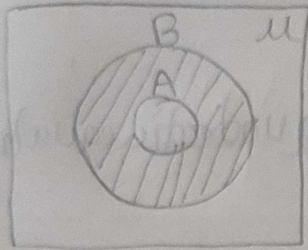
MATHS - set - B

PART-A

SECTION-I

1



$A \subset B$

$\Rightarrow B-A$

2. Given equations,

$\rightarrow (k-1)x + 3y = 7$

$\rightarrow (k+1)x + 6y = 5k-1$

$\rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ [$\because$ It has infinitely many solutions].

$\rightarrow \frac{k-1}{k+1} = \frac{3}{6} = \frac{7}{5k-1}$

$\rightarrow \frac{3}{6} = \frac{7}{5k-1}$

$\rightarrow 3(5k-1) = 42$

$\rightarrow 15k-3 = 42$

$\rightarrow \frac{15k}{5} = \cancel{48}\ \frac{45}{5}\ 3$

$\rightarrow \therefore k = 3$

3. According to given situation,

shortest side $= x$

another side $= 2x+4$

hypotenuse $= 2x+6$

$\rightarrow$ Quadratic equation;

$\rightarrow (x)^2 + (2x+4)^2 = (2x+6)^2$

$\rightarrow x^2 + 4x^2 + 16 + 16x = 4x^2 + 36 + 24x$

$5x^2+16x+16 = 4x^2+24x+36$

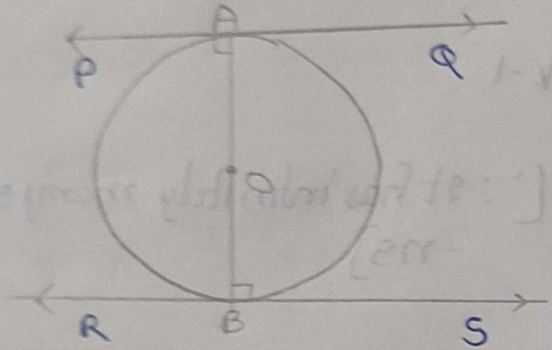
$\rightarrow 5x^2-4x^2+16x^2-24x+16-36$

$\rightarrow 7x^2-8x^2-20=0$

$\therefore x^2-8x^2-20$ is required quadratic equation.

---

4. Chandana said "Tangents at the end points of diameter are not parallel".

→ 

→ $OA \perp PQ$

→ $OB \perp RS$

→ $\angle OAP = 90°$ — ①

→ $\angle OBS = 90°$ — ②

→ From ① & ②

→ $\therefore \angle BAP = \angle ABS$

→ ∴ Here, Both alternative angles are equal, so that tangents are parallel.

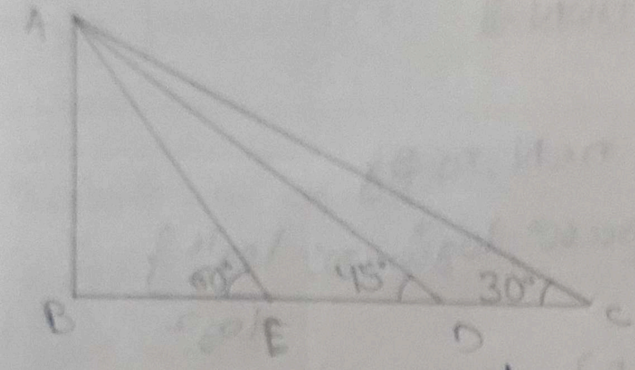
---

5. Yes, the statement is ture because,

From the figure,

→ AB = height of tower

→ BE = length of the shadow



BD = length of the shadow

BC = length of the shadow.

→ Here Angle of elevation increases from 30° to 60°, the length of the shadow decrease.

∴ Hence, proved.

Sample space : {HHH, HHT, HTH, THH, HTT, THT, TTT, TTH} ~~TTT}~~

→ Total no. of outcomes = 8

→ Probability of event 'A' getting atmost 1 head is,

→ Favourable outcomes : {TTT, THT, HTT, TTH}

→ no. of Favourable outcomes = 4

→ $P(A) = \frac{4}{8}$

→ $P(A) = 1/2$.

SECTION -II

7. Given,

$A = \{x : x = \log_2^{2n} ; n \in N, n \leq 5\}$

$B = \{\log \tan 45°, \log_2 \sec 60°, \log_{\operatorname{cosec} 30°}^{8}, \frac{\log^{16}}{\log^{2}}\}$

$\rightarrow A = \{1, 2, 3, 4, 5\}$

$B = \{0, 1, 3, 4\}$

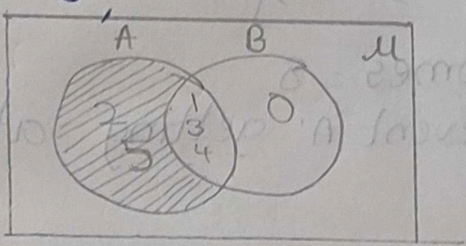
$\rightarrow A - B = \{1, 2, 3, 4, 5\} - \{0, 1, 3, 4\}$

$\rightarrow A - B = \{2, 5\}$

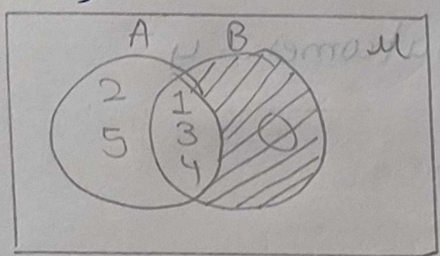
$\rightarrow B - A = \{0, 1, 3, 4\} - \{1, 2, 3, 4, 5\}$

$\rightarrow B - A = \{0\}$

$\Rightarrow A - B$



$\Rightarrow B - A$



8. $\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h.$

$\rightarrow$ l = Lower Boundary of modal class.

$\rightarrow$ f_1 = frequency of modal class.

$\rightarrow$ h = class size

$\rightarrow$ f_0 = frequency of its preceding class

→ f_2 = frequency of succeeding modal class.

9. Sisters age $= x$
girl's age $= 2x$
After 4 years,
→ $(2x+4)(x+4) = 160$
→ $2x^2 + 8x + 4x + 16 = 160$
→ $2x^2 + 12x = 144$
→ $x^2 + 6x = 72$
→ $x^2 + 6x - 72 = 0$
→ $x^2 + 12x - 6x - 72 = 0$
→ $x(x+12) - 6(x+12) = 0$
→ $(x+12)(x-6) = 0$
→ $x = -12, x = 6.$
→ $\therefore x = 6$
→ Sistersage $= 6$
girl's age $= 12.$

$-72x^2$

$+12x \quad -6x$

10. $a_4 + a_8 = 24$ | $a_6 + a_{10} = 34$

$a + 3d + a + 7d = 24$ | $a + 5d + a + 9d = 34$

→ $2a + 10d = 24$, $2a + 14d = 34$

→ $a + 5d = 12$, $a + 7d = 17.$

→ $\cancel{a} + 5d = 12$
$\underline{\overset{(-)}{\cancel{a}} + \overset{(-)}{7d} = \overset{(-)}{17}}$
$-2d = -5$

$d = 5/2$

sub $d = 5/2$ in ①

$\rightarrow a + 5\left(\frac{5}{2}\right) = 12 \rightarrow \frac{2a+25}{2} = 12$

$\rightarrow a + = 12 \bar{\cancel{x}} \frac{2}{25} \rightarrow 2a + 25 = 24$

$a + = \frac{\quad}{25} \rightarrow 2a = -1$

$\rightarrow a = -\frac{1}{2}$

$\rightarrow a = -\frac{1}{2}$

$\rightarrow a+d = \frac{-1}{2} + \frac{5}{2} = \frac{-1+5}{2}$

$= \frac{+4}{2} = 2$

$\rightarrow a+2d = \frac{-1}{2} + \frac{10}{2}, \frac{9}{2} = 4.5$

$\rightarrow a+3d = \frac{-1}{2} + \frac{15}{2} = \frac{14}{2} = 7.$

$\rightarrow AP = -\frac{1}{2}, 2, \frac{9}{2}, 7 \ldots$

11. sphere radius $= 42$ cm

$\rightarrow$ volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{\cancel{3}} \times \frac{22}{\cancel{7}} \times \overset{62}{\cancel{42}} \times 42 \times 42$

$= 8 \times 22 \times 42 \times 42$

$= 176 \times 42 \times 42$

$= 176 \times 1764$

$= 310464 \text{ cm}^3$

$\rightarrow$ surfare are $= 4\pi r^2$

$= 4 \times \frac{22}{\cancel{7}} \times \overset{6}{\cancel{42}} \times 42$

$= 24 \times 22 \times 42$

$\rightarrow 22,176\ cm^2$

12. Total no. of outcomes = 52.

$\rightarrow$ Probability of Red face card,

$$P(A) = \frac{6}{52}$$

$\rightarrow$ Probability of King of spade,

$$P(B) = \frac{1}{52}$$

$\rightarrow$ probability of Heart,

$$P(C) = \frac{13}{52}$$

$\rightarrow$ Probability of even number,

$$P(D) = \frac{20}{52}$$

SECTION - III

17. $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = 2\sec\theta$

$\rightarrow$ LHS,

$$\rightarrow \sqrt{\frac{1+\sin\theta}{1-\sin\theta} \times \frac{1+\sin\theta}{1+\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}}$$

$$\Rightarrow \sqrt{\frac{(1+\sin\theta)^2}{1^2-\sin^2\theta}} + \sqrt{\frac{(1-\sin\theta)^2}{1^2-\sin^2\theta}}$$

$$\rightarrow \sqrt{\frac{(1+\sin\theta)^2}{\cos^2\theta}} + \sqrt{\frac{(1-\sin\theta)^2}{\cos^2\theta}}$$

$$\rightarrow \frac{1+\sin\theta}{\cos\theta} + \frac{1-\sin\theta}{\cos\theta}$$

$\rightarrow \dfrac{1+\sin\theta}{\cos\theta} + \dfrac{1-\sin\theta}{\cos\theta}$

$\rightarrow \dfrac{1+\cancel{\sin\theta}+1-\cancel{\sin\theta}}{\cos\theta}$

$\rightarrow \dfrac{2}{\cos\theta}$

$\rightarrow 2 \times \sec\theta$

$\rightarrow 2\sec\theta$

LHS = RHS.

15. A ——— 1:2 ——— 2:1 ——— B

$(5,-6)$ P Q $(-7,5)$

→ According to given question,

→ P divides AB in ratio 1:2.

$\rightarrow P = \left(\dfrac{mx_2+nx_1}{m+n}, \dfrac{my_2+ny_1}{m+n}\right)$

$\Rightarrow P = \left\{\dfrac{1(-7)+2(5)}{3}, \dfrac{1(5)+2(-6)}{3}\right)$

$= \left(\dfrac{-7+10}{3}, \dfrac{5-12}{3}\right)$

$= \left(1, -7/3\right)$

→ Q divides AB in ratio 2:1

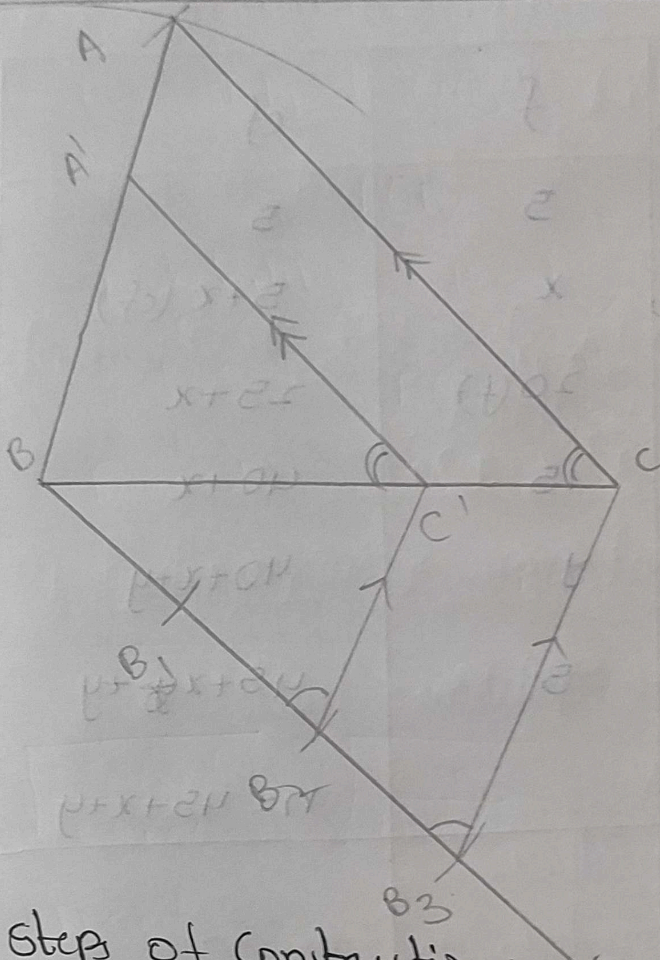
$\rightarrow Q = \left\{\dfrac{mx_2+nx_1}{m+n}, \dfrac{my_2+ny_1}{m+n}\right)$

$= \left\{\dfrac{2(-7)+1(5)}{3}, \dfrac{2(5)+1(-6)}{3}\right\}$

$$= \frac{-14+5}{3}, \frac{10-6}{3}$$

$$= \frac{-9}{3}, \frac{4}{3}$$

$$= \left(-3, 4/3\right)$$



Steps of Construction:

→ Draw Δle ABC by given measurements.

→ Draw a ray ~~from B~~ $\overrightarrow{BX}$ from B.

→ Mark the points B_1, B_2, B_3 on ray such that $BB_1 = B_1B_2 = B_2B_3$.

→ Join B_2 to C

→ Draw a line segment from B_2 parallel to $\overline{B_3C}$

→ Join C' to A' parallel to $\overline{CA}$

→ Required Δle is ΔA'BC'

→ $\Delta ABC \sim \Delta A'BC'$, $\frac{AB}{A'B} = \frac{BC}{BC'} = \frac{AC}{A'C'}$

18. ~~CI~~ Given,

Median = 28.5

CI	f	cf
0-10	5	5
10-20	x	5+x (cf)
(l) 20-30	20 (f)	25+x
30-40	15	40+x
40-50	y	40+x+y
50-60	5	45+x~~y~~+y
		n = 45+x+y

→ $\frac{n}{2} = \left(\frac{45+x+y}{2}\right) = \frac{60}{2} \Rightarrow 45+x+y = 60$ —①

→ $28.5 = 20 + \left\{\frac{\frac{45+x+y}{2} - 5+x}{20}\right\} \times 10$

→ $28.5 = 20 + \left\{\frac{\frac{45+x+y-10-2x}{2}}{20}\right\} \times 10$

→ $28.5 = 20 + \left\{\frac{\frac{35-x+y}{2}}{20}\right\}$

$8.5 = \frac{35-x+y}{4}$

$34.0 = 35-x+y$ $\left(\begin{matrix} x=1+y \\ y=x-1 \end{matrix}\right)$

$-1 = -x+y$

$y = -1+x$

$-1 = -x+(-1+x)$

$-1 = -x-1+x$

$\therefore x=1, y=0.$

$\rightarrow 8.5 = \frac{30-5-x}{2\cancel{0}} \times 1\cancel{0}$

$\rightarrow 8.5 = \frac{25-x}{2}$

$\rightarrow 17 = 25-x$

$\rightarrow x = 25-17$

$\rightarrow x = 8$

$\rightarrow$ from ① $45+x+y = 60$

$\rightarrow x+y=15$

$\rightarrow 8+y=15$

$\rightarrow y=15-8$

$\rightarrow y=7$ $\therefore x=8, y=7.$

13. RTP: square of any positive integer is in the form of $8m, 8m+1$, or $8m+4$.

→ According to $a = bq + r$

→ assume $b = 8$

→ Then, $a = 8q + r$

→ If $r = 1$, $a = 8q + 1$

→ SOBS

$a^2 = (8q+1)^2$

→ $a^2 = 64q^2 + 1 + 16q$

$a^2 = 8(8q^2 + 2q) + 1$

→ $a^2 = 8m + 1$ $(m = 8q^2 + 2q)$.

→ When $r = 2$, $a = 8q + \cancel{2}$

→ If $r = 0$

→ $a = 8q$

→ $a^2 = (8q)^2$

→ $a^2 = 64q^2$

→ $a^2 = 8(8q^2) + 0$

→ $a^2 = 8m$ $(\because m = 8q^2)$.

→ $r = 4$.

→ $a = 8q + 4$

→ $a^2 = (8q+4)^2$

$\rightarrow a^2 = 64q^2 + 16 + 64q$

$= 8(8q^2 + 8q$

$\rightarrow r = 2, \quad a = 8q + 2$

$\rightarrow a^2 = (8q+2)^2$

$\rightarrow a^2 = 64q^2 + 4 + 32q$

$\rightarrow a^2 = 8(8q^2 + 4q) + 4$

$a^2 = 8m + 4 \quad (\because m = 8q^2 + 4q)$

$\therefore$ Hence proved.

14. Given,

$p(x) = x^2 - x - 12$

$\rightarrow$ To find zeroes,

$\rightarrow x^2 - x - 12 = 0$

$-12x^2$

$-4x \quad +3x$

$\rightarrow x^2 - 4x + 3x - 12 = 0$

$\rightarrow x(x-4) + 3(x-4) = 0$

$\rightarrow (x-4)(x+3) = 0$

$\rightarrow x - 4 = 0$ (or) $x + 3 = 0$

$\rightarrow x = 4, -3$

$\rightarrow \therefore x = 4, -3.$

x	-4	-3	-2	-1	0	1	2	3	4	5
$y = x^2 - x - 12$	8	0	-6	-10	-12	-12	-10	-6	0	8
(x, y)	(-4,8)	(-3,0)	(-2,-6)	(-1,-10)	(0,-12)	(1,-12)	(2,-10)	(3,-6)	(4,0)	(5,8).