

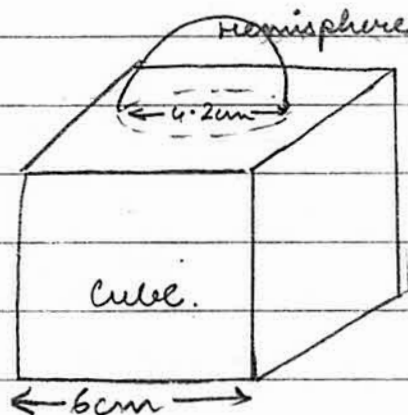
Mathematics

Section-D

23.

$$\begin{aligned} \text{Radius of the hemisphere} &= \frac{d}{2} \\ &= \frac{4.2 \text{ cm}}{2} \\ &= 2.1 \text{ cm} \end{aligned}$$

$$\text{Side of cube} = 6 \text{ cm.} \\ (a)$$



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

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

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

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

$$= 216 + \frac{22 \times 2.1^2}{7} \text{ cm}^2$$

$$= [216 + 13.86] \text{ cm}^2$$

$$= 229.86 \text{ cm}^2$$

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

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

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

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

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

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

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

Construction: Construct $BD \perp AC$

Name $\angle BAC = \theta$.

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

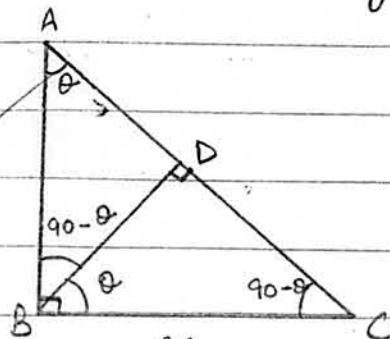


fig.

It is clear that,

$$\triangle ABD \sim \triangle ACB \sim \triangle BCD.$$

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

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

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

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

Adding ① and ②, gives:

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

$$\Rightarrow AB^2 + BC^2 = AC (AD + CD)$$

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

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

[AD + CD = AC]
Figure.

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

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

26. given - as per figure

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

$$\therefore BD - BC = 40 \text{ m}$$

$$\Rightarrow CD = 40 \text{ m}$$

In $\triangle ACB$,

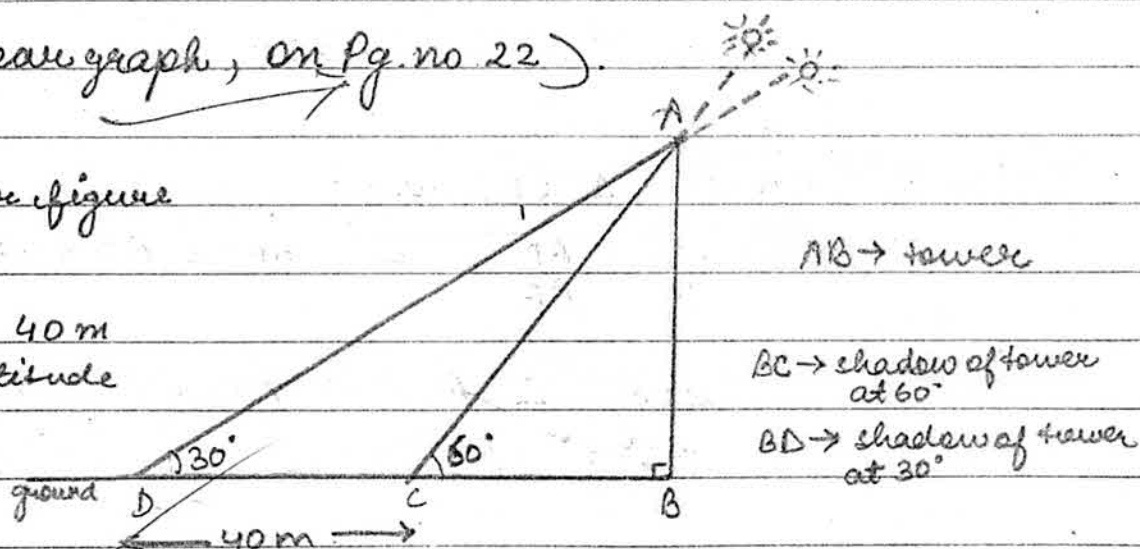
$$\tan 60^\circ = \frac{AB}{BC}$$

$$\Rightarrow \sqrt{3} \times BC = AB \Rightarrow BC = \frac{AB}{\sqrt{3}} \quad \text{--- (1)}$$

In $\triangle ADB$,

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

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



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

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

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

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

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

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

given, use $\sqrt{3} = 1.732$

$$\therefore AB = 20 \times 1.732 \text{ m} = 34.64 \text{ m}$$

$\therefore$ 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 denotes p^{th} term.

$$\text{given; } m(a_m) = n(a_n) \quad [m \neq n].$$

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

$$m(a_m) = n(a_n)$$

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow \text{at } \boxed{a_{m+n} = 0}$$

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

Hence, proved!

28.

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

Total money spent = Rs 80

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

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

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

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

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

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

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

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

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

$$\Rightarrow n = \frac{-4 \pm \sqrt{64}}{2}$$

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

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

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

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

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

$n = -20$ can be ignored.

$$\therefore \boxed{n=16}$$

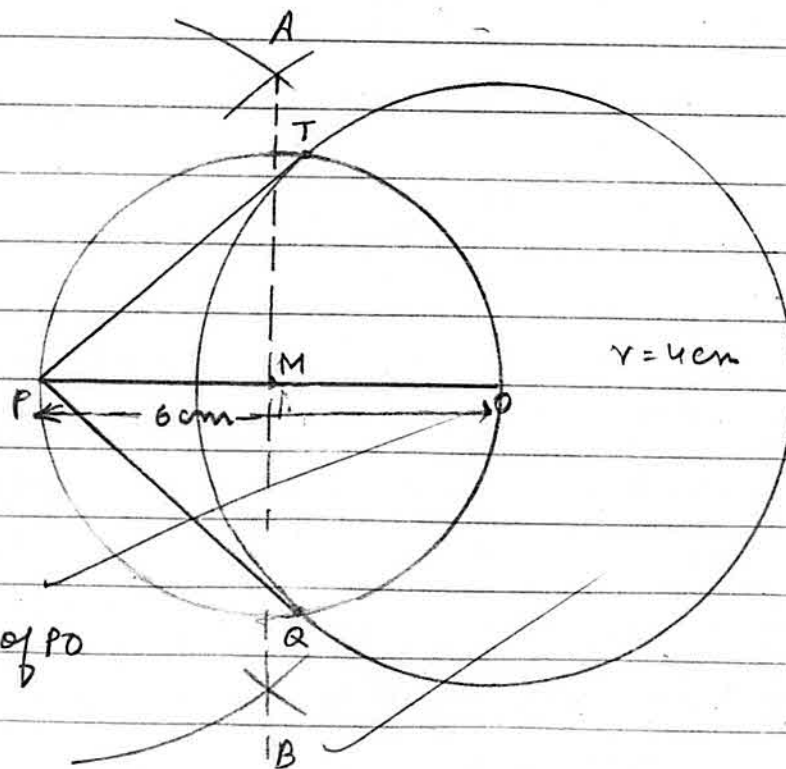
No. of books bought by the shopkeeper = 16.

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 4 cm 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 ($PM = MO$, $AB \perp PO$)
- 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.
 $\therefore$ PT and PQ are required tangents.



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

Taking from LHS,

= LHS

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

$$= \frac{1}{1+\sin^2\theta} + \frac{1}{1+\operatorname{cosec}^2\theta} + \frac{1}{1+\cos^2\theta} + \frac{1}{1+\sec^2\theta} \quad [\text{Re-arranging}]$$

$$= \frac{1}{1+\sin^2\theta} + \frac{1}{1+\left(\frac{1}{\sin\theta}\right)^2} + \frac{1}{1+\cos^2\theta} + \frac{1}{1+\left(\frac{1}{\cos\theta}\right)^2} \quad \left[\begin{array}{l} \operatorname{cosec}\theta = \frac{1}{\sin\theta} \\ \sec\theta = \frac{1}{\cos\theta} \end{array} \right]$$

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

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

$$= 1 + 1$$

$$= 2$$

$$= \text{RHS}$$

LHS = RHS
Hence, proved!

Section - C

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

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

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

$$\Rightarrow A+B = 45^\circ \quad \text{--- ①}$$

Now taking,

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

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

$$\Rightarrow A-B = 30^\circ \quad \text{--- ②}$$

Adding ① and ②;

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

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

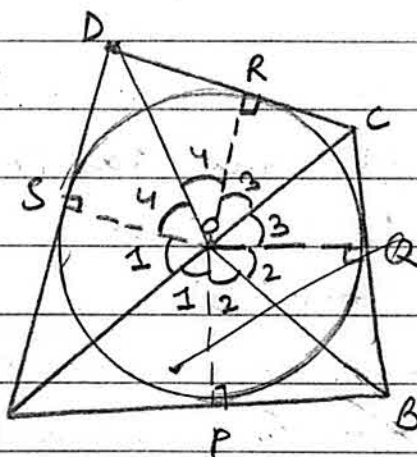
$$B = 45^\circ - A \Rightarrow B = 45^\circ - 37.5^\circ \Rightarrow B = 7.5^\circ$$

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

$$\begin{array}{r} 45.0 \\ 37.5 \\ \hline 7.5 \end{array}$$

$$\begin{array}{r} 7.5 \\ 37.5 \\ \hline 45.0 \end{array}$$

14. To prove: opposite sides of a quadrilateral 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: $\angle AOB + \angle COD = 180^\circ$
Or $\angle AOD + \angle BOC = 180^\circ$

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

$$\therefore \angle AOP = \angle DOS = \angle 1 \text{ (say)}$$

$$\text{Similarly, } \angle BOR = \angle COQ = \angle 2$$

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

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

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

[Complete angle around a point]

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

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

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

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

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

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

Hence, proved!

P.T.O.

Calculating mean using step deviation method.

15.

No. of days (class interval)	No. of students (f_i)	x_i ($\frac{\text{Upper} + \text{Lower limit}}{2}$)	$u_i = \frac{x_i - A}{h}$	$f_i \times u_i$
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	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 :	$\Sigma f_i = 40$			$\Sigma f_i u_i = -46$

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

$$\text{Assumed mean (A)} = \underline{21}$$

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

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

$$= 21 - \frac{23 \times 63}{20}$$

$$= 21 - 6.9$$

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

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

16. given, each reaper blade has length (r) = 21 cm.
and sweeps angle = 120°

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

$$= \frac{120^\circ}{360} \times \frac{22}{7} \times 21 \times 21 \text{ cm}^2$$

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

Blades don't overlap.

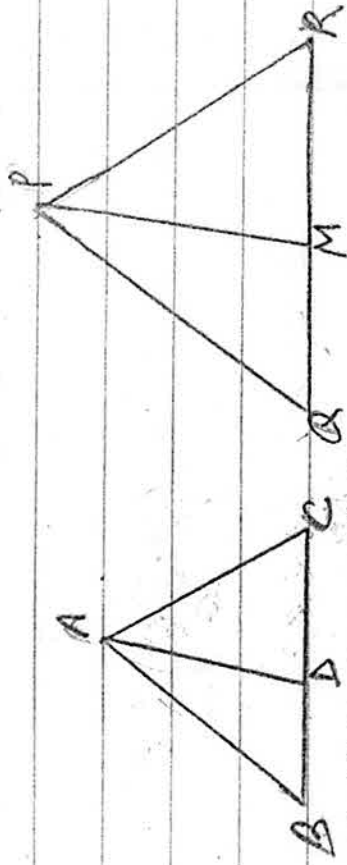
$$\therefore \text{Area swept by 2 blades} = 462 \times 2 \text{ cm}^2 = \underline{924 \text{ cm}^2}$$

17.

Given,

$$\triangle ABC \sim \triangle PQR$$

AB and PM

are medians of $\triangle ABC$ and $\triangle PQR$ respectively.Since, $\triangle ABC \sim \triangle PQR$

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

D is the midpoint of BC

(AD is median)

M is the midpoint of QR

(PM is median)

$$\therefore BC = 2BD$$

$$QR = 2QM$$

$$\therefore \frac{AB}{PQ} = \frac{BC}{QR}$$

[from (1)]

$$\Rightarrow \frac{AB}{PQ} = \frac{2BD}{2QM}$$

[from (2)]

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

 $\Rightarrow$

$$\therefore \triangle ABD \sim \triangle PQM \quad \text{--- (2)}$$

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

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

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

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

$\therefore \triangle ACD \sim \triangle PRM$

That is, $\frac{AC}{PR} = \frac{AD}{PM} = \frac{CD}{RM}$

From both ③ and ④ we get that.

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

hence proved!

18.

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

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

To check: if $q(x)$ is a factor of $P(x)$ or not.

Method: simply divide.

P.T.O.

→

$$\begin{array}{r}
 x^3 - 3x + 1 \mid x^5 - 4x^3 + 3x + 1 \quad (x^2 - 1) \\
 \underline{x^5 - 3x^3 + x^2} \\
 2x^3 - 3x + 1
 \end{array}$$

$$\begin{array}{r}
 -x^3 + 3x + 1 \\
 \underline{-x^3 + 3x - 1} \\
 2
 \end{array}$$

We get remainder = 2

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

$q(x)$ 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 [$\text{HCF}(p, q) = 1$]

$$\therefore \sqrt{3} = \frac{p}{q}$$

$$[p, q \in \mathbb{Z}; \text{HCF}(p, q) = 1]$$

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;

$$p = 3a \quad \text{for some integer 'a'}$$

On squaring,

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

$$\text{Put } p = 3q \text{ from ①}$$

$$\Rightarrow 3q^2 = 9a^2$$

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

$$\text{3 divides } q^2$$

$$\therefore 3 \text{ divides } q$$

$\therefore$ 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
 $\therefore$ This is irrational.

from Section D (4 marks)

25. More than series

or equal to
 More than 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

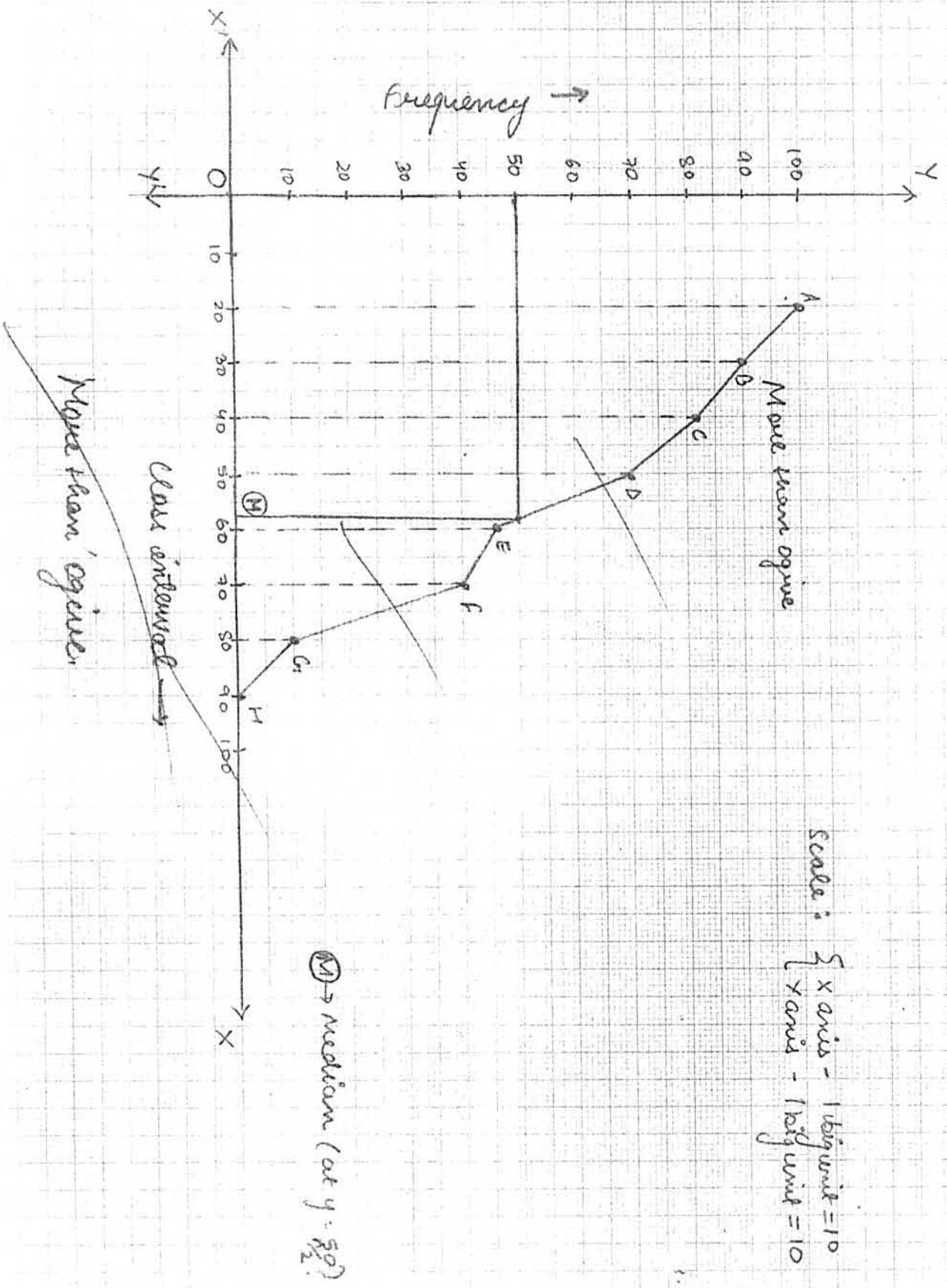
$$\Sigma f_i = 100$$

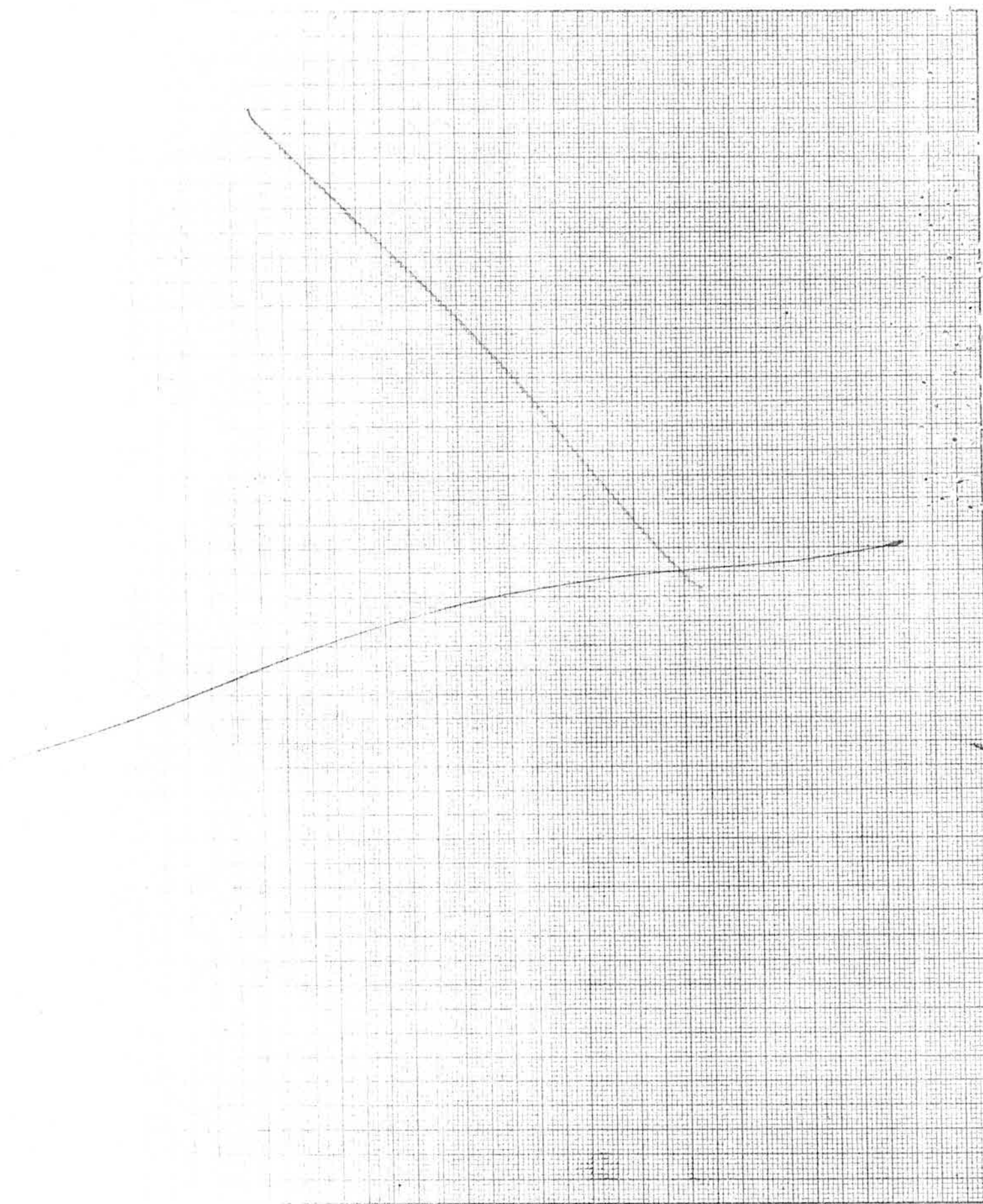
$$N = 100$$

$$n = 50$$

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).

Q.25.



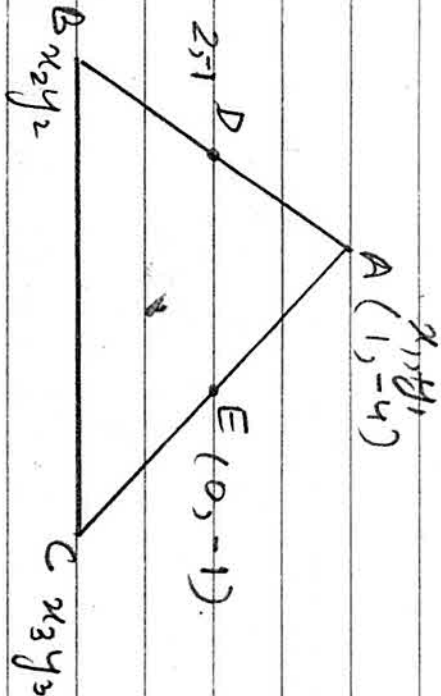


Q6.

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;

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

$$\Rightarrow x_2 = 3$$

$$y_2 = -2$$

$$(x_2, y_2) = (3, -2)$$

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

$$\Rightarrow x_3 = -1$$

$$y_3 = -2$$

$$(x_3, y_3) = (-1, -2) \quad x, y = -1, -2$$

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

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

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

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

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

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

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

$$\text{New. nos.} = (5x-7) \text{ and } (6x-7).$$

According to the question;

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

Solving ①;

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

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

$$\Rightarrow x = 35 - 28$$

$$\Rightarrow x = 7$$

The required nos. are : ~~$5x = 35$~~
 ~~$6x = 42$~~

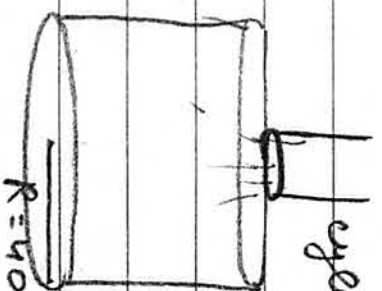
22.

Let the radius of cylindrical pipe be r metres

given -

Radius (R) of cylindrical tank = 40 cm

$$= \frac{2}{5} \text{ m}$$



cylindrical tank
 $R = 40 \text{ cm}$

Height of tank filled = 3.15 m

Time taken = $\frac{1}{2} \text{ h} = 30 \text{ minutes} = 30 \times 60 \text{ s}$.

Rate of flow of water = $2.52 \text{ km/h} = \frac{252}{100} \times \frac{5}{18} \text{ m/s}$

$$= 0.7 \text{ m/s}$$

~~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

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

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

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

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

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

$$\therefore \pi r^2 \times \frac{7}{10} \times 30 \times 60 = \pi \left(\frac{2}{5}\right)^2 \times \frac{315}{100}$$

$$\Rightarrow r^2 = \frac{4}{5 \times 8} \times \frac{315}{100} \times \frac{1}{7} \times \frac{1}{3} \times \frac{1}{60} \times \frac{60 \times 205}{205}$$

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

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

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

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

Internal diameter of pipe = $d = 2r = 4 \text{ cm}$
or 0.04 m.

Section - B.

7. Event: dice is thrown.

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

Favourable events :-

i) Composite number = 4, 6

$$\text{Probability of getting a composite no.} = \frac{\text{no. of favourable outcomes}}{\text{Total outcomes}} = \frac{2}{6} = \frac{1}{3}$$

ii)

prime no. : 2, 3, 5.

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

or $\frac{\text{no. of prime nos.}}{\text{Total outcomes}}$

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

$$\frac{40}{34}$$

8.

Event : cards numbered from 7-40 are chosen

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

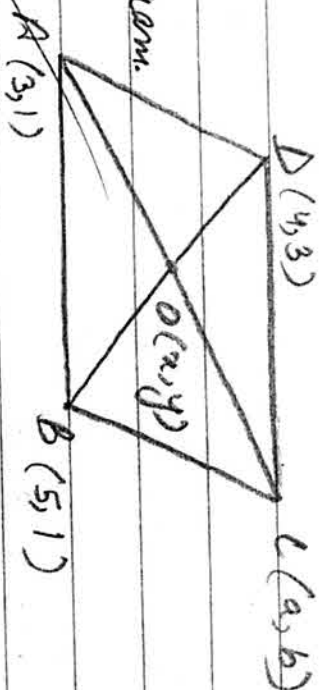
For Favourable event : cards multiple of 7.

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

Probability of selecting a card 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,

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

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

on AC

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

$$\Rightarrow \frac{9}{2} = \frac{3+a}{2}$$

$$\Rightarrow a = 6$$

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

$$b = 3.$$

$$\Rightarrow \boxed{a=6}, \boxed{b=3}$$

10.

given -

$$3x - 5y = 4 \quad \text{--- ①}$$

$$9x - 2y = 7 \quad \text{--- ②}$$

To find 'x' and 'y'

Multiplying ① by 3, and ② by 1 and adding; we get:

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

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

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

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

$$3x = 4 + 5y$$

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

$$\Rightarrow 3x = \frac{52 - 25}{13} \Rightarrow x = \frac{27}{13}$$

$$\Rightarrow x = \frac{27}{13}$$

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

$$117 = 65 \times 1 + 52$$

$$65 = 52 \times 1 + 13$$

$$52 = 13 \times 4 + 0$$

$$\therefore \text{HCF of } 65, 117 = 13$$

But,

$$65n - 117 = 13$$

$$\Rightarrow 65n = 13 + 117$$

$$\Rightarrow n = \frac{130}{65}$$

$$= 2$$

$$\Rightarrow$$

$$n = 2$$

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

$$\begin{array}{r} 117 \\ 13 \overline{) 130} \\ 130 \\ \hline 0 \end{array}$$

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

$$36 + 4k < 0$$

$$k < -9$$

That is, $D < 0$

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

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

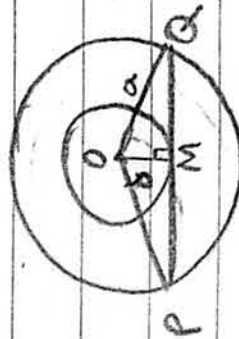
$$\Rightarrow 36 + 4k < 0$$

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

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

Section-A.

1) Given, 2 concentric circles



$$OP = OQ = a$$

$$OM = b$$

To find - PQ

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\text{Discriminant} = b^2 - 4ac$$

$$= 0^2 - 4 \times 1 \times 19$$

$$= 0 - 76$$

$$= -76$$

4. 429 can be expressed as -

$$3(429) \\ 11(143) \\ 13(11)$$

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

5. First 10 multiples of 6 form AP $\rightarrow 6, 12, 18, \dots, 60$

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

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

$$= 330$$

6.

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

Ans = 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

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