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WITH GRAPH PAPER

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

विषय Subject : Mathematics

विषय कोड Subject Code : 041

परीक्षा का दिन एवं तिथि
Day & Date of the Examination : 19.3.16 (Saturday)

उत्तर देने का माध्यम
Medium of answering the paper : English

प्रश्न पत्र के ऊपर लिखे कोड को दर्शाएं :
Write code No. as written on the top of the question paper :

Code Number	Set Number
30/2	① ● ③ ④

अतिरिक्त उत्तर-पुस्तिका (ओं) की संख्या
No. of supplementary answer-book(s) used : NIL

विकलांग व्यक्ति :
Person with Disabilities : हाँ / नहीं Yes / No : No

किसी शारीरिक अक्षमता से प्रभावित हो तो संबंधित वर्ग में ✓ का निशान लगाएँ।
If physically challenged, tick the category

B	D	H	S	C	A

B = दृष्टिहीन, D = मूक व बधिर, H = शारीरिक रूप से विकलांग, S = स्पास्टिक
C = डिस्लेक्सिक, A = ऑटिस्टिक
B = Visually Impaired, D = Hearing Impaired, H = Physically Challenged
S = Spastic, C = Dyslexic, A = Autistic

क्या लेखन – लिपिक उपलब्ध करवाया गया : हाँ / नहीं
Whether writer provided : Yes / No : No

यदि दृष्टिहीन हैं तो उपयोग में लाए गये सोफ्टवेयर का नाम :
If Visually 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.

कार्यालय उपयोग के लिए
Space for office use

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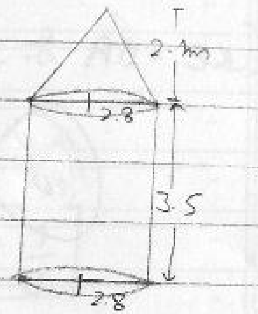
Section D



21) We have-

Radius of cylindrical and conical base = 2.8m.

Height of cylinder = 3.5m.

Height of conical part = 2.1 m

Slant height of conical part = $\sqrt{h^2+r^2}$

$\Rightarrow \sqrt{(2.8)^2+(2.1)^2} \Rightarrow \sqrt{7.84+4.41}$

$l \Rightarrow \sqrt{12.25m^2} \Rightarrow l = 3.5m$

Total canvas required to make 1 tent = C.S.A of cylinder + C.S.A of cone

$\Rightarrow 2\pi rh + \pi rl$

$\Rightarrow \pi r(2h+l) \Rightarrow \frac{22}{7} \times 2.8 (2 \times 3.5 + 3.5) m^2$

$\Rightarrow (22 \times .4 \times (7+3.5)) m^2 \Rightarrow (8.8 \times 10.5) m^2$

$\Rightarrow 92.4\ m^2$

Canvas required to make 1500 such tent

$= 92.4 \times 1500$

$138600.0 m^2 = 138600 m^2$

Total cost of making tent @ ₹ 120/m^2

$\Rightarrow$ ₹ 120 × 138600

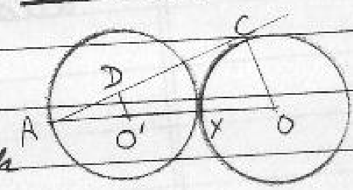
Amount shared by each school, when there are 50 school

$\frac{12\cancel{0} \times 138600}{5\cancel{0}}$

₹ 12 × 27720

= $\boxed{₹\ 332640}$

Value - $\boxed{\text{"Help the needy"}}$.



22). We have-

Two equal circles, O & O', touching each other at X and $O'D \perp AC$.

To find = $\frac{DO'}{CO}$

Let radius of each circle = r

In $\triangle ADO'$ & $\triangle ACO$ -

$\angle A = \angle A$ (common)

$\angle ADO' = \angle ACO$ (each 90°)

$\Rightarrow \triangle ADO' \sim \triangle ACO$ by AA similarity

By c.p.c.t. $\frac{AO'}{AO} = \frac{O'D}{OC} = \frac{AD}{AC}$

$(AO' = r$ & $AO = 3r)$

$\Rightarrow \frac{r}{3r} = \frac{O'D}{OC} \Rightarrow \frac{1}{3} = \frac{DO'}{CO}$

Ans:- $\boxed{\frac{DO'}{CO} = \frac{1}{3}}$

23) We have-

Total possible outcome = 1, 2, 3, 4 & 1, 4, 9, 16 = 16

	1	2	3	4
1	1	2	3	4
4	4	8	12	16
9	9	18	27	36
16	16	32	48	64

Total favourable event, having product less than 16

= 9+1, 2, 3, 4, 4, 8, 12 = 7+1 = 8

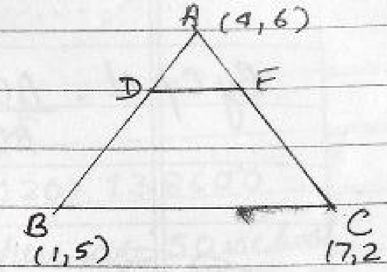
Probability = $\frac{\text{Favourable (event) outcome}}{\text{Total event}}$

$P[E] = \frac{7+1}{16} = \frac{8}{16} = \frac{1}{2}$

Ans:- $\boxed{\frac{1}{2}}$

24) The vertices of ΔABC are –

$A(4,6)$; $B(1,5)$; $C(7,2)$



Area of ΔABC (by cross method)

$$\Rightarrow \begin{array}{cccc} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{array}$$

$$\Rightarrow \frac{1}{2}\left[(x_2y_1 + x_3y_2 + x_1y_3) - (x_1y_2 + x_2y_3 + x_3y_1)\right.$$

$$\Rightarrow \begin{array}{cccc} 4 & 1 & 7 & 4 \\ 6 & 5 & 2 & 6 \end{array}$$

Area of $\Delta ABC = \frac{1}{2}\left[(6+35+8)-(20+2+42)\right]$

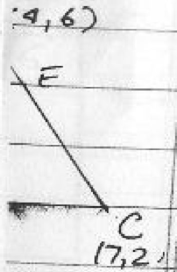
$$\Rightarrow \frac{1}{2}\left[49-(64)\right] = \frac{1}{2}\left|-15\right| = \frac{15}{2} \text{ unit}^2$$

We have – $\frac{AD}{DB} = \frac{1}{3}$ $\Rightarrow \frac{AD}{AD+DB} = \frac{1}{3}$

$$\Rightarrow 3AD = AD + DB$$

$$2AD = DB \Rightarrow \frac{AD}{DB} = \frac{1}{2}$$

$AD : DB = 1:2$, Similarily $AE : EC = 1:2$



By section formula. — $\dfrac{mx_2+nx_1}{m+n}$ & $\dfrac{my_2+ny_1}{m+n}$

$D(x,y) \Rightarrow \quad x = \dfrac{1+2\times4}{3}$ & $y = \dfrac{1\times5+2\times6}{3}$

$x = \dfrac{9}{3} = 3$ & $y = \dfrac{17}{3}$

$E(x_1,y_1) = x_1 = \dfrac{1\times7+2\times4}{3}$ & $y_1 = \dfrac{1\times2+2\times6}{3}$

$x_1 = \dfrac{7+8}{3}$ & $y_1 = \dfrac{2+12}{3}$

$x_1 = 5$ & $y_1 = \dfrac{14}{3}$

Area of ΔADE by cross method —

$$\begin{array}{cccc} A & D & E & A \\ 4 & 3 & 5 & 4 \\ 6 & \frac{17}{3} & \frac{14}{3} & 6 \end{array}$$

Area

$= \dfrac{1}{2}\left[\left(18 + \dfrac{85}{3} + \dfrac{56}{3}\right) - \left(\dfrac{68}{3} + \dfrac{14}{1} + \dfrac{30}{1}\right)\right]$

$= \dfrac{1}{2}\left[\left(\dfrac{54+85+56}{3}\right) - \left(\dfrac{68+42+90}{3}\right)\right]$

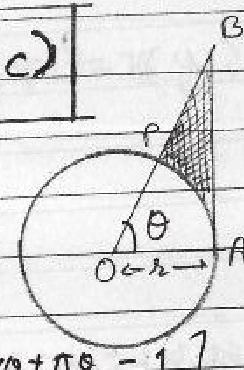
$\dfrac{5}{2}$ unit^2

$$\frac{1}{2}\left[\left(\frac{195}{3} - \frac{200}{3}\right)\right] \Rightarrow \frac{1}{2}\left|-\frac{5}{3}\right| = \frac{1\times 5}{2\ \ 3} = \frac{5}{6} \text{ unit}^2$$

$$\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC} = \frac{\frac{1}{2}\times\frac{5}{3}}{\frac{1}{2}\times 15} \Rightarrow \frac{5}{3\times 15} \Rightarrow \frac{1}{9}$$

$$\boxed{ar(\Delta ADE) = \frac{1}{9}(ar\ \Delta ABC)}$$

25) Given — OAP is sector of circle with centre O, $\angle POA = \theta$ and $OA \perp AB$



To prove —
Perimetre of shaded region $= r\left[\tan\theta + \sec\theta + \frac{\pi\theta}{180} - 1\right]$

Proof —
Perimetre of shaded region $= BP + AB + ar\ \widehat{AP}$ — (IV)
$= (\theta)$

Now —
$\tan\theta = \frac{AB}{r} \Rightarrow r\tan\theta = AB$ — (1)

$\sec\theta = \frac{OB}{r} \Rightarrow r\sec\theta = OB$

$OB - OP = BP \Rightarrow r\sec\theta - r = BP$ — (2)

$\frac{5}{6}$ und^2

Length of arc AP $= \frac{\theta}{360} \times 2\pi r = \frac{\theta \times 2\pi r}{360} = \frac{\theta\pi r}{180}$ — ③

Putting value from eq ①, ②, ③ in eq IV

⇒ Perimetre of shaded region

$\Rightarrow r\tan\theta + r\sec\theta - r + \frac{\theta\pi r}{180}$

$= \boxed{r\left[\tan\theta + \sec\theta + \frac{\theta\pi}{180} - 1\right]}$

Hence proved.

26) The houses are numbered consecutively from 1 to 49

1 2 3 ...... $x-1$, x, $x+1$ ..... 49.

Sum of no. of house preceding X numbered house

= Sum of no. following X

— IV

$\Rightarrow \frac{x-1}{2}\left[1 + (x-1)\right] = \left[(1 + \dots 49) - \left[1+2+\dots x\right]\right]$

$\Rightarrow \frac{x-1}{2}\left[1 + x - 1\right] = \left[\frac{49}{2} \times (1+49) - \left[\frac{x}{2}\left[1+x\right)\right]\right]$

$\frac{(x-1)x}{2} = \frac{49 \times 50}{2} - \frac{x}{2}(x+1)$

$$\frac{x(x-1)}{2} + (x+1)\frac{x}{2} = 49 \times 25$$

$$\frac{x^2 - x + x^2 + x}{2} = 49 \times 25$$

$$\frac{\cancel{2}x^2}{\cancel{2}} = 49 \times 25 \Rightarrow x^2 = 7 \times 7 \times 5 \times 5$$

$$x = 35$$

35, being whole no, proved that, given statement is true for $\boxed{X = 35}$

27) Let speed of stream $= x$

speed of boat $= 24$ km/h.

ATQ —

$$\frac{32}{24-x} + \frac{32}{24+x} = 1$$

"Sorry Sir/Mam"

$$\Rightarrow 32\left[\frac{1}{24-x} + \frac{1}{24+x}\right] = 1$$

$$\Rightarrow \frac{24+x+(24-x)}{576-x^2} = \frac{1}{32}$$

ATQ, —

$$\frac{32}{24-x} - \frac{32}{24+x} = 1$$

$$32\left[\frac{1}{24-x} - \frac{1}{24+x}\right] = 1$$

$$32\left[\frac{24+x-24+x}{576-x^2}\right] = 1$$

$32(\cancel{24}+x-\cancel{24}+x) = 576 - x^2$

$32 \times 2x = 576 - x^2$

$64x = 576 - x^2$

$x^2 + 64x - 576 = 0$

$x^2 + 72x - 8x - 576 = 0 \Rightarrow x^2 + 72x - 8x - 576 = 0$

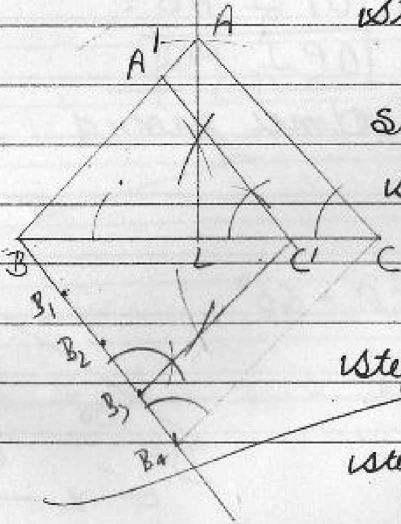
$x(x+72) - 8(x+72) = 0$

$(x-8)(x+72) = 0$

$x = 8, -72$

~~Speed can't~~ Speed of stream = 8 km/h.

28) Step of Construction



Step 1 – Draw base BC = 5.5 cm, with AL = 3 cm ⊥r on it

Step 2 – Join AB & AC.

Step 3 – Draw acute angle XBC & mark 4 point (B_1 ... B_4) at equal distance. Join B_4C.

Step 4 – From B_3, draw a ‖ line to B_4C that meet BC at C'

Step 5 – From C' draw ‖ AC, that meet AB at A'

$\triangle A'BC'$ is required $\triangle$

-

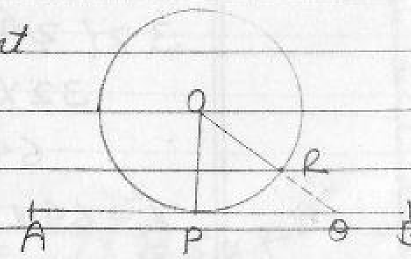
rtment

1

= 1

- 1

29) Given – A circle C(O, OP) and tangent at P.



To prove – $OP \perp PQ$

Const^n – Extend OR to Q, at AB

Proof – We have –

$OP = OR$ (radius)

$OQ = OR + RQ$

Clearly $OQ > OR$

$\therefore OQ > OP$

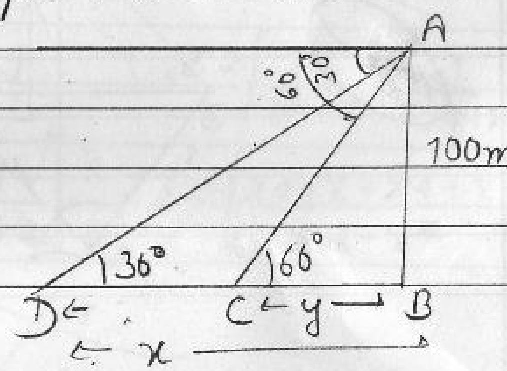
The shortest line joining a point to any point on given line is $\perp$r to that line

$\Rightarrow OP \perp AB$

or $\boxed{OP \perp PQ}$

Hence proved

30) ATQ →



In $\triangle ABC$, $\angle ACB = 60°$

$\tan 60° = \sqrt{3}$

$\Rightarrow \frac{100}{BC} = \sqrt{3}$

$$\frac{100}{\sqrt{3}} = BC = y$$

In ΔABD, $\angle ADB = 30^\circ$

$$\tan 30^\circ = \frac{1}{\sqrt{3}} \Rightarrow \frac{AB}{BD} = \frac{1}{\sqrt{3}} \Rightarrow \frac{100}{BD} = \frac{1}{\sqrt{3}}$$

$$100\sqrt{3} = BD = \cancel{y}\ x$$

Required distance travelled by ship $= -(y-x) = x-y$

$$\Rightarrow 100\sqrt{3} - \frac{100}{\sqrt{3}}\ m$$

$$x-y \Rightarrow 100\left[\sqrt{3}-\frac{1}{\sqrt{3}}\right] = 100\left[\frac{3-1}{\sqrt{3}}\right] = \frac{100\times 2}{\sqrt{3}}$$

$$CD = x-y \Rightarrow 100\times\frac{2\times\sqrt{3}}{\sqrt{3}\ \sqrt{3}} = \frac{200\sqrt{3}}{3}\ m$$

$$CD = \frac{200\times 1.73\ m}{3} = \frac{346}{3}\ m$$

$$\Rightarrow \boxed{115.33\ m}$$

31) Let length of park = x

Its breadth = $x-3$

Area = $x(x-3)\,m^2$

Base of isoceles Δ = $x-3$

and altitude = $12\,m$

Its area = $\frac{1}{2} \times (12 \times x-3)\,m^2 = 6(x-3)\,m^2$

A TQ →

$+x(x-3) = 6(x-3) \cancel{=4} + 4$

$x^2 - 3x = 6x - 18 + 4$

$x^2 - 3x = 6x - 14$

$x^2 - 3x - 6x + 14 = 0$

$x^2 - 9x + 14 = 0$

$x^2 - 7x - 2x + 14 = 0$ (By Factorisation Method)

$x(x-7) - 2(x-7) = 0$

$x = \cancel{2}, 7$

Length of rectangle field = $7m$

& breadth = $(7-3)m = 4m$

(Length can't be 2, because ~~of~~ then breadth = -1, that isn't possible).

Ans:- $\boxed{7m, 4m \text{ respectively}}$

Section C -

11) Given - The point $P(x, y)$ is equidistant from point $A[(a+b), b-a]$ & $B[(a-b), (a+b)]$

To prove = $bx = ay$

Proof -

$AP = BP \Rightarrow AP^2 = BP^2$

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

$AP^2 = BP^2$

$\Rightarrow [x-(a+b)]^2 + [y-(b-a)]^2 = [x-(a-b)]^2 + [y-(a+b)]^2$

$\Rightarrow \cancel{x^2} + \cancel{(a+b)^2} - 2x(a+b) + \cancel{y^2} + (b-a)^2 - 2y(b-a)$

$= \cancel{x^2} + (a-b)^2 - 2x(a-b) + \cancel{y^2} + \cancel{(a+b)^2} - 2y(a+b)$

$(b-a)^2 - 2x(a+b) + 2y(a-b) = (a-b)^2 - 2x(a-b) - 2y(a+b)$

$\cancel{b^2} + \cancel{a^2} - \cancel{2ba} - \cancel{2ax} - 2bx + 2ay - \cancel{2by} = \cancel{a^2} + \cancel{b^2} - \cancel{2ab} - \cancel{2ax} + 2bx - 2ay + \cancel{2by}$

$= 4ay = 4bx$

$\boxed{ay = bx}$

Hence proved

hod)

12) Radius & height of conical vessel = 5 cm & 24 cm resp.

Volume of cone = $\frac{1}{3}\pi r^2 h$

Volume of cone = $\frac{1}{3}\pi \times 25 \times 24 \text{ cm}^3$

Water is emptied of cylindrical vessel of $r = 10$ cm & height $= h$

Volume of cone = Volume of cylinder

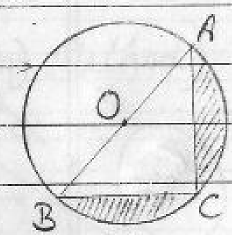
$\Rightarrow \frac{1}{\cancel{3}}\cancel{\pi}\times 25 \times \cancel{24}^{8} = \cancel{\pi}\times 10 \times 10 \times h$

Volume of —
Cone = $\frac{1}{3}\pi r^2 h$
Cylinder = $\pi r^2 h$

$= \frac{200}{100}$ cm $= h$

$= \boxed{2 \text{ cm} = h}$

13) AIQ —



Radius of semicircle ACB = $\frac{13}{2}$ cm.

area of semicircle = $\pi r^2 \times \frac{1}{2}$

Its area = $\frac{1}{2} \times 3.14 \times \frac{13}{2} \times \frac{13}{2} \text{ cm}^2$

$\frac{3.14 \times 169}{8} \text{ cm}^2 = \frac{530.66}{8} \text{ cm}^2$

17

Semicircle subtend 90° at circle, $\angle ACB = 90°$

In ΔABC —

$AC^2 + BC^2 = AB^2 \Rightarrow 12^2 + BC^2 = 169\ cm^2$

$\Rightarrow BC^2 = (169-144)\ cm^2 \quad BC^2 = 25\ cm$

$BC = 5\ cm.$

Area of $\Delta = \frac{1}{2} \times$ Base $\times$ Height

Area of $\Delta ABC = \frac{1}{2} \times AC \times BC = \frac{1}{\cancel{2}} \times \overset{6}{\cancel{12}} \times 5 = 30\ cm^2$

Area of shaded region $= \frac{530.66\ cm^2}{8} - 30\ cm^2$

$\Rightarrow (66.3325 - 30)\ cm^2$

$\Rightarrow \boxed{36.3325\ cm^2}$

14) Diametre of sphere = 12 cm

Its radius = 6 cm

Volume $= \frac{4}{3}\pi \times 6^3\ cm^3$ $\left\{ \text{Volume of sphere} = \frac{4}{3}\pi r^3 \right\}$

It is submerged into water, ~~in~~ cylindrical vessel, then water level rise by $3\frac{5}{9}$ cm $= \frac{32}{9}$ cm

Volume submerged = Volume rise.

Let radius of cylinder be r cm

$\Rightarrow \frac{4}{\cancel{3}} \pi \times 6^3 = \pi \times r^2 \times \frac{32}{\cancel{9}\,3} cm$

$27\ \frac{\cancel{216} \times 3 \times 4}{\cancel{32}\ 4} = r^2$

$\Rightarrow 4 \times \frac{27 \times 3}{4} = r^2 \Rightarrow \frac{4 \times 81 cm^2}{4} = r^2$

$r = \frac{9}{\cancel{2}} cm$

Diametre $= 2r = \frac{\cancel{2} \times 9}{\cancel{2}} cm = 9 cm \times 2 = \boxed{18 cm}$

15) Radius of cylinder as well as conical part $= \frac{3}{2}$ m.

Height of cylinder, $h = 2.1 m$

Slant height of cone, $l = 2.8 m$.

Total canvas required $= 2\pi r h + \pi r l$

$\pi r (2h + l)$

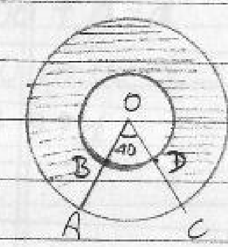
$\Rightarrow \frac{22}{7} \times \frac{3}{2} [4.2 + 2.8] m^2$

$$\Rightarrow \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \frac{3}{\cancel{2}} \times 7.0\ m^2 = 33\ m^2$$

Total cost @ ₹500/m^2 = ₹33 × 500

$$= \boxed{₹16,500}$$

16) Radii of two concentric circle = 7cm & 14cm
and $\angle AOC = 40^\circ$



$m\angle AOC = 360^\circ - 40^\circ = 320^\circ$

Area of shaded region

$$\frac{\theta \pi}{360}\left[R^2 - r^2\right]$$

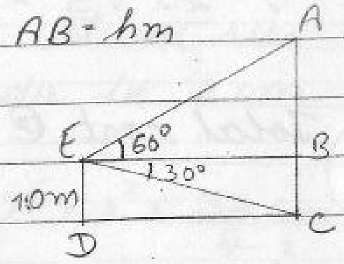
$$\Rightarrow \frac{320}{360} \times \frac{22}{7}\left[14^2 - 7^2\right] \Rightarrow \frac{8}{\underset{3}{\cancel{9}}} \times \frac{22}{\cancel{7}} \times \cancel{7} \times \overset{7}{\cancel{21}}$$

$$\Rightarrow \frac{8 \times 154\ cm^2}{3}$$

Required area = $\frac{1232}{3} cm^2$

$$= \boxed{410.67\ cm^2}$$

17) Let AC = be height of hill and AB = h m



In Δ BCE,

where BC = 10 m & $\angle BEC = 30^\circ$

$\tan 30^\circ = \frac{1}{\sqrt{3}}$

$\Rightarrow \frac{BC}{BE} = \frac{1}{\sqrt{3}} \Rightarrow \frac{10}{BE} = \frac{1}{\sqrt{3}}$

$\Rightarrow 10\sqrt{3}\,m = BE = CD$

Distance of hill from ship = $10\sqrt{3}\,m = 10 \times 1.732\,m$
$= 17.32\,m$

In Δ ABE, where AB = h m, BE = $10\sqrt{3}$ m & $\angle AEB = 60^\circ$

$\tan 60^\circ = \sqrt{3}$

$\Rightarrow \frac{h}{10\sqrt{3}} = \sqrt{3} \Rightarrow h = 10\sqrt{3} \times \sqrt{3}$

$h = 30\,m$

Height of hill = h + 10m

$\boxed{40\,m}$

18) Let three digit of 3 digit no be - $a-d, a, a+d$.

Their sum = 15

$a-d+a+a+d = 15 \Rightarrow 3a = 15 \Rightarrow a = 5$

Required 3 digit no = $100(a-d)+10a+a+d$

$100a-100d+10a+a+d$

$111a-99d$

No. obtained by reversing digit = $100(a+d)+10a+a-d$

$100a+100d+10a+a-d$

$111a+99d$

A.T.Q. -

$111a+99d = 111a-99d-594$

$\Rightarrow 594 = \cancel{111}a-99d-\cancel{111}a-99d$

$594 = -198d$

$\frac{-594}{198} = d$

$-3 = d.$

The no = $111a-99d$

$111\times5 - 99\times-3$

$555+297 = 852$

No. $\Rightarrow$ $\boxed{852 \text{ or } 258}$

19) $(a-b)x^2+(b-c)x+(c-a)=0$

The root are equal, then $D=0$

Comparing eq^n by $ax^2+bx+c=0$

$a=(a-b)$; $b=(b-c)$; $c=c-a$

$$D = b^2-4ac$$
$$=(b-c)^2-4\times(a-b)(c-a)$$

Here, $D = 0$

$$(b-c)^2-4(a-b)(c-a) = 0$$
$$b^2+c^2-2bc-4(ac-a^2-bc+ab) = 0$$
$$b^2+c^2-2bc-4ac+4a^2+4bc-4ab = 0$$
$$4a^2+b^2+c^2+2bc-4ab-4ac = 0$$
$$\Rightarrow (-2a+b+c)^2 = 0 \qquad [a^2+b^2+c^2+2ab+2bc+2ca=(a+b+c)^2]$$
$$-2a+b+c = 0$$
$$\boxed{b+c = 2a}$$

Hence proved

20) Total cards $=52$

Cards removed $= 6$

Card left $= 52-6 = 46$

∴ Total black king = 2.

Probability of drawing black king = $\frac{2}{46} = \boxed{\frac{1}{23}}$

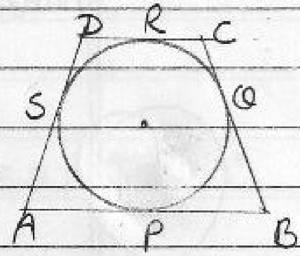
Total red card = 26 − 6
= 20

Probability of drawing red colour card = $\frac{20}{46} = \boxed{\frac{10}{23}}$

Total card of black colour = 26

Probability of drawing black colour card = $\frac{26}{46} = \boxed{\frac{13}{23}}$

Section B



5 Given A quadrilateral circumscribing a circle, with centre O, such that it touches side AB, BC, CD, AD at P, Q, R & S

To prove = AB + CD = BC + DA

Proof— Length of tangent drawn from external point are equal

AP = AS → (at A) —— (1)

BP = BQ → (at B) —— (2)

DR = DS → (at C) —— (3)

CR = CQ → at D —— (4)

Adding eq ①, ②, ③, ④

$\Rightarrow AP + BP + DR + CR = AS + DS + BQ + CQ$

$\boxed{AB + CD = AD + BC}$

Hence proved.

6) We have,

$a_4 = 0$

$a + 3d = 0$ $[a + (n-1)d = a_n]$

$3d = -a$

or $-3d = a$ — ①

Now,

$a_{25} = a + 24d$ $[a+(n-1)d = a_n]$

$-3d + 24d$ (Putting value of "a" from eq ①)

$= 21d$ — ②

$a_{11} = a + 10d$

$-3d + 10d$

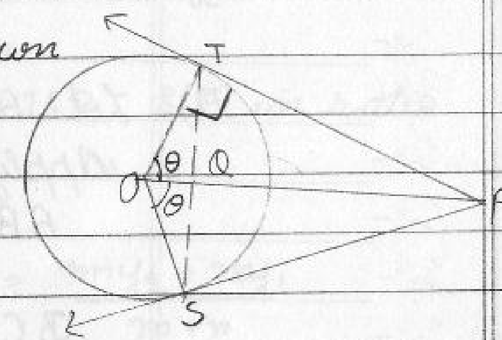
$= 7d$ — ③ $(a = -3d)$

From eq ② & eq ③

$\boxed{a_{25} = 3a_{11}}$

Hence Proved.

7) Given PT & PS are two tangent drawn from P to circle $C(O, r)$ & $OP = 2r$



To prove = $\angle OTS = \angle OST = 30°$

Proof —

In $\triangle OPT$,

Let $\angle TOP = \theta$

$$\cos\theta = \frac{OT}{OP} = \frac{r}{2r}$$

$$\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}}$$

$$\cos\theta = \frac{1}{2}$$

Also $\cos 60° = \frac{1}{2}$, then

$$\theta = 60°$$

similarity, $\angle SOP = 60°$, and $\angle SOT = 120°$

In $\triangle OST$,

Applying ~~(Pyth)~~ angle sum property of $\triangle$ —

$$\angle OTS + \angle OST + \angle TOS = 180°$$

$$\angle OTS + \angle OST = 180° - \angle TOS$$

$$\angle OTS + \angle OST = 60°$$

Since $OT = OS$ (radius of circle) $\Rightarrow \angle OTS = \angle OST$

$\Rightarrow 2\angle OST = 60° \Rightarrow \angle OST = 30$

$\Rightarrow \angle OTS = \angle OST = 30°$

Hence Proved.

8). Let $A = (3,0)$; $B = (6,4)$ and $C = (-1,3)$.

Applying distance formula –

$AB = \sqrt{(6-3)^2 + (4-0)^2} = \sqrt{3^2+4^2} = \sqrt{25} = 5$ unit

$BC = \sqrt{(6+1)^2 + (4-3)^2} = \sqrt{7^2+1^2} = \sqrt{49+1} = \sqrt{50} = 5\sqrt{2}$ unit

$AC = \sqrt{(3+1)^2 + (0-3)^2} = \sqrt{25} = 5$ unit.

Since,

$AB = AC = 5$ unit

ΔABC is isosceles triangle.

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

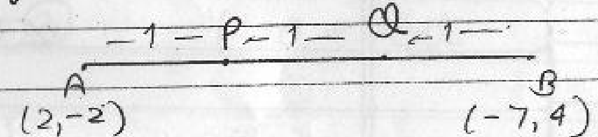
$\Rightarrow 5^2 + 5^2 = 50$

$25 + 25 = 50 = BC^2 = (5\sqrt{2})^2 \Rightarrow AB^2 + AC^2 = BC^2$

Hence, by converse of Pythagoras Theorem,

$\Rightarrow \Delta ABC$ is right angled triangle.

9). We have –



Line AB, joining points

$A(2,-2)$ and $B(-7,4)$

P & Q are points of trisection, then,

P ~~divides~~ divides AB in ratio 1:2 & Q in ratio 2:1

By section formula —

$$x = \frac{mx_2 + nx_1}{m+n} \quad \& \quad y = \frac{my_2 + ny_1}{m+n}$$

$$P(x,y) = \frac{1\times -7 + 2\times 2}{3} \text{ and } y = \frac{1\times 4 + 2\times -2}{3}$$

$$P(x,y) = \frac{-7+4}{3} \text{ and } \frac{4-4}{3}$$

$$\boxed{P(x,y) = (-1, 0)}$$

$$Q(x',y') = \frac{2\times -7 + 1\times 2}{3} \text{ and } y = \frac{2\times 4 + 1\times -2}{3}$$

$$Q(x',y') = \frac{-14+2}{3} \text{ and } \frac{8-2}{3}$$

$$\boxed{Q(x'y') = (-4, 2)}$$

16) $\sqrt{2x+9} + x = 13$

$\sqrt{2x+9} = 13 - x$

$2x+9 = (13-x)^2 \Rightarrow$

$2x+9 = 169 + x^2 - 26x \Rightarrow$

$\Rightarrow 169 + x^2 - 2x - 26 - 9$

$x^2 - 2x - 26 + 169 - 9 = 0$

$x^2 - 2x - 26 + 160 = 0$

$x^2 - 2x + 134 = 0$

$x^2 + 169 - 26x - 9 - 2x$

$x^2 - 28x + 160 = 0$

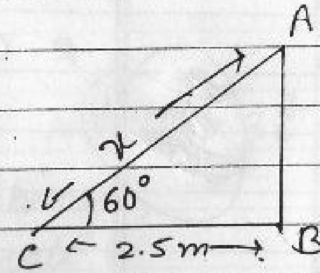
$x^2 - 20x - 8x + 160 = 0$

$x(x-20) - 8(x-20) = 0$

$(x-8)(x-20) = 0$

either = $\boxed{x = 8}$ or $\boxed{x = 20}$

Section A



1) In ΔABC, with $\angle C = 60^\circ$

Let length of ladder = $x = AC$

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

$\Rightarrow \frac{2.5}{AC} = \frac{1}{2} = 2 \times 2.5 = AC$

$\Rightarrow \boxed{5m = AC}$

2). We have-

Three consecutive terms of AP = $k+9, 2k-1, 2k+7$

~~Then~~ Then,

$$(k+9)+(2k+7) = 2(2k-1) \quad \{(a+c = 2b)\}$$

$$\Rightarrow k+9+2k+7 = 4k-2$$

$$3k+16 = 4k-2$$

$$16+2 = 4k-3k$$

$$\boxed{18 = k}$$

3) We have-

$$\angle CAB = 30^\circ$$

Since, $OA = OC$ (radius of circle)

$$\angle OAC = \angle OCA = 30^\circ$$

Line joining centre to tangent is perpendicular on tangent

$$\angle OCP = 90^\circ$$

$$\angle PCA = \angle OCP - \angle OCA$$

$$\Rightarrow 90^\circ - 30^\circ$$

$$= \boxed{60^\circ}$$

4) Total cards = 52

(b) Total red card & queen = 28

Probability of getting neither red card nor queen

$= 1 - \frac{28}{52} = \frac{52-28}{52}$

$= \frac{24}{52} = \frac{12}{26}$

Ans:- $\frac{12}{26}$ or $\boxed{\frac{6}{13}}$

1

$\frac{90}{90}$ 004130519

90

Ninety only

Excellent!

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