WITH GRAPH PAPER

केन्द्रीय माध्यमिक शिक्षा बोर्ड, दिल्ली
सैकण्डरी 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 : MONDAY, 03/04/2017

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 30/3 | Set Number ① ② ● ④

अतिरिक्त उत्तर–पुस्तिका (ओं) की संख्या
No. of supplementary answer-book(s) used : 0

विकलांग व्यक्ति : ~~हाँ~~ / नहीं
Person with Disabilities : ~~Yes~~ / No — NO

किसी शारीरिक अक्षमता से प्रभावित हों तो संबधित वर्ग में ✓ का निशान लगाएं।
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 A

1. A = getting a rotten apple.

$n(S) = 900$ — total apples

$P(A) = 0.18$.

let $n(A)$ be number of rotten apples.

Then, $P(A) = \frac{n(A)}{n(S)} = \frac{n(A)}{900}$

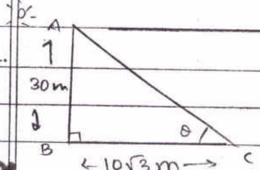
$0.18 \times 900 = n(A)$

$\therefore n(A) = 162$

So, there are 162 rotten apples in the heap.

$1.8 \times 9 = 16.200$

$\frac{162}{900} = \frac{18}{100}$.

2. 

Tower AB is 30m and shadow BC is $10\sqrt{3}$m

In $\triangle ABC$ which is right triangle,

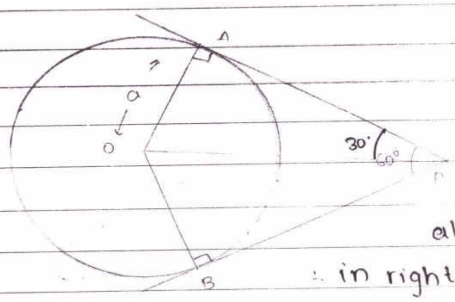
$\tan\theta = \frac{AB}{BC} = \frac{30}{10\sqrt{3}}$

$\tan\theta = \sqrt{3}$

but $\tan 60^\circ = \sqrt{3}$. $\therefore \theta = 60^\circ$.

So, angle of elevation of sun is 60°.

$\frac{30\sqrt{3} \times \sqrt{3}}{10\sqrt{3}}$

3. 

Tangents are equally inclined to line joining the external point P to centre O.

$\therefore \angle APO = \angle BPO = \frac{60}{2} = 30°$

also radius ⊥ tangent at point of contact.

$\therefore$ in right ΔOAP, $\angle APO = 30°$.

Now $\sin 30° = \frac{\cancel{AP}}{\cancel{O}} \quad \frac{AO}{OP}$

$\frac{1}{2} = \frac{a}{OP}$ $\quad \because$ radius $= a$.

$\therefore OP = 2a$

4. let a be 1st term and d be the common difference.

$a_{21} - a_7 = 84$

$a + (21-1)d - [a + (7-1)d] = 84$

$\cancel{a} + 20d - \cancel{a} - 6d = 84$

$14d = 84$

$d = 6$

$\therefore$ common difference is 6.

5

Section D

21\. The points A, B and C are collinear.

$\therefore$ $A(\Delta ABC) = 0$.

Using ~~area~~ formula,

$x_1 = k+1$, $x_2 = 3k$, $x_3 = 5k-1$

$y_1 = 2k$, $y_2 = 2k+3$, $y_3 = 5k$.

Using area formula,

$$x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2) = 0.$$

$$(k+1)(2k+3-5k) + 3k(5k-2k) + (5k-1)(2k-2k-3) = 0$$

$$(k+1)(3-3k) + 3k(3k) + (5k-1)(-3) = 0.$$

$$3(1+k)(1-k) + 3(k)(3k) - 3(5k-1) = 0.$$

$$3[1-k^2 + 3k^2 - 5k+1] = 0.$$

$$2k^2 - 5k+2 = 0$$

$$2k^2 - 4k - k+2 = 0$$

$$2k(k-2) - 1(k-2) = 0$$

$\therefore (2k-1)(k-2) = 0.$

$\therefore (k-2) = 0$ or $(2k-1) = 0$

$$\boxed{\therefore k = 2 \text{ or } \frac{1}{2}}$$

22. In $\triangle ABC$,

$\angle A + \angle B + \angle C = 180°$ — angle sum property.

$105° + 45° + \angle C = 180°$

$\therefore \angle C = 30°$

Steps of construction:

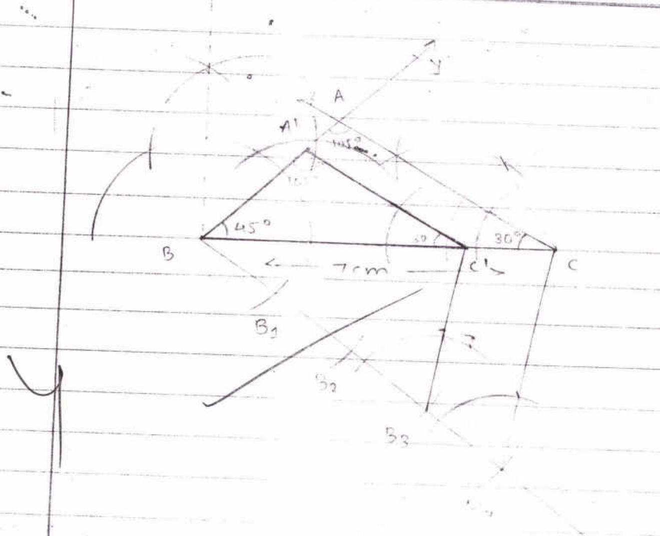
1) Draw $BC = 7$cm $\angle CBY = 45°$ and $\angle BCZ = 30°$.
   Let rays BY and CZ intersect at A. $\triangle ABC$ is given $\triangle$.
2) From B draw a ray BX below BC making acute angle with BC. Along it mark 4 points B_1, B_2, B_3, B_4 such that $BB_1 = B_1B_2 = \cdots = B_3B_4$.
3) Join B_4C. Make $\angle BB_4C$ at B_3 such that the ray intersects BC at C'. $\therefore \angle BB_4C = \angle BB_3C'$.
   so, $B_4C \parallel B_3C'$.
4) From C' make $\angle BC'A' = BCA$ so that $C'A' \parallel CA$.
   $\triangle A'BC'$ is the required triangle

105
45
150

105
45
30
180

Justification: $\angle B = \angle B$. and $\angle BC'A' = \angle BCA$ - construction

$\therefore \Delta A'BC' \sim \Delta ABC$ by ~~SS~~ AA so, $\frac{A'B}{AB} = \frac{A'C'}{AC} = \frac{BC'}{BC} = \frac{3}{4}$



$\Delta A'BC'$ is required triangle

23.

i) A = sum of digits is even.

$n(S) = 6^2 = 36.$ – total possible outcomes.

$n(A) = \{(1,3), (1,5), (1,1), (2,2), (2,4), (2,6), (3,1), (3,3), (3,5), (4,2), (4,4), (4,6), (5,1), (5,3), (5,5), (6,2), (6,4), (6,6)\}$

$= 18.$

$P(A) = \frac{n(A)}{n(S)} = \frac{18}{36}$

$= \frac{1}{2}$ or 0.5

$\therefore$ probability of getting an even sum is $\frac{1}{2}$ or 0.5.

ii) A = product of digits is even

$n(S) = 36.$

$n(A) = \{(1,2), (1,4), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (3,2), (3,4), (3,6), (4,1), (4,2), (4,3), (4,4), (4,5), (4,6), (5,2), (5,4), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)\}$

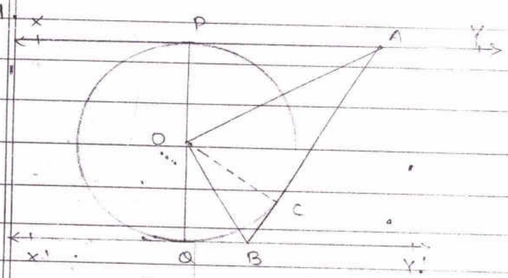
$= 27$

$$P(A) = \frac{n(A)}{n(S)} = \frac{27}{36}$$

$$= \frac{3}{4} = 0.75$$

$\therefore$ probability of getting even product is $\frac{3}{4}$ or 0.75.

24.



Given: $XY \parallel X'Y'$ – tangents.
POQ is diameter, OC is radius.
Tangent ACB touches XY at A and X'Y' at B.

To prove: $\angle AOB = 90°$.

Proof: $XY \parallel X'Y'$ and AB is transversal

$\therefore \angle XAB + \angle ABX' = 180°$ – cointerior angles.

or $\angle PAB = \angle ABQ$ —①

It is known that tangents from a same point are equally inclined to the line joining centre to that point.

$\Rightarrow \angle PAO = \angle CAO$ and $\angle QBO = \angle CBO$

In ①,

$2\angle CAO + 2\angle CBO = 180^\circ$

or $2\angle BAO + 2\angle ABO = 180^\circ$

$\angle BAO + \angle ABO = 90^\circ$ — ②

In ΔAOB,

$\angle BAO + \angle ABO + \angle AOB = 180^\circ$ — angle sum.

from ②, $90^\circ + \angle AOB = 180^\circ$

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

Hence, proved.

25. radius of cylindrical tank $= \frac{2}{2} = 1m.$

its height $= 3.5m. = \frac{35}{10} m$

Let the height of water on roof be h.

Volume of water on roof = volume of water in tank.

$lbh = \pi r^2 h'$

$22 \times 20 \times h = \frac{22}{7} \times \frac{35}{10} \times 1 \times 1$

$h = \frac{22}{2} \times \frac{1}{22} \times \frac{1}{20} = \frac{1}{40}$ m

$22 \times 20 \times h =$

$\frac{22}{7} \times \frac{35}{10}$

$h = \frac{22}{2} \times \frac{1}{22} \times \frac{1}{20}$

$= \frac{1}{40}$

4

$$\therefore h = \frac{1}{40} \text{ m} = \frac{1}{\cancel{40}} \times 10\cancel{0} \text{ cm}$$

$$= 2.5 \text{ cm}$$

So, the rainfall is 2.5cm

Views on water conservation:

a) It is important practice in today's era of irrational water consumption and pollution. It should be practised at municipal level at all places.

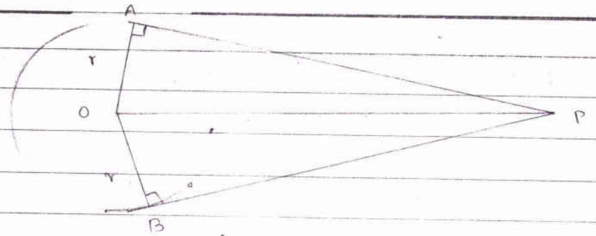
b) It can be done by many simple ways even at domestic level.

c) Doing it is a sign of environmental consciousness.

d) Some methods of water conservation are rooftop/surface water harvesting, building small earthen dams, etc.

e) This conserved water helps refill underground water bodies and so, all must practise water conservation for sustainable development.

26.



Given : Circle ~~ttl~~ C(O, r)

2 tangents from P at A and B

To prove : AP = BP

Construction: Join OA, OB and OP

Proof :

In ΔAPO and ΔBPO,

$OA = OB$ – radii of same circle

$OP = OP$ – common side

$\angle OAP = \angle OBP = 90^\circ$ – radius is $\perp$ tangent at point of contact

by RHS criterion,

$\Delta APO \cong \Delta BPO$.

and hence, $AP = BP$ – by cpct.

$\therefore$ lengths of 2 tangents drawn from an external point to a circle are equal.

27. Let a, d and A, D be the 1st term and common difference of the 2 APs respectively.

Then,

$$\frac{\frac{\cancel{n}}{2}\left[2a+(n-1)d\right]}{\frac{\cancel{n}}{2}\left[2A+(n-1)D\right]} = \frac{7n+1}{4n+27}$$

$$\frac{2a+(n-1)d}{2A+(n-1)D} = \frac{7n+1}{4n+27}$$

Replacing n by 17 in both LHS and RHS,

$$\frac{2a+(17-1)d}{2A+(17-1)D} = \frac{7(17)+1}{4(17)+27}$$

$$\frac{2a+16d}{2A+16D} = \frac{119+1}{68+27}$$

$$\frac{\cancel{2}(a+8d)}{\cancel{2}(A+8D)} = \frac{120}{95}$$

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

$$\frac{a_9}{A_9} = \frac{24}{19}$$

$\therefore$ ratio of 9^{th} terms is $24:19$

$7(2m-1)+1$
$14m-7+1$
$14m-6$
120
$17 \times 7 = 119$
$119 + 1 = 120$
$17 \times 4 = 68$
$68 + 27 = 95$
$4(2m-1)+27$
$8m-4+27$
$8m+23$
$72 + 23 = 95$

29

28. Let $\frac{x-1}{2x+1}$ be y,

$y + \frac{1}{y} = 2$

$y^2 + 1 = 2y$

$y^2 - 2y + 1 = 0$

$y^2 - y - y + 1 = 0$

$y(y-1) - 1(y-1) = 0$

$(y-1)(y-1) = 0$

$\therefore y = 1$ or 1.

Now, $\frac{x-1}{2x+1} = 1$ or $\frac{x-1}{2x+1} = 1$

$x - 1 = 2x + 1$

$-2 = x$

$\therefore x = -2$ or -2

$\therefore \boxed{x = -2}$

29. Let B complete a work in x days.
Then A takes $x-6$ days to complete it.
Together they complete it in 4 days.
According to work done per day,

$$\frac{1}{x-6} + \frac{1}{x} = \frac{1}{4}$$

$$\therefore \frac{x + x-6}{x(x-6)} = \frac{1}{4}$$

$$4(2x-6) = x(x-6)$$

$$8x - 24 = x^2 - 6x$$

$$\therefore x^2 - 14x + 24 = 0$$

$$x^2 - 12x - 2x + 24 = 0$$

$$x(x-12) - 2(x-12) = 0.$$

$$(x-2)(x-12) = 0$$

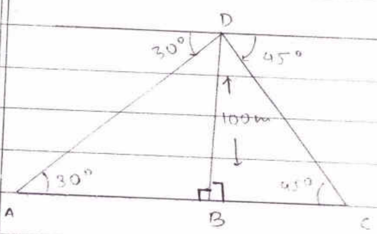
$$\therefore x = 2 \text{ or } 12.$$

$x=2$ is not possible because then $x-6$ is (-4)

$$\therefore x = 12.$$

So, B takes 12 days to finish the work.

30.



To find : AC

Solution:

In $\triangle ABD$, $\angle DAB = 30°$

In $\triangle BDC$, $\angle BCD = 45°$

also, $BD = 100m$.

In right $\triangle ABD$,

$$\tan 30° = \frac{DB}{AB}$$

$$\frac{1}{\sqrt{3}} = \frac{100}{AB}$$

$$AB = 100\sqrt{3} = 100 \times 1.732 = 173.2\,m$$

In right $\triangle DBC$,

$$\tan 45° = \frac{DB}{BC}$$

$$1 = \frac{100}{BC} \Rightarrow BC = 100m.$$

Now, $AC = AB + BC = 100 + 173.2\,m = \underline{273.2\,m}$

or $100(\sqrt{3}+1)\,m$

31.

~~625 × 33 = 1875, 18750, 20625~~

~~$\frac{3}{4} \times \frac{22}{7} \times \frac{625}{4} - \frac{1}{2} \times 2 \times 7$~~

~~- 42~~

~~5156.25~~

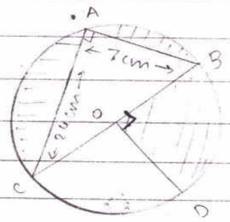
~~2578.125~~

~~368.3035~~

~~368.3035 − 42.000 = 326.3035~~

~~− 42 = 284.3035~~

31.



$\angle CAB = 90^\circ$ — angle subtended by diameter.

in right ΔCAB,

by pythagoras theorem,

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

$$24^2 + 7^2 = BC^2$$

$$576 + 49 = BC^2$$

$$625 = BC^2 \quad \text{—(ignoring -ve value)}$$

$\therefore$ $BC = 25\,cm.$ = diameter.

$\therefore$ radius = 12.5 cm or ~~$\frac{25}{2}$ cm.~~

~~so~~ area of shaded region = area of semicircle + area of quadrant − area of ΔACB

$$= \frac{2\times 1}{2\times 2} \times \pi r^2 + \frac{1}{4} \times \pi r^2 - \frac{1}{2} \times AB \times AC$$

$$= \frac{3}{4}\pi r^2 - \frac{1}{2} \times 7 \times 24$$

$$= \frac{3}{\cancel{4}_2} \times \frac{\cancel{22}^{11}}{7} \times \frac{625}{4} \cancel{- 7 \times 12}$$

$$= 368.3035 - 84$$

$= 284.3035$

$\approx 284.3 \text{ cm}^2$

$\therefore$ The area of shaded region is $\underline{\underline{284.3035 \text{ cm}^2}}$

625
$\times 11$
625
625
6875
$\times 22 \; 1 \; 3$
20625

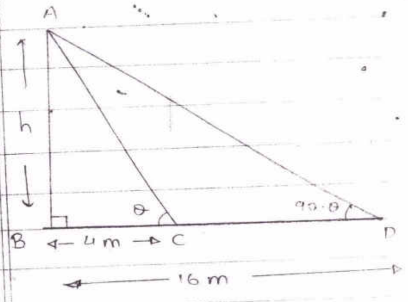
2578.125
$\cancel{20625}$ 10
$8 \; 17$

368.3035
$\cancel{2578.125}$ 40

$\cancel{368}.3035$
$- 84.0000$
284.3035

11

Section C

11. 

It is given that ∠ACB and ∠ADB are complementary.

Let them be θ and 90-θ respectively.

Now,

In right Δ ABC,

$\tan\theta = \frac{AB}{BC} = \frac{h}{4}$

$\tan\theta = \frac{h}{4}$ —(1)

In right ΔABD,

$\tan(90-\theta) = \frac{AB}{BD} = \frac{h}{16}$

$\cot\theta = \frac{h}{16}$ ... $\tan(90-\theta) = \cot\theta$

$\tan\theta = \frac{16}{h}$ —(2) ... $\cot\theta = \frac{1}{\tan\theta}$

From ① and ②,

$$\tan\theta = \frac{h}{4} = \frac{16}{h}$$

[redacted]

$$h^2 = 4 \times 16$$

$$h = \sqrt{4 \times 16}$$

$$\therefore h = 2 \times 4$$

$$h = 8 \text{ m} \quad \text{(ignoring -ve value)}.$$

∴ height of tower is 8 m.

12. Let there be x black balls and 15 white balls.

Total balls $= n(S) = 15 + x$

P(drawing black ball) = 3 × P(drawing white ball).

[redacted]

$$\Rightarrow \frac{x}{(15+x)} = 3 \times \frac{15}{(15+x)}$$

$$x = \frac{3 \times 15}{(15+x)} \times (15+x)$$

$$x = 45$$

∴ There are 45 black balls in the bag.

13. Area of shaded region = Area of semicircle with ~~r~~ d = 4.5 cm

+ Area of semicircle with d = 3 cm

− 2 × area of semicircle with d = 3 cm

− area of circle with d = 4.5 cm.

$$= \frac{1}{2} \times \pi \times (4.5)^2 + \left(\frac{1}{2} \times \pi \times \left(\frac{3}{2}\right)^2\right) - 2 \times \left(\frac{1}{2} \times \pi \left(\frac{3}{2}\right)^2\right) - \pi \left(\frac{4.5}{2}\right)^2$$

$$= \cancel{\left(\frac{1}{2} \times \pi \times (4.5)^2\right)}$$

$$= \frac{2 \times 1}{4} \times \pi \times \frac{20.25}{} - \frac{\pi}{2} \times \frac{9}{4} - \pi \times \frac{20.25}{4}$$

$$= \frac{\pi}{4}\left[\frac{2 \times 20.25}{} - \frac{9}{2} - 20.25\right]$$

$$= \frac{\pi}{4}\left[40.5 - 4.5 - 20.25\right]$$

$$= \pi/4 \left[20.25 - 4.5\right]$$

$$= \frac{\pi}{4}(15.75)$$

40.5
− 20.25
20.25
− 4.5
15.75

$= \frac{\cancel{22}^{11}}{\cancel{7} \times \cancel{4}_2} \times \cancel{5.75}^{2.25}$

$= \frac{11 \times 2.25}{2}$

$= \frac{24.75}{2}$

$= 12.375 \text{ cm}^2$

$\therefore$ area of shaded region is $\underline{\underline{12.375 \text{ cm}^2}}$

$225 \times 11 = 2475$

14.

m R n

P(2, −2) $\left(\frac{24}{11}, y\right)$ Q(3, 7)

Here $x_1 = 2$, $y_1 = -2$

$x_2 = 3$, $y_2 = 7$

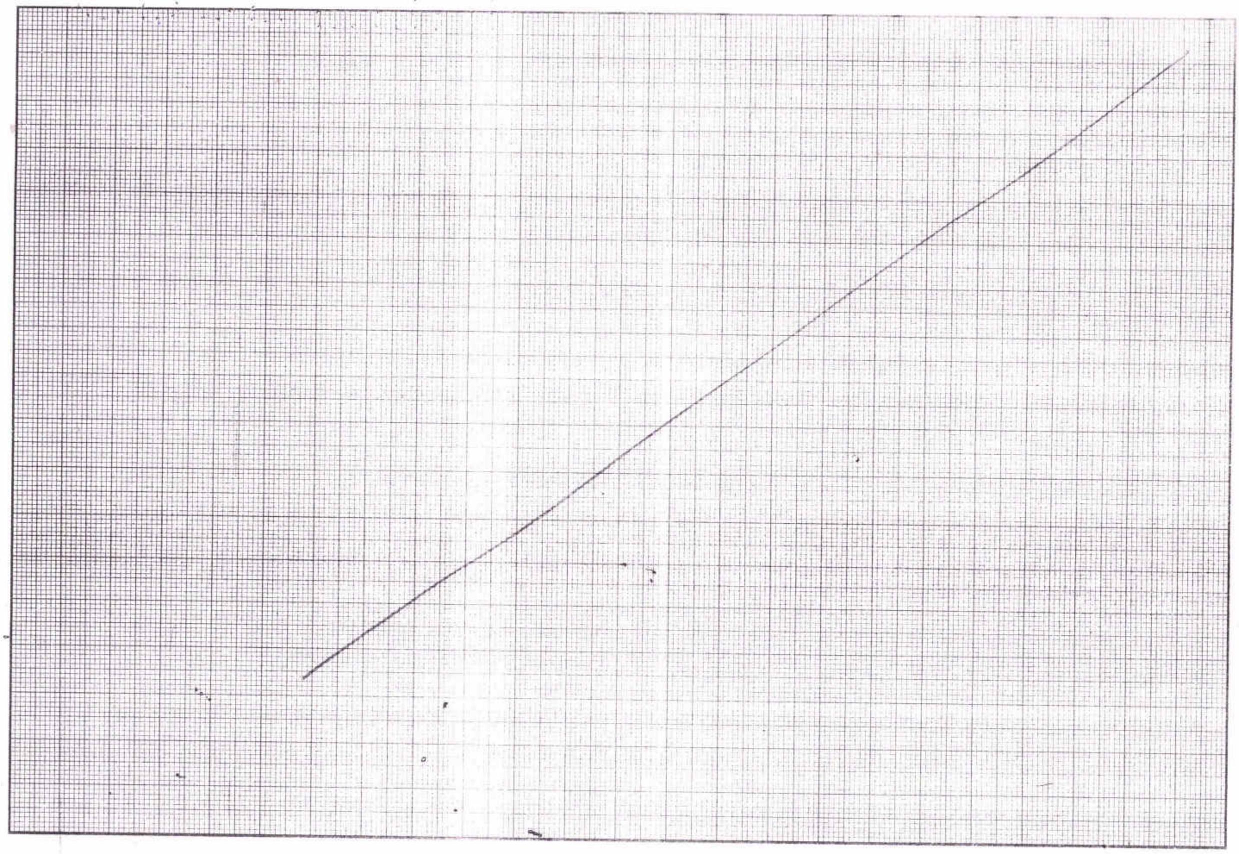
using section formula,

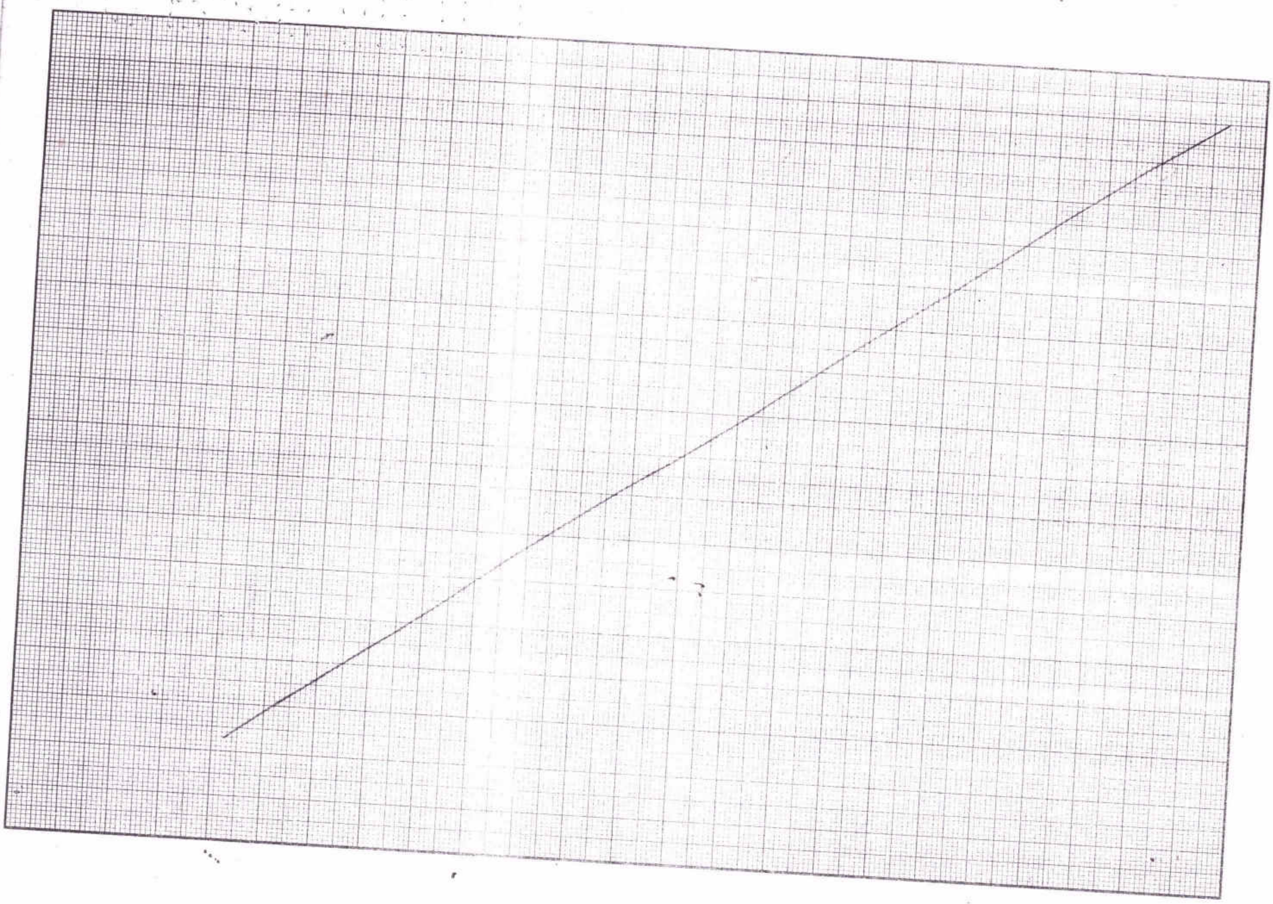
$$\left(\frac{24}{11}, y\right) = \left(\frac{3m + 2n}{m+n}, \frac{7m - 2n}{m+n}\right) \quad \text{—(1)}$$

$\Rightarrow \frac{24}{11} = \frac{3m + 2n}{m+n}$

$24m + 24n = 33m + 22n$

$33 - 24 = 9$





$2n = 9m$

$\frac{2}{9} = \frac{m}{n}$

$\therefore$ The given point divides the line segment in ratio $2:9$.

Taking $m = 2$ and $n = 9$,

$y = \frac{7m - 2n}{m+n}$ (from ①)

$y = \frac{7(2) - 2(9)}{2+9}$

$y = \frac{14 - 18}{11}$

$\boxed{y = \frac{-4}{11}}$

15. speed of water in canal = 25 km/hr.

in 40 min = $\frac{40}{60} = \frac{2}{3}$ hr,

length of water = $25 \times \frac{2}{3} = \frac{50}{3}$ km $= \frac{50000}{3}$ m volume of water in canal in 40 minutes = volume of water for irrigation.

$$\frac{\overset{18}{\cancel{54}}}{\cancel{10}} \times \frac{18}{\cancel{10}} \times \frac{5000\cancel{0}}{\cancel{3}}\ m^3 = \cancel{\frac{10}{100}} \times l \times b \quad m^3$$

$$324 \times 5000 = l \times b$$

$$\cancel{1600}\ 1620000 = l \times b$$

area irrigated in 40 minutes is

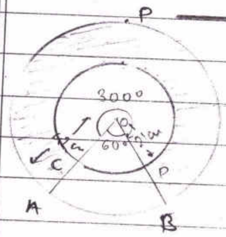
$1620000\ m^2$

$$= \frac{162\cancel{0000}}{1\cancel{000000}}$$

$$= \underline{1.62\ km^2} \text{ or } \underline{162 \text{ hectares.}}$$

17.

16.



$\angle AOB = \angle COD = 60°$ $\quad R = 42cm, \ r = 21cm.$

$\therefore$ reflex of $\angle AOB = 300° = \theta \ (360° - 60°)$

Now,

area of shaded region

$$= \frac{\theta}{360°} \times \pi R^2 - \frac{\theta}{360°} \times \pi r^2$$

$= \frac{\theta}{360°} \times \pi \times (R^2 - r^2)$

$= \frac{300°}{360°} \times \frac{22}{7} \times (42-21)(42+21)$

$= \frac{5}{\cancel{6}_2} \times \frac{\cancel{22}^{11}}{7} \times \cancel{21}^{3} \times 63$

$= 5 \times 11 \times 63$

$= 3465 \text{ cm}^2$

$\therefore$ area of shaded region is ~~3465 cm²~~ or 0.3465 m²

$$\begin{array}{r} 63 \\ \times 55 \\ \hline 315 \\ 3150 \\ \hline 3465 \end{array}$$

17. For the hollow cylindrical pipe,

$r = 30$ cm and $R = 30 + 5 = 35$ cm.

let its length be h.

volume of the 2 is same.

$\therefore$ ~~4.4 × 2.6 × t~~

$4.4 \times 100 \times 2.6 \times 100 \times 100 = \pi h (R^2 - r^2)$

$440 \times 260 \times 100 = \frac{22}{7} \times h \times (35+30)(35-30)$

$$440 \times 260 \times 100 = \frac{22}{7} \times h \times 65 \times 5$$

$$\therefore\ 7 \times \frac{\overset{20}{\cancel{440}}}{\cancel{22}} \times \frac{\overset{4}{\cancel{260}}}{\cancel{65}} \times \frac{\overset{20}{\cancel{100}}}{\cancel{5}} = h$$

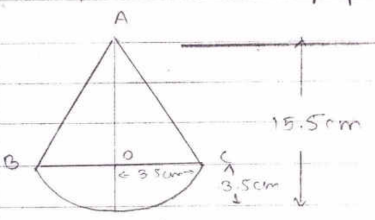
$$7 \times 20 \times 4 \times 20 = h$$

$$11200 = h$$

$\therefore$ pipe is 11200 cm or 112 m long

$$\begin{array}{r} 65 \\ \times\ 24 \\ \hline 260 \end{array} \qquad \begin{array}{r} 140 \\ \times\ 80 \\ \hline 11200 \end{array}$$

18.



Height of hemisphere = r
= 3.5cm

height of cone = 15.5cm − 3.5cm
= 12cm = h.

Slant height of cone $= \sqrt{r^2 + h^2}$
$= \sqrt{12.25 + 144}$
$= \sqrt{156.25}$
$= 12.5$ cm

$$\begin{array}{r} 144 \\ +\ 12.25 \\ \hline 156.25 \end{array}$$

$$\begin{array}{r|l} 2 & 156 \\ 2 & 78 \\ 3 & 39 \\ & 13 \end{array}$$

TSA of toy = CSA of cone + CSA of hemi-sphere.

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

$= \frac{22}{7} \times 12.5 \times 3.5 + 2 \times \frac{22}{7} \times \overset{0.5}{\cancel{3.5}} \times 3.5$

$= 22 \times 12.5 \times 0.5 + 22 \times 3.5$

$= 22 \left(12.5 \times \frac{5}{10} + 3.5\right)$

$= 22 \left(12.5 \times \frac{1}{2} + 3.5\right)$

$= 22 (6.25 + 3.5)$

$= 22 (9.75)$

$= 214.5\ cm^2$

$\therefore$ Total surface area of toy is $214.5\ cm^2$

6.25
3.50
9.75

975
× 22
1950
1950
21450

19. $a = 9$, $d = 8$, $S_n = 636$.

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

$$636 = \frac{n}{2}[18 + (n-1)8]$$

$$636 = n[9 + (n-1)4]$$

$$636 = n(9 + 4n - 4)$$

$$636 = n(5 + 4n)$$

$$636 = 5n + 4n^2$$

$$4n^2 + 5n - 636 = 0$$

$$4n^2 + 53n - 48n - 636 = 0$$

~~n & 4n+5~~

$$4n^2 - 48n + 53n - 636 = 0.$$

$$4n(n-12) + 53(n-12) = 0$$

$$(4n+53)(n-12) = 0$$

$$\therefore n = \frac{-53}{4} \text{ or } 12.$$

as n is a natural number, $\boxed{n = 12}$

$\therefore$ 12 terms are required to give sum 636.

$$\begin{array}{r} 17 \\ -9 \\ \hline 8 \end{array}$$

$$\begin{array}{r|l} 3 & 636 \\ 2 & 212 \\ 2 & 106 \\ & 53 \end{array}$$

$3 \times 2 \times 2 \times 53$ ~~$\times 2 \times 2$~~

20.

20. $A = (a^2+b^2)$, $B = -2(ac+bd)$ $C = (c^2+d^2)$

as roots are equal,

$$D = B^2 - 4AC = 0.$$

$$B^2 = 4AC$$

$$[-2(ac+bd)]^2 = 4(a^2+b^2)(c^2+d^2)$$

$$\cancel{4}(\cancel{a^2c^2} + 2abcd + \cancel{b^2d^2}) = \cancel{4}(\cancel{a^2c^2} + a^2d^2 + b^2c^2 + \cancel{b^2d^2})$$

$$2abcd = a^2d^2 + b^2c^2$$

$$0 = a^2d^2 - 2abcd + b^2c^2$$

$$0 = (ad - bc)^2$$

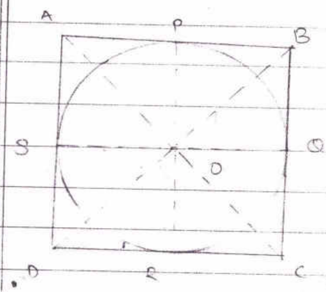
$$0 = ad - bc$$

$$ad = bc$$

$$\Rightarrow \boxed{\frac{a}{b} = \frac{c}{d}}$$

Hence, proved.

Section B

5. 

<u>Given</u> : circle touching sides of ABCD at P, Q, R & S.

<u>To prove</u>: $AB + CD = AD + BC$.

<u>Proof</u> :

$AP = AS$
$PB = BQ$
$DR = DS$
$CR = CQ$

} tangents from same point to a circle are equal in length

adding all ④,

$AP + PB + DR + CR = AS + BQ + DS + CQ$

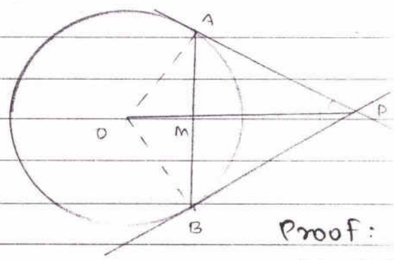
$AB + CD = AS + SD + BQ + QC$

$AB + CD = AD + BC$

Hence, proved.

6.

6.



Given: chord AB.

tangents AP and BP at A & B

To prove: ~~AP = BP~~ $\angle PAM = \angle PBM$

Construction: Join centre O to P

let OP meet AB at M.

Proof:

In $\triangle AMP$ and $\triangle BMP$,

$AP = BP$ — tangents from same point to a circle are equal.

$MP = MP$ — common side

$\angle APM = \angle BPM$ - tangents are equally inclined to line joining the point of emergence to circle's centre.

by SAS criterion,

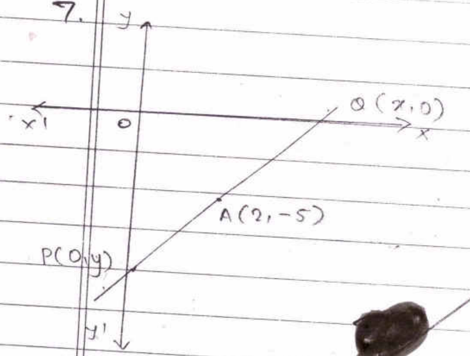
$\triangle AMP \cong \triangle BMP$.

by cpct, $\angle PAM = \angle PBM$

Hence, tangents at end points of a chord make equal angles with it

TOP

7.



Let coordinates of P be (0, y) and of Q be (x, 0).

A (2, -5) is mid point of PQ.

by section formula,

$(2, -5) = \left(\frac{0+x}{2}, \frac{y+0}{2} \right)$ 9.

$2 = \frac{x}{2}$ and $-5 = \frac{y}{2}$

$\therefore x = 4$ and $y = -10$.

$\therefore$ P is (0, -10) and Q is (4, 0)

8. $PA = PB$

$\therefore PA^2 = PB^2$

by distance formula,

$(5-x)^2 + (1-y)^2 = (-1-x)^2 + (5-y)^2$

$\Rightarrow (5-x)^2 + (1-y)^2 = (1+x)^2 + (5-y)^2$

$\cancel{25} - 10x + \cancel{x^2} + \cancel{1} - 2y + \cancel{y^2} = \cancel{1} + 2x + \cancel{x^2} + \cancel{25} - 10y + \cancel{y^2}$

$-10x - 2y = 2x - 10y$

$$8y = 12x$$
$$\cancel{4}(2y) = \cancel{4}(3x)$$
$$\therefore 3x = 2y$$

Hence, proved.

9. Let α and β be the roots of given quadratic equation.

$$\beta = 6\alpha$$

Here, $a = p$ $b = -14$, $c = 8$.

$$\alpha + \beta = \frac{-(-14)}{p} = \frac{-b}{a}$$

$$7\alpha = \frac{+42}{p}$$

$$\alpha = \frac{2}{p} \quad \text{—(1)}$$

Also, $\alpha\beta = \frac{8}{p} = \frac{c}{a}$

$$\alpha \times 6\alpha = \frac{8}{p}$$

$$6\alpha^2 = \frac{8}{p}$$

from (1).

$$6\left(\frac{2}{p}\right)^2 = \frac{8}{p}$$

$$6 \times \frac{\cancel{4}}{p^2} = \frac{\cancel{8}\,2}{p}$$

$$\frac{6}{p^2} = \frac{2}{p}$$

$$\frac{\cancel{6}\,3}{\cancel{2}} = \frac{p^{\cancel{2}}}{\cancel{p}}$$

$$\therefore p = 3$$

10. let a, d and A, D be the 1st term and common difference of the 2 A.Ps respectively.

n is same.

$a = 63$, $d = 2$

$A = 3$, $d = 7$

$a_n = A_n$

$\Rightarrow a + (n-1)d = A + (n-1)D$

$63 + (n-1)2 = 3 + (n-1)7$

$63 + 2n - 2 = 3 + 7n - 7$

$61 + 2n = 7n - 4$

$65 = 5n$

$13 = n$

$\therefore$ When n is 13, the n^{th} terms are equal

i.e., $a_{13} = A_{13}$.