

WITH GRAPH PAPER

केन्द्रीय माध्यमिक शिक्षा बोर्ड, दिल्ली  
माध्यमिक स्तर पर (कक्षा नववीं)  
वैश्विक प्रवेश-पत्र के अंगुष्ठ पर

विषय Subject: Mathematics  
विषय और विषय कोड: 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

पत्र पर लेखने के लिए  
कोड की संख्या  
Write Code No. on  
the top of the answer paper.  
Code Number: 30/2  
Set Number: 3 4

आवश्यक उत्तर-पुस्तिका (यदि हो सके)  
No. of supplementary answer-books used: NIL

विकलांग व्यक्ति  
Person with Disabilities: No  
Yes/No

किसी शारीरिक श्रमात्मक से प्रभावित हो तो संबंधित वर्ग में  का चिह्न लगाए।  
If physically challenged, tick the category

**B D H S C A**

B = अंधित्व, D = मूला व कटि, H = शारीरिक कम शक्ति, S = सांकेतिक  
C = श्रवण, A = अक्षिति  
B = Visually Impaired, D = Hearing Impaired, H = Physically Challenged  
S = Speech, C = Dyslexia, A = Autism

क्या लेखन - लिपि उपलब्ध करवाया गया: No  
Whether writer provided: Yes/No

यदि दृष्टिहीन हैं तो उत्तरों में सफेद गूदे  
कोमप्यूटर का नाम  
If visually challenged, name of software used

पत्र पर लेखने के लिए प्रत्येक भाग के बीच एक पंक्ति खाली छोड़ें।  
पत्र पर लेखने के लिए प्रत्येक भाग के बीच एक पंक्ति खाली छोड़ें।  
Back letter to be written in one box and one box to be left blank between each part of the  
name. In case Candidate's Name exceeds 24 letters, write first 24 letters.

**6290705**  
041/00222

कार्यालय उपयोग के लिए  
Space for office use

## Section D

21)

We have-

Radius of cylindrical and conical base = 2.8 m.

Height of cylinder = 3.5 m.

Height of conical part = 2.1 m

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

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

$$l = \sqrt{12.25} \Rightarrow l = 3.5 \text{ m}$$

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

$$\Rightarrow 2\pi rh + \pi r l$$

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

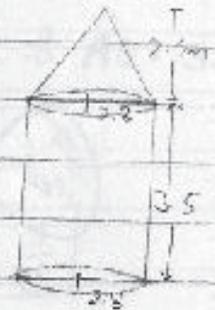
$$\Rightarrow (22 \times 4 \times (7 + 3.5)) \text{ m}^2 = (8.8 \times 10.5) \text{ m}^2$$

$$\Rightarrow 92.4 \text{ m}^2$$

Canvas required to make 1500 such tent

$$= 92.4 \times 1500$$

$$1386000 \text{ m}^2 = 138600 \text{ m}^2$$



Total cost of making tent @ ₹120/m<sup>2</sup>.

$$\Rightarrow ₹120 \times 138600$$

Amount shared by each <sup>school</sup> school, when there are 50 schools

$$\frac{120 \times 138600}{50}$$

$$= ₹12 \times 27720$$

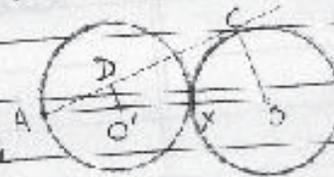
$$= ₹332640$$

Value - "Help the needy"

22) We have -

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

To find = DO'  
CO



Let radius of each circle = r

In ΔADO' & ΔACO -

$$\angle A = \angle A \quad (\text{common})$$

$$\angle ADO' = \angle ACO \quad (\text{each } 90^\circ)$$

$$\Rightarrow \Delta ADO' \sim \Delta ACO \text{ by AA similarity}$$

By C.P.C.  $\frac{AO'}{AO} = \frac{O'D}{OC} = \frac{AD}{AC}$

(  $AO' = 2x$  &  $AO = 3x$  )

$\Rightarrow \frac{2x}{3x} = \frac{O'D}{OC} \Rightarrow \frac{2}{3} = \frac{DO'}{CO}$

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

23) 201. hai -

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

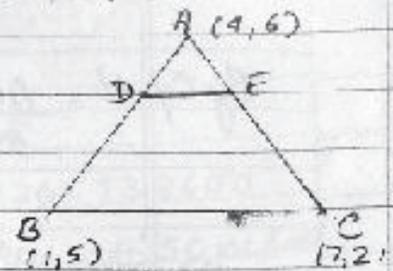
Total favourable event, having product less than 16  
 = 9 + 1, 2, 3, 4, 4, 8, 12 = 7 + 1 = 8

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

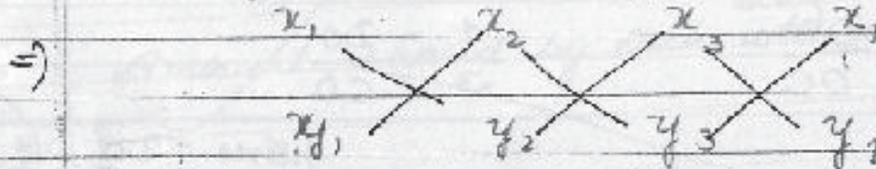
$P(E) = \frac{7+1}{16} = \frac{8}{16} = \frac{1}{2}$

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

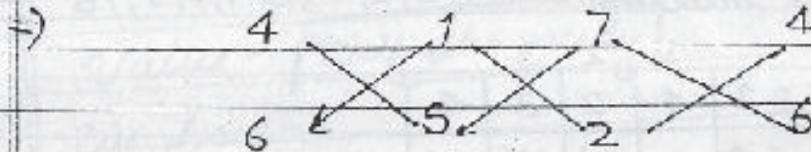
24) The vertices of  $\triangle ABC$  are -  
 $A(4,6)$ ,  $B(1,5)$ ,  $C(7,2)$



Area of  $\triangle ABC$  (by cross method)



$$\Rightarrow \frac{1}{2} [(x_2 y_1 + x_3 y_2 + x_1 y_3) - (x_1 y_2 + x_2 y_3 + x_3 y_1)]$$



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

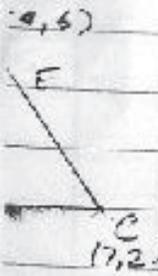
$$= \frac{1}{2} [49 - (64)] = \frac{1}{2} |-15| = \frac{15 \text{ unit}^2}{2}$$

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

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

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

$$AD : DB = 1 : 2, \text{ Similarly } AE : EC = 1 : 2$$



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

$$D(x, y) \Rightarrow x = \frac{1 + 2 \times 4}{3} \quad \& \quad y = \frac{1 \times 5 + 2 \times 6}{3}$$

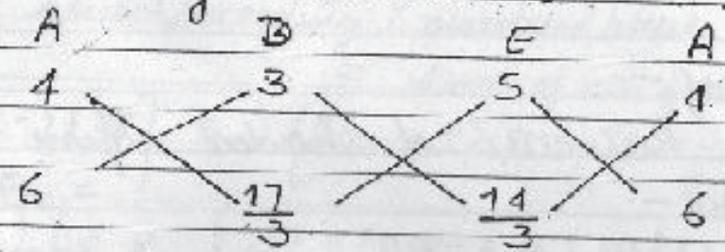
$$x = \frac{9}{3} = 3 \quad \& \quad y = \frac{17}{3}$$

$$F(x_1, y_1) = x_1 = \frac{1 \times 7 + 2 \times 4}{3} \quad \& \quad y_1 = \frac{1 \times 2 + 2 \times 6}{3}$$

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

$$x_1 = 5 \quad \& \quad y_1 = \frac{14}{3}$$

Area of  $\triangle ADF$  by cross method —



Area

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

$$= \frac{1}{2} \left[ \left( \frac{59 + 85 + 56}{3} \right) - \left( \frac{68 + 42 + 90}{3} \right) \right]$$

$\frac{5 \text{ cm}^2}{2}$

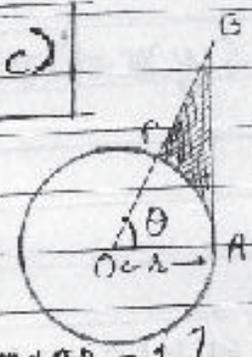
$$\frac{1}{2} \left[ \left| \frac{195}{3} - \frac{200}{3} \right| \right] \Rightarrow \frac{1}{2} \left| \frac{-5}{3} \right| = \frac{1 \times 5}{2 \times 3} = \frac{5}{6} \text{ unit}^2$$

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

$$\boxed{\text{Ar}(\triangle ADE) = \frac{1}{9}(\text{Ar} \triangle ABC)}$$



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



To prove -

$$\text{Perimeter of shaded region} = r \left[ \tan \theta + \sec \theta + \frac{\pi r}{180} - 1 \right]$$

Proof -

$$\text{Perimeter of shaded region} = BP + AB + \text{ar } \widehat{AP} \quad \text{--- (I)}$$

Now -

$$\tan \theta = \frac{AB}{r} \Rightarrow r \tan \theta = AB \quad \text{--- (1)}$$

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

$$OB - OP = BP \Rightarrow r \sec \theta - r = BP \quad \text{--- (2)}$$

$\frac{5 \text{ cm}^2}{6}$

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

Putting value from eq (1), (2), (3) in eq IV  
 Perimeter of shaded region

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



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

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

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

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

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

(IV)

10

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

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

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

$$x = 35$$

35, being whole no, proved that, given statement is true for  $x = 35$

27) Let speed of stream =  $x$

speed of boat = 24 km/h

Q10 -

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

"Sorry Sir/Mam"

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

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

Q10, -

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

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

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

$$32(2/4 + x - 2/4 + x) = 576 - x^2$$

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

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

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

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

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

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

$$x = 8, -72$$

Speed can't be negative  $\therefore$  speed of stream = 8 km/h.

28)

Step of Construction

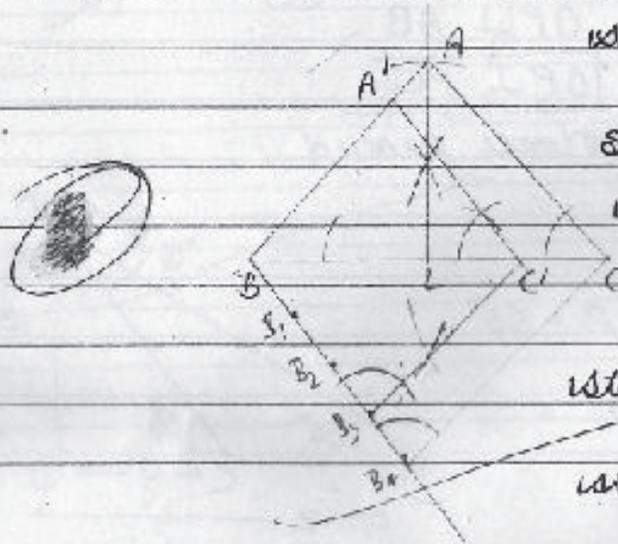
Step 1 - Draw base BC = 5.5 cm, with AL = 3 cm  $\perp$  on it

Step 2 - Join AB & AC

Step 3 - Draw acute angle  $\angle$ BC & mark 4 point ( $B_1, B_2, B_3, B_4$ ) at equal distance. Join  $B_4C$ .

Step 4 - From  $B_1$ , draw a  $\parallel$  line to  $B_4C$  that meet BC at  $C'$

Step 5 - From  $C'$  draw  $\parallel$  AC, that meet AB at  $A'$ .  $\triangle A'B'C'$  is required  $\triangle$



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

To prove -  $OP \perp PQ$

Const<sup>n</sup> - Extend OR to Q, at AB

Proof - we have -

$$OP = OR \text{ (radius)}$$

$$OQ = OR + RQ$$

$$\text{Clearly } OQ > OR$$

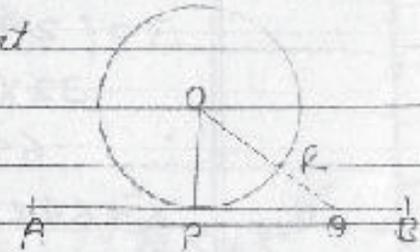
$$\therefore OQ > OP$$

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

$$\Rightarrow OP \perp AB$$

$$\therefore \boxed{OP \perp PQ}$$

Hence proved

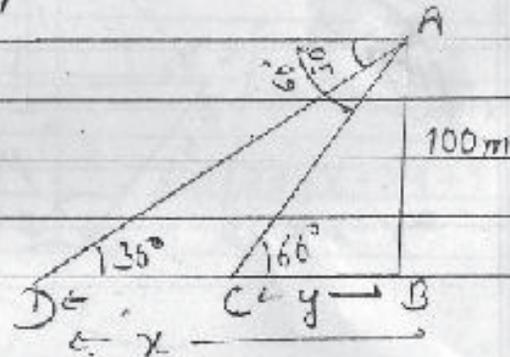


30)

In  $\triangle ABC$ ,  $\angle ACB = 60^\circ$

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

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



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

In  $\triangle ABD$ ,  $\angle ADB = 30^\circ$

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

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

Required distance travelled by ship =  $-(y-x) = x-y$   
 $= 100\sqrt{3} - 100$  m

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

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

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

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

14

31)

Let length of park =  $x$ Its breadth =  $x-3$ Area =  $x(x-3) \text{ m}^2$ Base of isosceles  $\Delta$  =  $x-3$ and altitude =  $12 \text{ m}$ Its area =  $\frac{1}{2} \times (12 \times x-3) \text{ m}^2 = 6(x-3) \text{ m}^2$ Q 10  $\rightarrow$ 

$$+x(x-3) = 6(x-3) + 4$$

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

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

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

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

$$x^2 - 7x - 2x + 14 = 0$$

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

$$x = 2, 7$$

Length of rectangle field =  $7 \text{ m}$ & breadth =  $(7-3) \text{ m} = 4 \text{ m}$ 

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

Ans:-  $7 \text{ m}, 4 \text{ m}$  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 =  $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

$$AP^2 = BP^2$$

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

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

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

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

$$b^2 + a^2 - 2ba - 2ax - 2bx + 2ay - 2by = a^2 + b^2 - 2ab - 2ax + 2bx - 2ay + 2by$$

$$= 4ay = 4bx$$

$$ay = bx$$

∴ Hence proved



16

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

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

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

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

$$\text{Volume of cone} = \text{Volume of cylinder}$$

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

$$= \frac{2500 \text{ cm} \cdot h}{100}$$

$$= \boxed{25 \text{ cm} \cdot h}$$

$$\left. \begin{array}{l} \text{Volume of -} \\ \text{Cone} = \frac{1}{3} \pi r^2 h \\ \text{Cylinder} = \pi r^2 h \end{array} \right\}$$

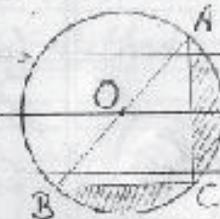
13) Q10 -

Radius of semicircle ACB = 13 cm.

$$\text{Area of semicircle} = \frac{1}{2} \pi r^2$$

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

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



Semicircle subtend  $90^\circ$  at circle,  $\angle ACB = 90^\circ$

In  $\triangle ABC$  -

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

$$\therefore BC^2 = (169 - 144) \text{ cm}^2 \quad BC^2 = 25 \text{ cm}$$

$$BC = 5 \text{ cm}$$

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

$$\text{Area of } \triangle ABC = \frac{1}{2} \times AC \times BC = \frac{1}{2} \times 12 \times 5 = 30 \text{ cm}^2$$

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

$$\Rightarrow (66.3325 - 30) \text{ cm}^2$$

$$\Rightarrow \underline{\underline{36.3325 \text{ cm}^2}}$$

14) - Diameter of sphere = 12 cm

Its radius = 6 cm

$$\text{Volume} = \frac{4}{3} \pi \times 6^3 \text{ cm}^3$$

$$\left\{ \begin{array}{l} \text{Volume of sphere} \\ = \frac{4}{3} \pi r^3 \end{array} \right.$$

It is submerged into water in cylindrical vessel, then  
water level rise by  $3\frac{8}{9} \text{ cm} = \frac{32}{9} \text{ cm}$

Volume submerged = Volume rise  
 Let radius of cylinder be  $r$  cm

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

$$\frac{2^7 \times 2 \times 3 \times 4}{3 \times 4} = r^2$$

$$\Rightarrow \frac{4 \times 2^7 \times 3}{4} = r^2 \Rightarrow \frac{4 \times 81}{4} = r^2$$

$$r = \frac{9}{1} \text{ cm}$$

$$\text{Diameter} = 2r = \frac{2 \times 9}{1} \text{ cm} = 9 \text{ cm} \times 2 = \boxed{18 \text{ cm}}$$

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

Height of cylinder,  $h = 2.1$  m

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

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

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

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

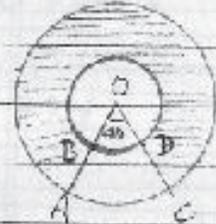
Total cost @ ₹500/m<sup>2</sup> =  $\frac{33 \times 500}{1}$   
 $\boxed{\text{₹16,500}}$

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

$$\text{m}\angle ADC = 360^\circ - 40^\circ = 320^\circ$$

Area of shaded region

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



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

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

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

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

20

17) Let  $AC$  be height of hill and  $AB = h$  m  
In  $\triangle BCE$ ,

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

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

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

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

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

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

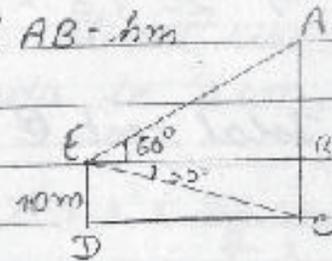
$$\tan 60^\circ = \sqrt{3}$$

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

$$h = 30 \text{ m}$$

$$\text{Height of hill} = h + 10 \text{ m}$$

$$\boxed{40 \text{ m}}$$



18) Let three digit of 3-digit no be -  $a-d, a, a+d$ .  
Their sum = 15

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

$$\begin{aligned} \text{Required 3 digit no} &= 100(a-d) + 10a + a+d \\ &= 100a - 100d + 10a + a + d \\ &= 111a - 99d \end{aligned}$$

$$\begin{aligned} \text{No. obtained by reversing digit} &= 100(a+d) + 100 + a-d \\ &= 100a + 100d + 10a + a - d \\ &= 111a + 99d \end{aligned}$$

ATQ -

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

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

$$594 = -198d$$

$$-594 = d$$

$$198$$

$$-3 = d$$

$$\text{The no} = 111a - 99d$$

$$111 \times 5 - 99 \times -3$$

$$555 + 297 = 852$$

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

22

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

The roots are equal, then  $D=0$

Comparing eq<sup>n</sup> by  $ax^2 + bx + c = 0$

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

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

$$\text{Here, } D = 0$$

$$(b-c)^2 - 4(a-b)(c-a) = 0$$

$$b^2 + c^2 - 2bc - 4(ac - a^2 - bc + ab) = 0$$

$$b^2 + c^2 - 2bc - 4ac + 4a^2 + 4bc - 4ab = 0$$

$$4a^2 + b^2 + c^2 + 2bc - 4ab - 4ac = 0$$

$$\Rightarrow (-2a + b + c)^2 = 0 \quad [a^2 + b^2 + c^2 + 2ab + 2ac + 2bc = (a+b+c)^2]$$

$$-2a + b + c = 0$$

$$\boxed{b + c = 2a}$$

Hence proved

$$20) \text{ Total cards} = 52$$

$$\text{Cards removed} = 6$$

$$\text{Card left} = 52 - 6 = 46$$

- Total black king = 2.

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

Total red card =  $26 - 6$   
 $= 20$

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

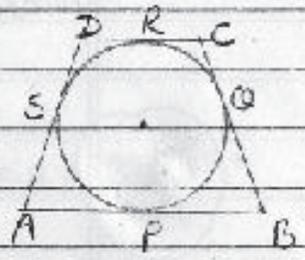


Total card of black colour = 26

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

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

$$\Rightarrow AP + BP + DP + CP = AS + DS + BS + CS$$

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

Hence proved.

6)

20th term,

$$a_4 = 0$$

$$a + 3d = 0$$

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

$$3d = -a$$

$$n - 3d = a \quad \text{--- ①}$$

Now,

$$a_{25} = a + 24d$$

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

$$-3d + 24d$$

$$= 21d \quad \text{--- ②}$$

(Putting value of 'a' from eq ①)

$$a_{11} = a + 10d$$

$$-3d + 10d$$

$$= 7d \quad \text{--- ③}$$

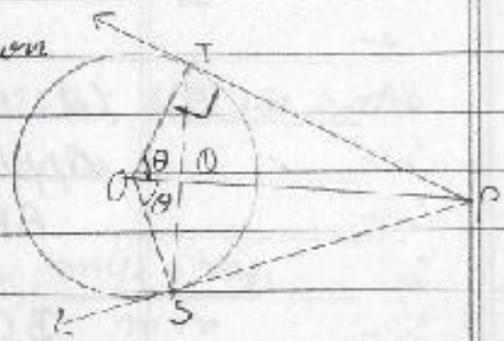
(a = -3d)

From eq ② & eq ③

$$\underline{7a_{25} = 30a_{11}}$$

Hence Proved.

7) Given PT & PS are two tangents drawn from P to circle C (O, r) & OP = 2r  
 To prove =  $\angle OTS = \angle OST = 30^\circ$



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

$$\theta = 60^\circ$$

Similarly,  $\angle SOP = 60^\circ$ , and  $\angle SOT = 120^\circ$

In  $\triangle OST$ ,

Applying (Pyth) angle sum property of  $\triangle$ -

$$\angle OTS + \angle OST + \angle TOS = 180^\circ$$

$$\angle OTS + \angle OST = 180^\circ - \angle TOS$$

$$\angle OTS + \angle OST = 60^\circ$$

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

$$\Rightarrow 2\angle OST = 60^\circ \Rightarrow \angle OST = 30^\circ$$

Hence Proved.

30

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

Applying distance formula -

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

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

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

Since,

$$AB = AC = 5 \text{ unit}$$

$\Delta ABC$  is isosceles triangle.

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

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

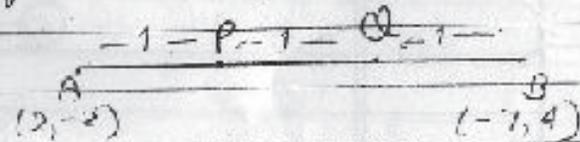
$$25 + 25 = 50 = BC^2 = (5\sqrt{2})^2 \Rightarrow AB^2 + AC^2 = BC^2$$

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 AB in ratio 1:2 & Q in ratio 2:1

By section formula -

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

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

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

$$P(x, y) = (-1, 0)$$

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

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

$$Q(x', y') = (-4, 2)$$

16)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Section A

1)

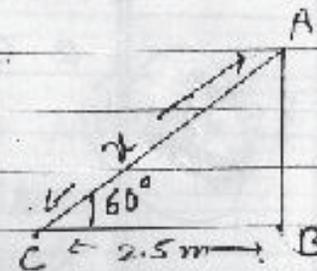
9m  $\Delta ABC$ , with  $\angle C = 60^\circ$

Let length of ladder =  $x = AC$

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

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

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



2) we have -

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

Among them,

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

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

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

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

$$\boxed{18 = k}$$

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

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

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

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

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



A  
B

4) Total cards = 52

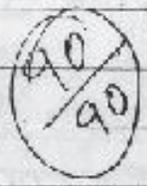
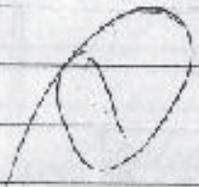
(a) Total red card & queen = 28

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  $\frac{6}{13}$



~~004130519~~



Excellent!  
Ninety only  
Niraj  
04/10/2018