



Unified International
Mathematics Olympiad

UNIFIED INTERNATIONAL MATHEMATICS OLYMPIAD (UPDATED)

CLASS - 10
Question Paper Code : 4P114

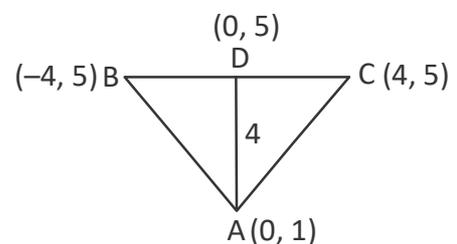
KEY

1	2	3	4	5	6	7	8	9	10
B	D	B	D	D	D	D	D	B	B
11	12	13	14	15	16	17	18	19	20
B	B	B	A	A	C	A	D	D	C
21	22	23	24	25	26	27	28	29	30
A	D	D	B	Delete	D	D	B	C	A
31	32	33	34	35	36	37	38	39	40
A,B,C,D	A,C,D	A,B,C,D	B,C	A,B,C,D	A	A	A	B	A
41	42	43	44	45	46	47	48	49	50
C	Delete	Delete	C	D	D	B	A	B	C

EXPLANATIONS

MATHEMATICS - 1

01. (B) $y = 5$ line and $y = 1 + x$ line intersect at $(4, 5)$
 $y = 5$ line and $y = 1 - x$ line intersect at $(-4, 5)$
 $y = 1 + x$ and $y = 1 - x$ line intersect at $(0, 1)$
 Base = Distance between BC



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

$$= \sqrt{8^2 + 0}$$

$$= 8 \text{ units}$$

Height distance between AD = 4 units

$$\text{Area of } \triangle ABC = \frac{1}{2}bh = \frac{1}{2} \times 8 \times 4 \text{ sq units}$$

$$= 16 \text{ sq units}$$

02. (D) $\triangle ADE \sim \triangle ABC$ [\therefore A. A similarity]

$$= \frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle ABC} = \frac{1^2}{(1+2)^2} = \frac{1}{9}$$

$$\Rightarrow \text{Area of } \triangle ADE = \frac{1}{9} \text{ of Area of } \triangle ABC$$

$$\text{Similarly area of } \triangle BEF = \frac{4}{9} \text{ of } \triangle ABC$$

\therefore Area of CDEF : Area of $\triangle ABC$ = area of

$$\triangle ABC - \frac{1}{9} \text{ area of } \triangle ABC - \frac{4}{9} \text{ of area of}$$

$\triangle ABC$: area of $\triangle ABC$

$$= \text{Area of } \triangle ABC \left(1 - \frac{1}{9} - \frac{4}{9}\right) : \text{area of } \triangle ABC$$

$$= \frac{9-1-4}{9} = 1 = \frac{4}{9} : 1$$

$$= \frac{4}{9} \times 9 : 1 \times 9 = 4 : 9$$

03. (B) $1 + 2 + 4 + 5 + 7 + 8 + 10 + \dots + 97 + 98 + 100 = (1 + 2 + 4 + 5 + 7 + 8 + 10 + \dots + 97 + 98 + 100) + (3 + 6 + 9 + \dots + 99) - (3 + 6 + 9 + \dots + 99)$

$$= (1 + 2 + 3 + 4 + 5 + 6 + 7 + \dots + 99 + 100) - (3 + 6 + 9 + \dots + 99)$$

$$= \frac{100 \times 101}{2} - 3(1 + 2 + 3 + \dots + 33)$$

$$= 5050 - \frac{3 \times 33 \times 34}{2}$$

$$= 5050 - 1683 = 3367$$

04. (D) Given $a = 23$

$$d = a_2 - a_1 = 22 \frac{1}{4} - 23 = \frac{-3}{4}$$

Given $a_n < 0$

$$a + (n - 1)d < 0$$

$$23 + (n - 1) \left(\frac{-3}{4}\right) < 0$$

$$23 - (n - 1) \frac{3}{4} < 0$$

$$23 < (n - 1) \frac{3}{4}$$

$$23 \times \frac{4}{3} < n - 1$$

$$\frac{92}{3} < n - 1$$

$$30.6 + 1 < n$$

$$n > 31.6$$

\therefore Next integer of 31.6 is '32'

\therefore $N = 32$

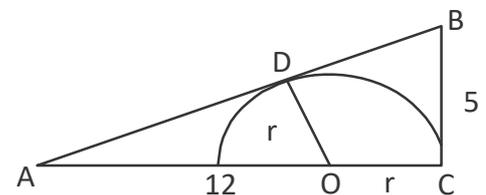
\therefore a_{32} is the first negative term

$$\therefore a_{32} = 23 + 31 \times \left(\frac{-3}{4}\right) = \frac{92 - 93}{4} = \frac{-1}{4}$$

$$a_{31} = a + 30d = 23 + 30 \left(\frac{-3}{4}\right)$$

$$= \frac{92 - 90}{4} = \frac{2}{4} = \frac{1}{2}$$

05. (D) We can draw another radius from the center to the point of tangency. This angle, $\angle ODB$ is 90° . Label the center O, the point of tangency D, and the radius r.



Since ODBC is a kite, then $DB = CB = 5$. Also, $AD = 12 - 5 = 7$. By the pythagorean Theorem, $r^2 + 8^2 = (12 - r)^2$. Solving, $r^2 + 64 = 144 - 24r + r^2 \Rightarrow 24r = 80$

$$r = \frac{10}{3}$$

06. (D) Let the speed of the man in still water be x KMPH and speed of stream be y KMPH respectively

$$\text{Given } \frac{\frac{3}{4} \text{ km}}{x-y} = \frac{11\frac{1}{4} \text{ hours}}{60}$$

$$x-y = \frac{3}{4} \times \frac{60}{45} \times 4$$

$$x-y = 4 \rightarrow (1)$$

$$\text{Given } \frac{\frac{3}{4} \text{ km}}{x+y} = \frac{7\frac{1}{2} \text{ hours}}{60}$$

$$x+y = \frac{3}{4} \times \frac{60}{15} \times 2$$

$$x+y = 6 \rightarrow (2)$$

$$\text{equ (1) + (2)} \Rightarrow 2x = 10$$

$$x = 5 \text{ KMPH}$$

07. (D) $x^6 - 3x^4 + 3x^2 - 1$
 $= (x^2)^3 - 3(x^2)^2 + 3(x^2)(1) - 1^3$
 $= (x^2 - 1)^3 = (x+1)^3(x-1)^3$
 $x^3 + 3x^2 + 3x + 1 = (x+1)^3$
 $\therefore \text{HCF} = (x+1)^3$

08. (D) Given $\frac{x+b+x+a}{x^2+xa+xb+ab} = \frac{1}{c}$
 $(2x+a+b)c = x^2+xa+xb+ab$
 $\therefore x^2+x(a+b-2c) + (ab-bc-ca) = 0$

$$\text{Given } \alpha + \beta = 0$$

$$\frac{-(a+b-2c)}{1} = 0$$

$$a+b = 2c \Rightarrow c = \left(\frac{a+b}{2}\right)$$

$$\alpha\beta = ab - bc - ca = ab - (a+b)c$$

$$= ab - (a+b)\left(\frac{a+b}{2}\right)$$

$$= \frac{2ab - a^2 - b^2}{2} = \frac{-(a^2 + b^2)}{2}$$

09. (B) $\triangle ACB \sim \triangle ADC$ [\therefore A.A. similarly]

$$\frac{AC}{AD} = \frac{BC}{DC} = \frac{AB}{AC}$$

$$\frac{\sqrt{52}}{4} = \frac{BC}{6} = \frac{AB}{\sqrt{52}} \quad [\therefore AC^2 = 4^2 + 6^2]$$

$$4AB = \sqrt{52} \times \sqrt{52}$$

$$AB = \frac{52}{4} = 13$$

$$\text{Area of } \triangle ABC = \frac{1}{2} \times AB \times CD$$

$$= \frac{1}{2} \times 13 \times 6 \text{ units}^2$$

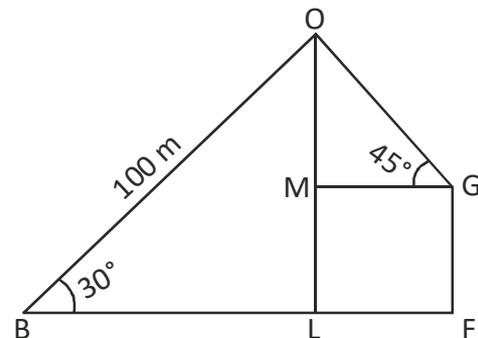
$$= 39 \text{ square units}$$

10. (B) Let O be the position of the bird, B be the position of the boy and FG be the building at which G is the position of the girl

Let OL, BF and GM, OL

Then, BO = 100 m, $\angle OBL = 30^\circ$,

FG = 20 m and $\angle OGM = 45^\circ$.



From right $\triangle OLB$, we have

$$\frac{OL}{BO} = \sin 30^\circ \Rightarrow \frac{OL}{100 \text{ m}} = \frac{1}{2}$$

$$\Rightarrow OL = 100 \text{ m} \times \frac{1}{2} = 50 \text{ m.}$$

$$OM = OL - ML = OL - FG$$

$$= 50 \text{ m} - 20 \text{ m} = 30 \text{ m}$$

From right $\triangle OGM$, we have

$$\frac{OM}{OG} = \sin 45^\circ = \frac{1}{\sqrt{2}}$$

$$\Rightarrow OG = \sqrt{2} \times OM = \sqrt{2} \times 30 \text{ m}$$

$$\Rightarrow OG = 30 \times 1.41 \text{ m} = 42.3 \text{ m.}$$

Distance of the bird from the girl = 42.3 m

11. (B) $AC^2 = AB^2 + BC^2$

$$\therefore AC = 10 \text{ cm}$$

$$S = \frac{a+b+c}{2} = \frac{24 \text{ cm}}{2} = 12 \text{ cm}$$

$$\frac{1}{2} \times 6 \text{ cm} \times 8 \text{ cm} = rs$$

$$\frac{24 \text{ cm}^2}{12 \text{ cm}} = r$$

$$r = 2 \text{ cm}$$

$$= \frac{1}{2} \times 6 \times 8 \text{ cm}^2 - \frac{22}{7} \times 2 \times 2 \text{ cm}^2$$

$$= 24 \text{ cm}^2 - 12.57 \text{ cm}^2$$

$$= 11.43 \text{ cm}^2$$

12. (B) Mid point of QS =

$$\left(\frac{6+18}{2}, \frac{10+10}{2} \right) = (12, 10)$$

Given (12, 10) be the midpoint of PR.

Let R be (x, y)

$$\therefore \left(\frac{10+x}{2}, \frac{4+y}{2} \right) = (12, 10)$$

$$\frac{10+x}{2} = 12 \text{ and } \frac{y+4}{2} = 10$$

$$\therefore 10+x = 24 \text{ and } y+4 = 20$$

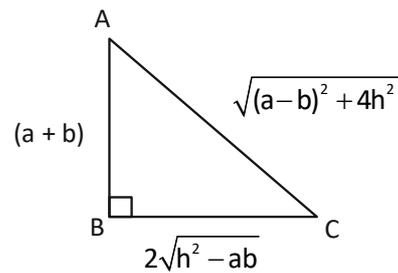
$$\Rightarrow x = 24 - 10 \text{ and } y = 20 - 4 = 16$$

$$x = 14 \text{ and } y = 16$$

$$\therefore R = (x, y) = (14, 16)$$

13. (B) In $\triangle ABC$, $\angle B = 90^\circ$, Opposite side to

$$\angle A = BC = 2\sqrt{h^2 - ab}$$



Adjacent side to $\angle A = AB = (a + b)$

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

$$= (a+b)^2 + (2\sqrt{h^2 - ab})^2$$

$$= a^2 + 2ab + b^2 + 4(h^2 - ab)$$

$$= a^2 + 2ab + b^2 + 4h^2 - 4ab$$

$$= a^2 - 2ab + b^2 + 4h^2$$

$$AC = \sqrt{(a-b)^2 + 4h^2}$$

$$\cos A = \frac{\text{adj side to } \angle A}{\text{hyp}} = \frac{(a+b)}{\sqrt{(a-b)^2 + 4h^2}}$$

14. (A) Given $\cos^2\theta - 3\cos\theta + 2 = \sin^2\theta$

$$\cos^2\theta - 3\cos\theta + 2 = 1 - \cos^2\theta$$

$$\cos^2\theta + \cos^2\theta - 3\cos\theta + 2 - 1 = 0$$

$$2\cos^2\theta - 3\cos\theta + 1 = 0$$

$$2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$$

$$2\cos\theta(\cos\theta - 1) - 1(\cos\theta - 1) = 0$$

$$(\cos\theta - 1)(2\cos\theta - 1) = 0$$

$$\cos\theta - 1 = 0 \text{ (or) } 2\cos\theta - 1 = 0$$

$$\cos\theta = 1 \text{ (or) } 2\cos\theta = 1$$

$$\cos\theta = \cos 0^\circ \quad \cos\theta = \frac{1}{2} \Rightarrow \cos\theta = \cos 60^\circ$$

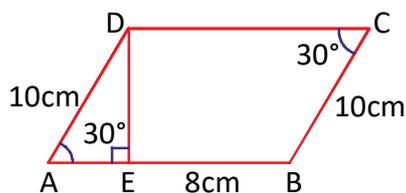
$$\theta = 0^\circ \quad \theta = 60^\circ$$

15. (A) $LHS = \frac{\sqrt{a_1} - \sqrt{a_2}}{a_1 - a_2} + \frac{\sqrt{a_2} - \sqrt{a_3}}{a_2 - a_3}$

$$+ \frac{\sqrt{a_3} - \sqrt{a_4}}{a_3 - a_4} + \dots + \frac{\sqrt{a_{n-1}} - \sqrt{a_n}}{a_{n-1} - a_n}$$

$$\begin{aligned}
&= \frac{\sqrt{a_1} - \sqrt{a_2}}{-d} + \frac{\sqrt{a_2} - \sqrt{a_3}}{-d} \\
&+ \frac{\sqrt{a_3} - \sqrt{a_4}}{-d} + \dots + \frac{\sqrt{a_{n-1}} - \sqrt{a_n}}{-d} \\
&= \frac{\sqrt{a_1} - \sqrt{a_2} - \sqrt{a_2} + \sqrt{a_3} + \sqrt{a_3} - \sqrt{a_4} + \dots + \sqrt{a_{n-1}} - \sqrt{a_n}}{(-d)} \\
&= \frac{\sqrt{a_1} - \sqrt{a_n}}{(-d)} \times \frac{\sqrt{a_1} + \sqrt{a_n}}{\sqrt{a_1} + \sqrt{a_n}} \\
&= \frac{a_1 - a_n}{-d(\sqrt{a_1} + \sqrt{a_n})} \\
&= \frac{a_n - a_1}{d(\sqrt{a_1} + \sqrt{a_n})} \\
&= \frac{\cancel{d} + (n-1)d - \cancel{d}}{d(\sqrt{a_1} + \sqrt{a_n})} \\
&= \frac{(n-1)d}{d(\sqrt{a_1} + \sqrt{a_n})}
\end{aligned}$$

16. (C) Const: Draw $DE \perp AB$



In $\triangle ADE$, $\angle E = 90^\circ$ & $\angle A = 30^\circ$

$$\therefore \sin 30^\circ = \frac{DE}{DA} \quad \frac{1}{2} = \frac{DE}{10\text{cm}}$$

$$DE = \frac{10\text{cm}}{2} = 5\text{cm}$$

\therefore Area of the parallelogram ABCD = $AB \times DE = 8\text{cm} \times 5\text{cm} = 40\text{cm}^2$

17. (A) Let the radius be r and height be h

Given $2\pi rh : \pi r l = 8 : 5$

$$2h : \sqrt{h^2 + r^2} = 8 : 5$$

$$\frac{2h}{\sqrt{h^2 + r^2}} = \frac{8}{5}$$

$$\frac{4h^2}{h^2 + r^2} = \frac{64}{25}$$

$$100h^2 = 64h^2 + 64r^2$$

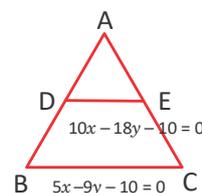
$$36h^2 = 64r^2$$

$$\frac{36}{64} = \frac{r^2}{h^2}$$

$$\frac{r}{h} = \frac{\sqrt{36}}{\sqrt{64}} = \frac{6}{8} = \frac{3}{4}$$

$$r : h = 3 : 4$$

18. (D) $5x - 9y - 10 = 0$ and $10x - 18y - 10 = 0$ are the given lines



$$\therefore \frac{a_1}{a_2} = \frac{5}{10} = \frac{1}{2},$$

$$\frac{b_1}{b_2} = \frac{-9}{-18} = \frac{1}{2}, \quad \frac{c_1}{c_2} = \frac{-10}{-10} = 1$$

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow DE \parallel BC$$

$$\therefore \frac{AD}{DB} = \frac{AE}{EC}$$

(\therefore Basic proportionality theorem)

$$\Rightarrow \frac{DB}{AD} = \frac{EC}{AE}$$

$$\Rightarrow \frac{DB}{AD} + 1 = \frac{EC}{AE} + 1$$

$$\Rightarrow \frac{DB + AD}{AD} = \frac{EC + AE}{AE}$$

$$\Rightarrow \frac{AB}{AD} = \frac{AC}{AE}$$

$$\Rightarrow \frac{AD}{AB} = \frac{AE}{AC}$$

19. (D) Given $\sin\theta - \cos\theta = \frac{1}{2}$

squaring on both sides

$$\sin^2\theta + \cos^2\theta - 2\sin\theta\cos\theta = \frac{1}{4}$$

$$1 - \frac{1}{4} = 2\sin\theta\cos\theta$$

$$\therefore \sin\theta\cos\theta = \frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$$

Given $\sin\theta - \cos\theta = \frac{1}{2}$

cubing on both sides

$$\sin^3\theta - \cos^3\theta - 3\sin\theta\cos\theta(\sin\theta - \cos\theta) = \frac{1}{8}$$

$$\sin^3\theta - \cos^3\theta - 3 \times \frac{3}{8} \times \frac{1}{2} = \frac{1}{8}$$

$$\therefore \sin^3\theta - \cos^3\theta = \frac{1}{8} + \frac{9}{16} = \frac{2+9}{16} = \frac{11}{16}$$

20. (C) We get cubic polynomial.

21. (A) Given 4, 12, 20, 28 996 are in AP

Given $a + (n - 1)d = 996$

$$4 + (n - 1)(8) = 996$$

$$(n - 1)(8) = 992$$

$$(n - 1) = \frac{992}{8} = 124$$

$$\therefore n = 125$$

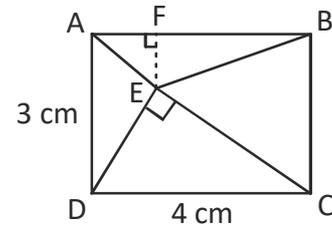
$$\therefore S_n = \frac{n}{2}(a + l) = \frac{125}{2}(4 + 996)$$

$$= 125 \times 500$$

$$= 62,500$$

22. (D) Const:- $EF \perp AD$

Proof :- $\triangle ABE \sim \triangle ACB$ [\therefore A.A.A similarity]



$$\therefore \frac{AB}{AC} = \frac{BE}{BC} = \frac{AE}{AB}$$

$$\frac{3 \text{ cm}}{5 \text{ cm}} = \frac{BE}{4 \text{ cm}} = \frac{AE}{3 \text{ cm}}$$

$$AE = \frac{9}{5} \text{ cm}$$

$\triangle AEF \sim \triangle ACD$ [\therefore A. A. A similarity]

$$\therefore \frac{AE}{AC} = \frac{EF}{CD}$$

$$\frac{\frac{9}{5} \text{ cm}}{5 \text{ cm}} = \frac{EF}{3 \text{ cm}}$$

$$EF = \frac{27}{25} \text{ cm}$$

$$\text{Area of } \triangle AED = \frac{1}{2} \times AD \times EF$$

$$= \frac{1}{2} \times 4 \times \frac{27}{25} \text{ cm}^2 = \frac{54}{25} \text{ cm}^2$$

23. (D) Given $n + n + 2 + n + 4 + \dots + n + 48 = 10,000$

$$\Rightarrow 25n + [2 + 4 + 6 + \dots + 48] = 10,000$$

$$\Rightarrow 25n + 600 = 10,000$$

$$\Rightarrow n = \frac{9400}{25} = 376$$

$$\therefore n + 48 = 376 + 48 = 424$$

24. (B) All are continuous numbers from 200 to 478

$$\therefore \text{Their HCF} = 1$$

25. Delete

26. (D) Let the number be $(5k + 3)$

$$\begin{aligned} \therefore (5k + 3)^2 &= 25k^2 + 30k + 9 \\ &= 5k^2 + 30k + 5 + 4 \\ &= 5(5k^2 + 6k + 1) + 4 \end{aligned}$$

The $(5k + 3)^2$ is divided by 5 leaves a remainder 4.

27. (D) Let speed of the sailer in still water be x kmph and speed of the stream be y kmph

$$\frac{8h}{x + y} = 40 \text{ min} = \frac{2}{3} \text{ hour}$$

$$\therefore x + y = \frac{24}{2} = 12 \longrightarrow \textcircled{1}$$

$$\text{Given } \frac{8h}{x - y} = 1 \text{ hour}$$

$$\therefore x - y = 8 \longrightarrow \textcircled{2}$$

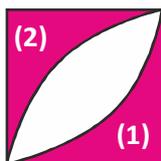
$$\text{Eq. } \textcircled{1} + \textcircled{2} \Rightarrow x + \cancel{y} + x - \cancel{y} = 12 + 8$$

$$2x = 20$$

$$x = 10 \text{ kmph}$$

28. (B) Area of shaded region (1) = Square area - sector (2) area

$$= 28 \times 28 \text{ cm}^2 - \frac{1}{4} \times \frac{22}{7} \times 28^2 \times \frac{90}{360} \text{ cm}^2$$



$$= 784 \text{ cm}^2 - 616 \text{ cm}^2$$

$$= 168 \text{ cm}^2 \longrightarrow \textcircled{1}$$

$$\therefore \text{Total shaded area} = 2 \times \text{Area of Eq. } \textcircled{1} = 336 \text{ cm}^2$$

29. (C) Let α, β are the roots of $x^2 - bx + c = 0$

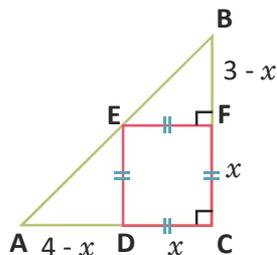
$$\therefore \alpha + \beta = \frac{-(-b)}{1} = b \text{ \& } \alpha\beta = \frac{c}{1} = c$$

$$\text{Given } \alpha - \beta = 2$$

$$\text{But } (\alpha + \beta)^2 = (\alpha - \beta)^2 + 4\alpha\beta$$

$$b^2 = 4 + 4c$$

30. (A)



Let CF be x cm

$$\Rightarrow BF = (3 - x) \text{ cm \& } AD = (4 - x) \text{ cm}$$

$\triangle BEF \sim \triangle BAC$ [\because AA similarity]

$$\therefore \frac{EF}{AC} = \frac{BF}{BC}$$

$$\Rightarrow \frac{x}{4} = \frac{3 - x}{3}$$

$$3x = 12 - 4x$$

$$7x = 12$$

$$x = \frac{12}{7} \text{ cm}$$

MATHEMATICS - 2

31. (A,B,C,D)

Option A

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

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

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

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

$$= \frac{1 - \sin\theta}{\cos\theta}$$

$$\sqrt{\frac{1 - \sin\theta}{1 + \sin\theta}} = \sec\theta - \tan\theta$$

Option B

$$\operatorname{Cosec}^2\theta - \cot^2\theta = (3x)^2 - \left(\frac{3}{x}\right)^2$$

$$1 = 9x^2 - \frac{9}{x^2}$$

$$1 = 3\left(3x^2 - \frac{3}{x^2}\right)$$

$$\therefore 3\left(3x^2 - \frac{3}{x^2}\right) = \frac{1}{3}$$

Option C

$$\cos A = \frac{AB}{AC} = \frac{3\text{ cm}}{6\text{ cm}} = \frac{1}{2}$$

$$= \cos 60^\circ$$

$$\therefore \angle A = 60^\circ$$

Option D

$$1 - 2\sin^2\theta = 1 - 2(1 - \cos^2\theta)$$

$$= 1 - 2 + 2\cos^2\theta$$

$$= 2\cos^2\theta - 1$$

32. (A,C,D)

$$\text{Given } P(x) = x^4 - 9x^3 + 27x^2 - 29x + 6$$

$$P(-3) = (-3)^4 - 9(-3)^3 + 27(-3)^2 - 29(-3) + 6$$

$$= 81 + 243 + 243 + 87 + 6$$

$$P(-3) \neq 0$$

$$P(3) = 3^4 - 9(3)^3 + 27(3)^2 - 29(3) + 6$$

$$= 81 - 243 + 243 - 87 + 6$$

$$P(3) = 0$$

'3' is a zero of $p(x)$

$$P(2) = 2^4 - 9 \times 2^3 + 27 \times 2^2 - 29 \times 2 + 6$$

$$= 16 - 72 + 108 - 58 + 6$$

$$P(2) = 0$$

2 is the zero of $p(x)$

$$x^2 - 4x + 1 = 0$$

$$a = 1, b = -4, c = 1$$

$$\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 1 \times 1}}{2 \times 1}$$

$$= \frac{4 \pm \sqrt{16 - 4}}{2} = \frac{4 \pm \sqrt{12}}{2}$$

$$= \frac{4 \pm 2\sqrt{3}}{2}$$

$$= 2 \pm \sqrt{3}$$

$\therefore 3, 2$ & $2 \pm \sqrt{3}$ are roots of $p(x)$

33. (A,B,C,D)

$$\text{Given } 2x - 3y = 7 \rightarrow (1)$$

$$3x + 2y = 4 \rightarrow (2)$$

$$\text{eg } \textcircled{1} \times 3 \Rightarrow 6x - 9y = 21$$

$$\text{eg } \textcircled{2} \times 2 \Rightarrow 6x + 4y = 8$$
$$\begin{array}{r} (-) \quad (-) \quad (-) \\ \hline -13y = 13 \end{array}$$

$$y = \frac{13}{-13} = -1$$

$$2x - 3(-1) = 7$$

$$2x + 3 = 7$$

$$2x = 7 - 3$$

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

$$\therefore x = 2$$

Option (A)

$$2x + 3y = 2(2) + 3(-1) = 4 - 3 = 1$$

\therefore option 'A' true.

Option (B)

$$3x - 4y - 10 = 3(2) - 4(-1) - 10$$

$$= 6 + 4 - 10$$

$$= 0$$

\therefore Option 'B' is true

Option (C)

$$5x - 3y = 5(2) - 3(-1)$$

$$= 10 + 3 = 13$$

\therefore option 'C' is true

Option (D)

$$4x + 9y + 1 = 4(2) + 9(-1) + 1$$

$$= 8 - 9 + 1 = 0$$

∴ option 'D' is also true

34. (B,C)

Given 2027, 2021, 2015, 1877 are in AP

$$a = 2027 \quad d = -6 \quad a_n = 1877$$

$$a_n = 2027 + (n - 1)(-6) = 1877$$

$$(n - 1)(-6) = 1877 - 2027$$

$$n - 1 = \frac{-150}{-6}$$

$$n - 1 = 25$$

$$n = 25 + 1 = 26$$

If 'n' is even then middle terms are a_{13} and a_{14}

$$\therefore a_{13} = a + 12d = 2027 + 12(-6) = 2027 - 72 = 1955$$

$$a_{14} = a_{13} + d = 1955 + (-6) = 1949$$

35. (A,B,C,D)

ABCD is a cyclic quadrilateral

$$\therefore \angle A + \angle C = 180^\circ \quad \& \quad \angle B + \angle D = 180^\circ$$

$$2x - 3^\circ + 2y + 17^\circ = 180^\circ$$

$$y + 7^\circ + 4x - 9^\circ = 180^\circ$$

$$2x + 2y + 14^\circ = 180^\circ$$

$$4x + y = 182^\circ \rightarrow 2$$

$$2x + 2y = 180^\circ - 14^\circ$$

$$2(x + y) = 166^\circ$$

$$x + y = \frac{166^\circ}{2} = 83^\circ \rightarrow (1)$$

Solving eq (1) & (2) we get $x = 33^\circ$ & $y = 50^\circ$

$$\therefore \angle A + \angle B = 2x - 3^\circ + y + 7^\circ = 63^\circ + 50^\circ + 7^\circ = 120^\circ$$

$$\angle A = 2x - 3 = 2 \times 33^\circ - 3^\circ = 66^\circ - 3^\circ = 63^\circ$$

$$\angle B = y + 7^\circ = 50^\circ + 7^\circ = 57^\circ$$

$$\angle C = 2y + 17^\circ = 100^\circ + 17^\circ = 117^\circ$$

$$\angle D = 180^\circ - \angle B = 180^\circ - 57^\circ = 123^\circ$$

$$\therefore \angle A - \angle B = 63^\circ - 57^\circ = 6^\circ$$

$$\angle C - \angle B = 117^\circ - 57^\circ = 60^\circ$$

$$\angle D - \angle B = 123^\circ - 57^\circ = 66^\circ$$

$$\angle C - \angle A = 117^\circ - 63^\circ = 54^\circ$$

REASONING

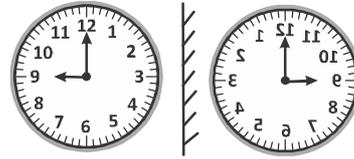
36. (A) Read left to right:

$P + Q \rightarrow P$ is the mother of Q

$Q \div R \rightarrow Q$ is the sister of R

So the expression means:

P is the mother of the sister of R.



37. (A)

38. (A) 5-11-25-19-11-45-11

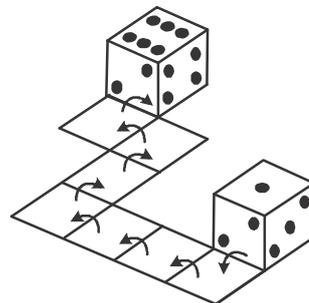
$A=3, B=5, C=7 \rightarrow$ letter at position n maps to $2n+1$.

So for BELIEVE (B E L I E V E) \rightarrow positions (2,5,12,9,5,22,5) \rightarrow codes $2n + 1$:

5, 11, 25, 19, 11, 45, 11.

39. (B) $(73 + 25) \div 2 = 49$

40. (A) Net displacement = 30 m South + 30 m West \rightarrow she is south-west of home, so to go back she must move North-East.

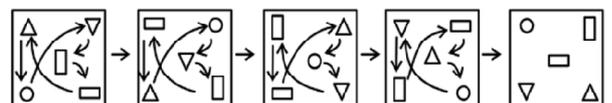


41. (C)

42. Delete

43. Delete

44. (C) In the given figure, follow the directions to find the next term



45. (D) We need the region that is inside the triangle (surgical specialists) and inside the rectangle (medical specialists) but outside the circle (not professors).

Z lies where the triangle and rectangle overlap, and does not touch the circle, so it represents those who are surgical and medical specialists but not professors.

CRITICAL THINKING

46. (D) Put all 5 white balls in one box.
Put 1 black ball in each box.
Tanu picks the white box: probability of

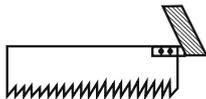
$$\text{white} = \frac{5}{6}$$

Tanu picks other boxes: probability of white = 0

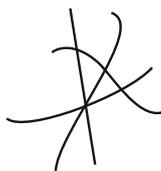
$$\text{Total probability Tanu wins} = \frac{1}{5} \times \frac{5}{6} = \frac{1}{6}$$

$$\rightarrow \text{Anu wins } \frac{5}{6}$$

47. (B) Option B has the handle angled backward, which aligns the hand and wrist naturally with a downward to-and-fro motion. This allows the arm to move comfortably without bending the wrist awkwardly, making it ergonomic for vertical sawing



48. (A) 1st March = Friday
Days from 1st March to 15th April = 31 (March) + 15 (April) - 1 = 45 days
45 ÷ 7 = 6 weeks + 3 days → 3 days after Friday = Monday



49. (B)
50. (C) thier → their
conseintious → conscientious
recieve → receive
atitudes → attitudes
beginings → beginnings
bee → been
everyting → everything
comonplace → commonplace