

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

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 लिखें

कोड की दशांश :
Write code No. as written on
the top of the question paper :

Code Number

30/2

Set Number

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 द बहिर, H = शारीरिक रूप से विकलांग, S = स्पास्टिक
C = डिस्लेक्सिक, A = ऑटिस्टिक
B = Visually Impaired, D = Hearing Impaired, H = Physically Challenged
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क्या लेखन - लिपिक उपलब्ध करवाया गया : हाँ / नहीं
Whether writer provided : Yes / No

No

यदि दृष्टिहीन है तो उपयोग में लाए गए
सॉफ्टवेयर 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.

6290705

041/00222

कार्यालय उपयोग के लिए
Space for office use

Section D

21) We have-

Radius of cylindrical and conical base = 2.8m.

Height of cylinder = 3.5m.

Height of conical part = 2.1m

$$\text{Slant height of conical part} = \sqrt{h^2 + r^2} \\ \Rightarrow \sqrt{(2.8)^2 + (2.1)^2} \Rightarrow \sqrt{7.84 + 4.41}$$

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

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

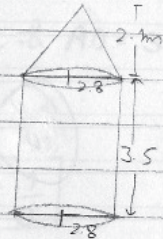
$$= 2\pi rh + \pi rl \\ \Rightarrow \pi r(2h + l) \Rightarrow \frac{22 \times 2.8(2 \times 3.5 + 3.5)}{7} \text{m}^2$$

$$\Rightarrow (22 \times 2.8 \times (7 + 3.5)) \text{m}^2 \Rightarrow (8.8 \times 10.5) \text{m}^2 \\ \Rightarrow 92.4 \text{m}^2$$

Canvas required to make 1500 such tent

$$= 92.4 \times 1500$$

$$138600.0 \text{m}^2 = 138600 \text{m}^2$$



Total cost of making tent @ ₹120/m²

$$\Rightarrow ₹120 \times 138600$$

Amount shared by each ^{school} std, when there are 50 school

$$120 \times 138600$$

50

$$₹12 \times 27720$$

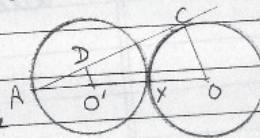
$$= ₹332640$$

Value - "Help the needy"

22). We have -

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

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



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.U. $\frac{AO'}{AO} = \frac{O'D}{OC} = \frac{AD}{AC}$

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

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

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

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

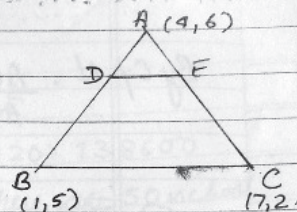
Probability = $\frac{\text{Favourable (event) outcome}}{\text{Total event}}$

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

Ans: $-\left[\frac{1}{2}\right]$

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

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



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

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

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

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

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

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

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

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

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

(4, 6)

E

C
(7, 2)

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

$$D(x, y) \Rightarrow x = \frac{1 \times 4 + 2 \times 7}{3} \quad \& \quad y = \frac{1 \times 5 + 2 \times 6}{3}$$

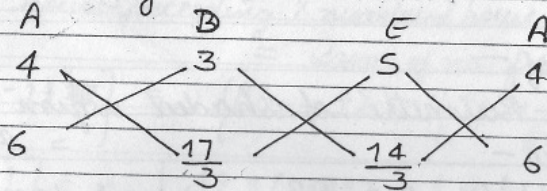
$$x = \frac{9+14}{3} \quad y = \frac{17}{3}$$

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

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

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

Area of $\triangle ADE$ by cross method —



Area

$$= \frac{1}{2} \left[\left(\frac{18}{3} + \frac{85}{3} + \frac{56}{3} \right) - \left(\frac{68}{3} + \frac{14 \times 4}{1 \times 17} \right) \right]$$

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

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

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

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

2s) Given - OAP is sector of circle with centre O, $\angle POA = \theta$ and $OA \perp AB$

To prove -

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

Proof -

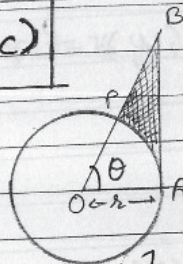
$$\text{Perimetre of shaded region} = BP + AB + \text{arc AP} \quad \text{--- (IV)}$$

Now -

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

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

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



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

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

Putting value from eq (1), (2), (3) in eq IV
 $\Rightarrow$ 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

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

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

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

--- (IV)

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

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

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

$$x = 35$$

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

27) Let speed of stream = x

speed of boat = 24 km/h.

WTO-

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

"Sorry Sir/Mam"

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

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

WTO, -

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

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

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

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

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

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

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

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

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

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

$$x = 8, -72$$

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

28)

Step of Construction

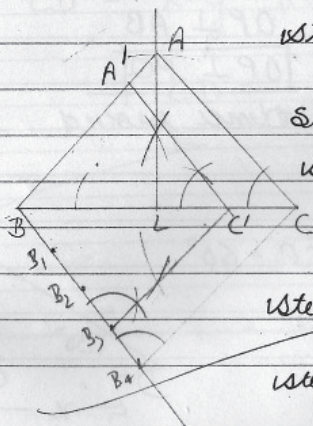
Step 1 - Draw base $BC = 5.5 \text{ cm}$, with $AL = 3 \text{ cm} \perp$ on it

Step 2 - Join AB & AC .

Step 3 - Draw acute angle $\angle B$ & mark 4 points ($B_1, \dots, B_4$) at equal distance. Join B_4C .

Step 4 - From B_3 , draw a $\parallel$ line to B_4C that meet BC at C' .

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



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

To prove - $OP \perp PQ$

Constⁿ - Extend OR to Q , at 'AB'

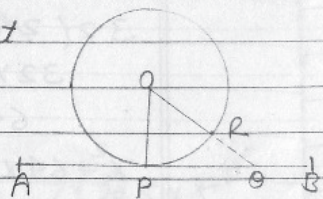
Proof - We have -

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

$$OQ = OR + RQ$$

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

$$\therefore OQ > OP$$



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

$$\Rightarrow OP \perp AB$$

$$\text{or } \boxed{OP \perp PQ}$$

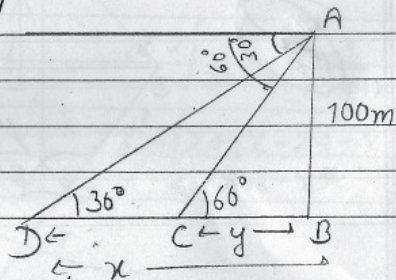
Hence proved

30) Q10 -

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 ΔABD , $\angle ADB = 30^\circ$

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

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

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

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

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

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

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

31)

Let length of park = x Its breadth = $x-3$

$$\text{Area} = x(x-3) \text{ m}^2$$

Base of isosceles Δ = $x-3$

and altitude = 12 m

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

Q 10 $\rightarrow$

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

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

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

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

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

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

(By Factorisation Method)

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

$$x = 2, 7$$

Length of rectangle field = 7 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 m, 4 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 -

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

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

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

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

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

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

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

$$= 4ay = 4bx$$

$$\boxed{ay = bx}$$

Hence proved

mod.)

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

Volume of cone = Volume of cylinder

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

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

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

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

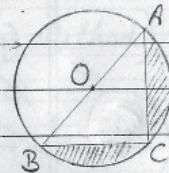
13) Q10 -

Radius of semicircle ACB = 13 cm.

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

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

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



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

In ΔABC -

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

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

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

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

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

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

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

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

14) - Diameter of sphere = 12 cm

Its radius = 6 cm

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

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

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

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

$$\frac{27 \times 16 \times 3 \times 4}{32 \times 4} = r^2$$

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

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

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

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

Height of cylinder, $h = 2.1 \text{ m}$

Slant height of cone, $l = 2.8 \text{ m}$

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

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

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

Total cost @ ₹500/m² = $\frac{33 \times 500}{1}$ = ₹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

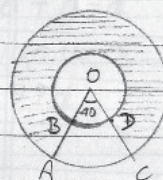
$$\frac{\theta}{360} \pi [R^2 - r^2]$$

$$\Rightarrow \frac{320}{360} \times \frac{22}{7} [14^2 - 7^2] = \frac{8 \times 22 \times 7 \times 21}{3 \times 7}$$

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

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

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



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

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

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

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

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

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

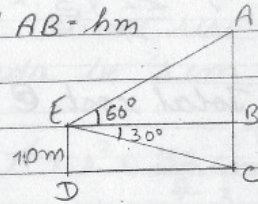
In $\triangle ABE$ -, where $AB = h$ m, $BE = 10\sqrt{3}$ m & $\angle AEB = 60^\circ$

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

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

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

$$\text{Height of hill} = h + 10 \text{ m} = \boxed{40 \text{ m}}$$



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

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

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

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

Q10 -

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

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

$$594 = -198d$$

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

$$-3 = d$$

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

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

$$555 + 297 = 852$$

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

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

The roots are equal, then $D=0$

Comparing eqⁿ by $ax^2 + bx + c = 0$

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

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

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

Thus, $D = 0$

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

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

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

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

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

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

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

Hence proved

20) Total cards = 52

Cards removed = 6

Card left = $52 - 6 = 46$

• Total black king = 2.

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

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

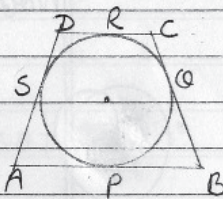
Probability of drawing red colour card = $\frac{20}{46} = \frac{10}{23}$

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)
$CP = CQ$	→ (at D)	— (4)

adding eq ①, ②, ③, ④

$$AP + BP + DR + CR = AS + DS + BS + CS$$

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

hence proved.

6) we have,

$$a_4 = 0$$

$$a + 3d = 0$$

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

$$3d = -a$$

$$a - 3d = a \quad \text{--- ①}$$

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

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

hence Proved.

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

Proof -

In $\triangle OPT$,

Let $\angle TOP = \theta$

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

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

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

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

$$\theta = 60^\circ$$

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

In $\triangle OST$,

Applying Pyth's angle sum property of $\triangle$ -

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

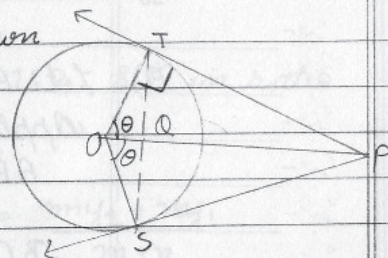
$$\angle OTS + \angle OST = 180^\circ - \angle TOS$$

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

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

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

Hence Proved



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,

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

ΔABC is isosceles triangle.

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

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

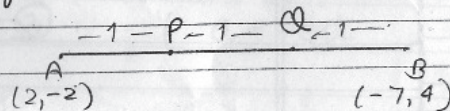
$$25 + 25 = 50 = BC^2 = (5\sqrt{2})^2 \Rightarrow AB^2 + AC^2 = BC^2$$

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) $\sqrt{2x+9} + x = 13$
 $\sqrt{2x+9} = 13 - x$
 $2x+9 = (13-x)^2 \Rightarrow$
 $2x+9 = 169 + x^2 - 26x \Rightarrow x^2 + 169 - 26x - 9 - 2x$
 $= 169 + x^2 - 2x - 26 - 9$
 $x^2 - 2x - 26 + 169 - 9 = 0$
 $x^2 - 2x - 26 + 160 = 0$
 $x^2 - 2x + 134 = 0$
 $x^2 - 28x + 160 = 0$
 $x^2 - 20x - 8x + 160 = 0$
 $x(x-20) - 8(x-20) = 0$
 $(x-8)(x-20) = 0$
 either $x = 8$ or $x = 20$

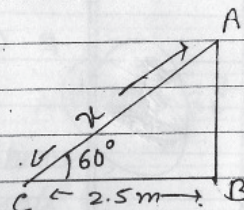
Section A

- 1) In ΔABC , with $\angle C = 60^\circ$
 Let length of ladder = $x = AC$

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

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

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



2). we have-

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

~~Then~~ Then,

$$(k+9)(2k+7) = 2(2k-1)$$

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

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

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

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

$$\boxed{18 = k}$$

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

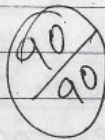
Ans) Total red card & queen = 28

Probability of getting neither red card nor queen

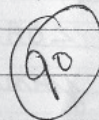
$$= 1 - \frac{28}{52} = \frac{52-28}{52}$$

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

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



Ans 004130519



Ninety only

Excellent!

041400296