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UNIFIED COUNCIL OLYMPIADS

UIMO
Unified International Mathematics Olympiad

## UNIFIED INTERNATIONAL MATHEMATICS OLYMPIAD

***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 | D | Delete | C | D | D | B | A | B | C |

### EXPLANATIONS

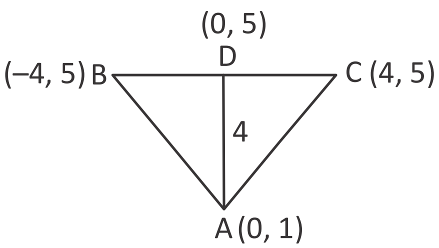
**MATHEMATICS - 1**

01. (B) $y = 5$ line and $y = 1 + x$ ine intersect at (4, 5)

$y = 5$ line and $y = 1 - x$ line intersect at (–4, 5)

$y = 1 + x$ and $y = 1 - x$ ine intersect at (0, 1)

Base = Distance between BC




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

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

= 8 units

Height distance between AD = 4 units

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

= 16 sq units

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

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

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

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

$\therefore$ Area of CDEF : Area of $\Delta ABC$ = area of $\Delta ABC - \frac{1}{9}$ area of $\Delta ABC - \frac{4}{9}$ of area of $\Delta ABC$ : area of $\Delta ABC$

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

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

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

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

= (1 + 2 + 3 + 4 + 5 + 6 + 7 + ..... + 99 + 100) – (3 + 6 + 9 + ..... + 99)

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

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

= 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

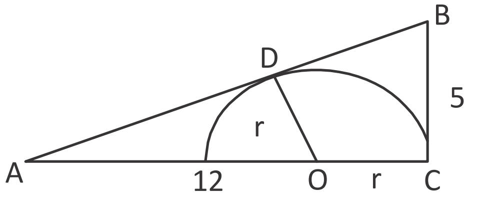
$\therefore$ $a_{32}$ is the first negative term

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

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

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

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 = 13 – 5 = 8. By the pythogorean Theorem, $r^2$ 82 = ( 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

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

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

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

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

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

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

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

$x = 5$ KMPH

07. (D) $x^6 - 3x^4 + 3x^2 - 1$

$= (x^2)^3 - 3(x^2)^2 + 3(x^2)(1) - 1^3$

$= (x^2 - 1)^3 = (x+1)^3(x-1)^3$

$x^3 + 3x^2 + 3x + 1 = (x+1)^3$

$\therefore$ HCF $= (x+1)^3$

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

$(2x + a + b)c = x^2 + xa + xb + ab$

$\therefore x^2 + x(a+b-2c) + (ab - bc - ca) = 0$

Given $\alpha + \beta = 0$

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

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

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

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

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

09. (B) $\Delta ACB \sim \Delta ADC$ [$\because$ A.A. similarly]

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

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

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

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

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

$= \frac{1}{\cancel{2}}\times 13\times\cancel{6}^{3}$ units$^2$

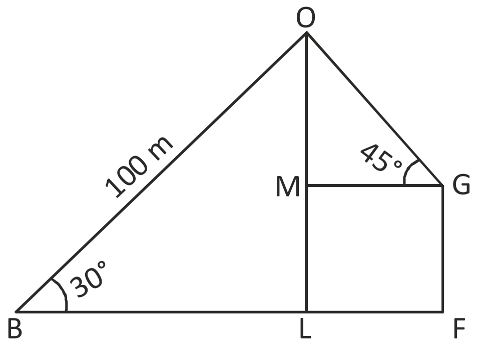
= 39 square units

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, $\angle OBL = 30°$,

FG = 20 m and $\angle OGM = 45°$.




From right $\Delta OLB$, we have

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

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

OM = OL – ML = OL – FG

= 50 m – 20 m = 30 m

From right $\Delta OMG$, we have

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

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

$\Rightarrow OG = 30 \times 1.41$ m = 42.3 m.

Distance of the bird from the girl = 42.3 m

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

$\therefore$ AC = 10 cm

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

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

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

r = 2 cm

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

$= 24\ cm^2 - 12.57\ cm^2$

$= 11.43\ cm^2$

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 $(x, y)$

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

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

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

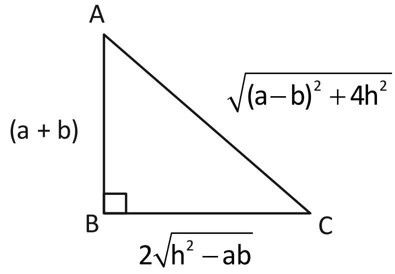
$\Rightarrow x = 24 - 10$ and $y = 20 - 4 = 16$

$x = 14$ and $y = 16$

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

13. (B) In $\Delta ABC$, $\angle B = 90°$, 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 $\cos^2\theta - 3\cos\theta + 2 = \sin^2\theta$

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

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

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

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

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

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

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

$\cos\theta = 1$ (or) $2\cos\theta = 1$

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

$\theta = 0°$ $\quad \theta = 60°$

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

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

$$= \frac{\sqrt{a_1} - \sqrt{a_2}}{-d} + \frac{\sqrt{a_2} - \sqrt{a_3}}{-d}$$

$$+ \frac{\sqrt{a_3} - \sqrt{a_4}}{-d} + \text{.........} + \frac{\sqrt{a_{n-1}} - \sqrt{a_n}}{-d}$$

$$= \frac{\sqrt{a_1} - \cancel{\sqrt{a_2}} - \cancel{\sqrt{a_2}} - \cancel{\sqrt{a_3}} + \cancel{\sqrt{a_3}} - \cancel{\sqrt{a_4}} + \ldots + \cancel{\sqrt{a_{n-1}}} - \sqrt{a_n}}{(-d)}$$

$$= \frac{\sqrt{a_1} - \sqrt{a_n}}{(-d)} \times \frac{\sqrt{a_1} + \sqrt{a_n}}{\sqrt{a_1} + \sqrt{a_n}}$$

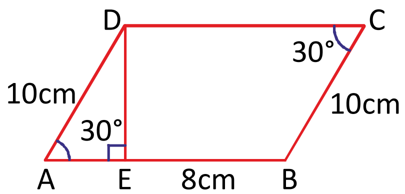
$$= \frac{a_1 - a_n}{-d\,(\sqrt{a_1} + \sqrt{a_n})}$$

$$= \frac{a_n - a_1}{d\,(\sqrt{a_1} + \sqrt{a_n})}$$

$$= \frac{\cancel{a} + (n-1)d - \cancel{a}}{d\,(\sqrt{a_1} + \sqrt{a_n})}$$

$$= \frac{(n-1)\cancel{d}}{\cancel{d}(\sqrt{a_1} + \sqrt{a_n})}$$

16. (C) Const: Draw DE⊥AB




In ΔADE, ∠E = 90° & ∠A = 30°

∴ 5m 30° = $\frac{DE}{DA}$ $\frac{1}{2} = \frac{DE}{10\text{cm}}$

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

∴ Area of the parallelogram ABCD = AB × DE = 8 cm × 5m = 40 cm$^2$

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

Given 2πrh : πr$l$ = 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$^2$

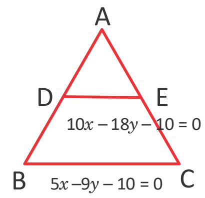
36h$^2$ = 64r$^2$

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

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

r : h = 3 : 4

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




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

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

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

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

(∵ 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

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

∴ n = 125

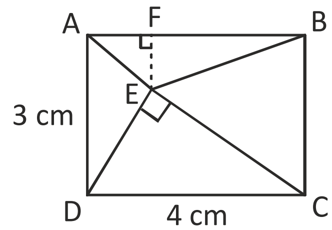
$$\therefore S_n = \frac{n}{2}(a + l) = \frac{125}{2}(4 + 996)$$

= 125 × 500

= 62,500

22. (D) Const:- EF ⊥ AD

Proof :- ΔABE ~ ΔACB [∵ A.A.A similarity]




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

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

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

ΔAEF ~ ΔACD [∵ A. A. A similarity]

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

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

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

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

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

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

⇒ 25n + [2 + 4 + 6 + ..... + 48] = 10, 000

⇒ 25n + 600 = 10, 000

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

∴ n + 48 = 376 + 48 = 424

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

∴ Their HCF = 1

25. Delete

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

∴ $(5k + 3)^2 = 25k^2 + 30k + 9$

$= \angle 5k^2 + 30k + 5 + 4$

$= 5(5k^2 + 6k + 1) + 4$

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

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

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

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

∴ $x - y = 8 \longrightarrow ②$

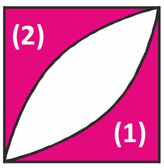
Eq. ① + ② $\Rightarrow x + \cancel{y} + x - \cancel{y} = 12 + 8$

$2x = 20$

$x = 10$ kmph

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

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




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

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

∴ Total shaded area = 2 × Area of Eq. ① = 336 $\text{cm}^2$

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

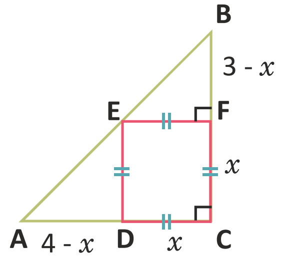
∴ $\alpha + \beta = \frac{-(-b)}{1} = b$ & $\alpha\beta = \frac{c}{1} = c$

Given $\alpha - \beta = 2$

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

$b^2 = 4 + 4c$

30. (A)




Let CF be $x$ cm

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

ΔBEF ~ ΔBAC [∵ A A similarity)

∴ $\frac{EF}{AC} = \frac{BF}{BC}$

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

$3x = 12 - 4x$

$7x = 12$

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

**MATHEMATICS – 2**

31. (A,B,C,D)

Option A

$$\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sqrt{\frac{1-\sin\theta}{1+\sin\theta} \times \left(\frac{1-\sin\theta}{1-\sin\theta}\right)}$$

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

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

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

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

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

Option B

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

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

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

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

Option C

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

$= \text{Cos } 60°$

$\therefore\ \angle A = 60°$

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)

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)

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

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

eg (1) × 3 ⇒ $6x - 9y = 21$

eg (2) × 2 ⇒ $6x + 4y = 8$

(–) (–) (–)

$-13y = 13$

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

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

$2x + 3 = 7$

$2x = 7 - 3$

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

$\therefore\ x = 2$

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)

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

$= 8 - 9 + 1 = 0$

$\therefore$ option 'D' is also true

34. (B,C)

Given 2027, 2021, 2015, .... 1877 are in AP

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

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

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

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

$n - 1 = 25$

$n = 25 + 1 = 26$

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

$\therefore \angle A + \angle C = 180°$ & $\angle B + \angle D = 180°$

$2x - 3° + 2y + 17° = 180°$

$y + 7° + 4x - 9° = 180°$

$2x + 2y + 14° = 180°$

$4x + y = 182° \rightarrow 2$

$2x + 2y = 180° - 14°$

$2(x + y) = 166°$

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

Solving eq (1) & (2) we get $x = 33°$ & $y = 50°$

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

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

$\angle B = y + 7° = 50° + 7° = 57°$

$\angle C = 2y + 17° = 100° + 17° = 117°$

$\angle D = 180° - \angle B = 180° - 57° = 123°$

$\therefore \angle A - \angle B = 63° - 57° = 6°$

$\angle C - \angle B = 117° - 57° = 60°$

$\angle D - \angle B = 123° - 57° = 66°$

$\angle C - \angle A = 117° - 63° = 54$

## REASONING

36. (A) Read left to right:

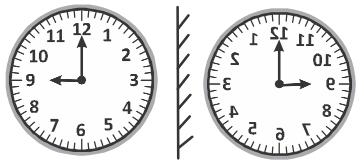
P + Q → P is the mother of Q

Q ÷ R → 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 → letter at position n maps to 2n+1.

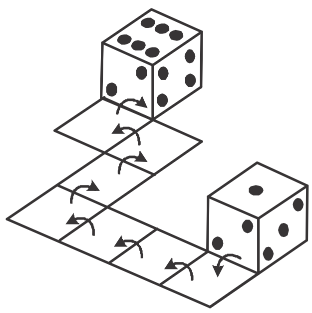
So for BELIEVE (B E L I E V E) → positions (2,5,12,9,5,22,5) → codes 2n + 1:

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

39. (B) (73 + 25) ÷ 2 = 49

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

41. (C)

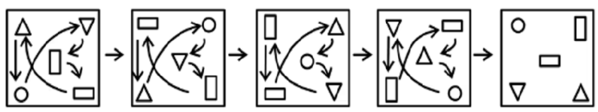


42. (D) In A, B, and C, the shaded portion is exactly 25% (one-fourth) of the whole figure.

In D, the shaded area is not 25% of the figure.

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.

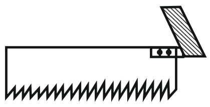
Tanu picks the white box: probability of white = $\frac{5}{6}$

Tanu picks other boxes: probability of white = 0

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

$\rightarrow$ 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

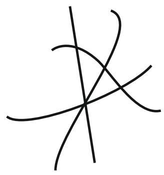


48. (A) 1st March = Friday

Days from 1st March to 15th April = 31 (March) + 15 (April) – 1 = 45 days

45 ÷ 7 = 6 weeks + 3 days $\rightarrow$ 3 days after Friday = Monday

49. (B)



50. (C) thier $\rightarrow$ their

consceintious $\rightarrow$ conscientious

recieve $\rightarrow$ receive

atitudes $\rightarrow$ attitudes

begininngs $\rightarrow$ beginnings

bee $\rightarrow$ been

everyting $\rightarrow$ everything

comonplace $\rightarrow$ commonplace