4b \pm \sqrt{(4a)^2}}{2 \times 4} = \frac{-4b \pm \sqrt{16a^2}}{8}$

$$\alpha = \frac{-4b + 4a}{8} = \frac{4(a-b)}{8} = \frac{a-b}{2}$$

$$\beta = \frac{-4b - 4a}{8} = \frac{4(-a-b)}{8} = -\frac{(a+b)}{2}$$

10. Let $A(4/3)$, $B(-1/y)$ and $C(3/4)$ be the vertices of a right $\triangle ABC$ right-angled at A .



Now, By pythagoras theorem,

$$BC^2 = AB^2 + AC^2$$

$$\text{or, } (-1-3)^2 + (y-4)^2 = (4+3)^2 + (3-y)^2 + (4-3)^2 + (3-4)^2$$

$$\text{or, } (-4)^2 + (y-4)^2 = (5)^2 + (3-y)^2 + 1 + 1$$

$$\text{or, } 16 + y^2 + 16 - 8y = 25 + 9 + y^2 - 6y + 2$$

$$\text{or, } 32 - 2y = 36$$

$$\text{or, } 2y = -4$$

$$\text{or, } y = -2 \quad \underline{\text{Ans}}$$

$$\text{or, } x = 3$$

Sec-A.

1. 120°

2.

1. Given, $\angle QPT = 60^\circ$

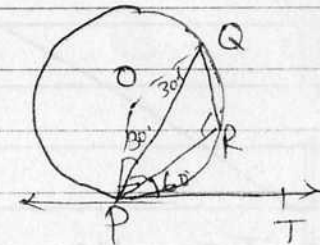
Then, $\angle OPQ = 30^\circ$

$\therefore \angle POQ = 120^\circ$

So, $\angle POQ = 240^\circ$

$\therefore \angle PRQ = 120^\circ$ Ar.

$\angle PRQ = 120^\circ$



2.

$D = 0$ (for equal roots)

$$\Rightarrow (-2\sqrt{5}p)^2 - 4p \times 15 = 0$$

$$\text{or, } 4 \times 5p^2 - 60p = 0$$

$$\text{or, } 20p^2 - 60p = 0$$

$$\text{or, } 20p(p-3) = 0$$

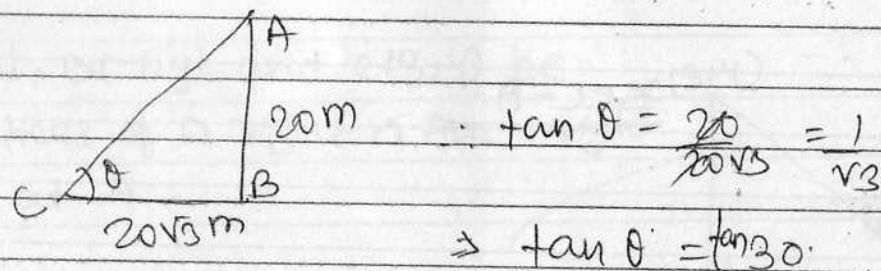
$$\text{or, } 20p = 0 \quad | \quad \text{or, } p = 3$$

$$\text{or, } p = 0$$

(invalid)

$$\therefore p = 3$$

3.



$$\therefore \theta = 30^\circ$$

So, sun's altitude = 30°

4. Two dice are tossed together.

All possible outcomes are (1,1), (1,2) ... (6,6)

Total no. of " = 36

Let E be the event of getting the product of 2 nos on top is 6

Then, favourable outcomes = (1,6), (2,3), (3,2), (6,1)

No. of " " = 4

$$P(E) = \frac{4}{36} = \frac{1}{9}$$