CDS MATHS MOCK TEST - 70 (SOLUTION)

1. (B) α and β are complementary angles, then $\alpha + \beta = 90 \Rightarrow \beta = 90 - \alpha$

Now, $\sqrt{\sin\alpha.\cos\beta + \cos\alpha.\sin\beta}$

$\Rightarrow \sqrt{\sin\alpha.\cos(90-\alpha) + \cos\alpha.\sin(90-\alpha)}$

$\Rightarrow \sqrt{\sin\alpha.\sin\alpha + \cos\alpha.\cos\alpha}$

$\Rightarrow \sqrt{\sin^2\alpha + \cos^2\alpha} = 1$

2. (A) $2x = \text{cosec}\theta$ and $\frac{2}{x} = \cot\theta$

Now, $(2x)^2 - \left(\frac{2}{x}\right)^2 = \text{cosec}^2\theta - \cot^2\theta$

$\Rightarrow 4x^2 - \frac{4}{x^2} = 1$

$\Rightarrow 4\left(x^2 - \frac{1}{x^2}\right) = 1$

$\Rightarrow \left(x^2 - \frac{1}{x^2}\right) = \frac{1}{4}$

$\Rightarrow 3\left(x^2 - \frac{1}{x^2}\right) = \frac{3}{4}$

3. (B) $a^2 = by + cz$, $b^2 = ax + cz$, $c^2 = ax + by$

Now, $a^2 = by + cz$

$\Rightarrow a^2 + ax = ax + by + cz$

$\Rightarrow a(a + x) = ax + by + cz$

$\Rightarrow a + x = \frac{ax+by+cz}{a}$

Similarly $b + y = \frac{ax+by+cz}{b}$,

$c + z = \frac{ax+by+cz}{c}$

Now, $\frac{x}{a+x} + \frac{y}{b+y} + \frac{z}{c+z}$

$\Rightarrow \frac{ax}{ax+by+cz} + \frac{by}{ax+by+cz} + \frac{cz}{ax+by+cz}$

$\Rightarrow \frac{ax+by+cz}{ax+by+cz} = 1$

4. (B)

5. (C) $(x + 2)$ is a factor of $x^3 + kx^2 + 4x + 28$, then remainder = 0

$\Rightarrow (-2)^3 + k(-2)^2 + 4(-2) + 28 = 0$

$\Rightarrow -8 + 4k - 8 + 28 = 0$

$\Rightarrow 4k + 12 = 0 \Rightarrow k = -3$

6. (B) L.C.M. of 2 and 3 = 6

Numbers = 6, 12,................,246

Now, $l = a + (n-1)d$

$\Rightarrow 246 = 6 + (n-1)\times 6$

$\Rightarrow 240 = (n-1)\times 6$

$\Rightarrow n - 1 = 40 \Rightarrow n = 41$

The required numbers = 41

7. (A)

8. (C) A.T.Q,

$180 - \frac{360}{n} = 120$

$\Rightarrow 180 - 120 = \frac{360}{n}$

$\Rightarrow 60 = \frac{360}{n} \Rightarrow n = 6$

9. (D) $A = 0.7\overline{4} = \frac{74-7}{90} = \frac{67}{90}$

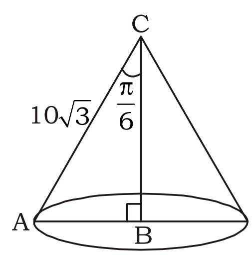
$B = 0.2\overline{7} = \frac{27-2}{90} = \frac{25}{90}$

Distance between A and B $= \frac{67}{90} - \frac{25}{90}$

$= \frac{42}{90} = 0.4\overline{6}$

10. (A)

11. (C)



In ΔABC

$\sin\frac{\pi}{6} = \frac{AB}{AC}$

$\Rightarrow \frac{1}{2} = \frac{AB}{10\sqrt{3}} \Rightarrow AB = 5\sqrt{3} = r$

and $\cos\frac{\pi}{6} = \frac{BC}{AC}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{BC}{10\sqrt{3}} \Rightarrow BC = 15 = h$

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

$= \frac{1}{3}\pi \times (5\sqrt{3})^2 \times 15$

$= \pi \times 25 \times 3 \times 5 = 375\pi \text{ cm}^3$

12. (D) $(x-2)$ is a common factor of $x^2 + bx + a$ and $x^2 + ax + b$, then

$2^2 + b(2) + a = 0$

$\Rightarrow a + 2b = -4$ ...(i)

and $2^2 + a(2) + b = 0$

$\Rightarrow 2a + b = -4$ ...(ii)

from eq(i) and eq(ii)

$a + 2b = 2a + b$

$\Rightarrow a = b \Rightarrow \frac{a}{b} = 1$

Hence $a : b = 1 : 1$

13. (B) Ratio = $1 : \frac{1}{4} : \frac{1}{3} = 12 : 3 : 4$

Middle term = $\frac{3}{19} \times 95 = 15$

14. (A) $a = 51$ cm, $b = 20$ cm, $c = 37$ cm

$s = \frac{a+b+c}{2} = \frac{51+20+37}{2} = 54$

Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{54(54-51)(54-20)(54-37)}$

$= \sqrt{54 \times 3 \times 34 \times 17}$

$= \sqrt{18 \times 3 \times 3 \times 2 \times 17 \times 17}$

$= \sqrt{36 \times 3 \times 3 \times 17 \times 17}$

$= 6 \times 3 \times 17 = 306$ sq.cm

15. (B) $\frac{x}{a} - \frac{y}{b}\cot\theta = 1$ ...(i)

and $\frac{x}{a}\cot\theta + \frac{y}{b} = 1$ ...(ii)

On solving eq(i) and eq(ii)

$\left(\frac{x}{a} - \frac{y}{b}\cot\theta\right)^2 + \left(\frac{x}{a}\cot\theta + \frac{y}{b}\right)^2 = 1^2 + 1^2$

$\Rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2}\cot^2\theta - \frac{2xy}{ab}\cot\theta + \frac{x^2}{a^2}\cot^2\theta + \frac{y^2}{b^2} + \frac{2xy}{ab}\cot\theta = 2$

$\Rightarrow \left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right) + \cot^2\theta\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right) = 2$

$\Rightarrow \left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right)(1 + \cot^2\theta) = 2$

$\Rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} = 2\sin^2\theta$

16. (A) Let length of the train = x m

A.T.Q.,

$\frac{x+162}{18} = \frac{x+120}{15}$

$\Rightarrow \frac{x+162}{6} = \frac{x+120}{5}$

$\Rightarrow 5x + 810 = 6x + 720$

$\Rightarrow x = 90$ m

Lenth of the train = 90m

17. (D) **Statement 1**

$\cos^6A + \sin^6A = (\cos^2A)^3 + (\sin^2A)^3$

$\Rightarrow \cos^6A + \sin^6A = (\cos^2A + \sin^2A)(\cos^4A + \sin^4A - \sin^2A.\cos^2A)$

$\Rightarrow \cos^6A + \sin^6A = 1.[(\cos^2A + \sin^2A)^2 - 3\sin^2A\cos^2A]$

$\Rightarrow \cos^6A + \sin^6A = [1 - 3\sin^2A.\cos^2A]$

Statement 1 is correct.

Statement 2

$\cos^4A + \sin^4A = (1-\sin^2A)^2 + \sin^4A$

$\Rightarrow \cos^4A + \sin^4A = 1 + \sin^4A - 2\sin^2A + \sin^4A$

$\Rightarrow \cos^4A + \sin^4A = 1 - 2\sin^2A + 2\sin^4A$

$\Rightarrow \cos^4A + \sin^4A = 1 - 2\sin^2A(1 - \sin^2A)$

$\Rightarrow \cos^4A + \sin^4A = 1 - 2\sin^2A.\cos^2A$

Statement 2 is correct.

Statement 3

$\cos^4A - \sin^4A = (\cos^2A - \sin^2A)(\cos^2A + \sin^2A)$

$\Rightarrow \cos^4A - \sin^4A = (\cos 2A).1$

$\Rightarrow \cos^4A - \sin^4A = 2\cos^2A - 1$

Statement 3 is correct.

18. (A) $\sin A + \frac{1}{\sin A} = \frac{5}{2}$

$\Rightarrow \sin A + \frac{1}{\sin A} = \frac{1}{2} + 2$

here $\sin A = \frac{1}{2}$

$\Rightarrow \sin A = \sin 30° \Rightarrow A = 30°$

19. (A) $\tan(x^2 - 8x + 60)° = \cot(6x - 5)°$

$\Rightarrow \tan(x^2 - 8x + 60) = \tan[90 - (6x - 5)]$

$\Rightarrow x^2 - 8x + 60 = 90 - (6x - 5)$

$\Rightarrow x^2 - 8x + 60 = 95 - 6x$

$\Rightarrow x^2 - 2x - 35 = 0$

$\Rightarrow (x-7)(x+5) = 0$

$\Rightarrow x = 7, -5$

Hence, $x = 7$

20. (C) $p = \cos x - \sin x$, $q = \frac{1-\sin^2 x}{1-\sin x} = 1 + \sin x$

and $r = \frac{1-\cos^2 x}{1+\cos x} = 1 - \cos x$

Now, $p + q + r$

$\Rightarrow \cos x - \sin x + 1 + \sin x + 1 - \cos x = 2$

21. (C) $\sec\theta = \sqrt{2.\sqrt{2.\sqrt{2............\infty}}}$

$\Rightarrow \sec\theta = \sqrt{2\sec\theta}$

$\Rightarrow \sec^2\theta = 2\sec\theta$

$\Rightarrow \sec^2\theta - 2\sec\theta = 0$

$\Rightarrow \sec\theta\,(\sec\theta - 2) = 0$

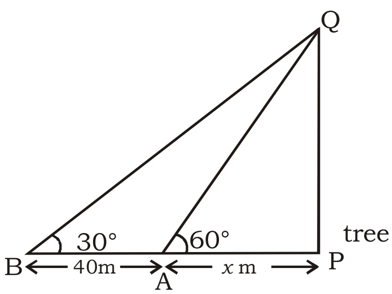
$\sec \neq 0$, $\sec\theta = 2 \Rightarrow \cos\theta = \frac{1}{2}$

Now, $\cos\theta(1+2\cos\theta)$

$\Rightarrow \frac{1}{2}(1+2\times\frac{1}{2})$

$\Rightarrow \frac{1}{2}\times 2 = 1$

22. (B) Let breadth of the river = x m



In ΔAPQ

$\tan 60° = \frac{PQ}{AP}$

$\Rightarrow \sqrt{3} = \frac{PQ}{x} \Rightarrow PQ = \sqrt{3}x$

In ΔBPQ

$\tan 30° = \frac{PQ}{BP}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{\sqrt{3}x}{x+40}$

$\Rightarrow x + 40 = 3x \Rightarrow x = 20$

Hence breath of the river = 20m

23. (B) (cosecA – sinA)(secA – cosA)(tanA + cotA)

$\Rightarrow \left(\frac{1}{\sin A} - \sin A\right)\left(\frac{1}{\cos A} - \cos A\right)\left(\frac{\sin A}{\cos A} + \frac{\cos A}{\sin A}\right)$

$\Rightarrow \frac{1-\sin^2 A}{\sin A} \times \frac{1-\cos^2 A}{\cos A} \times \frac{\sin^2 A + \cos^2 A}{\sin A.\cos B}$

$\Rightarrow \frac{\cos^2 A}{\sin A} \times \frac{\sin^2 A}{\cos A} \times \frac{1}{\sin A.\cos A} = 1$

24. (D) $x = \cos^2\theta + \sec^2\theta = \cos^2\theta + \frac{1}{\cos^2\theta}$

We know that

A.M. $\geq$ G.M.

$\Rightarrow \frac{\cos^2\theta + \frac{1}{\cos^2\theta}}{2} \geq \sqrt{\cos^2\theta \times \frac{1}{\cos^2\theta}}$

$\Rightarrow \frac{x}{2} \geq 1 \Rightarrow x \geq 2$

26. (C) Given that sinA + cosB = x

$\Rightarrow \sin^2A + \cos^2B + 2\sin A.\cos B = x^2$

$\Rightarrow \sin^2A + 1 - \sin^2B + 2\sin A.\cos B = x^2$

$\Rightarrow 2\sin A.\cos B = x^2 - \sin^2A - 1 + \sin^2B$ ...(i)

and cosA + sinB = y

$\Rightarrow \cos^2A + \sin^2B + 2\cos A.\sin B = y^2$

$\Rightarrow 1 - \sin^2A + \sin^2B + 2\cos A.\sin B = y^2$

$\Rightarrow 2\cos A.\sin B = y^2 + \sin^2A - \sin^2B - 1$ ...(ii)

from eq(i) and eq(ii)

$2\sin A.\cos B + 2\cos A.\sin B = x^2 + \sin^2B - \sin^2A - 1 + y^2 + \sin^2A - \sin^2B - 1$

$\Rightarrow 2(\sin A.\cos B + 2\cos A.\sin B) = x^2 + y^2 - 2$

$\Rightarrow \sin A.\cos B + \cos A.\sin B = \frac{x^2 + y^2 - 2}{2}$

27. (D) CP = $\frac{100}{27}$, SP = $\frac{34}{8}$

Profit% = $\frac{\frac{34}{8} - \frac{100}{27}}{\frac{100}{27}} \times 100$

Profit% = $\frac{\frac{34\times 27 - 800}{8\times 27}}{\frac{100}{27}} \times 100$

Profit% = $\frac{118}{800} \times 100 = 14.75\%$

28. (B) CP of 1 orange = ₹$\frac{2}{3}$

SP of 1 orange = ₹1

Profit on 1 orange = $1 - \frac{2}{3}$ = ₹$\frac{1}{3}$

Profit on 30 orange = $30 \times \frac{1}{3}$ = ₹10

Hence he sold 30 oranges.

29. (C) $x + \frac{1}{x} = 2 \Rightarrow \left(x + \frac{1}{x}\right)^2 = 2^2$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 4 \Rightarrow x^2 + \frac{1}{x^2} = 2$

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

$\Rightarrow (x^2)^3 + \left(\frac{1}{x^2}\right)^3 + 3.x^2.\frac{1}{x^2}\left(x^2 + \frac{1}{x^2}\right) = 8$

$\Rightarrow x^6 + \frac{1}{x^6} + 3 \times 1 \times 2 = 8$

$\Rightarrow x^6 + \frac{1}{x^6} = 8 - 6 = 2$

30. (B) $x = \sqrt{11} + \sqrt{5}$

$\Rightarrow x^2 = 11 + 5 + 2\sqrt{55} = 16 + 2\sqrt{55}$

$y = \sqrt{10} + \sqrt{6}$

$\Rightarrow y^2 = 10 + 6 + 2\sqrt{60} = 16 + 2\sqrt{60}$

$z = \sqrt{3} + \sqrt{13}$

$\Rightarrow z^2 = 3 + 13 + 2\sqrt{39} = 16 + 2\sqrt{39}$

$\Rightarrow y > x > z$

31. (D) $2\sin\alpha + 15\cos^2\alpha = 7$

$\Rightarrow 2\sin\alpha + 15(1 - \sin^2\alpha) = 7$

$\Rightarrow 2\sin\alpha + 15 - 15\sin^2\alpha = 7$

$\Rightarrow 15\sin^2\alpha - 2\sin\alpha - 8 = 0$

$\Rightarrow 15\sin^2\alpha - 12\sin\alpha + 10\sin\alpha - 8 = 0$

$\Rightarrow 3\sin\alpha(5\sin\alpha - 4) + 2(5\sin\alpha - 4) = 0$

$\Rightarrow (5\sin\alpha - 4)(3\sin\alpha + 2) = 0$

$\Rightarrow 3\sin\alpha + 2 \neq 0$ but $5\sin\alpha - 4 = 0$

$\Rightarrow 5\sin\alpha = 4 \Rightarrow \sin\alpha = \frac{4}{5}$

$\therefore \cot\alpha = \frac{3}{4}$

32. (A) $a + \frac{1}{a} = 1 \Rightarrow \left(a + \frac{1}{a}\right)^3 = 1^3$

$\Rightarrow a^3 + \frac{1}{a^3} + 3 \times a \times \frac{1}{a}\left(a + \frac{1}{a}\right) = 1$

$\Rightarrow a^3 + \frac{1}{a^3} + 3 = 1 \Rightarrow a^3 + \frac{1}{a^3} = -2$

$\Rightarrow a^3 + \frac{1}{a^3} = -1 - 1 \Rightarrow a^3 = -1$

33. (A) $x + \frac{1}{x} = 4$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 16$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 4 = 16$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 12 \Rightarrow x - \frac{1}{x} = 2\sqrt{3}$

34. (B) $q(p^2 - 1)$

$\Rightarrow (\sec\theta + \operatorname{cosec}\theta)\{(\sin\theta + \cos\theta)^2 - 1\}$

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

$\Rightarrow \left(\frac{\sin\theta + \cos\theta}{\cos\theta\sin\theta}\right)(1 + 2\sin\theta\cos\theta - 1)$

$\Rightarrow \left(\frac{\sin\theta + \cos\theta}{\cos\theta\sin\theta}\right)(2\sin\theta\cos\theta)$

$\Rightarrow 2(\sin\theta + \cos\theta) = 2p$

35. (A) $\frac{x}{y} + \frac{y}{x} = -2$

$\Rightarrow \frac{x^2 + y^2}{xy} = -2$

$\Rightarrow x^2 + y^2 = -2xy$

$\Rightarrow x^2 + y^2 + 2xy = 0$

$\Rightarrow (x + y)^2 = 0 \Rightarrow x + y = 0$

$\therefore x^3 + y^3 + 3xy(x + y) = (x + y)^3 = 0$

36. (B) $\frac{x+a}{b+c} + \frac{x+b}{c+a} + \frac{x+c}{a+b} + 3 = 0$

$\Rightarrow \frac{x+a}{b+c} + 1 + \frac{x+b}{c+a} + 1 + \frac{x+c}{a+b} + 1 = 0$

$\Rightarrow \frac{x+a+b+c}{b+c} + \frac{x+b+c+a}{c+a} + \frac{x+c+a+b}{a+b} = 0$

$\Rightarrow (x + a + b + c)\left(\frac{1}{b+c} + \frac{1}{c+a} + \frac{1}{a+b}\right) = 0$

$\Rightarrow (x + a + b + c) = 0$

$\Rightarrow x = -(a + b + c)$

37. (C) $x^2 + 4y^2 + z^2 + 3 = 2x + 4y + 2z$

$\Rightarrow x^2 + 4y^2 + z^2 - 2x - 4y - 2z + 3 = 0$

$\Rightarrow x^2 - 2x + 1 + 4y^2 - 4y + 1 + z^2 - 2z + 1 = 0$

$\Rightarrow (x - 1)^2 + (2y - 1)^2 + (z - 1)^2 = 0$

$\Rightarrow x - 1 = 0 \Rightarrow x = 1$

$2y - 1 = 0 \Rightarrow y = \frac{1}{2}$

$z - 1 = 0 \Rightarrow z = 1$

$\Rightarrow x + y + z = 1 + \frac{1}{2} + 1 = 2\frac{1}{2}$

38. (C) Given that $m = \frac{\cos\alpha}{\cos\beta}$ and $n = \frac{\cos\alpha}{\sin\beta}$

$(m^2 + n^2)\cos^2\beta \Rightarrow \left(\frac{\cos^2\alpha}{\cos^2\beta} + \frac{\cos^2\alpha}{\sin^2\beta}\right)\cos^2\beta$

$\Rightarrow \left(\frac{\cos^2\alpha\sin^2\beta + \cos^2\alpha\cos^2\beta}{\cos^2\beta\sin^2\beta}\right)\cos^2\beta$

$\Rightarrow \cos^2\alpha\left(\frac{\sin^2\beta + \cos^2\beta}{\cos^2\beta\sin^2\beta}\right)\cos^2\beta$

$\Rightarrow \cos^2\alpha\left(\frac{1}{\cos^2\beta\sin^2\beta}\right)\cos^2\beta$

$\Rightarrow \frac{\cos^2\alpha}{\sin^2\beta} = \left(\frac{\cos\alpha}{\sin\beta}\right)^2 = n^2$

39. (B) $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$

Now, $m^2 - n^2 = (\tan\theta + \sin\theta)^2 - (\tan\theta - \sin\theta)^2$

$\Rightarrow m^2 - n^2 = 4\tan\theta\sin\theta$

and $4\sqrt{mn} = 4\sqrt{(\tan\theta+\sin\theta)(\tan\theta-\sin\theta)}$

$\Rightarrow 4\sqrt{mn} = 4\sqrt{\tan^2\theta - \sin^2\theta}$

$\Rightarrow 4\sqrt{mn} = 4\sqrt{\frac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta}$

$\Rightarrow 4\sqrt{mn} = 4\sqrt{\frac{\sin^2\theta - \sin^2\theta\cos^2\theta}{\cos^2\theta}}$

$\Rightarrow 4\sqrt{mn} = 4\sqrt{\frac{\sin^2\theta(1-\cos^2\theta)}{\cos^2\theta}}$

$\Rightarrow 4\sqrt{mn} = 4\sqrt{\frac{\sin^4\theta}{\cos^2\theta}} = 4\frac{\sin^2\theta}{\cos\theta}$

$\Rightarrow 4\sqrt{mn} = 4\sin\theta\frac{\sin\theta}{\cos\theta} = 4\sin\theta\tan\theta$

$\Rightarrow 4\sqrt{mn} = m^2 - n^2$

Hence $m^2 - n^2 = 4\sqrt{mn}$

40. (D) $4\operatorname{cosec}^2\alpha + 9\sin^2\alpha$

$\Rightarrow \frac{4}{\sin^2\alpha} + 9\sin^2\alpha$

$\Rightarrow \left(\frac{2}{\sin\alpha}\right)^2 + (3\sin\alpha)^2$

$\Rightarrow \left(\frac{2}{\sin\alpha} - 3\sin\alpha\right)^2 + 2\cdot\frac{2}{\sin\alpha}\cdot 3\sin\alpha$

$\Rightarrow \left(\frac{2-3\sin^2\alpha}{\sin\alpha}\right)^2 + 12$

For the least value, $\left(\frac{2-3\sin^2\alpha}{\sin\alpha}\right)^2$ would be 0 (zero).

$\therefore$ The least value = 12

41. (A) $5\tan\theta = 4 \Rightarrow \tan\theta = \frac{4}{5}$

Now, $\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 3\cos\theta}$

$\Rightarrow \frac{5\tan\theta - 3}{5\tan\theta + 3} \Rightarrow \frac{5\times\frac{4}{5} - 3}{5\times\frac{4}{5} + 3} = \frac{1}{7}$

42. (D) Let the third proportional to $(x^2 - y^2)$ and $(x - y)$ be z. Then

$(x^2 - y^2) : (x - y) :: (x - y) : z$

$\Rightarrow (x^2 - y^2) \times z = (x - y)^2$

$\Rightarrow z = \frac{(x-y)^2}{(x^2-y^2)} = \frac{(x-y)}{(x+y)}$.

43. (C) $\frac{\sin 2\theta + \sin\theta}{\cos 2\theta + \cos\theta + 1} \Rightarrow \frac{2\sin\theta\cdot\cos\theta + \sin\theta}{2\cos^2\theta - 1 + \cos\theta + 1}$

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

$\Rightarrow \frac{\sin\theta}{\cos\theta} \Rightarrow \tan\theta$

44. (B) $\sin 38°.\operatorname{cosec}142° + \cos35°.\sec145°$

$\Rightarrow \sin38°.\operatorname{cosec}(180° - 38°) + \cos35°.\sec(180° - 35°)$

$\Rightarrow \sin38°.\operatorname{cosec}38° + \cos35°.(-\sec35°)$

$\Rightarrow \sin38° \times \frac{1}{\sin 38°} + \cos35° \times \frac{1}{\cos 35°}$

$\Rightarrow 1 - 1 = 0$

45. (B) Given that $x = \frac{\sqrt{3}}{2}$

Now, $\frac{\sqrt{1+x}}{1+\sqrt{1+x}} \times \frac{1-\sqrt{1+x}}{1-\sqrt{1+x}}$

$+ \frac{\sqrt{1-x}}{1-\sqrt{1-x}} \times \frac{1+\sqrt{1-x}}{1+\sqrt{1-x}}$

$\Rightarrow \frac{\sqrt{1+x} - 1 - x}{1-1-x} + \frac{\sqrt{1-x} + 1 - x}{1-1+x}$

$\Rightarrow \frac{\sqrt{1-x} + 1 - x}{x} - \frac{\sqrt{1+x} - 1 - x}{x}$

$\Rightarrow \frac{\sqrt{1-x} + 1 - x - \sqrt{1+x} + 1 + x}{x}$

$\Rightarrow \frac{2 + \sqrt{1-x} - \sqrt{1+x}}{x}$

$\Rightarrow \frac{2 + \sqrt{1 - \frac{\sqrt{3}}{2}} - \sqrt{1 + \frac{\sqrt{3}}{2}}}{\frac{\sqrt{3}}{2}}$

$\Rightarrow \frac{2 + \frac{\sqrt{4-2\sqrt{3}}}{2} - \frac{\sqrt{4+2\sqrt{3}}}{2}}{\frac{\sqrt{3}}{2}}$

$\Rightarrow \frac{4 + \sqrt{3} - 1 - \sqrt{3} - 1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$

46. (B) 50% of $(x - y)$ = 30% of $(x + y)$

$\Rightarrow \frac{50}{100} \times (x - y) = \frac{30}{100} \times (x + y)$

$\Rightarrow 5(x - y) = 3(x + y)$

$\Rightarrow 2x = 8y \Rightarrow x = 4y$

$\therefore$ Required percentage = $\left(\frac{y}{x} \times 100\right)\%$

$= \left(\frac{y}{4y} \times 100\right)\% = 25\%$

47. (B) sin θ and cos θ are the roots of $ax^2 - bx + c = 0$

$\therefore \sin\theta + \cos\theta = \frac{b}{a}$ ...(i)

and $\sin\theta \cdot \cos\theta = \frac{c}{a}$

Squaring the equation (i)

We get $(\sin\theta + \cos\theta)^2 = \left(\frac{b}{a}\right)^2$

$\Rightarrow \sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta = \frac{b^2}{a^2}$

$\Rightarrow 1 + 2 \times \left(\frac{c}{a}\right) = \frac{b^2}{a^2} \Rightarrow \frac{b^2}{a^2} - \frac{2c}{a} = 1$

$\Rightarrow \frac{b^2 - 2ac}{a^2} = 1 \Rightarrow b^2 - 2ac = a^2$

$\Rightarrow a^2 - b^2 + 2ac = 0$

48. (C) $\frac{x + \frac{1}{x}}{2} = M$

$\Rightarrow x + \frac{1}{x} = 2M$

Required average $= \frac{x^2 + \frac{1}{x^2}}{2}$

$= \frac{\left(x + \frac{1}{x}\right)^2 - 2}{2} = \frac{4M^2 - 2}{2} = 2M^2 - 1$

49. (A) $\tan\theta = 1 \Rightarrow \theta = 45°$

Now, $\frac{8\sin\theta + 5\cos\theta}{\sin^3\theta - 2\cos^3\theta + 7\cos\theta}$

$\Rightarrow \frac{8 \times \frac{1}{\sqrt{2}} + \frac{5}{\sqrt{2}}}{\frac{1}{2\sqrt{2}} - \frac{2}{2\sqrt{2}} + \frac{7}{\sqrt{2}}} \Rightarrow \frac{\frac{13}{\sqrt{2}}}{\frac{13}{2\sqrt{2}}} = 2$

50. (B) $x = \frac{4\sqrt{15}}{\sqrt{5} + \sqrt{3}} \Rightarrow x = \frac{\sqrt{20} \times \sqrt{12}}{\sqrt{5} + \sqrt{3}}$

$\frac{x}{\sqrt{20}} = \frac{\sqrt{12}}{\sqrt{5} + \sqrt{3}}$ and $\frac{x}{\sqrt{12}} = \frac{\sqrt{20}}{\sqrt{5} + \sqrt{3}}$

$\frac{x + \sqrt{20}}{x - \sqrt{20}} = \frac{\sqrt{12} + \sqrt{5} + \sqrt{3}}{\sqrt{12} - \sqrt{5} - \sqrt{3}}$

and $\frac{x + \sqrt{12}}{x - \sqrt{12}} = \frac{\sqrt{20} + \sqrt{5} + \sqrt{3}}{\sqrt{20} - \sqrt{5} - \sqrt{3}}$

Now, $\frac{x + \sqrt{20}}{x - \sqrt{20}} + \frac{x + \sqrt{12}}{x - \sqrt{12}}$

$\Rightarrow \frac{\sqrt{12} + \sqrt{5} + \sqrt{3}}{\sqrt{12} - \sqrt{5} - \sqrt{3}} + \frac{\sqrt{20} + \sqrt{5} + \sqrt{3}}{\sqrt{20} - \sqrt{5} - \sqrt{3}}$

$\Rightarrow \frac{3\sqrt{3} + \sqrt{5}}{\sqrt{3} - \sqrt{5}} + \frac{3\sqrt{5} + \sqrt{3}}{\sqrt{5} - \sqrt{3}}$

$\Rightarrow \frac{3\sqrt{3} + \sqrt{5} - 3\sqrt{5} - \sqrt{3}}{\sqrt{3} - \sqrt{5}} = \frac{2\sqrt{3} - 2\sqrt{5}}{\sqrt{3} - \sqrt{5}} = 2$

51. (A) $\sin^2 30°.\cos^2 45° + 5\tan^2 30° + \frac{3}{2}\sin^2 90° - 3\cos^2 90°$

$\Rightarrow \left(\frac{1}{2}\right)^2 \times \left(\frac{1}{\sqrt{2}}\right)^2 + 5 \times \left(\frac{1}{\sqrt{3}}\right)^2 + \frac{3}{2} \times 1 - 3 \times 0$

$\Rightarrow \frac{1}{4} \times \frac{1}{2} + 5 \times \frac{1}{3} + \frac{3}{2}$

$\Rightarrow \frac{1}{8} + \frac{5}{3} + \frac{3}{2} \Rightarrow \frac{3 + 40 + 36}{24}$

$\Rightarrow \frac{79}{24} \Rightarrow 3\frac{7}{24}$

52. (A) $x + \frac{1}{x} = \sqrt{3}$

Cubing both sides,

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = \left(\sqrt{3}\right)^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow x^3 + \frac{1}{x^3} = 0$

$\Rightarrow \frac{x^6 + 1}{x^3} = 0 \Rightarrow x^6 + 1 = 0$

Now, $x^{18} + x^{12} + x^6 + 1$

$\Rightarrow x^{12}(x^6 + 1) + 1(x^6 + 1)$

$\Rightarrow (x^{12} + 1)(x^6 + 1)$

$\Rightarrow (x^{12} + 1).0 = 0$

53. (A) $(1-\sin^2\alpha)(1-\cos^2\alpha)(1+\cot^2\beta)(1+\tan^2\beta)$
$\Rightarrow \cos^2\alpha \,.\, \sin^2\alpha \,.\, \text{cosec}^2\beta\ \sec^2\beta$
$\Rightarrow \cos^2\alpha \,.\, \text{cosec}^2\beta.\sin^2\alpha \,.\, \sec^2\beta$
$\Rightarrow (\cos^2\alpha \,.\, \sec^2\alpha)\ (\sin^2\alpha \,.\, \text{cosec}^2\alpha)$
$\Rightarrow 1 \times 1 = 1$ $[\because \alpha + \beta = 90°]$

54. (A) $3(a^2+b^2+c^2) = (a+b+c)^2$
$\Rightarrow 3a^2+3b^2+3c^2 = a^2+b^2+c^2+2ab+2bc+2ca$
$\Rightarrow 2a^2+2b^2+2c^2-2ab-2bc-2ca = 0$
$\Rightarrow a^2+b^2-2ab+b^2+c^2-2bc+c^2+a^2-2ca = 0$
$\Rightarrow (a-b)^2+(b-c)^2+(c-a)^2 = 0$
$\Rightarrow a-b = 0 \Rightarrow a = b$
similarly $b-c = 0 \Rightarrow b = c$
$c-a = 0 \Rightarrow c = a$
$\therefore a = b = c$

55. (A) Let $x-y = \frac{x+y}{7} = \frac{xy}{4} = k$
$x-y = k$ ...(i)
$x+y = 7k$ ...(ii)
$xy = 4k$ ...(iii)
from eq(i) and (ii)
$x = 4k,\ y = 3k$
from eq(iii)
$xy = 4k$
$\Rightarrow 4k \times 3k = 4k \Rightarrow k = \frac{1}{3}$
Now, $xy = 4k = 4 \times \frac{1}{3} = \frac{4}{3}$

56. (B) $\frac{x}{y} = \frac{\left(\frac{a^2-25}{a^2-36}\right)}{\left(\frac{a+5}{a+6}\right)} = \frac{\frac{(a+5)(a-5)}{(a+6)(a-6)}}{\left(\frac{a+5}{a+6}\right)} = \frac{a-5}{a-6}$

57. (D) $\cos\theta\cdot\text{cosec}23° = 1$
$\Rightarrow \text{cosec}23° = \frac{1}{\cos\theta} = \sec\theta$
$\Rightarrow \text{cosec}23° = \text{cosec}(90°-\theta)$
$\Rightarrow 23° = 90° - \theta$
$\Rightarrow \theta = 90° - 23° = 67°$

58. (D) $9x - \frac{9}{2x} = 18 \Rightarrow x - \frac{1}{2x} = 2$
Cubing both sides,
$\Rightarrow x^3 - \frac{1}{8x^3} - 3x\cdot\frac{1}{2x}\left(x-\frac{1}{2x}\right) = 8$
$\Rightarrow x^3 - \frac{1}{8x^3} - \frac{3}{2} \times 2 = 8$
$\Rightarrow x^3 - \frac{1}{8x^3} = 8 + 3 = 11$

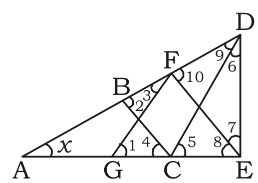
59. (D) $\frac{x}{4} + \frac{y}{3} = \frac{5}{12} \Rightarrow 3x + 4y = 5$ ...(i)
$x + 2y = 2$ ...(ii)
On solving
$x = 1,\ y = 1/2$
$\therefore x + y = 1 + \frac{1}{2} = \frac{3}{2}$

60. (A) $11x - 13 = -2x + 78$
$\Rightarrow 11x + 2x = 78 + 13$
$\Rightarrow 13x = 91 \Rightarrow x = 7$

61. (A) $x + y = 2z$
$\Rightarrow x = 2z - y$
$\Rightarrow x - z = 2z - y - z = z - y$
Now, $\frac{x}{x-z} + \frac{z}{y-z} \Rightarrow \frac{x}{x-z} - \frac{z}{z-y}$
$\Rightarrow \frac{x}{x-z} - \frac{z}{x-z} \Rightarrow \frac{x-z}{x-z} = 1$

62. (A) **Short-trick:-**
$x^4 - 17x^3 + 17x^2 - 17x + 17$
$\Rightarrow x^4 - 16x^3 - x^3 + 16x^2 + x^2 - 16x - x + 17$
When $x = 16$,
Expression
$= 16^4 - 16^4 - 16^3 + 16^3 + 16^2 - 16^2 - 16 + 17 = 1$

63. (C)



$\because$ AB = BC
$\therefore \angle 4 = x$
$\therefore \angle 2 = x + \angle 4 = 2x$ (exterior angle)
$\therefore \angle 9 = \angle 2 = 2x$ $[\because$ BC = CD$]$
$\therefore \angle 3 = x$ $(\because$ FG = GA$)$
$\therefore \angle 1 = x + \angle 3 = 2x$ (exterior angle)
$\angle 8 = \angle 1 = 2x$ $[\because$ EF = FG$]$
$\angle 5 = \angle A + \angle 9 = x + 2x = 3x$ (exterior angle)
$\angle 7 + \angle 8 = \angle 5$ $[\because$ CD = DE$]$
$\Rightarrow \angle 7 = 3x - 2x = x$
$\angle 10 = A + \angle 8 = 3x$ (exterior angle)
$\angle 9 + \angle 6 = \angle 10$ $[\because$ DE = EF$]$
$\Rightarrow \angle 6 = 3x - 2x = x$
In ΔADE,
$\Rightarrow \angle A + \angle D + \angle E = 180°$
$\Rightarrow x + 3x + 3x = 180° \Rightarrow x = \left(\frac{180}{7}\right)^{\circ}$

Short trick -
The value of x will be
$= \frac{180}{\text{No. of bounded regions in the figure}}$
$\therefore$ Here we can observe that
no. of figures is 7
$\therefore \left(\frac{180}{7}\right)^{\circ}$ will be right answer.

64. (D) In ΔABC and ΔADE,

$\angle BAC = \angle DAE$

$\angle BAC = 180° - (75° + 65°) = 40°$

$\angle AED = 75° = \angle ABC$

$\therefore \Delta AED \sim \Delta ABC$

$\therefore \frac{DE}{BC} = \frac{AE}{AB} = \frac{AD}{AC} \Rightarrow \frac{2}{3} = \frac{12}{AB}$

$\Rightarrow AB = 18$ cm

65. (C) Given $a = 3 + 2\sqrt{2}$

$\Rightarrow \frac{1}{a} = \frac{1}{3+2\sqrt{2}} = \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{3}}{3-2\sqrt{2}}$

$\Rightarrow \frac{1}{a} = 3 - 2\sqrt{2}$

$a + \frac{1}{a} = 3 + 2\sqrt{2} + 3 - 2\sqrt{2} = 6$

Now, $\frac{a^6 + a^4 + a^2 + 1}{a^3}$

$\Rightarrow \frac{a^6}{a^3} + \frac{a^4}{a^3} + \frac{a^2}{a^3} + \frac{1}{a^3}$

$\Rightarrow a^3 + \frac{1}{a^3} + a + \frac{1}{a}$

$\Rightarrow \left(a + \frac{1}{a}\right)^3 - 3\left(a + \frac{1}{a}\right) + \left(a + \frac{1}{a}\right)$

$\Rightarrow (6)^3 - 2 \times 6 = 204$

66. (C) $\frac{T_3 - T_5}{T_1} = \frac{\sin^3\theta + \cos^3\theta - (\sin^5\theta + \cos^5\theta)}{\sin\theta + \cos\theta}$

$= \frac{(\sin^3\theta - \sin^5\theta) + (\cos^3\theta - \cos^5\theta)}{\sin\theta + \cos\theta}$

$= \frac{\sin^3\theta(1 - \sin^2\theta) + \cos^3\theta(1 - \cos^2\theta)}{\sin\theta + \cos\theta}$

$= \frac{\sin^3\theta \cdot \cos^2\theta + \cos^3\theta \cdot \sin^2\theta}{\sin\theta + \cos\theta}$

$= \frac{\sin^2\theta \cdot \cos^2\theta(\sin\theta + \cos\theta)}{(\sin\theta + \cos\theta)}$

$= \sin^2\theta \cdot \cos^2\theta$

67. (C) Given $x^3 + y^3 = 35$ and $x + y = 5$

Now, $x^3 + y^3 = 35$

$\Rightarrow (x + y)^3 - 3xy\,(x + y) = 35$

$\Rightarrow (5)^3 - 3xy(5) = 35 \Rightarrow xy = 6$

Now, $\frac{1}{x} + \frac{1}{y} = \frac{x+y}{xy} = \frac{5}{6}$

Short trick -

the value of $x + y = 5$

$\therefore$ assume the value of $x = 3$, and $y = 2$

$\therefore$ the value of $\frac{1}{x} + \frac{1}{y}$ will be $\frac{1}{3} + \frac{1}{2}$

$= \frac{3+2}{6} = \frac{5}{6}$

68. (A) $\frac{8\sin\theta + 5\cos\theta}{\sin^3\theta + 2\cos^3\theta + 3\cos\theta}$

$\Rightarrow \frac{8\tan\theta + 5}{\tan\theta \cdot \sin^2\theta + 2\cos^2\theta + 3}$

$\Rightarrow \frac{8\tan\theta + 5}{2\sin^2\theta + 2\cos^2\theta + 3}$

$\Rightarrow \frac{8\tan\theta + 5}{2(\sin^2\theta + \cos^2\theta) + 3}$

$\Rightarrow \frac{8 \times 2 + 5}{5} = \frac{21}{5}$

69. (A) $MN = \frac{1}{2}(AB + CD)$

$\Rightarrow 2 \times 15 = 14 + CD$

$\Rightarrow CD = 16$ cm

70. (C) **Short-trick:-**

Take $\theta = 45°$

$l = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$ & $m = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

Now, $l^2m^2(l^2 + m^2 + 3) = \frac{1}{2} \times \frac{1}{2}\left(\frac{1}{2} + \frac{1}{2} + 3\right)$

$\Rightarrow l^2m^2(l^2 + m^2 + 3) = \frac{1}{4} \times 4 = 1$

71. (C) $\tan\theta + \cot\theta = 2$

$\Rightarrow \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = 2$

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

$\Rightarrow 1 = \sin 2\theta$

$\Rightarrow 2\theta = 90° \Rightarrow \theta = 45°$

$\therefore \tan^7\theta + \cot^9\theta = 1 + 1 = 2$

72. (B) A, B and C are the angles of ΔABC.

$B - C = 30° \Rightarrow B = C + 30°$

$\therefore A - B = 15° \Rightarrow A = B + 15° = C + 30° + 15°$

$\Rightarrow A = C + 45°$

Now, $A + B + C = 180°$

$\Rightarrow (C + 45°) + (C + 30°) + C = 180°$

$\Rightarrow 3C = 180° - 75° = 105° \Rightarrow C = 35°$

$\therefore \angle A = 35° + 45° = 80°$

73. (C) $\frac{x}{1} = \frac{a-b}{a+b}$

by Componendo and Dividendo Rule

$\Rightarrow \frac{x+1}{x-1} = \frac{a-b+a+b}{a-b-a-b} = -\frac{2a}{2b} = -\frac{a}{b}$

Similarly,

$\frac{y+1}{y-1} = -\frac{b}{c}$ and $\frac{z+1}{z-1} = -\frac{c}{a}$

Now, $\frac{x+1}{x-1} \times \frac{y+1}{y-1} \times \frac{z+1}{z-1}$

$\Rightarrow \left(-\frac{a}{b}\right) \times \left(-\frac{b}{a}\right) \times \left(-\frac{c}{a}\right) = -1$

74. (B) $4\sin^2\theta + 6(1 - \sin^2\theta)$

$\Rightarrow 4\sin^2\theta + 6 - 6\sin^2\theta$

$\Rightarrow 6 - 2\sin^2\theta$

Now put the value of $\theta = 90°$

Minimum value = 6 – 2 = 4

75. (A) $\because 4x = \sec\theta \Rightarrow x = \frac{\sec\theta}{4}$

and $\frac{4}{x} = \tan\theta \Rightarrow x = \frac{4}{\tan\theta}$

Now, $8\left(x^2 - \frac{1}{x^2}\right) = 8\left(\frac{\sec^2\theta}{16} - \frac{1}{\frac{16}{\tan^2\theta}}\right)$

$\Rightarrow 8\left(x^2 - \frac{1}{x^2}\right) = 8\left(\frac{\sec^2\theta}{16} - \frac{\tan^2\theta}{16}\right)$

$\Rightarrow 8\left(x^2 - \frac{1}{x^2}\right) = 8 \times \frac{1}{16} = \frac{1}{2}$

76. (B) Let $x = 8 + \cfrac{1}{8 + \cfrac{1}{8 + \cfrac{1}{8 + \ldots\infty}}}$

$\Rightarrow x = 8 + \frac{1}{x}$

$\Rightarrow x^2 = 8x + 1$

$\Rightarrow x^2 - 8x = 1$

Adding '16' to both sides,

$\Rightarrow x^2 - 8x + 16 = 1 + 16$

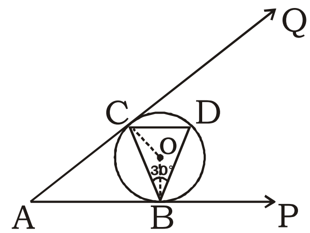
$\Rightarrow (x-4)^2 = 17$

$\Rightarrow x - 4 = \pm\sqrt{17} \Rightarrow x = 4 \pm \sqrt{17}$

But we can't take $x = 4 - \sqrt{17}$ because it gives negative value.

Hence, $x = 4 + \sqrt{17}$

77. (A)



$\angle DBP = \angle BCD$ **[Alternate segment theorem]**

and $\angle DBP = \angle BDC$ **[Alternate angle]**

$\therefore$ From the above two,

$\angle BCD = \angle BDC = x$ (Let)

In ΔBDC,

$\angle BCD + \angle BDC + \angle CBD = 180°$

$\Rightarrow x + x + 30° = 180°$

$\Rightarrow x = 75°$

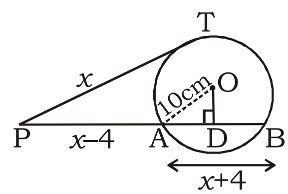
Now, $\angle BOC = 2\ \angle BDC = 2 \times 75° = 150°$

and $\angle BOC + \angle BAC = 180°$

$\Rightarrow 150° + \angle BAC = 180°$

$\Rightarrow \angle BAC = 180° - 150° = 30°$.

78. (C)



We know that,

$PT^2 = PA.\ PB$

$\Rightarrow x^2 = (x-4)\ 2x$

$\Rightarrow x = 2(x-4)$

$\Rightarrow x = 2x - 8 \Rightarrow x = 8$ cm

$\therefore AB = x + 4 = 8 + 4 = 12$ cm

$\because OD \perp AB$ and AB is a chord.

So, $AD = DB = \frac{AB}{2} = \frac{12}{2} = 6$cm

Now, $OD = \sqrt{OA^2 - AD^2}$

$\Rightarrow OD = \sqrt{10^2 - 6^2} = 8$ cm

79. (C) $\frac{(x^2+5x+4)(x+2)}{(x^2+2x-8)(x+1)}$

$\Rightarrow \frac{(x+1)(x+4)(x+2)}{(x+4)(x-2)(x+1)} = \frac{x+2}{x-2}$

80. (D) A(2,–3) ———— B(6,3)

Slope of line AB = $m_1 = \frac{3-(-3)}{6-2} = \frac{6}{4} = \frac{3}{2}$

For perpendicular lines,

$m_1 m_2 = -1$

$\Rightarrow \frac{3}{2} \times m_2 = -1 \Rightarrow m_2 = \frac{-2}{3}$

81. (A) $16\frac{2}{3}\% = \frac{1}{6}$

Principal		Amount
6	:	7
6	:	7
6	:	7
216		343

Difference = 127 unit = 3810 (given)

$\therefore$ 216 unit = $\frac{3810}{127} \times 216$ = ₹6480

82. (C) $2\sec^2\theta + 3\tan^2\theta = 22$ …(i)

and we know that

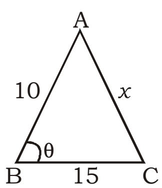
$\sec^2\theta - \tan^2\theta = 1$ …(ii)

By solving (i) and (ii),

$\sec^2\theta = 5 \Rightarrow \sec\theta = \sqrt{5}$

$\therefore \text{cosec}\theta = \frac{\sqrt{5}}{2}$

83. (A)



Area of $\Delta ABC = \frac{1}{2} \times a \times b \times \sin\theta$

$\Rightarrow 60 = \frac{1}{2} \times 10 \times 15 \times \sin\theta$

$\Rightarrow \sin\theta = \frac{4}{5}$

$\therefore \cos\theta = \frac{3}{5}$

Now, $\cos\theta = \frac{a^2 + b^2 - c^2}{2ab}$

$\Rightarrow \frac{3}{5} = \frac{10^2 + 15^2 - x^2}{2 \times 10 \times 15}$

$\Rightarrow 180 = 325 - x^2$

$\Rightarrow x^2 = 145 \Rightarrow x = \sqrt{145}$

84. (D) $10^{105} = 2^{105} \times 5^{105}$

Now, $\frac{2^{105} \times 5^{105}}{5^{85}} = 2^{105} \times 5^{20}$

$\Rightarrow \frac{2^{105} \times 5^{105}}{5^{85}} = 2^{20} \times 2^{85} \times 5^{20}$

$\Rightarrow \frac{2^{105} \times 5^{105}}{5^{85}} = 2^{85} \times 10^{20}$

85. (C) Let the numbers = $5x$ and $4x$

ATQ,

$(5x)^2 + (4x)^2 = 369$

$\Rightarrow 25x^2 + 16x^2 = 369$

$\Rightarrow 41x^2 = 369$

$\Rightarrow x^2 = 9 \Rightarrow x = 3$

$\therefore$ Numbers are $5x = 5 \times 3 = 15$

and $4x = 4 \times 3 = 12$

Hence, difference = 15 – 12 = 3

86. (D) $x(x-2) = -1$

$\Rightarrow x - 2 = -\frac{1}{x}$

$\Rightarrow x + \frac{1}{x} = 2$

$\therefore x = 1$

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

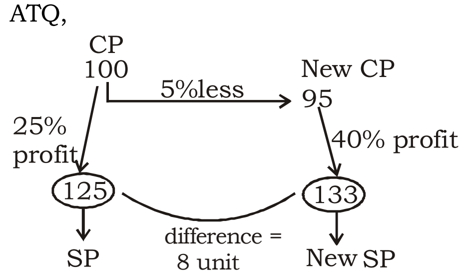
87. (A) 37.5% of x = 345

$\Rightarrow x = \frac{345}{37.5} \times 100 = 920$

Now, 23 = z% of 920

$\Rightarrow z = \frac{23}{920} \times 100 = 2.5\%$

88. (B) ATQ,



8 units = ₹48 (given)

$\therefore$ 100 units = $\frac{48}{8} \times 100$ = ₹600

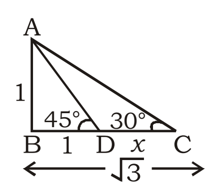
Therefore, CP of fan = ₹600

89. (B) $\text{cosec}^4\theta - \cot^4\theta = (\text{cosec}^2\theta)^2 - (\cot^2\theta)^2$

$= (\text{cosec}^2\theta - \cot^2\theta)(\text{cosec}^2\theta + \cot^2\theta)$

$= 1 \times \sqrt{3} = \sqrt{3}$

90. (C)



Let length of tower = AB = 1 unit

Difference between shadow's length

$x = BC - BD = (\sqrt{3} - 1)$ unit

$\because$ 1 unit = 40 m

$\therefore (\sqrt{3} - 1)$ unit $= 40(\sqrt{3} - 1)$ m

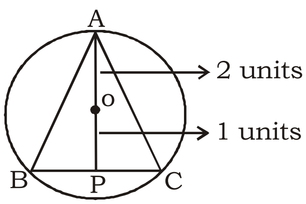
91. (A) ATQ,

$$15 = \frac{8+10+16+x+13+22+24}{7}$$

$\Rightarrow 105 = 93 + x$

$\Rightarrow x = 105 - 93 = 12$

92. (A)



Given,

ΔABC is an equilateral triangle.

AO = circumradius = 2 units

OP = Inradius = 1 unit

$\therefore$ 2 units = $2\sqrt{3}$ (given)

$\therefore$ 1 unit = $\frac{2\sqrt{3}}{2} = \sqrt{3}$

$\therefore$ Height of triangle = AO + OP

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

$= 3\sqrt{3}$ cm

93. (D)

CP	:	MP
(100 – Discount%)	:	(100+ profit%)
100 –10	:	100 +20
90	:	120
⇓×10	:	⇓×10
900		1200 (given)

$\therefore$ Cost price of article = ₹900

94. (D) $x = a(b-c) \Rightarrow \frac{x}{a} = (b-c)$,

$y = b(c-a) \Rightarrow \frac{y}{b}(c-a)$ and

$z = c(a-b) \Rightarrow \frac{z}{c} = (a-b)$

if $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

$\therefore \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = b - c + c - a + a - b = 0$

& $\left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3 = \frac{3xyz}{abc}$

95. (C) Let breadth = x and length = $2x$

ATQ,

$x \times 2x = 578$

$\Rightarrow x^2 = \frac{578}{2} = 289 \Rightarrow x = 17$

$\therefore$ breadth = 17 m and length = 34 m

Hence, perimeter = $2(l + b) = 2(34 + 17)$

= 102 m

96. (C) Given that $a = 1005$, $b = 1009$, $c = 1012$

Now, $\frac{a^3+b^3+c^3-3abc}{a+b+c}$

$\Rightarrow \frac{1}{2}\frac{(a+b+c)[(a-b)^2+(b-c)^2+(c-a)^2]}{a+b+c}$

$\Rightarrow \frac{1}{2}[(a-b)^2 + (b-c)^2 + (c-a)^2]$

$\Rightarrow \frac{1}{2}[(-4)^2 + (-3)^2 + (7)^2]$

$\Rightarrow \frac{1}{2} \times 74 = 37$

97. (D) Number of players in Archery

$= \frac{5}{100} \times 800 = 40$

Number of females = 40 – 12 = 28

Required ratio = 28 : 40 = 7 : 10

98. (B) Number of players in wrestling

$= \frac{24}{100} \times 800 = 192$

$\therefore$ Required percentage $= \frac{144}{192} \times 100 = 75\%$

99. (A) Number of players in shooting

$= 800 \times \frac{20}{100} = 160$

Number of females = 160 – 74 = 86

$\therefore$ Required percentage $= \frac{86}{800} \times 100 = 10.75\%$

100. (C) Total players in wrestling = 192

Males = 144

Females = 192 – 144 = 48

$\therefore$ Required ratio = 144 : 48 = 3 : 1

CDS (MATHS) MOCK TEST - 70 (Answer Key)

1.	(B)	21.	(C)	41.	(A)	61.	(A)	81.	(A)
2.	(A)	22.	(B)	42.	(D)	62.	(A)	82.	(C)
3.	(B)	23.	(B)	43.	(C)	63.	(C)	83.	(A)
4.	(B)	24.	(D)	44.	(B)	64.	(D)	84.	(D)
5.	(C)	25.	(C)	45.	(B)	65.	(C)	85.	(C)
6.	(B)	26.	(D)	46.	(B)	66.	(C)	86.	(D)
7.	(A)	27.	(D)	47.	(B)	67.	(C)	87.	(A)
8.	(C)	28.	(B)	48.	(C)	68.	(A)	88.	(B)
9.	(D)	29.	(C)	49.	(A)	69.	(A)	89.	(B)
10.	(A)	30.	(B)	50.	(B)	70.	(C)	90.	(C)
11.	(C)	31.	(D)	51.	(A)	71.	(C)	91.	(A)
12.	(D)	32.	(A)	52.	(A)	72.	(B)	92.	(A)
13.	(B)	33.	(A)	53.	(A)	73.	(C)	93.	(D)
14.	(A)	34.	(B)	54.	(A)	74.	(B)	94.	(D)
15.	(B)	35.	(A)	55.	(A)	75.	(A)	95.	(C)
16.	(A)	36.	(B)	56.	(B)	76.	(B)	96.	(C)
17.	(D)	37.	(C)	57.	(D)	77.	(A)	97.	(D)
18.	(A)	38.	(C)	58.	(D)	78.	(C)	98.	(B)
19.	(A)	39.	(B)	59.	(D)	79.	(C)	99.	(A)
20.	(C)	40.	(D)	60.	(A)	80.	(D)	100.	(C)

Note : *If your opinion differ regarding any answer, please message the mock test and Question number to 8860330003*

Note : *If you face any problem regarding result or marks scored, please contact : 9313111777*

Note : *Whatsapp with Mock Test No. and Question No. at 705360571 for any of the doubts. Join the group and you may also share your sugesstions and experience of Sunday Mock Test.*