~~Annual~~ E
MOCK TEST - 2025
STANDARD MATHEMATICS
SECTION-A

1. Prime factorisation of $78 = 2 \times 3 \times 13$ and $130 = 2 \times 5 \times 13$

$\therefore$ HCF$(78, 130) = 2 \times 13 = 26$

$\therefore$ option (c)

2. Sum of the roots of a quadratic polynomial $ax^2 + bx + c$ is $-\frac{b}{a}$

$\therefore$ option (a)

3. $x^2 + Kx + K$; $K \neq 0$

zeroes are $\frac{-K \pm \sqrt{K^2 - 4K}}{2}$

i.e. $\alpha = \frac{-K + \sqrt{K^2 - 4K}}{2}$ and $\beta = \frac{-K - \sqrt{K^2 - 4K}}{2}$

$\therefore \alpha = \beta$ iff $K^2 - 4K = 0 \Rightarrow K(K-4) = 0 \Rightarrow \boxed{K = 4}$ as $K \neq 0$.

Again $\alpha + \beta = -K$ and $\alpha\beta = K$

$\Rightarrow \alpha + \beta = -\alpha\beta \Rightarrow \frac{1}{\alpha} + \frac{1}{\beta} = -1$.

$\Rightarrow \alpha$ and β can't both positive.

$\therefore$ option (a)

4. $3x + 2Ky = 2$ and $2x + 5y + 1 = 0$ are not parallel,

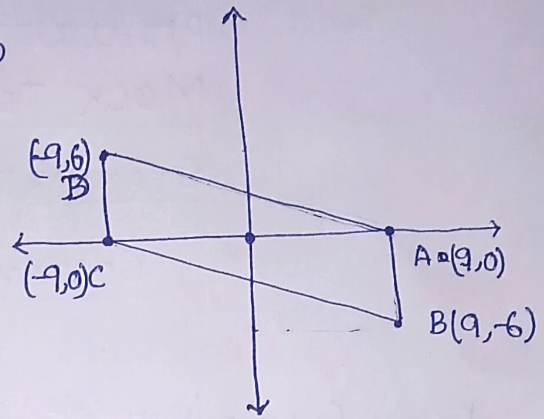
i.e., $\frac{3}{2} \neq \frac{2K}{5} \Rightarrow \boxed{K \neq \frac{15}{4}}$

$\therefore$ option (b)

5.

Clearly $AB = BC = 6$ and $AB \parallel CD$

$AB \perp AC$ and $DC \perp AC$.



$\Delta ACD \cong \Delta CAB$

$\therefore CD = 9$

$\therefore \square ABCD$ is a parallelogram.

$\therefore$ option (c)

6.

Given AP $-8, -5, -2, \ldots, 49$

Common difference $(d) = -5-(-8) = 3$

1st term$(a) = 49$ $\quad$ n^{th} term $= a+(n-1)d = 49+(n-1)(-3)$

$\cancel{= 46+3n}$

$= 52-3n$

~~4th term~~ $\cancel{= T_4 = 46+3(4)}$

$\cancel{= 46+12}$

$\cancel{= 58}$

4th term $= T_4 = 52-3(4) = 52-12 = 40$

$\therefore$ option (b)

7.

A quadratic polynomial is

$P(x) = k(x^2 - (\text{sum of roots})x + \text{product of roots})$; $k \neq 0$

$= k\left(x^2 - \left(\frac{2}{5}-\frac{1}{5}\right)x + \frac{2}{5}\left(-\frac{1}{5}\right)\right)$; $k \neq 0$

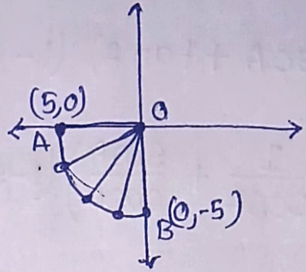
$= k\left(x^2 - \frac{1}{5}x - \frac{2}{25}\right)$

$= \frac{k}{25}(25x^2 - 5x - 2)$; $k \neq 0$.

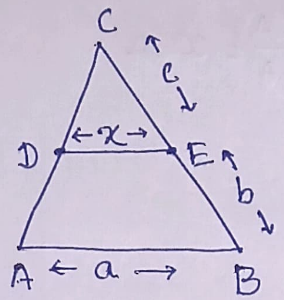
For $k = 25$, $\boxed{P(x) = 25x^2 - 5x - 2}$

$\therefore$ option (d)

8. option (d) Infinitely many



9.



$\Delta CDE \sim \Delta CAB$

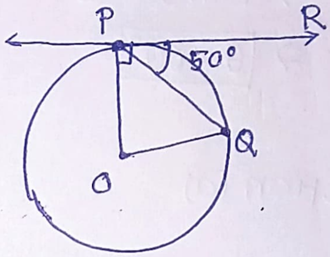
By ~~BPT~~ as $DE \parallel AB$

$$\frac{CE}{CB} = \frac{DE}{AB}$$

$$\Rightarrow \frac{c}{b+c} = \frac{x}{a} \Rightarrow \boxed{x = \frac{ac}{b+c}}$$

$\therefore$ option (b)

10. $\angle QPR = 50^\circ$ and $\angle OPR = 90^\circ$

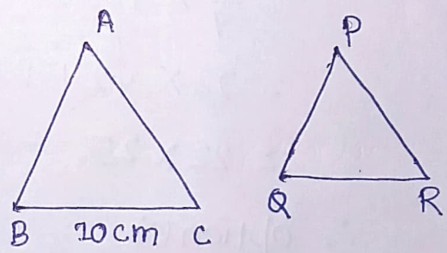


$\Rightarrow \angle OPQ = 40^\circ$, so $\angle OQP = 40^\circ$
(As $OP = OQ$)

$\therefore \angle POQ = 180^\circ - (\angle OPQ + \angle OQP)$
$= 100^\circ$.

$\therefore$ option (b)

11. $\Delta ABC \sim \Delta PQR$



then $\dfrac{AB}{PQ} = \dfrac{AC}{PR} = \dfrac{BC}{QR}$.

$\Rightarrow \dfrac{BC}{QR} = \dfrac{AB}{PQ} = \dfrac{2}{3}$ (given)

$\Rightarrow QR = \dfrac{3}{2} BC = \dfrac{3}{2} \times 10$

$\Rightarrow \boxed{QR = 15}$

12. $3 \cot A = 4 \Rightarrow \tan A = \dfrac{3}{4}$ and $0^\circ < A < 90^\circ$

$\Rightarrow \tan^2 A = \dfrac{9}{16}$

$\Rightarrow 1 + \tan^2 A = 1 + \dfrac{9}{16} = \dfrac{25}{16}$

$\Rightarrow \sec^2 A = \dfrac{25}{16} \Rightarrow \sec A = \pm \dfrac{5}{4} \Rightarrow \boxed{\sec A = \dfrac{5}{4}}$ as $0^\circ < A < 90^\circ$

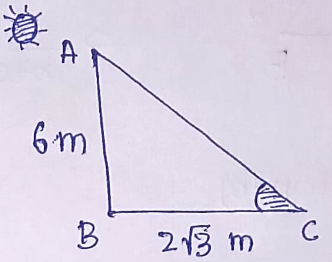
$\therefore$ option (a)

13. $(\sec A + \tan A)(1 - \sin A)$

$$= \left(\frac{1}{\cos A} + \frac{\sin A}{\cos A}\right)(1 - \sin A) = \frac{1 - \sin^2 A}{\cos A} = \frac{\cos^2 A}{\cos A} = \cos A$$

$\therefore$ option (b)

14. Angle of elevation



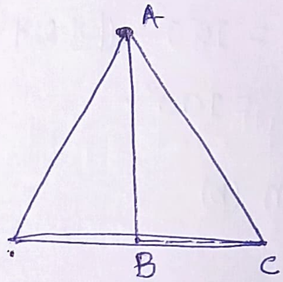
$$\tan\theta = \frac{AB}{CB} = \frac{6}{2\sqrt{3}}$$

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

$\Rightarrow \boxed{\theta = 60^\circ}$

$\therefore$ option (a)

15. $h = 24$ cm ; $r = 7$ cm



$$CSA = \pi r l$$

$$= \frac{22}{7} \times 7 \times \sqrt{h^2 + r^2}$$

$$= 22 \times \sqrt{24^2 + 7^2}$$

$$= 22 \times 25 = 550 \text{ cm}^2$$

$\therefore$ option (c)

16.

I	0–10	10–20	20–30	30–40	40–50	50–60	~~60–70~~
f	3	9	15	30	18	5	

modal class : 30–40

Here $l = 30$, $f_0 = 30$, $f_1 = 15$, $f_2 = 18$ and $h = 10$

$\therefore$ ~~mode = l +~~ Hence option (c)

17. Two dice are thrown

Sample space $(S) = \{(1,1), \cdots, (6,6)\}$

$$n(S) = 6 \times 6 = 36$$

E = differ face difference is 3

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

$n(E) = 6$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{6}{36} = \frac{1}{6}$$

$\therefore$ option (C)

18. $n(S) = 52$

$n(E) = 4$; E = Ace.

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{4}{52} = \frac{1}{13}$$

$\therefore E' =$ not an ace

$$\therefore P(E') = 1 - P(E) = 1 - \frac{1}{13} = \frac{12}{13}$$

$\therefore$ option (d) $\frac{12}{13}$

19. option (A)

20. option (C)

Section-B

21. prime factorisation of $12 = 2^2 \times 3$

It not containing 5. So 12^n never end with the digit 0 for any natural number n.

22. (A) $A = (-3,-3)$, $B = (3,3)$, $C = (-3,3)$

By distance formula

$AB = \sqrt{(3-(-3))^2 + (3-(-3))^2} = \sqrt{2 \times 36} = 6\sqrt{2}$

$AC = \sqrt{(-3-(-3))^2 + (-3-(3))^2} = 6$

$BC = \sqrt{(-3-3)^2 + (3-3)^2} = 6$

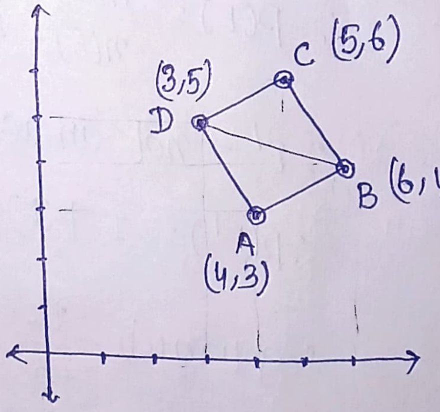
$\therefore AC = CB$

So $\triangle ABC$ is an isoscele triangle.

(B) $A = (4,3)$

$B = (6,4)$

$C = (5,6)$ and $D = (3,5)$



$AB = \sqrt{(6-4)^2 + (4-3)^2} = \sqrt{5}$

$BC = \sqrt{(6-5)^2 + (4-6)^2} = \sqrt{1+4} = \sqrt{5}$

$CD = \sqrt{(5-3)^2 + (6-5)^2} = \sqrt{5}$

$AD = \sqrt{(4-3)^2 + (3-5)^2} = \sqrt{5}$

$BD = \sqrt{(6-3)^2 + (4-5)^2} = \sqrt{10}$

$\therefore \tan \angle ABD = \dfrac{AD}{AB} = 1 \Rightarrow \boxed{\angle ABD = 45^\circ}$

As $AD = AB$ so $\angle ADB = 45^\circ$.

By sum of angle of any $\triangle$ $\angle A = 180^\circ - (\angle ABD + \angle ADB) = 90^\circ$.

Hence ABCD quadrilateral is a square.

23. Let speed of boat $= x$ and speed of stream $= y$

, upstream (speed of boat) $= (x-y)$ km/h

speed of boat in downstream $= (x+y)$ km/h

According to question

$$\frac{30}{x-y} + \frac{44}{x+y} = 10 \quad \text{———(i)}$$

and $$\frac{40}{x-y} + \frac{55}{x+y} = 13 \quad \text{———(ii)}$$

Take $u = \frac{1}{x-y}$ and $v = \frac{1}{x+y}$

$\therefore$ from (i) $\quad 30u + 44v = 10$

$$\Rightarrow 15u + 22v = 5 \quad \text{———(iii)}$$

and from (ii) $\quad 40u + 55v = 13 \quad$ ———(iv)

Eq^n(iii) $\times 5$: $\quad 75u + 110v = 25$

Eq^n(iv) $\times 2$: $\quad 80u + 110v = 26$

(−)

$$-5u = -1 \Rightarrow \boxed{u = 1/5}$$

$$\Rightarrow \boxed{x - y = 5} \quad \text{———(v)}$$

From (iii) $\quad 15\left(\frac{1}{5}\right) + 22v = 5 \Rightarrow 22v = 5 - 3 = 2$

$$\Rightarrow v = \frac{1}{11} \Rightarrow \boxed{x + y = 11} \quad \text{——— vi}$$

$\therefore$ Add eq^n(v) and (vi)

$$2x = 16 \Rightarrow \boxed{x = 8}$$

then $y = 11 - 8 \Rightarrow \boxed{y = 3}$

$\therefore$ speed of boat $= 8$ km/h

speed of stream $= 3$ km/h

24.

Class	0-10	10-20	20-30	30-40
Frequency	5	10	30	20

Here modal class: 20-30

$l = 20$, $f_1 = 30$, $f_0 = 10$, $f_2 = 20$ and $h = 10$

$$\therefore \text{mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$= 20 + \frac{30-10}{2 \times 30 - 10 - 20} \times 10$$

$$= 20 + \frac{20}{30} \times 10$$

$$= 20 + 0.67$$

$$\Rightarrow \boxed{\text{mode} = 20.67}$$

25. (A) Given $\tan\theta + \sec\theta = m$ —— (i)

$$\Rightarrow \sec^2\theta - \tan^2\theta = m(\sec\theta - \tan\theta)$$

$$\Rightarrow \sec\theta - \tan\theta = \frac{1}{m} \text{ —— (ii)}$$

Add (i) and (ii)

$$2\sec\theta = m + \frac{1}{m}$$

$$\Rightarrow \boxed{\sec\theta = \frac{m^2+1}{2m}}$$

(B) $\sin A = \frac{12}{13}$ and $\cos B = \frac{12}{13}$

$$\therefore \tan A + \tan B = \frac{\sin A}{\cos A} + \frac{\sin B}{\cos B} = \frac{\sin A}{\sqrt{1-\sin^2 A}} + \frac{\sqrt{1-\cos^2 B}}{\cos B}$$

$$= \frac{12/13}{\sqrt{1-\left(\frac{12}{13}\right)^2}} + \frac{\sqrt{1-\left(\frac{12}{13}\right)^2}}{12/13}$$

$$= \frac{12/13}{5/13} + \frac{5/13}{12/13}$$

$$= \frac{12}{5} + \frac{5}{12} = \frac{144+25}{60} = \frac{169}{60}$$

SECTION-C

26. Suppose $\sqrt{3}$ is a rational number

i.e., $\sqrt{3} = \frac{p}{q}$; where HCF(p, q) = 1

$\Rightarrow 3q^2 = p^2$ ——— (i)

$\Rightarrow 3 \mid p^2$ (as HCF(p, q) = 1)

$\Rightarrow 3 \mid p$ ——— (ii)

$\Rightarrow p = 3m$ for some integer m.

From (i) $3q^2 = (3m)^2$

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

$\Rightarrow q^2 = 3m$

$\Rightarrow 3 \mid q^2$

$\Rightarrow 3 \mid q$ ——— (iii)

From (ii) and (iii) 3 is a common factor of both p & q

$\therefore$ So, HCF(p, q) ≥ 3

Which is contradict to ~~the~~ ~~ass~~ fact that HCF(p, q) = 1.

Hence $\sqrt{3}$ is an irrational number.

27. Given $(a^2+b^2)x^2 + 2(ac+bd)x + (c^2+d^2) = 0$

Discriminant $(D) = B^2 - 4AC$

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

$= 4\{a^2c^2+b^2d^2+2abcd - a^2c^2 - b^2d^2 - a^2d^2 - b^2c^2\}$

$= -4(a^2d^2+b^2c^2-2adbc)$

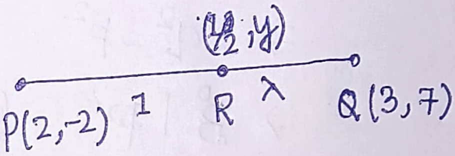
$= -4(ad-bc)^2$

$\Rightarrow D < 0$ as $ad \neq bc$ (given)

Hence both roots are not real.

28. (A) Given two points

$P=(2,-2)$, $Q=(3,7)$



Let $R=(\frac{11}{22}, y) = (\frac{1}{2}, y)$ divide

PQ in $1:\lambda$ ratio.

By Section formula $\left(\frac{1}{2}, y\right) = \left(\frac{2\lambda+3}{\lambda+1}, \frac{-2\lambda+7}{\lambda+1}\right)$

$\therefore \frac{1}{2} = \frac{2\lambda+3}{\lambda+1} \Rightarrow \lambda+1 = 4\lambda+6$

$\Rightarrow 3\lambda = -5$

$\Rightarrow \lambda = -5/3$

$\therefore$ R divide PQ in $-3:5$ ratio

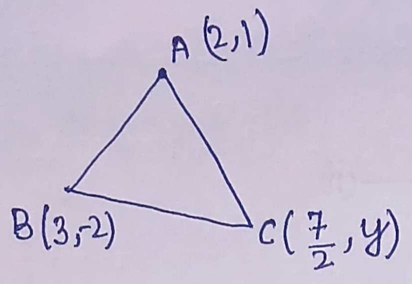
$\therefore y = \frac{-2(-5/3)+7}{-5/3+1} = \frac{10+21}{-5+3} = \frac{31}{-2}$

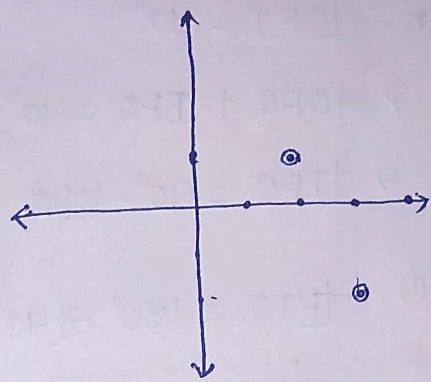
Hence $y = \frac{-31}{2}$.

N.B This divide the line Externally and not internally.

NOTE If student has already done by taking point $(\frac{22}{11}, y)$ and solve properly then also they will get full mark

28 (B)





Given $[ABC] = 5 \text{ unit}^2$

Here $(x_1, y_1) = (2, 1)$

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

$(x_3, y_3) = (\frac{7}{2}, y)$

By area of a triangle

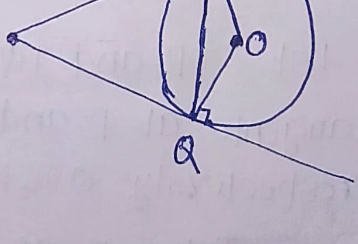
So $\Delta = \frac{1}{2}\{x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2)\}$; ~~posi~~ negative Value

$\Rightarrow 5 = \frac{1}{2}\{2(-2-y) + 3(y-1) + \frac{7}{2}(1-(-2))\}$

$\Rightarrow 5 \times 2 = -4-2y+3y-3+\frac{21}{2} = y + \frac{7}{2}$

$\Rightarrow y = 10 - \frac{7}{2} = \frac{13}{2}$

29 (A) Given TP and TQ are two tangent. and O is the centre.



Then $OP \perp TP$ and $OQ \perp TQ$.

Since $TP = TQ$

$\Rightarrow \Delta TPQ$ is an isoscele triangle.

$\Rightarrow \angle TPQ = \angle TQP$

Since Sum of angle in a Δ

$\angle PTQ = 180^\circ - 2\angle TPQ$ —— (i)

Again $\angle OPT = 90^\circ$

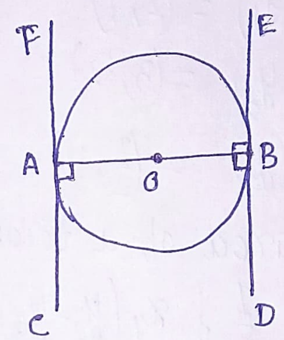
$\Rightarrow \angle OPQ + \angle TPQ = 90^\circ$

$\Rightarrow \angle TPQ = 90^\circ - \angle OPQ$ ——— (ii)

From (i) $\angle PTQ = 180^\circ - 2(90^\circ - \angle OPQ)$

$\Rightarrow \boxed{\angle PTQ = 2\angle OPQ}$

29. (B) AB is a diameter and AC, BD are tangents at A and B respectively.



As OA and OB are radius.

So $OA \perp AC$ and $OB \perp BD$

$\therefore \angle OAC = \angle OBD = 90^\circ$

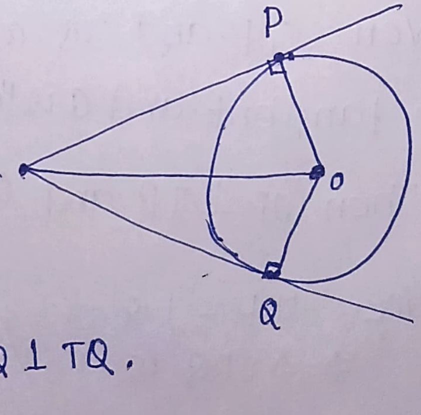
Since $\angle OAC = \angle OBE = 90^\circ$

AOB is a straight line segment

By corresponding angle

$AC \parallel BD$

30. Let TP and TQ are two tangents at P and Q respectively. O is the centre.



Join OP, OQ and OT.

Clearly $OP \perp TP$ and $OQ \perp TQ$.

In $\triangle OPT$ and $\triangle OQT$

OT is common

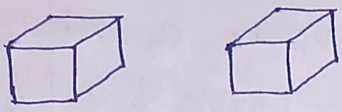
$OP = OQ$

$\angle OPT = \angle OQT = 90^\circ$

$\therefore$ By RHT, $\triangle OPT \cong \triangle OQT$

Hence $TP = TQ$.

31. Two different dice are ~~thrown~~ thrown.



Sample space $(S) = \{(1,1), (2,2), \ldots, (6,6)\}$

$n(S) = 6 \times 6 = 36$

(i) $E_1 =$ sum of two dice is less than 7

$= \{(1,1), (1,2), (1,3), (1,4), (1,5)$
$(2,1), (2,2), (2,3), (2,4),$
$(3,1), (3,2), (3,3),$
$(4,1), (4,2)$
$(5,1)\}$.

$n(E) = 5+4+3+2+1 = \frac{5 \times 6}{2} = 15$

$P(E) = \frac{n(E)}{n(S)} = \frac{15}{36} = \frac{5}{12}$

(ii) $E_2 =$ product of two dice is less then 16

~~Since~~ $\cancel{16 = 1 \times 16}$
$\cancel{= 2 \times 8}$
$\cancel{= 4 \times 4}$

$= \{(1,1), (1,2), \ldots (1,6),$
$(2,1), \ldots (2,6),$
$(3,1), \ldots (3,5)$
$(4,1), (4,2), (4,3)$
$(5,1), (5,2), (5,3), \cancel{(6,1)},$
$(6,1), (6,2)\}$

~~1st dice have four option 1, 2, 3 and 4~~

$\therefore n(E_2) = 6+6+5+3+3+2 = 25$

$P(E_2) = \frac{n(E_2)}{n(S)} = \frac{25}{36}$

(iii) $E_3 =$ is a doublet of odd numbers
$= \{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)\}$

$n(E_3) = 6$

$$P(E_2) = \frac{n(E_2)}{n(S)} = \frac{6}{36} = \frac{1}{6}$$

SECTION - D

32.(A). Let sum of 1st terms of two AP's are a and a' and their common differences d and d' respectively.

Let their general term's and sum of 1st n terms are T_n, T_n' and S_n, S_n' respectively.

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

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

$$= \frac{a+\left(\frac{n-1}{2}\right)d}{a'+\left(\frac{n-1}{2}\right)d'} \quad \text{—— (i)}$$

Let $m-1 = \frac{n-1}{2}$

$$\Rightarrow \boxed{n = 2m-1}$$

$\therefore$ From (i) $$\frac{a+(m-1)d}{a'+(m-1)d'} = \frac{7(2m-1)+1}{4(2m-1)+27}$$

$$\Rightarrow \boxed{\frac{S_{2m-1}}{S'_{2m-1}} = \frac{T_m}{T_m'} = \frac{14m-6}{8m+23}}$$

$$\therefore \frac{T_9}{T_9'} = \frac{14(9)-6}{8(9)+23} = \frac{120}{95} = \frac{24}{19}$$

OR

32.(B). Given Eq^n $-4+(-1)+2+\cdots+x=437$ —— ①

Here First term $(a) = -4$

Common difference $(d) = 3$

Say there are 'n' terms in Eq^n ① of LHS.

So $\frac{n}{2}\{2(-4)+(n-1)3\} = 437$

$\Rightarrow n(-8+3n-3) = 874$

$\Rightarrow 3n^2 - 11n - 874 = 0$

$\Rightarrow 3n^2 - 57n + 46n - 874 = 0$

$\Rightarrow 3n(n-19) + 46(n-19) = 0$

$\Rightarrow (n-19)(3n+46) = 0$

$\Rightarrow \boxed{n=19}$ (only possible values)

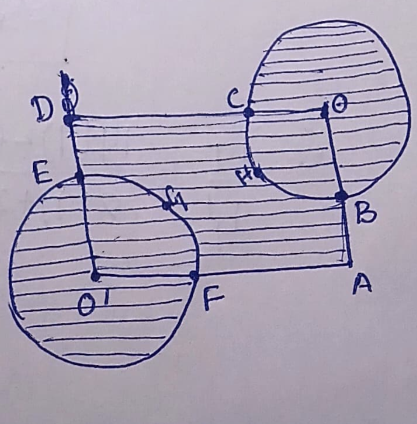
again last term $a_n = a+(n-1)d$

$\Rightarrow x = -4+(19-1)3$

$= 57-7$

$\Rightarrow \boxed{x=50}$

33. Sides of square O'AOD = (a) = 28 cm



radius of each circle $(r) = \frac{1}{2}a$

$\Rightarrow r = \frac{1}{2}\times 28 = 14$

Area of a square $= a^2 = 28\times 28 = 784$ sq. cm

Area of two circle $= 2 \times \pi r^2$

$= 2 \times \frac{22}{7} \times 14^2$

$= 44 \times 28 = \cancel{4312}$ 1232 sq.cm

Area of Sector $EO'FG$ + Area of sector $OCHB$

$= \frac{\theta}{360^\circ} \times \pi r^2 = \frac{180^\circ}{360^\circ} \times \frac{22}{7} \times 14^2 = 11 \times 28 = 308$ sq.cm

~~Area of two circle~~ $\cancel{= 2 \times \pi r^2}$

$\cancel{= 2 \times \frac{22}{7} \times 14^2}$

$\cancel{= 44 \times 28}$

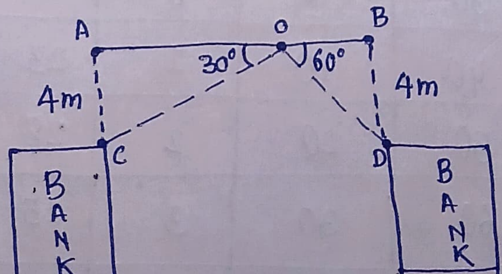
Area of shaded region = Area of 2 circle + Area of the square − Area of two sector $EO'FG$ and $COBH$.

$= 1232 + 784 - 308$

$= 1708$ sq. cm

$\boxed{\text{NOTE}}$ Some student are confused with the shaded region If you found the two common shaded sector area of $O'FGE$ and $OCHB$, then also full mark awarded.

$\boxed{34.}$



AB is the width of the bridge.

Angle of depression from point O to the bank are given as $\angle AOC = 30^\circ$ and $\angle BOD = 60^\circ$

height from bank to the bridge $= AC = BD = 4m$.

Here in $\triangle OAC$, RAT, $\tan 30^\circ = \frac{CA}{OA}$

$\Rightarrow OA = \frac{4}{1/\sqrt{3}} = 4\sqrt{3}$ m.

and in $\triangle OBD$, RAT, $\tan 60^\circ = \frac{BD}{BO}$

$\Rightarrow OB = \frac{4}{\sqrt{3}} = \frac{4}{3}\sqrt{3}$

So, width (AB) $= AO + BO$

$= 4\sqrt{3} + \frac{4}{3}\sqrt{3}$

$= \frac{16}{3}\sqrt{3}$ m.

Hence width of the river is $\frac{16}{3}\sqrt{3}$ m.

35. (A)

Age (Y)	Patients (f)	x	$x-a$ $= x-30$	$u = \frac{x-a}{h}$	uf
5-15	6	10	-20	-2	-12
15-25	11	20	-10	-1	-11
25-35	21	30	0	0	0
35-45	23	40	10	1	23
45-55	14	50	20	2	28
55-65	5	60	30	3	15

$\Sigma f =$

Let assumed mean $a = 30$

Interval length $h = 10$

$N = \Sigma f = 6 + 11 + 21 + 23 + 14 + 5$

$= 80$

$\Sigma uf = -12 - 11 + 0 + 23 + 28 + 15$

$= 43$

By step-deviation method

$\therefore$ mean $(\bar{x}) = a + \dfrac{\Sigma uf}{\Sigma f} \times h$

$= 30 + \dfrac{43}{80} \times 10$

$= 30 + \dfrac{43}{8} = 30 + 5.375$

$\Rightarrow \boxed{\bar{x} = 35.375}$

Again maximum frequency $(f_1) = 23$

Modal class : 35 − 45

l = lower class of the modal class = 35

f_1 = frequency of the modal class

f_0 = Preceding frequency of the modal class = 21

f_2 = Suceeding frequency of the modal class = 14

h = length of equal intervals = 20

so mode $= l + \dfrac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$

$= 35 + \dfrac{23 - 21}{2(23) - 21 - 14} \times 10$

$= 35 + \dfrac{20}{11} \approx 35 + 1.818$

$\Rightarrow$ mode $= 36.818$

35(B)

Given $\Sigma f = 100$ and median $= 545$

Class	Frequency (f)	Cumulative frequency c_f	
0-100	3	3	
100-200	4	7	
200-300	5	12	
300-400	x	$12+x$	
400-500	17	$29+x$	
500-600	20	$49+x$	←
600-700	19	$68+x$	
700-800	y	$68+x+y$	$= 89$
800-900	8	$76+x+y$	$= 97$
900-1000	3	$79+x+y$	$= 100$

Since $N = \Sigma f = 3+4+5+x+17+20+19+y+8+3$

$\Rightarrow N = 79+x+y$

$\Rightarrow 100 = 79+x+y$

$\Rightarrow \boxed{x+y=21}$ ——— (i)

Now $\frac{N}{2} = \frac{100}{2} = 50$

Since median $= 545$

So, median class: 500-600

c_f : cumulative frequency preceding of the modal class $= 29+x$

f : frequency of the modal class $= 20$

h : length of the median class $= 100$

l : lower limit of the median clas $= 500$

$\therefore$ median $= l + \dfrac{\frac{N}{2} - c_f}{f} \times h$

$= 500 + \dfrac{50 - 29 - x}{20} \times 100$

$= 500 + 250 - 145 - 5x$

$= 605 - 5x$

$\Rightarrow 545 = 605 - 5x$

$\Rightarrow 5x = 605 - 545$

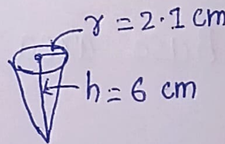
$\Rightarrow x = \dfrac{60}{5} \Rightarrow \boxed{x = 12}$

From Eq^n (i) $\quad y = 21 - 12 \Rightarrow \boxed{9 = y}$

SECTION-E

36. The dimensions of the cuboid are : $10\,cm \times 10\,cm \times 8\,cm$

Each cone carved out of Radius $(r) = 2.1$ cm & Height $(h) = 6$ cm.



Volume of each cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 2.1^2 \times 6$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{21}{10} \times \frac{21}{10} \times 6$

$= \dfrac{2772}{100} = 27.72\ cm^3$

Volume of 5 cone $= 5 \times 27.72 = 5 \times \dfrac{2772}{100} = \dfrac{1386}{10}$

$= 138.6\ cm^3$

(ii) (A) Volume of wood of the final product = Volume of cuboid − volume of 5 cone

$= 10 \times 10 \times 8 - 138.6$

$= 800 - 138.6$

$= 661.4 \text{ cm}^3$

(B) CSA Surface area of a cone $= \pi r l$

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

$= \frac{22}{7} \times \frac{21}{10} \times \frac{3}{10}\sqrt{449}$

$= \frac{198}{100}\sqrt{449} \text{ cm}^2$

CSA surface area of 5 cone $= 5 \times \pi r l$

$= 5 \times \frac{198}{100}\sqrt{449}$

$= \frac{99}{10}\sqrt{449} \text{ cm}^2$

Base area of 5 cone $= 5 \times \pi r^2$

$= 5 \times \frac{22}{7} \times \frac{21}{10} \times \frac{21}{10}$

$= \frac{33 \times 21}{10} = \frac{693}{10} \text{ cm}^2$

Hence TSA of the final product = Area of cuboid − 5 base of cone + 5 CSA of cone

$= 2(10 \times 10 + 10 \times 8 + 10 \times 8) - \frac{693}{10} + \frac{99}{10}\sqrt{449}$

$\approx 520 - 69.3 + 208.89$

$\Rightarrow \boxed{\text{TSA} = 659.59 \text{ cm}^2}$.

37.

(i)(A) No. of triangles in figure-1 = 4

" " " -2 = 6

" " " -3 = 8 and so on.

Here AP is 4, 6, 8, 10, ...

First term (a) = 4

Common difference (d) = 2

nth term is $T_n = a + (n-1)d$

$= 4 + (n-1)2$

$\Rightarrow \boxed{T_n = 2n + 2}$

(ii)B No. of matchsticks in figure-1 = 12

" " " " " -2 = 19

" " " " " -3 = 26

Here AP for the no of matchsticks is

12, 19, 26, 33, 40, ...

Here First term (a') = 12

Common difference (d') = 7

Sum of 1st n terms = $S_n' = \frac{n}{2}[2a' + (n-1)d']$

$= \frac{n}{2}[2(12) + (n-1)7]$

$= \frac{n}{2}(7n + 17)$

(iii) General term of no of match sticks AP

$T_n' = a' + (n-1)d' = 12 + (n-1)7$

$\Rightarrow \boxed{T_n' = 7n + 5}$

For term having 61 matchstick

$T_n' = 61$

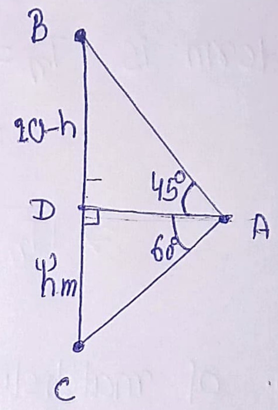
$\Rightarrow 7n+5=61$

$\Rightarrow 7n = 56$

$\Rightarrow \boxed{n=8}$

Hence 8th term of the AP has 61 matchsticks.

38 (i) Here angle of elevation from A to B is 45° and angle of depression from A to C is 60°.



DC = Given height of A from C (water level)

= h metre

BC = height of B from C (water level)

= 10 metre

BD = BC − CD = 10 − h metre.

(ii) (A) In $\triangle ADB$, $\tan 45^\circ = \frac{BD}{AD} = \frac{10-h}{AD}$

$\Rightarrow \boxed{AD = 10-h}$ (As $\tan 45^\circ = 1$)

Again in $\triangle ACD$, $\tan 60^\circ = \frac{CD}{AD}$

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

$\Rightarrow 10\sqrt{3} - h\sqrt{3} = h$

$\Rightarrow 10\sqrt{3} = h(\sqrt{3}+1)$

$\Rightarrow \boxed{h = \frac{10\sqrt{3}}{1+\sqrt{3}} \text{ m.}}$

(ii) (B) In Δ ACD, $\sin 60^\circ = \frac{CD}{AC}$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{h}{AC}$$

$$\Rightarrow AC = \frac{2}{\sqrt{3}} \times \frac{10\sqrt{3}}{1+\sqrt{3}}$$

$$\Rightarrow \boxed{AC = \frac{20}{1+\sqrt{3}} \text{ m.}}$$

Hence distance between A and c is $\frac{20}{1+\sqrt{3}}$ m.

——— END ———