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SSC TIER II (MATHS) MOCK TEST - 23 (ANSWER KEY)

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

SSC TIER II (MATHS) MOCK TEST - 23 (SOLUTION)

1. (B) We know that when two chords intersect each other, THEN

$MA \times MB = MC \times MD$

and, $MA = MB = \frac{24}{2} = 12$ cm

and, $12 \times 12 = MC \times 4$

$MC = 36$ cm

$CD = MC + MD = 36 + 4 = \mathbf{40\ cm.}$

2. (B) Let exterior angle be y and interior angle be x.

ATQ,

$x + y = 180^\circ$

$x - y = 108^\circ$

Then, $y = \frac{180 - 108}{2} = 36^\circ$

Required number of side $= \frac{360^\circ}{36^\circ} = \mathbf{10}$

3. (B) $\tan x = a \tan y$

$$\frac{\sin x}{\cos x} = a\frac{\sin y}{\cos y} \Rightarrow \frac{\sin x}{\sin y} = a\frac{\cos x}{\cos y}$$

$$\Rightarrow \quad \frac{b}{a} = \frac{\cos x}{\cos y}$$

Squaring both side, we get

$$\cos^2 x = \frac{b^2}{a^2}\cos^2 y \quad \ldots\ldots (i)$$

Given, $\sin x = b \sin y$

$\sin^2 x = b^2 \sin^2 y$

$$\Rightarrow \quad \sin^2 y = \frac{\sin^2 x}{b^2}$$

$$\Rightarrow \quad \cos^2 y = 1 - \frac{1 - \cos^2 x}{b^2}$$

$$\Rightarrow \quad \cos^2 y = \frac{b^2 - 1 + \cos^2 x}{b^2}$$

Put the value in equation (i)

$$\cos^2 x = \frac{b^2}{a^2} \times \left[\frac{b^2 - 1 + \cos^2 x}{b^2}\right]$$

$$\Rightarrow \quad a^2 \cos^2 x = b^2 - 1 + \cos^2 x$$

$$\Rightarrow \quad (a^2 - 1)\cos^2 x = b^2 - 1$$

$$\Rightarrow \quad \cos^2 x = \frac{\boldsymbol{b^2 - 1}}{\boldsymbol{a^2 - 1}}$$

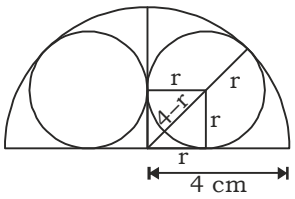
4. (D) Using pythagoras theorem

$r^2 + r^2 = (4 - r)^2$

$\Rightarrow \quad 2r^2 = (4 - r)^2$

$\Rightarrow \quad \sqrt{2}\, r = 4 - r$

$$\Rightarrow \quad r = \frac{4}{\sqrt{2} + 1}$$



$$= \mathbf{4\left(\sqrt{2} - 1\right)\ cm}$$

5. (B) Volume of the cube = sum of the volume of three small cubes

$= 3^3 + 4^3 + 5^3$

$= 27 + 64 + 125$

$= 216\ cm^3$

Hence, the length of side of the cube $= (216)^{1/3}$

$= \mathbf{6\ cm}$

6. (C)We know that

$\tan 75^\circ = \tan(90^\circ - 15^\circ) = \cot 15^\circ = 2 + \sqrt{3}$

Now, $\frac{\tan 60^\circ - \tan 75^\circ}{\cot 15^\circ - \cot 30^\circ}$

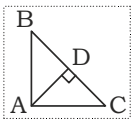
$$\frac{\sqrt{3} - 2 - \sqrt{3}}{2 + \sqrt{3} - \sqrt{3}} = \frac{-2}{2} = \mathbf{-1}$$

7. (A) In ΔABD,

$AB^2 = AD^2 + BD^2$ .....(1)

In ΔADC,

$AC^2 = AD^2 + CD^2$ .....(2)



Subtract equation (ii) from equation (i)

$AB^2 - AC^2 = BD^2 - CD^2$

$\Rightarrow \quad AB^2 + CD^2 = \mathbf{AC^2 + BD^2}$

8. (D) Sum (P) $= 5x^2 + 13x + 16$

Diff. (Q) $= x^2 + 19x + 26$

Expressions are $\frac{P + Q}{2}$ & $\frac{P - Q}{2}$

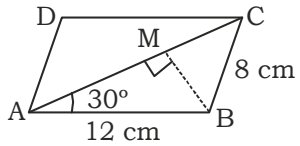
i.e, $3x^2 + 16x + 21$ and $2x^2 - 3x - 5$
Now, $(3x^2 + 16x + 21) = (x + 3)(3x + 7)$
Now, $(2x^2 - 3x - 5) = (2x - 5)(x + 1)$
Both the expression have no common factor
So, HCF $\rightarrow$ **1**

9. (A) $py + qx = mxy$ .....(i)
$\_qy + \_px = \_nxy$ .....(ii)

$(p - q)y - (p - q)x = (m - n)xy$
$\Rightarrow (p - q)(y - x) = (m - n)xy$
$\Rightarrow \dfrac{y - x}{xy} = \dfrac{m - n}{p - q}$
$\Rightarrow \dfrac{1}{x} - \dfrac{1}{y} = \dfrac{m - n}{p - q}$

10. (C) $4^x \cdot 2^y = 128$
$2^{2x} \cdot 2^y = 2^7 \Rightarrow 2x + y = 7$ .....(i)
$3^{3x} \cdot 3^{2y} - 9^{xy} = 0 \Rightarrow 3^{3x} \cdot 3^{2y} = 3^{2xy}$
$\Rightarrow 3x + 2y = 2xy$ .....(ii)
Put $x = 2$, $y = 3$
Both the eq. are satisfied
$\therefore x + y = 2 + 3 = 5$

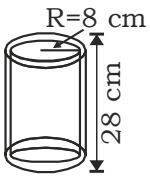
11. (D) In ΔAMB,
$AM = 12 \cos 30^\circ$
$= 12 \times \dfrac{\sqrt{3}}{2}$
$= 6\sqrt{3}$ cm



and, BM = 12 sin 30° = $12 \times \dfrac{1}{2}$ = 6 cm

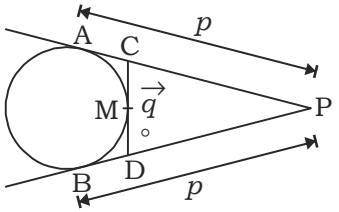
In ΔBMC,
$CM = \sqrt{BC^2 - BM^2}$
$= \sqrt{8^2 - 6^2} = \sqrt{64 - 36} = 2\sqrt{7}$
$AC = AM + MC$
$= 6\sqrt{3} + 2\sqrt{7} \Rightarrow \mathbf{2\left(3\sqrt{3} + \sqrt{7}\right)}$ **cm**

12. (B) Volume of cylinder = 3432
$\pi(R^2 - r^2)h = 3432$



$\Rightarrow \dfrac{22}{7} \times (8^2 - r^2) \times 28 = 3432$
$\Rightarrow r^2 = 25$
$\Rightarrow r = 5$ cm
Total surface area
$= 2\pi Rh + 2\pi rh + 2\pi(R^2 - r^2)$
$= 2\pi h(R + r) + 2\pi(R^2 - r^2)$
$= 2 \times \dfrac{22}{7} \times 28 \times 13 + 2 \times \dfrac{22}{7} \times 39$
$= 2288 + 244.92$
$= 2532.92$ cm^2

13. (C)



$PA + PB = 2p$
$\Rightarrow PC + CA + PD + BD = 2p$
$\Rightarrow PC + PD + CM + DM = 2p$
$\Rightarrow CP + PD + CD = 2p$
$\Rightarrow PC + PD = \mathbf{2p - q}$

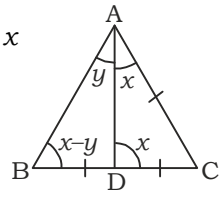
14. (C) Water : Milk = 9 : 16
Milk : Mixture = $\dfrac{16}{25}$
In original mixture, $\dfrac{\text{Milk}}{\text{Mixture}} = \sqrt{\dfrac{16}{25}} = \dfrac{4}{5}$
(5 – 4) units = 6 l
1 unit = 6 l
Mixture = 5 × 6 = 30 l

15. (B) $\dfrac{V_1}{V_2} = \sqrt{\dfrac{t_2}{t_1}}$

$\Rightarrow \dfrac{V_1}{V_2} = \sqrt{\dfrac{6\frac{2}{5}}{3\frac{3}{5}}} = \sqrt{\dfrac{32}{18}}$

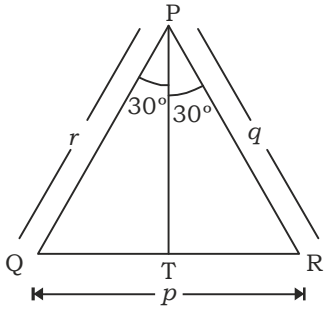
$\dfrac{V_1}{V_2} = \dfrac{4}{3} \Rightarrow V_2 = \dfrac{3}{4}V_1 = \dfrac{3}{4} \times 32 = 24$ km/h

16. (A) Let $\angle BAD$ be y° and
$\angle CAD = \angle ADC = x$
Then, $\angle ABD = x - y$
$\angle BAC - \angle ABC = 60^\circ$
$(x + y) - (x - y) = 60^\circ$
$x + y - x + y = 60^\circ$
$\Rightarrow 2y = 60^\circ$
$\Rightarrow y = \mathbf{30^\circ}$



17. (C) $\sin^2 A + \sin^2 B - \sin^2 C$
$= \dfrac{1 - \cos 2A}{2} + \dfrac{1 - \cos 2B}{2} - \dfrac{1 - \cos 2C}{2}$
$= \dfrac{1}{2} - \dfrac{1}{2}[\cos 2A + \cos 2B] + \dfrac{1}{2}\cos 2C$
$= \dfrac{1}{2} - \dfrac{1}{2}[2\cos(A + B)\cos(A - B)]$
$+ \dfrac{1}{2} \times (2\cos^2 C - 1)$
$= \dfrac{1}{2} + \cos C \cos(A - B) + \cos^2 C - \dfrac{1}{2}$
$= \cos C[\cos(A - B) - \cos(A + B)]$
$= \cos C \times 2 \sin A \sin B$
$= \mathbf{2 \sin A \sin B \cos C}$

18. (B)



Area of ΔPQR,

$\Rightarrow \frac{1}{2} qr \sin 60^\circ = \frac{1}{2} r \times PT \sin 30^\circ$

$+ \frac{1}{2} q \times PT \sin 30^\circ$

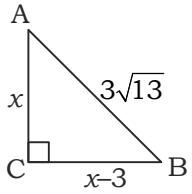
$\Rightarrow \frac{1}{2} qr \times \frac{\sqrt{3}}{2} = \frac{1}{2} PT \times \frac{1}{2} [q + r]$

$\Rightarrow PT = \frac{\sqrt{3}qr}{q+r}$

19. (B) Cost of one chair

$= \frac{3150 \times 12 \times 16 \times 27}{18 \times 14 \times 36}$ = **₹ 1800**

20. (A) By using pythagoras



$x^2 + (x-3)^2 = \left(3\sqrt{13}\right)^2$

$\Rightarrow x^2 + x^2 + 9 - 6x = 117$

$\Rightarrow 2x^2 - 6x - 108 = 0$

$\Rightarrow x^2 - 3x - 54 = 0$

On solving, we get $x = 9$

AC = 9 cm, BC = 6 cm, AB = $3\sqrt{13}$

In-radius = $\frac{9+6-3\sqrt{13}}{2} = \frac{15-3\sqrt{13}}{2}$

$= \mathbf{\frac{3}{2}\left[5-\sqrt{13}\right]}$ **units**

21. (C) LCM of 36, 54 and 81 = 324

$\Rightarrow 324 \text{ sec} = \frac{324}{60} \Rightarrow 5\frac{2}{5} = \frac{27}{5}$ min

i.e., in 27 minutes ⇒ 5 times

54 minutes ⇒ 10 times

$59\frac{2}{5}$ minutes ⇒ 11 times

Including of 9 am ⇒ **12 times**

22. (A) A $5 \times 8 = 40$

B $15 \times 4 = 60$

C $\frac{36}{40} \times 100 = 90$

360 → 9, 6, 4

Time taken by A, B and C to complete the work

$= \frac{360}{9+6+4} = \frac{360}{19} = \mathbf{18\frac{18}{19}}$ **days**

23. (C) Length of the wire = $2\pi r$

$= 2 \times \frac{22}{7} \times 35 = 220$ cm

Length of each side of square

$= \frac{220}{4} = 55$ cm

Area of the square = 55^2 = **3025 cm²**

24. (A) ATQ,

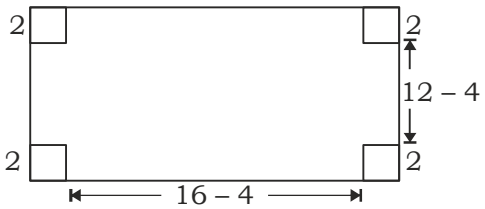
$\pi \times 3 \times 3 \times h_1 = \pi \times 4 \times 4 \times h_2$

$\Rightarrow \frac{h_1}{h_2} = \frac{16}{9}$

Hence, Required percentage

$= \frac{7}{9} \times 100 = \mathbf{77\frac{7}{9}\%}$

25. (B)



Volume of the box

$= (16-4)(12-4) \times 2$

= **192 cm²**

26. (A) $x^2 + \frac{1}{x^2} - 2 = 171 - 2$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 13^2 \Rightarrow x - \frac{1}{x} = 13$

Taking cube on both sides,

$x^3 - \frac{1}{x^3} - 3 \times x \times \frac{1}{x}\left(x - \frac{1}{x}\right) = 2197$

$\Rightarrow x^3 - \frac{1}{x^3} = 2197 + 39 = \mathbf{2236}$

27. (B) $\cos\theta = \sqrt{1 - \sin^2\theta}$

$= \sqrt{1 - \left(\frac{2xy}{x^2+y^2}\right)^2}$

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

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \mathbf{\frac{2xy}{x^2 - y^2}}$

28. (C) In ΔABC,

AB = 120 . cot 60°

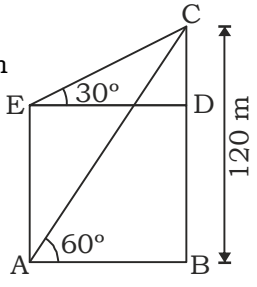
$= \frac{120}{\sqrt{3}} = 40\sqrt{3}$ m

Now, In ΔCDE

CD = DE tan 30°

$= 40\sqrt{3} \times \frac{1}{\sqrt{3}}$

= 40 m



Height of the building = 120 – 40 = **80 m**

29. (C) $\cos 60° + \cos 180° + \cos 20° - \cos 80° - \cos 40°$

$= \frac{1}{2} - 1 + \cos 20° - [\cos 80° + \cos 40°]$

$= -\frac{1}{2} + \cos 20° - 2\cos 60° \cos 20°$

$= -\frac{1}{2} + \cos 20° - 2 \times \frac{1}{2} \cos 20°$

$= \mathbf{-\frac{1}{2}}$

30. (B) An isosceles right angled triangle has the maximum area.
If hypotenuse = p
Then,

base = height = $\frac{p}{\sqrt{2}}$

Area = $\frac{1}{2} \times \frac{p}{\sqrt{2}} \times \frac{p}{\sqrt{2}} = \mathbf{\frac{p^2}{4}}$ **sq. unit**

31. (C) Consider the equation
$4x^2 + 4ax + 3a = 0$

Sum of the roots $(\alpha + \beta) = -\frac{4a}{4} = -a$

Product of the roots $(\alpha\beta) = \frac{3a}{4}$

Given, $\alpha - \beta = \sqrt{10}$
$(\alpha - \beta)^2 = 10$
$(\alpha + \beta)^2 - 4\alpha\beta = 10$

$(-a)^2 - 4 \times \frac{3a}{4} = 10$

$a^2 - 3a - 10 = 0$

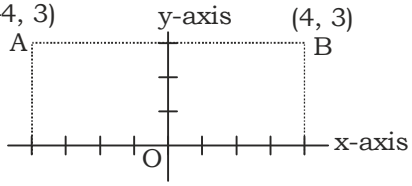
On solving we get, $a = \mathbf{-2}$ and $\mathbf{5}$

32. (B) Increased value = 63 – 36 = 27

Effect on mean = $\frac{27}{30} = 0.9$

Correct mean = 35 – 0.9 = 34.1

33. (A) (–4, 3) y-axis (4, 3)



Reflection of point B from y–axis = (–4,3)

34. (B) $p^2 + q^2 = \sin^2 x + \sin^2 y + 2 \sin x \sin y + \cos^2 x + \cos^2 y + 2 \cos x \cos y$
$= (\sin^2 x + \cos^2 x) + (\sin^2 y + \cos^2 y) + 2[\cos x \cos y + \sin x \sin y]$
$= 2 + 2[\cos(x - y)]$
$= 2[1 + \cos(x - y)]$

$= 2 \times 2 \cos^2 \frac{x - y}{2}$

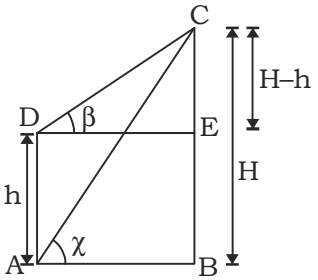
$\Rightarrow 4 - (p^2 + q^2) = 2 - 2\cos(x - y)$
$= 2[1 - \cos(x - y)]$

$= 2 \times 2 \sin^2 \frac{x - y}{2}$

$\Rightarrow \tan^2 \frac{x - y}{2} = \frac{4 - (p^2 + q^2)}{p^2 + q^2}$

$\Rightarrow \tan\left(\frac{x - y}{2}\right) = \mathbf{\sqrt{\frac{4 - (p^2 + q^2)}{p^2 + q^2}}}$

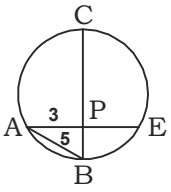
35. (A)



In ΔABC,
AB = H cot β .....(i)
In ΔCDE,
DE = (H – h) cot α .....(ii)
Since AB = DE
So, (H – h) cot α = H cot β
$\Rightarrow$ H cot α – h cot α = H cot β
$\Rightarrow$ H[cot α – cot β] = h cot α

$\Rightarrow$ $\mathbf{H = \frac{h \cot \alpha}{\cot \alpha - \cot \beta}}$

36. (B) By pythagoras theorem,



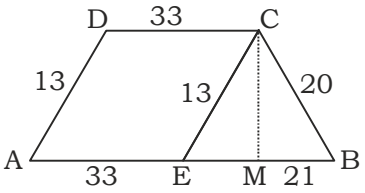
$PB = \sqrt{5^2 - 3^2} = 4$
BC and AE intersect each other at P.
Then, PA × PE = PB × PC
$\Rightarrow$ 3 × PE = 4 × 12
$\Rightarrow$ PE = 16 cm
and, AE = AP + PE
= 16 + 3
= **19 cm**

37. (D) $\sin x = m \sin y$ and $\cos x = n \cos y$
By squaring and adding both the equations,
$\sin^2 x + \cos^2 x = m^2 \sin^2 y + n^2 \cos^2 y$
$\Rightarrow$ $m^2 \sin^2 y + n^2 \cos^2 y = 1$
Divide the equation by "$\cos^2 y$"
$\Rightarrow m^2 \tan^2 y + n^2 = \sec^2 y$
$\Rightarrow m^2 \tan^2 y + n^2 = 1 + \tan^2 y$

$\Rightarrow$ $\tan^2 y = \frac{1 - n^2}{m^2 - 1}$

$\Rightarrow$ $\tan y = \mathbf{\sqrt{\frac{1 - n^2}{m^2 - 1}}}$

38. (A)



Area of ΔBEC using hero's formula

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

$= \sqrt{27 \times 14 \times 7 \times 6} = 126$

Now area $= \frac{1}{2} \times b \times h$

$\Rightarrow \quad \frac{1}{2} \times CM \times 21 = 126 \text{ cm}^2$

$\Rightarrow \quad CM = 12$

Area of trapezium

$= \frac{1}{2}$[sum of parallel sides] × height

$= \frac{1}{2}[33 + 54] \times 12 =$ **522 cm²**

39. (D) $\sqrt{x} + \sqrt{y} + \sqrt{z} = 0$

$\sqrt{y} + \sqrt{z} = -\sqrt{x}$

Squaring both sides,

$y + z + 2\sqrt{yz} = x$

$\Rightarrow \quad y + z - x = -2\sqrt{xy}$

Again, squaring both sides

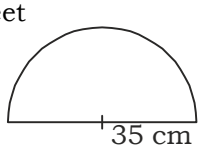
$(y + z - x)^2 = 4yz$

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

40. (A) Radius of the cone

$= \frac{1}{2}$ Radius of sheet

$= \frac{35}{2}$ cm.



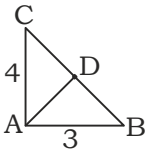
Slant height of cone

= radius of sheet = 35 cm

$h = \sqrt{l^2 - r^2}$

$= \sqrt{35^2 - \left(\frac{35}{2}\right)^2} \Rightarrow \frac{\mathbf{35\sqrt{3}}}{\mathbf{2}}$

41. (B)



The mid point of BC is the centre of circumcircle of ΔABC.

CD = DB = AD = radius of the circle

i.e., AD $= \frac{BC}{2} = \frac{5}{2} =$ **2.5 m**

42. (B) Let the rise in the level of water be h m

Then, $\pi R^2 h = \frac{4}{3}\pi r^3$

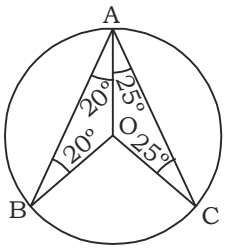
$\Rightarrow 28 \times 28 \times h = \frac{4}{3} \times 10.5 \times 10.5 \times 10.5$

$\Rightarrow h = \frac{63}{32} = 1.97$ cm

43. (A) $3A + A - 34° = 90°$

$\Rightarrow 4A = 124 \Rightarrow A = 31°$

44. (B)



OA = OC = Radius

$\therefore \angle CAO = \angle OCA = 25°$

Similarly,

$\angle BAO = \angle OBA = 20°$

$\angle A = 25° + 20° = 45°$

and, $\angle O = 2\angle A = 2 \times 45° =$ **90°**

[$\because$ angle subtended by arc at the centre is always twice the angle subtended at its circumfernce]

45. (B) Let the length of AN be x.

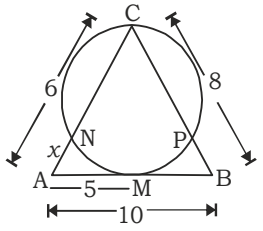
$AN \times AC = AM^2$

$\Rightarrow x \times 6 = 25$

$\Rightarrow x = \frac{25}{6}$

$AN : AC = \frac{25}{6} : 6$

= **25 : 36**



46. (A) $\tan\theta = \frac{\sin\theta \to 2}{\cos\theta \to 3}$

Put, $\sin\theta = 2$ & $\cos\theta = 3$

$\frac{3\sin\theta - 4\cos\theta}{2\sin\theta + 3\cos\theta} = \frac{3\times 2 - 4 \times 3}{2 \times 2 + 3 \times 3} = \frac{\mathbf{-6}}{\mathbf{13}}$

47. (B) Height of equilateral triangle

= 3× in-radius

$\frac{\sqrt{3}}{2}a = \frac{9}{2}$

$\Rightarrow \quad a = \frac{9}{\sqrt{3}} = 3\sqrt{3}$

and, Perimeter = $3 \times 3\sqrt{3} =$ **$9\sqrt{3}$ cm**

48. (C) Difference of first & last number

= (38 – 35) × 8 = 3 × 8 = 24

49. (D) $\begin{vmatrix} P \to 10 \\ Q \to 12 \\ R \to 15 \end{vmatrix} 60 \begin{vmatrix} 6 \\ 5 \\ 4 \end{vmatrix}$

P + Q = 11

P + R = 10

21 units cistern is filled in 2 hours
42 units in 4 hours
(42 + 11) = 53 units in 5 hours

Remaining 7 units will be filled in $\frac{7}{10}$ hours

$\therefore$ Total time = $\mathbf{5\frac{7}{10}}$ **hours**

50. (D) 10% $\Rightarrow$ 10 – 9
15% $\Rightarrow$ 20 – 17
20% $\Rightarrow$ 5 – 4

250 – 153

Required discount

$= \frac{250-153}{250} \times 100 =$ **38.8%**

51. (A) $16\frac{2}{3}\% \Rightarrow \begin{matrix} 7 \to \text{SP} \\ \frac{6}{} \to \text{CP} \end{matrix}$

$25\% \Rightarrow \begin{matrix} 5 \to \text{SP} \times 3 \to 15 \\ 4 \to \text{CP} \times 3 \to 12 \end{matrix}$

$\Rightarrow$ SP of IInd article = 15 – 7 = 8
difference = 8 – 7 = 1
1 = 2400
6 = 2400 × 6 = ₹14400
$\therefore$ Required cost price = **₹ 14400**

52. (C) $\frac{1}{2} \times 30\% + \frac{1}{4} \times (-40\%)$
= 15% – 10% = 5% profit.

53. (B) $20\% = \frac{1}{5}$

Price has been increased so quantity will reduced

i.e, $\frac{1}{5+1} = \frac{1}{6}\left(\frac{\text{numerator}}{\text{denominator} + \text{numerator}}\right)$

$\Rightarrow \frac{1}{6} = 3 \Rightarrow$ total eggs = 3 × 6 = 18
Now, quantity of eggs = 18 – 3 = 15

price = $\frac{90}{15}$ = ₹6 per egg

54. (A) Let $x = \sqrt{5\sqrt{5\sqrt{5}}}$ ...
Squaring both sides,
$\Rightarrow x^2 = 5x \Rightarrow x =$ **5**

55. (B) Let the number be $10x + y$
ATQ,
Now, $10x + y = 4(x + y)$
$\Rightarrow 10x + y - 4x - 4y = 0$
$\Rightarrow y = 2x$
and, $10x + y + 27 = 10y + x$
$\Rightarrow 9(y - x) = 27$
$\Rightarrow y - x = 3$
Put $y = 2x$
$2x - x = 3 \Rightarrow x = 3$
and, $y = 6$
Hence, $x + y =$ **9**

56. (B) Difference between simple interest and compound interest for 2 years = $P\left[\frac{r}{100}\right]^2$

$\Rightarrow P\left[\frac{35}{400}\right]^2 = 49$

$\Rightarrow P = \frac{49 \times 400 \times 400}{35 \times 35} =$ **₹ 6400**

57. (D)

A	B	C
9 × 12	4 × 4 + 7 × 8	11 × 12
⇓	⇓	⇓
108	72	132
9	6	11

Hence, total profit = $\frac{14300}{11} \times 26 =$ **₹ 33800**

58. (B) Let the age of A be x
Then, age of B = $2x$
and, age of C = $x + 5$
A.T.Q,

$\frac{2x-11}{x+5} = \frac{5}{6}$

$\Rightarrow 12x - 66 = 5x + 25$
$\Rightarrow 7x = 91$
$\Rightarrow x = 13$
Age of B = $2x = 2 \times 13 =$ **26 years**

59. (A) Using formula

$\frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$

$\Rightarrow \frac{A \times 10}{\frac{3}{5}} = \frac{(A+B)6}{\frac{2}{5}}$

$\Rightarrow 10A = 9A + 9B$
$\Rightarrow A = 9B$

$\Rightarrow \frac{A}{B} = \begin{matrix} \to 9 \\ \to 1 \end{matrix}$

Let B completes the work in x days.

Then, $B \times x = \frac{A \times 10}{\frac{3}{5}}$

$\Rightarrow x = \frac{9 \times 10 \times 5}{3 \times 1} =$ **150 days**

60. (C) Distance = $\frac{\text{Product of speeds}}{\text{difference of speeds}} \times$ time(difference)

$= \frac{75 \times 60}{75 - 60} \times \frac{12}{60}$

$= \frac{75 \times 60}{15} \times \frac{1}{5} = 60$ km

Required time period

$= \frac{60}{60}\frac{(\text{distance})}{(\text{speed})} - 15$ min

= 1 hour – 15 min = 45 min

61. (A) Average speed $= \frac{n}{\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+\ldots}$

$= \frac{3}{\frac{1}{15}+\frac{1}{30}+\frac{1}{45}}$

$= \frac{3}{\frac{6+3+2}{90}} = \frac{3 \times 90}{11}$

$= \frac{270}{11} = \mathbf{24\frac{6}{11}}$ **km/hr**

62. (C) $3x \sin\theta = 2y \cos\theta$

$\Rightarrow \tan\theta = \frac{2y}{3x}$

Using $\sec\theta = \sqrt{1+\tan^2\theta}$

& $\text{cosec}\theta = \sqrt{1+\cot^2\theta}$

We get,

$\sec\theta = \frac{\sqrt{9x^2+4y^2}}{3x}$ & $\text{cosec}\theta = \frac{\sqrt{9x^2+4y^2}}{2y}$

Putting these values in given equation

$3x\ sec\,\theta - y\ cosec\,\theta - 1 = 0$

$\Rightarrow 3x \times \frac{\sqrt{9x^2+4y^2}}{3x} - y \times \frac{\sqrt{9x^2+4y^2}}{2y} = 1$

$\Rightarrow \frac{\sqrt{9x^2+4y^2}}{2} = 1 \Rightarrow \sqrt{9x^2+4y^2} = 2$

$\Rightarrow 9x^2 + 4y^2 = \mathbf{4}$

63. (C)

	A : B	A : B
Initial	$(4 : 3)_{\times 5}$	$\Downarrow$ 20 : 15 $\}$ +13
Final	$(5 : 7)_{\times 4}$	$\Downarrow$ 20 : 28 $\}$

ATQ,

13 units = 26

1 unit = 2

and, (20 + 28) units = 48 × 2 = 96

∴ Required amount of mixture = 96 litre.

64. (A)

	Speeds	Length
A	9	5
B	4	12

Required ratio $\Rightarrow \frac{5}{9} : \frac{12}{4} \Rightarrow \frac{5}{9} : 3 \Rightarrow$ **5 : 27**

65. (B)

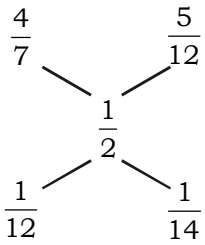
5	500
5	100
5	20
	4

Required number of zeros

= 100 + 20 + 4 = **124**

66. (C)

		Alcohol		Water
I.	Mixture	4	:	3
II.	Mixture	5	:	7



Ratio = $\frac{1}{12} : \frac{1}{14}$

14 : 12 = 7 : 6

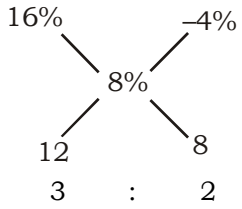
×5 ↓ ↓ ×5

35 30

Required quantity of mixture = **30 lit**

67. (D) Required sum $= \frac{900 \times 900}{1350} =$ **600**

68. (B) Using alligation method,



3 : 2

Required quantity of rice $= \frac{2}{5} \times 50 =$ **20 kg**

69. (A)

	Eff.	Time Taken	
A ↓	3	1 $\}$	2 = 36
B ↓	1	3 $\}$	

1 unit = 18 days.

Time taken by A to complete the work = **18 days**

70. (D) $(547)^{234} + (238)^{737}$

$\Rightarrow [(7)^4]^{58} \times 7^2 + [(8)^4]^{184} \times 8$

$\Rightarrow 1 \times 9 + 6 \times 8 \Rightarrow 9 + 48 = 57$

Unit digit = **7**

71. (B) LCM × HCF = Product of the numbers

Let HCF = x

then, LCM = $84x$

$x \times 84x = 12096$

$\Rightarrow x^2 = \frac{12096}{84} = 144$

$\Rightarrow x = 12$

HCF = 12 and LCM = 84×12

$84 \Rightarrow 1 \times 84$

3×28

$4 \times 21 \rightarrow$ Numbers are

$\Rightarrow \quad 12 \times 4 \;\&\; 12 \times 21$

$\Downarrow \qquad \Downarrow$

$48 \qquad 252$

72. (B) $30\% \Rightarrow \frac{13 \rightarrow \text{MRP} \times 5 = 65}{10 \rightarrow \text{CP} \times 5 = 50}$

$20\% \Rightarrow \frac{4 \rightarrow \text{SP} \times 13 = 52}{5 \rightarrow \text{MRP} \times 13 = 65}$

Profit = 52 – 50 = ₹2

2 units = 36 $\Rightarrow$ 1 unit = 18

$\therefore$ Required CP = 50 = 50×18 = ₹900

73. (B) $\frac{\text{Income}}{\text{Expenditure}} \rightarrow \frac{7:5}{25:17}$

Saving $\rightarrow$ 10,000 & 8000

Then, $\frac{7x - 10,000}{5x - 8000} = \frac{25}{17}$

$\Rightarrow \quad 119x - 170,000 = 125x - 200,000$

$\Rightarrow \quad 125x - 119x = 200,000 - 170,000$

$\Rightarrow \quad 6x = 30,000$

$\Rightarrow \quad x = 5,000$

Difference = $7x - 5x = 2x$

$= 2 \times 5000 = 10,000$

74. (C) Remainder in first case = 41

$41 = 21 \times 1 + 20$

Required Remainder = 20

75. (C) Downstream speed = $\frac{3}{\frac{45}{2}} \times 60$

$= \frac{6 \times 60}{45} = 8$ km/h

Upstream speed = 6 km/h

Speed of boat in still water

= (downstream speed + upstream speed)/2

$= \frac{(8+6)}{2} = 7$ km/h

76. (A) $\left.\begin{matrix} A \rightarrow 8 \\ B \rightarrow \frac{15}{2} \end{matrix}\right\rangle 120 \left\langle \begin{matrix} 15 \\ 16 \end{matrix}\right.$

Tank filled in $2\frac{1}{2}$ hours = $31 \times \frac{5}{2} = \frac{155}{2}$

Remaining = $120 - \frac{155}{2} = \frac{85}{2}$

Remaining tank is filled by A in

$\frac{85}{2 \times 15} = \frac{17}{6}$ hours

Total time = $\frac{5}{2} + \frac{17}{6} = \frac{32}{6} = 5\frac{1}{3}$ hours

77. (D) Price on cash down payment

$= 13500 \times \frac{92}{100} \times \frac{95}{100} =$ ₹11799

78. (B) $\left.\begin{matrix} P + Q \rightarrow 12 \\ Q + R \rightarrow 15 \end{matrix}\right\rangle 60 \left\langle \begin{matrix} 5 \\ 4 \end{matrix}\right.$

$\Rightarrow 12P + (Q + R)9 = 60$

$\Rightarrow 12P + 9 \times 4 = 60 \Rightarrow 12P = 60 - 36$

$P = 2$

Then, Q = 3

& R = 1

Time taken by P = $\frac{60}{2}$ = 30 days

Time taken by R = $\frac{60}{1}$ = 60 days

Difference = 60 – 30 = **30 days**

79. (D) $\frac{35}{43}$

80. (A) Ratio of males and females = 15 : 14

$\Rightarrow$ (15 + 14) units = 1,30,500

1 unit = 4500

No. of males = $4500 \times 15 = 67500$

No. of females = 4500

Illiterate male = $67500 \times \frac{36}{100} = 24300$

Illiterate female = $63000 \times \frac{52}{100} = 32760$

Total illiterate persons = 24300 + 32760

= **57060**

81. (D) ATQ,

$P_A \left[1 + \frac{r}{100}\right]^5 = P_B \left[1 + \frac{r}{100}\right]^7$

$\Rightarrow \quad \frac{P_A}{P_B} = \left(1 + \frac{r}{100}\right)^2$

Given, $r = 16\frac{2}{3}\% \Rightarrow \frac{50}{3}\%$

$\Rightarrow \quad \frac{P_A}{P_B} = \left(1 + \frac{50}{300}\right)^2$

$\Rightarrow \quad \frac{P_A}{P_B} = \frac{49}{36}$

(49 + 36) units = 10,285

$\Rightarrow$ 1 unit = 121

$P_A = 49 \times 121 = 5929$

$P_B = 36 \times 121 = 4356$

82. (A) Time taken to travel 20 km without any rest

$= \frac{20}{8} = 2.5$ hr.

Total number of stops in 20 km

$= 20 \times 2 - 1 = 39$

Time taken during rest

$= 39 \times 5 = 195$ min

Total time = 2 hr 30 min + 195 min

Required time taken = $\mathbf{5\frac{3}{4}}$ **hours**

83 (B) Let the number be x

ATQ,

$$\frac{5x}{4} - \frac{4x}{5} = 54$$

$$\Rightarrow \frac{25x - 16x}{20} = 54 = \frac{9x}{20} = 54 = x = \mathbf{120}$$

84. (B) $A \rightarrow 1000$ m $\quad B \rightarrow 800$

and,

$B \rightarrow 950$ m $\quad C \rightarrow 700$

A : B : C = 160 : 152 : 133

If A travels 160 m, then C travels 133 m when A travels 750 m than C will travel

$\frac{133}{160} \times 750 = 623$ approx.

A will beat C by 750 – 623 = **127 approx.**

85. (D) Let the fraction be $\frac{x}{x+9}$

$$\frac{x+7}{x+9+8} = \frac{3}{5} \Rightarrow \frac{x+7}{x+17} = \frac{3}{5}$$

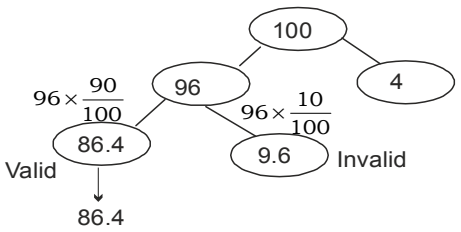
$\Rightarrow 5x + 35 = 3x + 51$

$\Rightarrow 2x = 16$

$\Rightarrow x = 8$

$\therefore$ Fraction = $\frac{8}{8+9} = \frac{8}{17}$

86. (B)



Winning candidate = 45%

Losing candidate = 86.4-45 = 41.4

Difference = 45-41.4 = 3.6

$\Rightarrow$ 3.6 units = 720

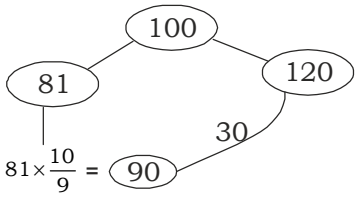
$\Rightarrow$ 1 unit = $\frac{720}{3.6}$

$\Rightarrow$ 100 units = $\frac{720}{3.6} \times 100$

= 20000

$\therefore$ Number of total voters = 20,000

87. (A)



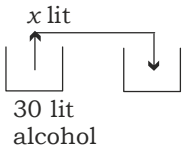
30 units = 150

$\Rightarrow$ 1 unit = 5

$\Rightarrow$ 100 units = 100 × 5 = 500

CP of article = ₹ 500

88. (A)



I container →

Remaining alcohol = $30 - x$

II container →

Alcohol → x

Water → $30 - x$

After second drawn

I container →

$$\text{Alcohol} \rightarrow (30 - x) + \frac{x^2}{30}$$

$$\text{Water} \rightarrow (30 - x)\frac{x}{30} = x - \frac{x^2}{30}$$

II container →

$$\text{Alcohol} \rightarrow x - \frac{x^2}{30}$$

$$\text{Water} \rightarrow (30 - x) - \left(x - \frac{x^2}{30}\right)$$

After third drawn

I container →

$$\text{Alcohol} \rightarrow \left(30 - x + \frac{x^2}{30}\right) \times \frac{9}{14}$$

$$= \left(\frac{75}{7}\, lit\ mixture = \frac{5}{14}\, of\ total\ mix.\right)$$

II container →

$$\text{Alcohol} = \left(x - \frac{x^2}{30}\right) + \frac{5}{14}\left[30 - x + \frac{x^2}{30}\right]$$

alcohol and I and II container are equal then

$$\left(30 - x + \frac{x^2}{30}\right)\frac{4}{7} = x - \frac{x^2}{30}$$

$$\Rightarrow \quad 60 - 2x + \frac{2x^2}{30} = 7x - \frac{7x^2}{30}$$

$$\Rightarrow \quad \frac{9x}{30} - 9x + 60 = 0$$

$$\Rightarrow \quad 3x^2 - 90x + 600 = 0$$

$$\Rightarrow \quad x = 10$$

89. (B) P = 16000/-

$r = 20\% = \frac{20}{4} = 5\%$ quarterly

$n = 9$ months $= \frac{9}{3} = 3$

$$A = P\left[1 + \frac{r}{100}\right]^n = 16000 \times \left[1 + \frac{5}{100}\right]^3$$

$$= 16000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = 18522$$

Required interest = 18522 – 16000 = ₹ 2522

90. (B) Area of the triangle

$= \frac{4}{3} \times$ **[Area of the triangle formed by the medians]**

$$= \frac{4}{3} \times \left(\frac{1}{2} \times 6 \times 8\right)$$

$= 32\ cm^2$

91. (B) Average no. of Male teachers

$$= \frac{180}{4} = 45$$

Average no. of Female teachers

$$= \frac{240}{4} = 60$$

Required difference = 60 – 45
= 15

92. (C) Female teachers of C = 90
total teachers of D = 80

$$\text{Required percentage} = \frac{90}{80} \times 100$$

= **112.5%**

93. (A) Let the number of Female teachers be x
ATQ, $100 - x = 80 + x$
$2x = 20 \Rightarrow x =$ **10**

94. (D) Relative speed
= 84 + 57 = 141 km/h
Distance travelled

$= 36 \times 141 \times \frac{5}{18} = 1410$ m

Length of train $\times \frac{3}{2} = 1410$

Length of train $= \frac{1410 \times 2}{3} = 940$ m

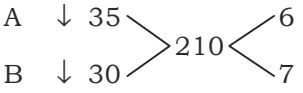
Distance travelled by train in 108 sec.

$= 108 \times 84 \times \frac{5}{18} = 2520$ m

Length of bridge = 2520 – 940 = **1580**

95. (B) Ratio of coins = 3 : 5 : 7
Ratio of amount
ATQ, = 3 × 100 : 5 × 50 : 7 × 25
i.e., 3 × 4 : 5 × 2 : 7 × 1
= 12 : 10 : 7
12 + 10 + 7 ⇒29 units = ₹1450
1 unit = ₹ 50
10 unit = ₹ 500
Number of coins of 50 paise
= 2 × 500 = **1000**

96. (C)

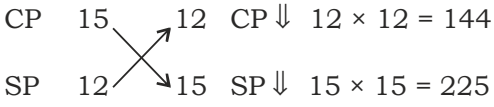


Work done by A in 9 days = 9 × 6 = 54 units
Remaining work = 210 – 54 = 156 units
156 units work done by A and B together

$= \frac{156}{6+7} = 12$ days

∴ Required number of days = **12 days**

97. (B)



Profit % $= \frac{225 - 144}{144} \times 100 =$ **56.25%**

98. (C) We know that
If a + b + c = 0 then $a^3 + b^3 + c^3 = 3abc$
ATQ,
$(x - 3) + (y - 4) + (z - 5) = 0$
then, $(x-3)^3 + (y-4)^3 + (z-5)^3$
= $\mathbf{3(x-3)(y-4)(z-5)}$

99. (D) We know that,
$a^3 + b^3 = (a + b)^3 - 3ab(a + b)$
$\Rightarrow \quad 1395 = (15)^3 - 3ab \times 15$
$\Rightarrow \quad 93 = 225 - 3ab$
$\Rightarrow \quad 3ab = 132$
$\Rightarrow \quad ab = 44$
Numbers are 11 and 4
Required difference = 11 – 4 = 7

100. (B) ATQ,
16 SP – 16 CP = 4 SP
$\Rightarrow$ 16 CP = 12 SP

$$\Rightarrow \quad \frac{CP}{SP} = \frac{12}{16}$$

Profit % $= \frac{4}{12} \times 100 =$ **33** $\frac{1}{3}$ %