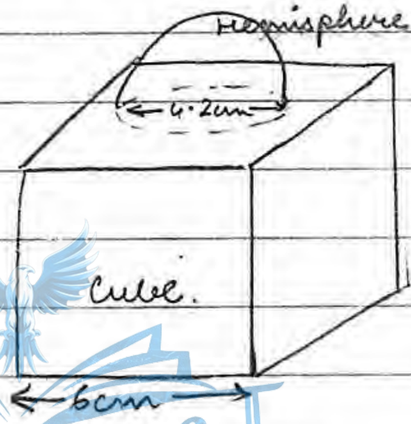
Mathematics

Section - D



23. Radius of the hemisphere $(r) = \frac{d}{2}$

$= \frac{4.2\,cm}{2}$

$= 2.1cm$

Side of cube $(a) = 6cm$.

a) Total surface area of block = Total surface area of cube + Curved surface area of hemisphere - area enclosed by base of hemisphere

$$= 6a^2 + \frac{4\pi r^2}{2} - \pi r^2$$

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

$$= 6 \times 6^2 + \frac{22}{7} \times (2.1)^2 \ cm^2$$

$$= 216 + \frac{22}{7} \times \overset{0.3}{\cancel{2.1}} \times 2.1 \ cm^2$$

$$= [216 + 13.86] \ cm^2$$

$$= 229.86 \ cm^2.$$

b) Volume of block formed = volume of cube + volume of hemisphere

$$= a^3 + \frac{2}{3}\pi r^3$$

$$= 6^3 + \frac{2}{3} \times \frac{22}{7} \times 2.1^3 \text{ cm}^3$$

$$= 216 + \frac{2}{\cancel{3}} \times \frac{22}{\cancel{7}} \times \frac{\cancel{21} \times 21 \times 21}{1000} \text{ cm}^3$$

$$= 216 + 19.404 \text{ cm}^3$$

$$= \underline{235.404 \text{ cm}^3}.$$

24. To prove: Square of hypotenuse, in a right triangle, is equal to the sum of squares of other two sides. (Pythagoras theorem)

That is, $AC^2 = AB^2 + BC^2$.

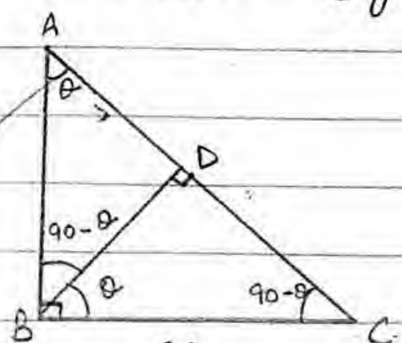


fig.

Construction: Construct $BD \perp AC$

Name $\angle BAC = \theta$.

Then, $\angle BCA = 90 - \theta$, $\angle ABD = 90 - \theta$, $\angle DBC = \theta$

It is clear that,

$$\Delta ABD \sim \Delta ACB \sim \Delta BCD.$$

Using $\Delta ABD \sim \Delta ACB$, we get:

$$\frac{AB}{AC} = \frac{AD}{AB} \Rightarrow AB^2 = AC \times AD \quad \text{—— ①}$$

Similarly, using $\Delta BCD \sim \Delta ACB$, we get:

$$\frac{BC}{AC} = \frac{CD}{CB} \Rightarrow \frac{BC}{AC} = \frac{CD}{BC} \Rightarrow BC^2 = AC \times CD \quad \text{—— ②}$$

Adding ① and ②, gives:

$$AB^2 + BC^2 = AC \times AD + AC \times CD$$

$$\Rightarrow AB^2 + BC^2 = AC(AD + CD) \qquad [AD + CD = AC] \text{ figure.}$$

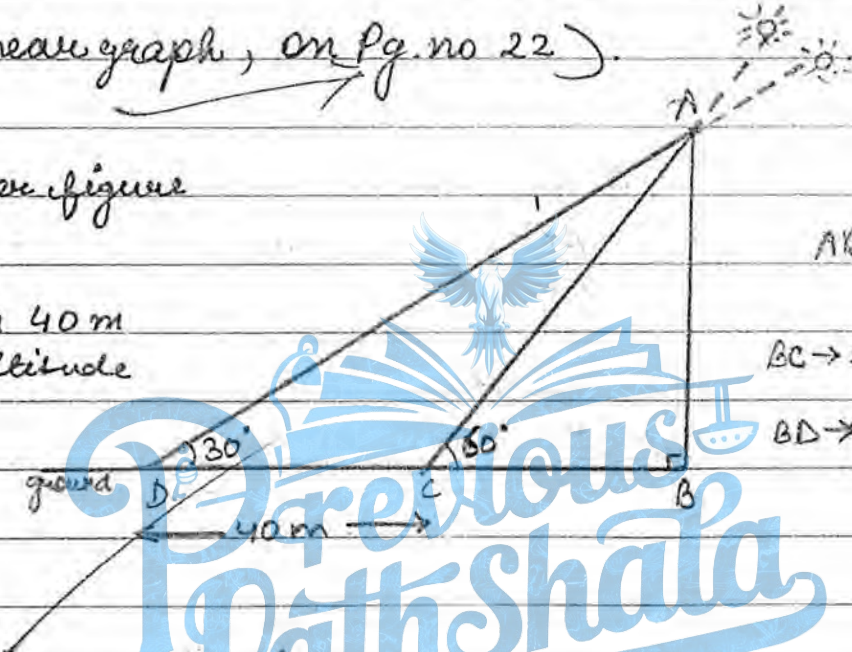
$$\Rightarrow AB^2 + BC^2 = AC \times AC$$

$$\Rightarrow \boxed{AB^2 + BC^2 = AC^2.}$$

Hence, proved that in a right triangle, sum of square of ~~by~~ other 2 sides is equal to the square of hypotenuse.

25. Graph paper (near graph, on Pg. no 22).

26. given – as per figure



AB → tower

BC → shadow of tower at 60°

BD → shadow of tower at 30°

Shadow of tower is 40 m longer at sun's altitude at 30°

∴ $BD - BC = 40m$

$\Rightarrow CD = 40m$

In ΔACB,

$$\tan 60° = \frac{AB}{BC}$$

$$\Rightarrow \sqrt{3} \times BC = AB \Rightarrow BC = \frac{AB}{\sqrt{3}} \quad —①$$

In ΔADB,

$$\tan 30° = \frac{AB}{BD} \Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{40 + BC}$$

$$\Rightarrow 40 + BC = \sqrt{3} \times AB$$

$$\Rightarrow 40 + \frac{AB}{\sqrt{3}} = \sqrt{3} \times AB$$ [Put $BC = \frac{AB}{\sqrt{3}}$ from ①].

$$\Rightarrow AB\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) = 40$$

$$\Rightarrow AB\left(\frac{3-1}{\sqrt{3}}\right) = 40$$

$$\Rightarrow AB \times \frac{2}{\sqrt{3}} = 40 \Rightarrow AB = \frac{40 \times \sqrt{3}}{2} m$$

$$\Rightarrow AB = 20\sqrt{3} m$$

given, use $\sqrt{3} = 1.732$ $\therefore AB = 20 \times 1.732 m = 34.64 m$

$\therefore$ Height of tower $= 34.64 m$.

27. Let the first term of given A.P. be 'a'
And, the common difference be 'd'.
and a_p dentotes p^{th} term.

given; $m(a_m) = n(a_n)$ [$m \neq n$].

To show: $a_{(m+n)} = 0$

$m(a_m) = n(a_n)$

$\Rightarrow m[a+(m-1)d] = n[a+(n-1)d]$

$\Rightarrow am + md(m-1) = an + nd(n-1)$

$\Rightarrow am - an = nd(n-1) - md(m-1)$

$\Rightarrow a(m-n) = d[n(n-1) - m(m-1)]$

$\Rightarrow a(m-n) = d[n^2 - n - m^2 + m]$

$\Rightarrow a(m-n) = d[n^2 - m^2 + m - n]$

$\Rightarrow a(m-n) = d[(m+n)(n-m) + (m-n)]$

$\Rightarrow a(\cancel{m-n}) = d(\cancel{m-n})[-(m+n) + 1]$

$\Rightarrow a - d[-(m+n)+1] = 0$

$\Rightarrow \boxed{a + (m+n-1)d = 0}$

$\Rightarrow \cancel{a+} \boxed{a_{m+n} = 0}$

$\therefore a_{m+n} = 0$

Hence, proved!

28. Let the no. of books bought by the shopkeeper be 'n'.

Total money spent $=$ Rs 80

$\therefore$ Cost of each book $=$ Rs $\frac{80}{n}$

Now, given : He buys 4 more books, no. of books bought $= n+4$ (for same amount)

New cost of each book $=$ Rs $\frac{80}{n+4}$

given, new cost of each book is Rs. 1 less than earlier.

$$\therefore \frac{80}{n} - \frac{80}{n+4} = 1$$

$$\Rightarrow 80\left(\frac{1}{n} - \frac{1}{n+4}\right) = 1$$

$$\Rightarrow \frac{\cancel{n}+4-\cancel{n}}{n(n+4)} = \frac{1}{80} \Rightarrow 4\times 80 = n(n+4)$$

$$\Rightarrow n^2+4n-320 = 0$$

Using quadratic formula; $\Rightarrow n = \frac{-4 \pm \sqrt{16+4\times 320}}{2}$

$$\cancel{\Rightarrow n = \frac{-4 \pm \sqrt{676}}{2}}$$

$$\cancel{= \frac{-4 \pm 26}{2} \Rightarrow n = \frac{-30}{2} \text{ or } \frac{22}{2}}$$

$$\Rightarrow n = \frac{-4 \pm \sqrt{1296}}{2}$$

$$\Rightarrow n = \frac{-4 \pm 36}{2}$$

$$\Rightarrow n = \frac{-40}{2} \text{ or } \frac{32}{2} \Rightarrow n = -20 \text{ or } 16$$

Since, no. of books is a whole no., it cannot be negative

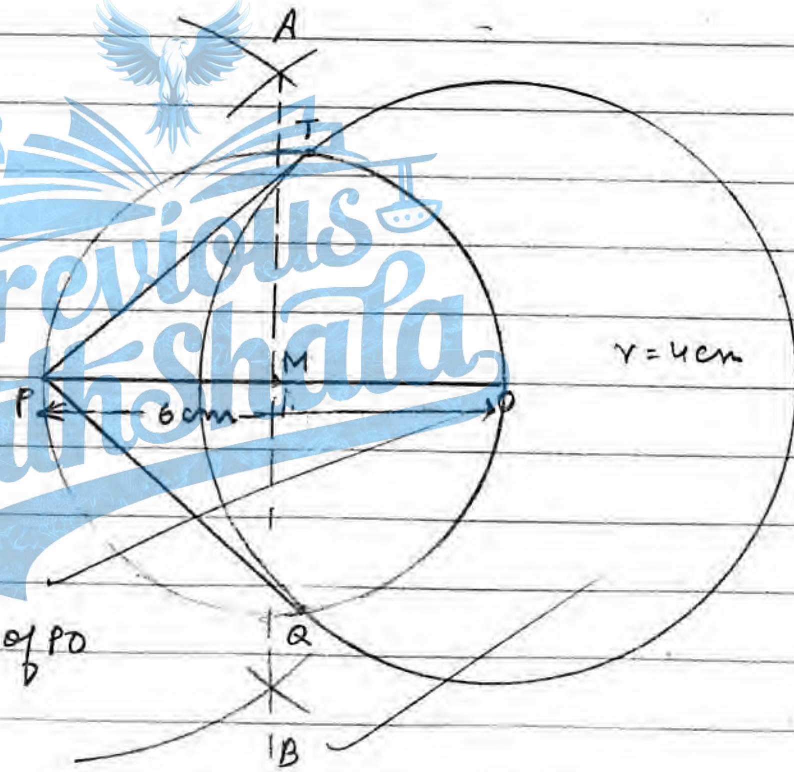
$n = -20$ can be ignored.

$\therefore \boxed{n = 16}$

No. of books bought by the shopkeeper = 16.

29. To construct: a pair of tangents to a circle of radius = 4 cm, from a point at a distance 6 cm from centre.

Steps of construction:



1) Draw a circle of radius 4cm with O as the centre.

2) Take a point P at PO = 6 cm.

3) Join PO. Construct a perpendicular bisector of PO at M (PM = MO, AB ⊥ PO)

4) With M as centre and PM (= MO) as radius, draw a circle touching the circle with centre O at T and Q

5) Join PT and PQ

∴ PT and PQ are required tangents.

30. To prove: $\frac{1}{1+\sin^2\theta} + \frac{1}{1+\cos^2\theta} + \frac{1}{1+\sec^2\theta} + \frac{1}{1+\csc^2\theta} = 2.$

Taking from LHS,

$= LHS$

$= \frac{1}{1+\sin^2\theta} + \frac{1}{1+\cos^2\theta} + \frac{1}{1+\sec^2\theta} + \frac{1}{1+\csc^2\theta}$

$= \frac{1}{1+\sin^2\theta} + \frac{1}{1+\csc^2\theta} + \frac{1}{1+\cos^2\theta} + \frac{1}{1+\sec^2\theta}$ [Re-arranging]

$= \frac{1}{1+\sin^2\theta} + \frac{1}{1+\left(\frac{1}{\sin^2\theta}\right)} + \frac{1}{1+\cos^2\theta} + \frac{1}{1+\left(\frac{1}{\cos^2\theta}\right)}$ $\left[\csc\theta = \frac{1}{\sin\theta},\ \sec\theta = \frac{1}{\cos\theta}\right]$

$= \frac{1}{1+\sin^2\theta} + \frac{1\times\sin^2\theta}{1+\sin^2\theta} + \frac{1}{1+\cos^2\theta} + \frac{1\times\cos^2\theta}{1+\cos^2\theta}$

$= \frac{1+\sin^2\theta}{1+\sin^2\theta} + \frac{1+\cos^2\theta}{1+\cos^2\theta}$

$= 1 + 1$

$= 2$

$= RHS$

LHS = RHS

Hence, proved!

Section - C

13. Given, $\tan(A+B) = 1$ and $\tan(A-B) = \frac{1}{\sqrt{3}}$

$\tan(A+B) = 1.$

$\Rightarrow \tan(A+B) = \tan 45^\circ$

$\Rightarrow A+B = 45^\circ$ —— ①

Now taking,

$\tan(A-B) = \frac{1}{\sqrt{3}}$

$\Rightarrow \tan(A-B) = \tan 30^\circ$

$\Rightarrow A-B = 30^\circ$ —— ②

Adding ① and ②;

$A+B+A-B = 45^\circ + 30^\circ$

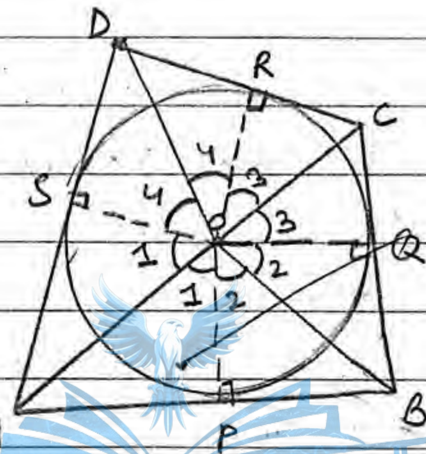
$\Rightarrow 2A = 75^\circ \Rightarrow A = \frac{75}{2}^\circ \Rightarrow A = 37.5^\circ$

$B = 45^\circ - A \Rightarrow B = 45^\circ - 37.5^\circ \Rightarrow B = 7.5^\circ$

$\therefore \boxed{A = 37.5^\circ, B = 7.5^\circ}$

45.0
37.5
7.5

14. To prove: opposite sides of a quadrilater circumscribing a circle subtend equal angles at the centre.



Construction: Constructed a quadrilateral ABCD, circumscribing a circle (centre @ O). Circle touches AB, BC, CD, DA at P, Q, R, S respectively.

To prove: $\angle AOB + \angle COD = 180°$
Or $\angle AOD + \angle BOC = 180°$

We know, that tangents from same exterior point subtend equal angle at the centre of circle with radius.

$\therefore \angle AOP = \angle AOS = \angle 1$ (say)

Similarly, $\angle BOP = \angle BOQ = \angle 2$

$\angle COQ = \angle COR = \angle 3$

$\angle DOR = \angle \angle DOS = \angle 4$.

$\therefore \angle AOP + \angle BOP + \angle BOQ + \angle COQ + \angle COR + \angle DOR + \angle DOS + \angle AOS = 360^\circ$

[complete angle around a point]

$\Rightarrow 2\angle 1 + 2\angle 2 + 2\angle 3 + 2\angle 4 = 360^\circ$

$\Rightarrow \angle 1 + \angle 2 + \angle 3 + \angle 4 = 180^\circ$

$\Rightarrow (\angle 1 + \angle 2) + (\angle 3 + \angle 4) = 180^\circ$

$\Rightarrow \angle AOB + \angle COD = 180^\circ$

Or $(\angle 1 + \angle 4) + (\angle 2 + \angle 3) = 180^\circ$

$\Rightarrow \angle AOD + \angle BOC = 180^\circ$

Hence, proved!

P.T.O.

Calculating mean using stepdeviation method.

15.

No. of days (Class interval)	No. of students (f_i)	x_i $\left(\frac{\text{Upper+lower limit}}{2}\right)$	$u_i = \frac{x_i - A}{h}$	$f_i \times u_i$
0 - 6	10	3	$\frac{3-21}{6} = -3$	$10 \times -3 = -30$
6 - 12	11	9	$\frac{9-21}{6} = -2$	$11 \times -2 = -22$
12 - 18	7	15	$\frac{15-21}{6} = -1$	$7 \times -1 = -7$
18 - 24	4	A 21	$\frac{21-21}{6} = 0$	$4 \times 0 = 0$
24 - 30	4	27	$\frac{27-21}{6} = 1$	$4 \times 1 = 4$
30 - 36	3	33	$\frac{33-21}{6} = 2$	$3 \times 2 = 6$
36 - 42	1	39	$\frac{39-21}{6} = 3$	$1 \times 3 = 3$
Total :	$\Sigma f_i = 40$			$\Sigma f_i u_i = -46$

Class size $(h) = 6 - 0 = \underline{6}$

Assumed mean $(A) = \cancel{h}.21$

Mean $= A + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$

$\Rightarrow$ Mean $= 21 + \left(-\frac{46}{40}\right) \times 6$

$= 21 - \frac{23}{20_{10}} \times \cancel{6}3$

$= 21 - 6.9$

$= \underline{14.1 \text{ days}}$

Mean of no. of days student remains absent = 14.1 days

16. given, each wiper blade has length $(r) = 21$ cm.

and sweeps angle $= 120°$

Area swept by one blade $= \frac{\theta}{360} \times \pi r^2$ unit square

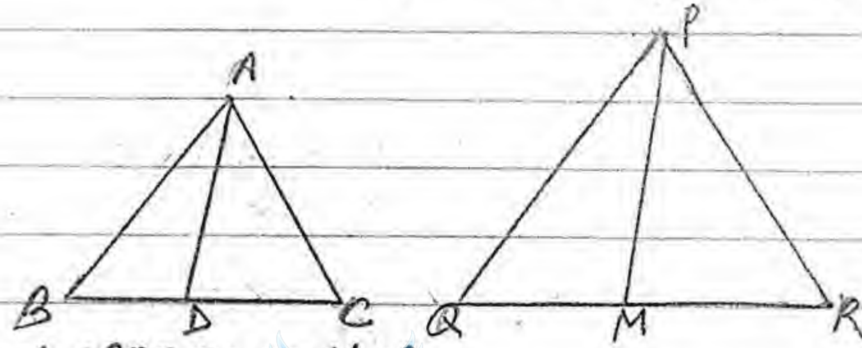
$= \frac{12\cancel{0}}{36\cancel{0}_{3}} \times \frac{22}{\cancel{7}} \times \cancel{21}^{3} \times 21 \text{ cm}^2$

$= \underline{462 \text{ cm}^2}$

Blades donot overlap.

$\therefore$ Area swept by 2 blades $= 462 \times 2 \text{ cm}^2 = \underline{924 \text{ cm}^2}$

17. Given,



$\Delta ABC \sim \Delta PQR$.

AD and PM are medians of ΔABC and ΔPQR respectively

Since. $\Delta ABC \sim \Delta PQR$

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR} \quad \text{—} (1)$$

D is the midpoint of BC (AD is median)

M is the midpoint of QR (PM is median)

$\therefore$ $\left.\begin{array}{l} BC = 2BD \\ QR = 2QM \end{array}\right\} (2)$

$$\therefore \frac{AB}{PQ} = \frac{BC}{QR} \quad [\text{from } (1)]$$

$$\Rightarrow \frac{AB}{PQ} = \frac{\cancel{2}BD}{\cancel{2}QM} \quad [\text{from } (2)]$$

$$\Rightarrow \frac{AB}{PQ} = \frac{BD}{QM} \Rightarrow$$

$\therefore \Delta ABD \sim \Delta PQM$

That is, $\frac{AB}{PQ} = \frac{BD}{QM} = \frac{AD}{PM}$ (a)

Similarly, $\frac{BC}{QR} = \frac{AC}{PR}$ [from ①]

$\Rightarrow \frac{2BD}{2QM} = \frac{AC}{PR}$

$\Rightarrow \frac{AC}{PR} = \frac{BD}{QM}.$

$\therefore \triangle ACD \sim \triangle \cancel{PMR}\ \triangle PRM$ ← ⓑ That is, $\frac{AC}{PR} = \frac{AD}{PM} = \frac{CD}{RM}$

From both ⓐ and ⓑ, we get that.

$$\frac{AB}{PQ} = \frac{AD}{PM}$$

Hence proved!

18. Given: $p(x) = x^5 - 4x^3 + x^2 + 3x + 1.$

$g(x) = x^3 - 3x + 1$

To check: if $g(x)$ is a factor of $p(x)$ or not.

Method: simply divide.

P.T.O.

$\Rightarrow$

$$
\begin{array}{r|l}
x^3-3x+1 & x^5-4x^3+x^2+3x+1 \;(\, x^2-1 \\
 & \underline{\begin{array}{l} x^5-3x^3+x^2 \\ - \quad + \quad - \end{array}} \\
 & -x^3+3x+1 \\
 & \underline{\begin{array}{l} -x^3+3x-1 \\ + \quad - \quad + \end{array}} \\
 & \qquad 2
\end{array}
$$

We get remainder $= 2$

Therefore, $p(x)$ is not completely divisible by $g(x)$

$g(x)$ is not a factor of $p(x)$

19. Let us assume, if possible, that $\sqrt{3}$ is rational

Then, $\sqrt{3}$ can be expressed as $\frac{p}{q}$ where $(q \neq 0)$ and p, q are coprimes [$HCF(p,q)=1$]

$\therefore \sqrt{3} = \frac{p}{q}$ [$p,q \in Z$; $HCF(p,q)=1$]

On squaring both sides,

$$3 = \frac{p^2}{q^2}$$

$$\Rightarrow p^2 = 3q^2. \quad \text{--- (1)}$$

3 divides p^2

$\therefore$ 3 divides p.

Then, p can be written as;

$p = 3a$ for some integer 'a'.

On squaring,

$$p^2 = 9a^2$$

Put $p = 3q^2$ from (1)

$$\Rightarrow \cancel{3}q^2 = \overset{3}{\cancel{9}}a^2$$

$$\Rightarrow q^2 = 3a^2.$$

3 divides q^2

$\therefore$ 3 divides q.

$\therefore$ 3 divides both p and q, 3 is a common factor of p and q.

But, p and q are co-primes.

Therefore, our assumption is wrong

$\therefore$ $\sqrt{3}$ is irrational.

from Section D (4 marks)

25. More than series

More than or equal to 20 - 100

More than 30 - 90

More than 40 - 82

More than 50 - 70

More than 60 - 46

More than 70 - 40

More than 80 - 15

More than 90 - 0

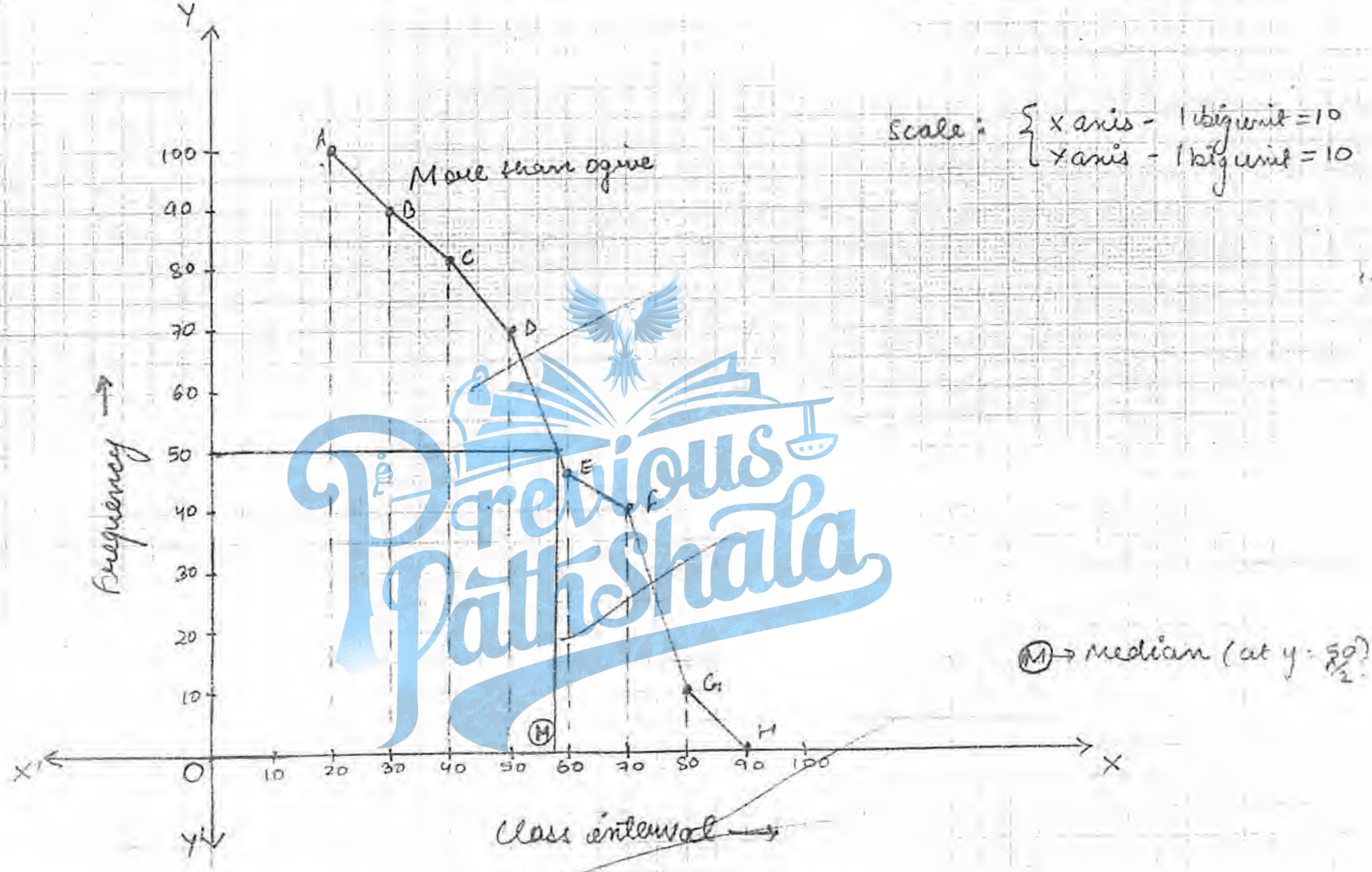
Class Interval	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	10	8	12	24	6	25	15

$\Sigma f_i = 100$

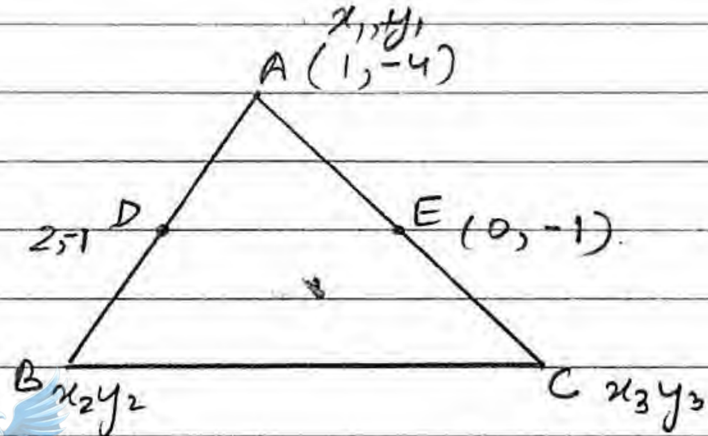
$n = 100.$ $\frac{n}{2} = 50$

For more than ogive, we plot the point A (20,100), B (30,90), C (40,82) D (50, 70), E (60,46), F (70,40), G (80, 15) and H (90,0)

Q25.



More than ogive.



20. Given: Triangle ABC with
$A(x_1, y_1) = A(1, -4)$

D and E are midpoints of
AB and AC.

Let coordinates of B be (x_2, y_2) and that of C be (x_3, y_3).
Using section formula for mid-point;

$$\frac{1+x_2}{2} = 2 \quad , \quad \frac{-4+y_2}{2} = -1$$

$$\Rightarrow \quad x_2 = 3 \quad , \quad y_2 = 2$$

$$\underline{(x_2, y_2) = (3, 2)}$$

Similarly, $\frac{1+x_3}{2} = 0 \quad , \quad \frac{-4+y_3}{2} = -1$

$$\Rightarrow \quad x_3 = -1 \quad , \quad y_3 = 2.$$

$$\cancel{(x_3, y_3) = (-1, 2)} \quad x_3 y_3 = -1, 2$$

Area of triangle $= \frac{1}{2}|x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)|$ unit square

$= \frac{1}{2}|1(\cancel{-2}+2)+3(\cancel{2}+4)+(-1)(-4-2)|$ unit square

$= \frac{1}{2}|1\times 0+3\times 6+(-1\times -6)|$ sq. units

$= \frac{1}{2}|18+6|$ sq. units $= 12$ sq. units

$\therefore$ Area of Δ $= \underline{12 \text{ sq. units}}$

21. Let the required two numbers be $5x$ and $6x$.

Given, if 7 is subtracted from both nos, ratio becomes 4 : 5.

New. nos. = $(5x-7)$ and $(6x-7)$.

According to the question;

$$\frac{5x-7}{6x-7} = \frac{4}{5} \quad \text{——} ①$$

Solving ①;

$5(5x-7) = 4(6x-7)$

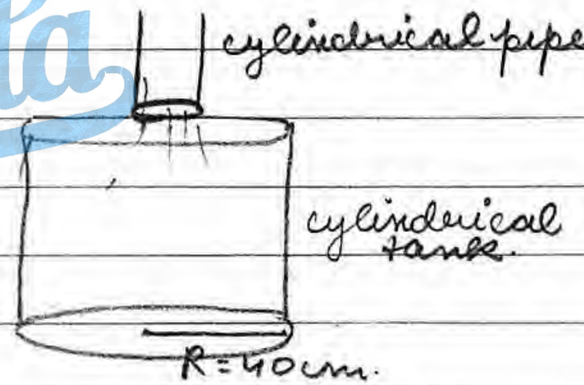
$\Rightarrow 25x - 35 = 24x - 28$

$\Rightarrow x = 35 - 28$

$\Rightarrow \underline{x = 7}$

$\therefore$ The required nos. are : $5x = 35$

$6x = 42$



22\. Let the radius of cylindrical pipe be 'r' metres

given -

Radius (R) of Cylindrical tank = 40 cm $= \frac{2}{5}m$

Height of tank filled = 3.15 m

Timetaken = $\frac{1}{2}h$ = 30 minutes = $30 \times 60s$.

Rate of flow of water via pipe = 2.52 km/h $= \frac{\cancel{252}^{\cancel{126}\,14}}{\cancel{100}_{20}} \times \frac{\cancel{5}}{\cancel{18}_{9}}$ m/s.

$= 0.7 m/s$.

~~Volume of~~

To find - internal diameter of pipe $(2r)$.

Solution:

Volume of water passed through pipe in $\frac{1}{2}$ hour $= \pi r^2 \times h$ unit cube

$= \pi r^2 \times$ rate of flow $\times$ time

$= \pi r^2 \times 0.7 \times 30 \times 60 \ m^3$.

Volume of water in tank in $\frac{1}{2}$ hour $= \pi R^2 \times h$

$= \pi \left(\frac{2}{5}\right)^2 \times 3.15 \ m^3$

But, volume of water passed through pipe = Volume of water collected in tank

$$\therefore \cancel{\pi} r^2 \times \frac{7}{1\cancel{0}} \times 3\cancel{0} \times 60 = \cancel{\pi} \left(\frac{2}{5}\right)^2 \times \frac{315}{100}$$

$$\Rightarrow r^2 = \frac{4}{5 \times \cancel{5}} \times \frac{\cancel{315}}{\cancel{5}100} \times \frac{1}{\cancel{7}} \times \frac{1}{\cancel{7}} \times \frac{1}{\cancel{60}}$$

$$\Rightarrow r^2 = \frac{1}{2500} \Rightarrow r = \sqrt{\frac{1}{50^2}} \Rightarrow r = \pm \frac{1}{50}$$

Radius is always positive, so $r = -\frac{1}{50}$ can be ignored.

$\Rightarrow r = \frac{1}{50} m.$

$\Rightarrow r = \frac{1}{50} \times 100 cm \Rightarrow r = 2 cm$

Internal diameter of pipe $= d = 2r = 4cm$
Or $0.04m$.

Section-B.

7. Event : Dice is thrown.

Outcomes : {1, 2, 3, 4, 5, 6 (6 outcomes)

Favourable events :-

i) Composite number = 4, 6

Probability of getting a composite no. $= \frac{\text{no. of favourable outcomes}}{\text{Total outcomes}}$

$= \frac{2}{6} = \frac{1}{3}$

ii) prime no. : 2, 3, 5.

Probability = $\frac{\text{no. of outcomes favourable to the event}}{\text{Total possible outcomes}}$

or $\left(\frac{\text{no. of prime nos.}}{\text{Total outcomes}}\right)$

$= \frac{3}{6} = \frac{1}{2}$

$\frac{40}{-6}$ 34

8. Event : cards ~~no~~ numbered from 7-40 are chosen.

Total possible outcomes : (7, 8, 9 - - - 40) = 34 cards.

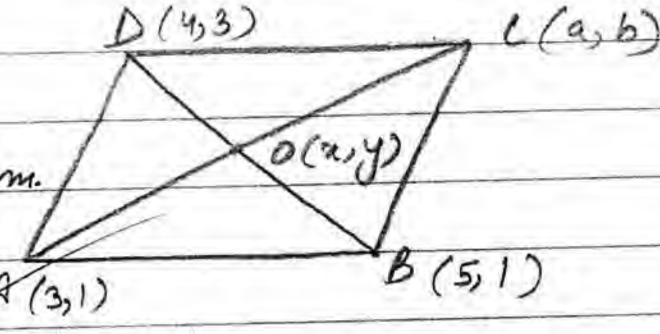
For Favourable event : cards multiple of 7.

Favourable outcomes : (7, 14, 21, 28, 35) 5 cards

Probability of selecting a cards multiple of 7 = $\frac{\text{Favourable outcomes}}{\text{Total no. of outcomes}}$

$= \frac{5}{34}$

9. Points A, B, C, D are vertices of a parallelogram.



We know that diagonals of a parallelogram bisect each other.

$\therefore$ O is the midpoint of both AC and BD.

Using section formula for mid-point.

on BD,

$$x = \frac{4+5}{2}, \quad y = \frac{3+1}{2}$$

$$\Rightarrow \quad x = \frac{9}{2}, \quad y = 2.$$

on AC

$$x = \frac{3+a}{2}, \quad y = \frac{b+1}{2}$$

$$\Rightarrow \quad \frac{9}{2} = \frac{3+a}{2}, \quad 2 = \frac{b+1}{2} \quad \Rightarrow \boxed{a = 6}, \boxed{b = 3}$$

$\Rightarrow$ a = 6, b = 3.

10. Given -

$$3x - 5y = 4 \quad \text{—①}$$
$$9x - 2y = 7 \quad \text{—②}$$

To find- 'x' ~~ang~~ and 'y'

Multiplying ① × 3, ~~and~~ ② × 1 and ~~adding~~ subtracting ② from ①; we get :

$$(3x-5y)\times 3 - (9x-2y)\times 1 = 4\times 3 - 7\times 1$$

$$\Rightarrow 9x - 15y - 9x + 2y = 12 - 7$$

$$\Rightarrow -13y = 5 \quad \Rightarrow \boxed{y = -\frac{5}{13}}$$

Then, Putting $y = -\frac{5}{13}$ in ①;

$$3x = 4 + 5y$$

$$\Rightarrow 3x = 4 + 5 \times -\frac{5}{13}$$

$$\Rightarrow 3x = \frac{52 - 25}{13} \quad \Rightarrow x = \frac{\cancel{27}^{9}}{13 \times \cancel{3}}$$

$$\Rightarrow \boxed{x = \frac{9}{13}}$$

11. Using Euclid's Division Lemma (states that $a = bq + r, 0 \le r < b$) we can find the HCF of 65 and 117.

$$117 = 65 \times 1 + 52$$
$$65 = 52 \times 1 + 13$$
$$52 = 13 \times 4 + 0$$

$\therefore$ HCF of $65, 117 = 13$

But,

$$65n - 117 = 13$$
$$\Rightarrow 65n = 13 + 117$$
$$\Rightarrow n = \frac{130}{65}$$
$$\Rightarrow \boxed{n = 2}$$

117
13
130

12) Given, quadratic equation $\Rightarrow kx^2 - 6x - 1 = 0$.
where $a = k$, $b = -6$, $c = -1$.

For no real roots (for imaginary roots), discriminant must be less than 0.

That is, $D < 0$

$\Rightarrow b^2 - 4ac < 0$

$\Rightarrow (-6)^2 - 4 \times k \times -1 < 0$

$\Rightarrow 36 + 4k < 0$

$\Rightarrow 4k < -36 \Rightarrow \boxed{k < -9}$

$\therefore$ k should be less than -9. ($k = -10, -11 \ldots$)

$36 + 4k < 0$
$k < -9$

Section-A.

1) Given, 2 concentric circles

$OP = OQ = a$

$OM = b$

To find - PQ

$PM = \sqrt{PO^2 - OM^2} \Rightarrow PM = \sqrt{a^2 - b^2}$

$PQ = 2PM \Rightarrow PQ = 2\sqrt{a^2 - b^2}$ units

$36+4 \times 2x$
$x<-9$

2. $\tan\alpha = \frac{5}{12}$

Using identity; $\sec^2\alpha - \tan^2\alpha = 1$

$\sec^2\alpha = 1 + \tan^2\alpha$

$\Rightarrow \sec^2\alpha = 1 + \left(\frac{5}{12}\right)^2$

$\Rightarrow 1 + \frac{25}{144}$

$= \frac{144+25}{144}$

$\Rightarrow \sec^2\alpha = \frac{169}{144} \Rightarrow \sec\alpha = \sqrt{\frac{13^2}{12^2}}$

$\sec\alpha = \frac{13}{12}$

3. $(x+5)^2 = 2(5x-3)$

$\Rightarrow x^2+25+\cancel{10x} = \cancel{10x} - 6$

$\Rightarrow x^2+31 = 0.$

$a=1, \; b=0, \; c=19$

Discriminant $= b^2 - 4ac$

$= 0^2 - 4 \times 1 \times 39$

$= 0 - \cancel{76}\, 124$

$= \cancel{-73}\; \cancel{-76}\; -124$

4. 429 can be expressed as -

$429 = 3 \times 11 \times 13.$

$$\begin{array}{r|l} 3 & 429 \\ 11 & 143 \\ 13 & 13 \\ & 1 \end{array}$$

5. First 10 multiples of 6 form AP $\rightarrow$ $\underset{a}{6}, 12, 18 \ldots\ldots \underset{l}{60}.$

Sum of 1^{st} 10 multiples $= \frac{n}{2}[a+l]$

$= \frac{\cancel{10}^{5}}{\cancel{2}}[6+60]$

$= 330$

$\begin{array}{r} 66 \\ \times 5 \\ \hline \end{array}$

6. Given, $A = 5, -3$
$B = 13, m$

$AB = 10$ units

Using distance formula;

$$\sqrt{(13-5)^2 + (m+3)^2} = 10$$

On squaring;

$$8^2 + (m+3)^2 = 100$$

$$\Rightarrow (m+3)^2 = 100 - 64$$

$$\Rightarrow \sqrt{(m+3)^2} = \sqrt{36}$$

$$\Rightarrow (m+3) = \pm 6$$

Considering only positive value;

$$m = 6 - 3$$

$$\Rightarrow \boxed{m = 3}$$

Total