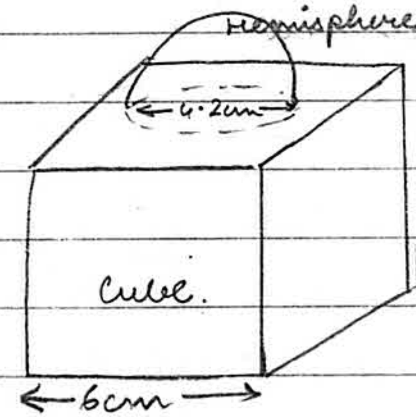
# Mathematics

## Section-D




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

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

$= 2.1$ cm

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

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

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

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

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

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

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

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

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

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

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

$$= 216 + 19.404 \ cm^3$$

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

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

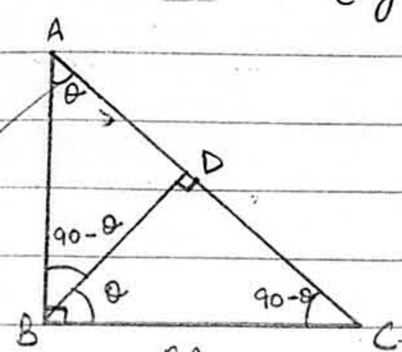


fig.

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 :

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

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

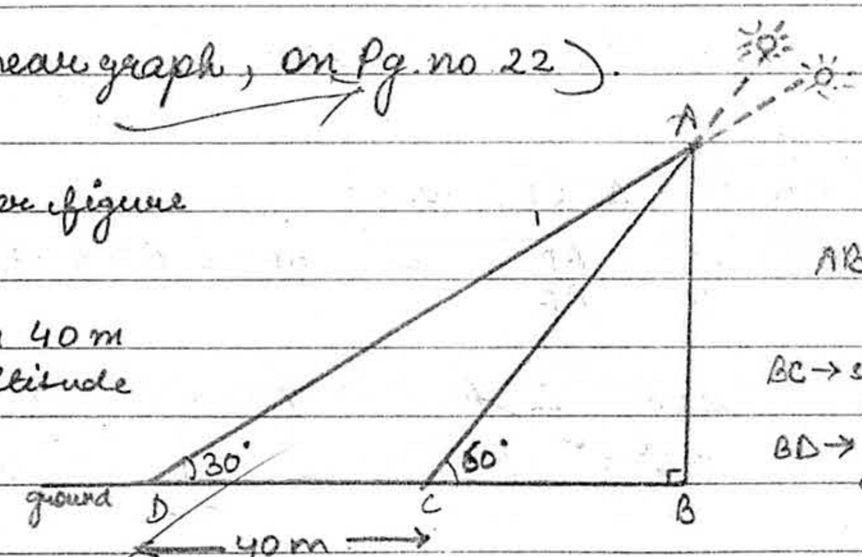
$$\Rightarrow AB^2 + BC^2 = AC \times AC$$

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

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°

$\therefore BD - BC = 40m$

$\Rightarrow CD = 40m$

In $\Delta ACB$,

$$\tan 60° = \frac{AB}{BC}$$

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

In $\Delta ADB$,

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

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

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

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

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

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

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

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

$\therefore$ 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.

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

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

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

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

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

$$\cancel{\Rightarrow n = \frac{-4 \pm \sqrt{676}}{2} = \frac{-4 \pm 26}{2} \Rightarrow n = \frac{-30}{2} \text{ or } \frac{22}{2}}$$

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

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

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

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

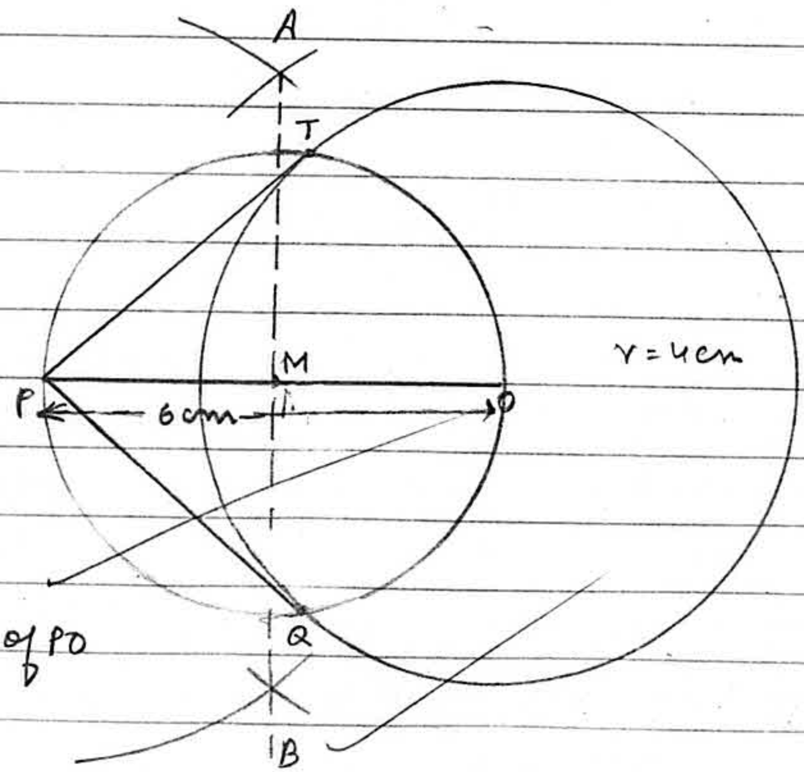
$n = -20$ can be ignored.

$\therefore \boxed{n = 16}$

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

Taking from LHS,

= LHS

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

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

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

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

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

$= 1 + 1$

$= 2$

= 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;

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

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

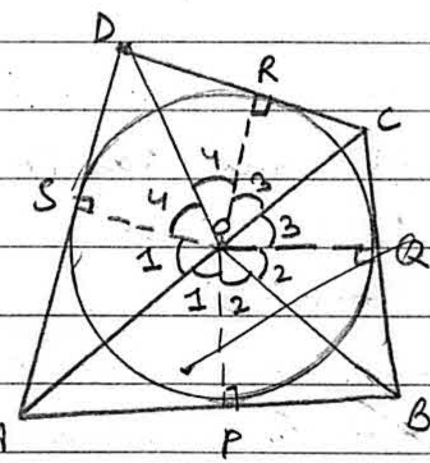
$B = 45^\circ - A \Rightarrow B = 45^\circ - 37.5^\circ \Rightarrow B = 7.5^\circ$

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

45.0
37.5
7.5

7.5
37.5
45.0
37

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.

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

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

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

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

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

[complete angle around a point]

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

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

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

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

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

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

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

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

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

$= 21 - 6.9$

$= \underline{14.1}$ 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

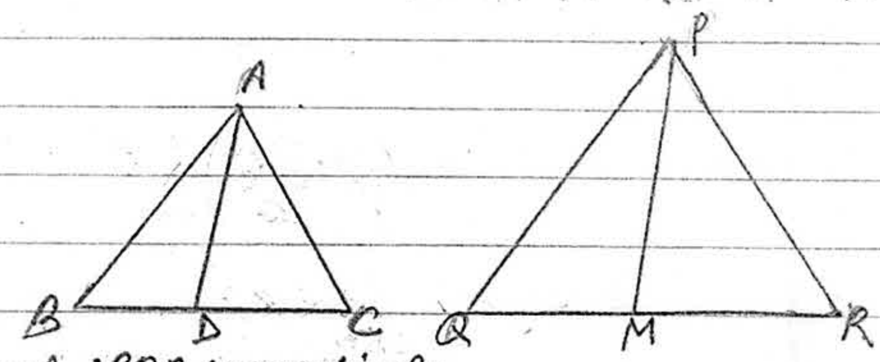
$= \frac{\cancel{120}}{\cancel{360}\,3} \times \frac{22}{\cancel{7}} \times \cancel{21}\,3 \times 21 \text{ cm}^2$.

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

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 $\Delta ABC$ and $\Delta PQR$ 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)

$\therefore BC = 2BD$

$QR = 2QM$ } (2)

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

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

$\Rightarrow \frac{AB}{PQ} = \frac{BD}{QM} \Rightarrow \therefore \Delta ABD \sim \Delta PQM$

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

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

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

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

$\therefore \Delta ACD \sim \Delta PRM$ ——— ⓑ 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.

$\Rightarrow$

$$x^3 - 3x + 1 \overline{\big) \; x^5 - 4x^3 + 3x^2 + 3x + 1 \;} \big( x^2 - 1$$

$$\begin{array}{l} x^5 - 3x^3 + x^2 \\ - \quad + \quad - \\ \hline -x^3 + 3x + 1 \\ -x^3 + 3x - 1 \\ + \quad - \quad + \\ \hline \qquad 2 \end{array}$$

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$(p,q) = 1$]

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

On squaring both sides,

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

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

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)

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

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

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 |

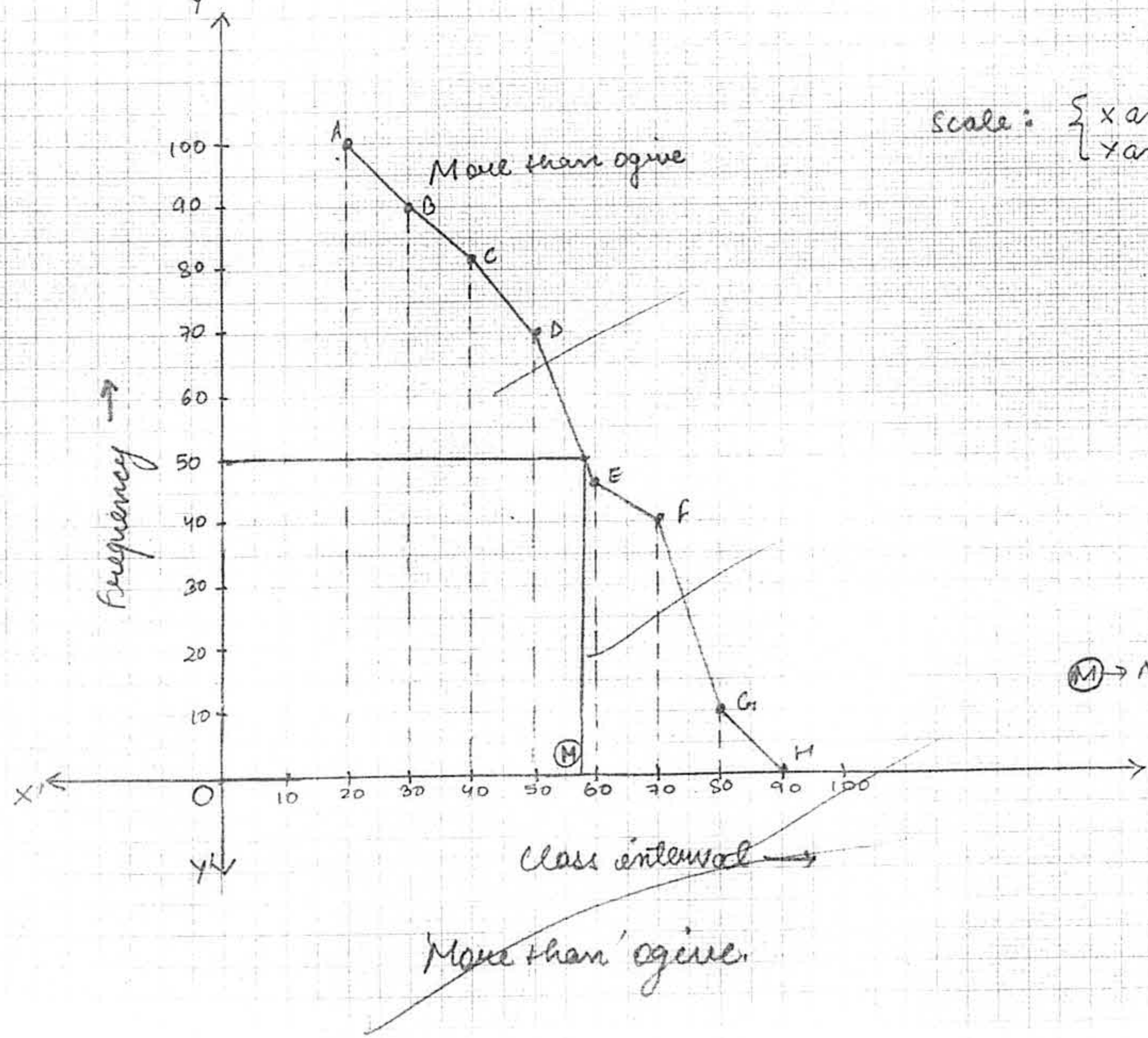
$\Sigma f_i = 100$

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

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)

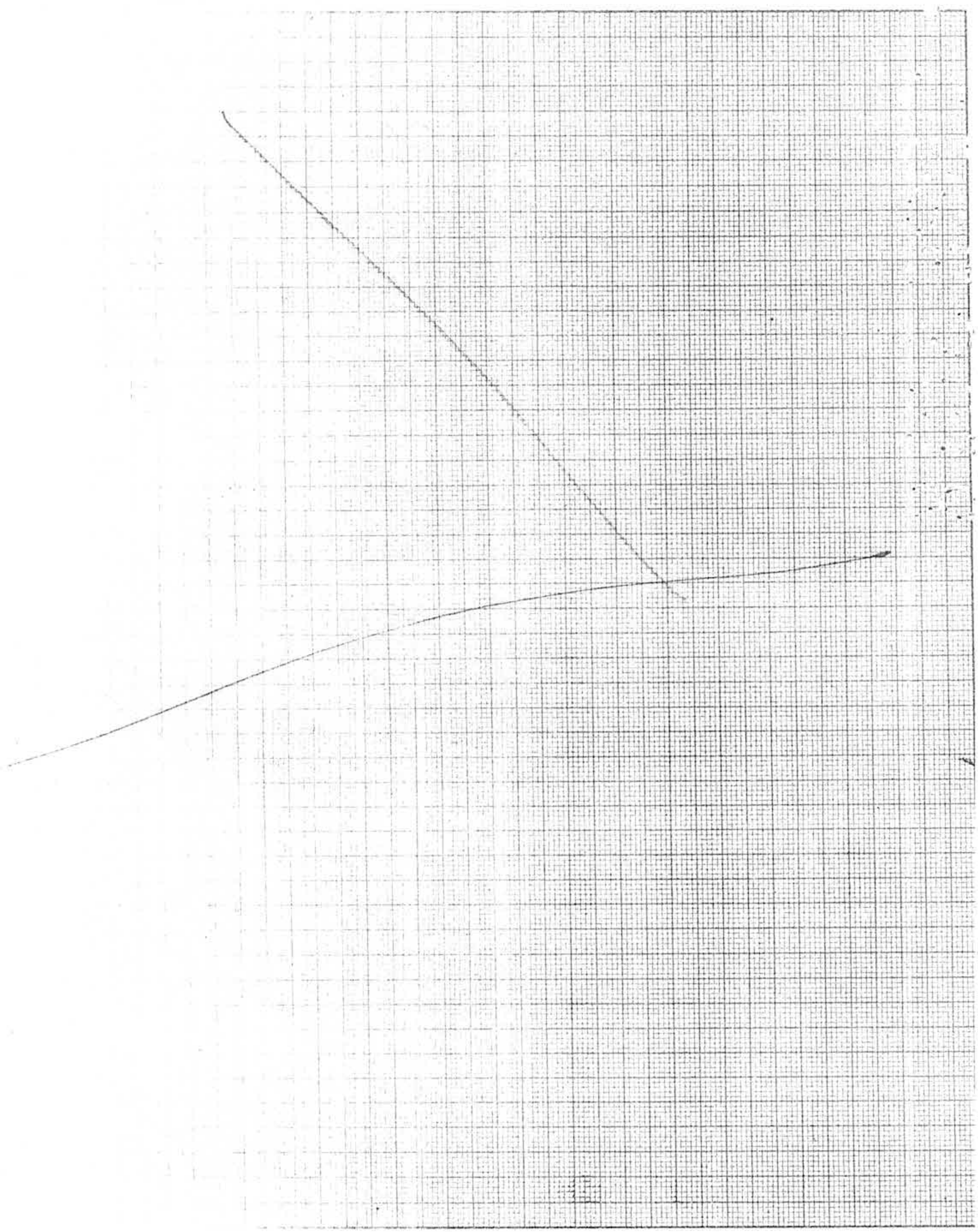
60
4 6

Q 25.

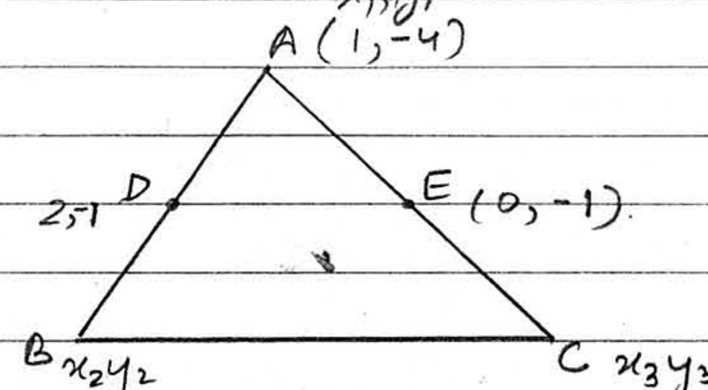



Scale: { X axis - 1 big unit = 10
Y axis - 1 big unit = 10 }

(M) → Median (at y = 50/2)



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;

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

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

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

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

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

~~$(x_3, y_3) = (-1, 2)$~~ $x, y_3 = -1, 2$

-2+4

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

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

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

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

$\therefore$ Area of $\Delta$ $= 12$ sq. units

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

Q. 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;

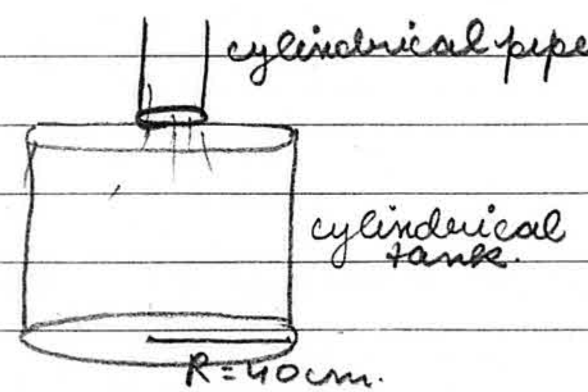
$5(5x-7) = 4(6x-7)$

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

$\Rightarrow x = 35-28$

$\Rightarrow \underline{x = 7}$

$\therefore$ 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

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

Rate of flow of water in pipe = 2.52 km/h $= \frac{\cancel{252}}{\cancel{100}} \times \frac{\cancel{5}}{\cancel{18}}$ 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 $\frac{1}{2}$ hours $= \pi R^2 \times h$

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

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

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

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

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

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 $= d = 2r = 4 cm$
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
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 = $\dfrac{\text{no. of outcomes favourable to the event}}{\text{Total possible outcomes}}$

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

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

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

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

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

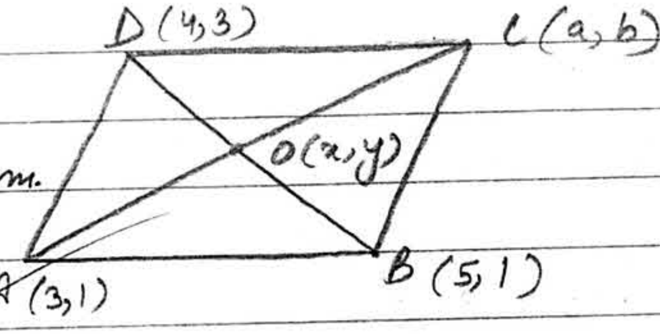
~~For~~ Favourable event : cards multiple of 7.

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

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

$= \dfrac{5}{34}$

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.

$40 - 6 = 34$

Using section formula for mid-point.

on BD,

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

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

on AC

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

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

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

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,

$65x - 117 = 13$

$\Rightarrow \quad 65x = 13 + 117$

$\Rightarrow \quad x = \frac{\cancel{130}\ 10}{\cancel{65}\ 5}$

$\Rightarrow \quad \boxed{x = 2}$

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

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, $D < 0$

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

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

$\Rightarrow 36 + 4k < 0$

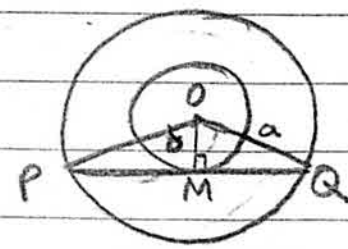
$\Rightarrow 4k < -36 \Rightarrow \boxed{k < -9}$

$\therefore$ 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

$36 + 4 x\alpha$
$x\alpha - 9$

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

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

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

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

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

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

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

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

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

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

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

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

Discriminant $= b^2 - 4ac$

$= 0^2 - 4 \times 1 \times 31$

$= 0 - 124$

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

4. 429 can be expressed as -

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

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

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

Sum of 1st 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

— x —