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SSC TIER II (MATHS) MOCK TEST - 25 (ANSWER KEY)

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

SSC TIER II (MATHS) MOCK TEST - 25 (SOLUTION)

1. (D) Using options,
$60 \times 60 = ₹\ 3600$
and, $60 \times 60 = 3600$ paise
Total collection = 3600 + 36 = 3636
$\therefore$ Required number of members = 60

2. (A) Remainder = 56
$$\text{Quotient} = \frac{3}{7} \times 56 = 24$$
$$\text{and, Divisor} = \frac{3}{2} \times 56 = 84$$
Now, Dividend = divisor × quotient + remainder = 2072

3. (D) Remainder
$\Rightarrow 97 = 11 \times 8 + \underline{9}$

4. (C) A.T.Q.
3A = 2B and 4B = 5C
$$\Rightarrow \frac{A}{B} = \frac{2}{3} \text{ and } \frac{B}{C} = \frac{5}{4}$$

A	B	C
↓	↓	↓
2	3	**3**
5	5	4
10	15	12

(10 + 15 + 12) units
$\Rightarrow$ 37 units = 407
$$\Rightarrow 1 \text{ unit} = \frac{407}{37} = 11$$
$\therefore$ 2nd number = 15 × 11 = 165

5. (C) $50^2 - 49^2 + 48^2 - 47^2 + 46^2 ..... - 41^2$
Taking $50^2 - 49^2$
$= (50 + 49)(50 - 49) = 50 + 49$
i.e, the value of the expression will be equal to sum of the numbers from 41 to 50
= sum of first 50 terms - sum of first 40 terms
$$= \frac{50 \times 51}{2} - \frac{40 \times 41}{2} = 455$$

6. (A) Let the numbers be (a - d), a and (a + d)
sum $= a - d + a + a + d = 45$
$\Rightarrow 3a = 45$
$\Rightarrow a = 15$
Multiplication = (a – d) × a × (a + d)
= 3240
$\Rightarrow (15 - d) \times 15 \times (15 + d) = 3240$
$\Rightarrow 225 - d^2 = 216$
$\Rightarrow d^2 = 9$
$\Rightarrow d = 3$
$\therefore$ greatest number = 18

7. (A) Let the hours per day be x, to complete the work hours.
A.T.Q
$$\frac{8 \times 6}{120} = \frac{16 \times x}{280}$$
$\Rightarrow x = 7$

8. (A) $(4913)^{-\frac{1}{3}} \times (512)^{\frac{1}{3}} \times (289)^{\frac{1}{2}} \div (4096)^{\frac{1}{3}}$
$$= \frac{1}{17} \times 8 \times 17 \div 16 = \frac{1}{2}$$

9. (B) $\left.\begin{matrix} A + B \to 12 \\ B + C \to 9 \end{matrix}\right\rangle 36 \left\langle \begin{matrix} 3 \\ 4 \end{matrix}\right.$
[One third work is done by B & C in 3 days. Then complete work will be done in 9 days]
Now, ATQ.
(A + B) 6 + (B + C)2 – 2C + 7C = 36
$\Rightarrow$ 3 × 6 + 4 × 2 + 5C = 36
$\Rightarrow$ 5C = 10
$\Rightarrow$ C = 2
capacity of B = 4 – 2 = 2
capacity of A = 3 – 2 = 1
Time taken by A
$$\Rightarrow \frac{36}{1} = 36 \text{ days}$$

10. (B) Vinit $\rightarrow$ 15
Vinita $\rightarrow$ 20 $\Big\rangle$ 60 $\Big\langle_{3}^{4}$
Work done by Vinit & Vinita in 5 days
= (4 + 3) × 5 = 35
Remaining work = 60 – 35 = 25
This work has been done in 5 days.
So, the capacity of Chamindavash = $\frac{25}{5}$
= 5 Required time taken = $\frac{60}{5}$ = 12 days

11. (C)

	A	B	C	
	3	1.5	1	
	×2	×2	×2	
	⇓	⇓	⇓	
Capacity	6.	3	2	[capacity
Time	1	2	3	× time = constant]

A takes 12 days.
i.e, 1unit = 12
then 3 unit = 3 × 12 = 36 days.
C will take 36 days to complete the work.

12. (C) A $\rightarrow$ 12
B $\rightarrow$ 15 $\Big\rangle$ 60 $\Big\langle_{4}^{5}$
Work done by A & B in 4 days = (5 + 4) ×4
= 36
Remaining work = 60 – 36 = 24
Now, Capacity of A & C = $\frac{24}{3}$ = 8
and, Capacity of C = 8 – 5 = 3
time taken by C to complete the work
= $\frac{60}{3}$ = 20 days

13. (B) Let the no. be x,
$(x-7) : (x-9) :: (x-11) : (x-12)$
$\Rightarrow \frac{x-7}{x-9} = \frac{x-11}{x-12}$
$\Rightarrow x^2 - 12x - 7x + 84 = x^2 - 11x - 9x + 99$
$\Rightarrow -19x + 20x = 99 - 84$
$\Rightarrow x = 15$

14. (A) $\left(1+\frac{1}{x}\right)\left(1+\frac{1}{x+1}\right)\left(1+\frac{1}{x+1}\right).....\left(1+\frac{1}{x+23}\right)$
$= \frac{x+1}{x} \times \frac{x+2}{x+1} \times \frac{x+3}{x+2} ..... \frac{x+24}{x+23}$
$= \frac{x+24}{x}$

15. (C) A.T.Q,
$35\% \Rightarrow \frac{135}{100} \Rightarrow \frac{27 \rightarrow \text{MP}}{20 \rightarrow \text{CP}}$
15% discount $\Rightarrow \frac{85}{100} \Rightarrow \frac{17 \rightarrow \text{SP}}{20 \rightarrow \text{MP}}$

MP	CP	SP × 20
27	20	
20	17	× 27

We get CP = 400 and SP = 27 × 17
(27 × 17) units = 688.5
400 units = $\frac{688.5}{27\times17} \times 400$ = ₹600
∴ Required cost price = ₹600

16. (B) A.T.Q,
25 % = 54
$\Rightarrow 1\% = \frac{54}{25}$
$\Rightarrow 100\% = \frac{54}{25} \times 100 =$ **216**
∴ Required cost price = ₹216

17. (D) Price at which the person sold the article = $3000 - 3000 \times 6\frac{2}{3}\%$ = ₹2800
Profit = $16\frac{2}{3} = \frac{1}{6}$
7 units = 2800
6 units = $2800 \times \frac{6}{7}$ = 2400
∴ cost price = ₹2400
Discount% = $\frac{3000-2400}{3000} \times 100$
= $\frac{600}{3000} \times 100 = 20$

18. (A) A.T.Q,
$7x + 2x = 315$
$\Rightarrow 9x = 315$
$\Rightarrow x = 35$
Male workers = 245, Female workers = 70
After arrival of 15 male workers,
Male workers = 245 + 15 = 260

5	:	2
×52 ↓		↓ ×52
260		104

∴ required number of female workers
= 104 – 70 = 34

19. (B) Let the no's be $7x$, $5x$ & $9x$
A.T.Q,
$(7x)^2 + (5x)^2 + (9x)^2 = 5580$
$\Rightarrow x^2 [49 + 25 + 81] = 5580$
$\Rightarrow x^2 \times 155 = 5580$
$\Rightarrow x^2 = 36 \Rightarrow x = 6$
Difference between second and third number
= 4x = 4 × 6 = 24.

20. (A)

	Milk	Water				
I.	5	3 =	8	× 3 ×	1	
II.	2	1 =	3	× 8 ×	3	

to make the ratio 1 : 3

New ratio

	Milk	Water
I.	15	9
II.	48	24
	63	33

New ratio of milk & water = 63 : 33
= 21 : 11

21. (D) Let one part = x

then, other part = $\frac{3}{11}x$

Now, ATQ,

$x + \frac{3x}{11} = 210$

$\Rightarrow \frac{14x}{11} = 210$

$\Rightarrow x = \frac{210 \times 11}{14} = 165$

and $\frac{3x}{11} = \frac{3 \times 165}{11} = 45$

Required difference = 165 – 45 = 120 cms

22. (C)

	Copper	Aluminium		
I	alloy	5	7 ⇒	12
II	alloy	13	5 ⇒	18
	Mixture	5	4 ⇒	9

Using alligation method.

$\frac{5}{12}$ and $\frac{13}{18}$ → $\frac{5}{9}$

$\frac{13}{18} - \frac{5}{9} = \frac{3}{18}$, $\frac{5}{9} - \frac{5}{12} = \frac{5}{36}$

Ratio $\Rightarrow \frac{3}{18} : \frac{5}{36}$

$\Rightarrow 6 : 5$

23. (B) Let the capacity of container P be 100.

Quantity of milk in container R

$= \frac{100}{2} - 30\% \text{ of } \left(\frac{100}{2}\right) = 50 - 15 = 35$

Quanity of milk in Q = 100 – 35 = 65

to make equal quantity of milk in containers Q & R, quantity of milk taken out from Q = $\frac{65-35}{2} = 15$

then, 15 units = 31.5

1 unit = $\frac{31.5}{15}$

$\therefore$ Capacity of P = $\frac{31.5}{15} \times 100 = 210$ litres

24. (A) Let the average run after 12th innings be x.

Then average run in 11th innings is $x-2.5$

A.T.Q.

$11(x-2.5) + 48 = 12x$

$\Rightarrow 11x - 27.5 + 48 = 12x$

$\Rightarrow x = 48 - 27.5 = 20.5$

25. (D) Average speed = $\frac{2 \times a \times b}{a+b}$

$= \frac{2 \times 48 \times 36}{48+36} = 41\frac{1}{7}$ kms/h

26. (C) Mon. + Tue. + Wed. + Thr.
= 37 × 4 = 148 ..... (i)
Tue. + Wed. + Thr. + Fri
= 41 × 4 = 164 .....(ii)
From (i) and (ii),
Fri. – Mon. = 164 – 148 = 16
Temp. of Monday = 50 – 16 = 34°C

27. (C) Discount on gift = $12\frac{1}{2}\% = \frac{1}{8}$

S.P. → 7 → 945
M.P → 8 → $\frac{945}{7}$ = 1080

After returning the gift, the amount of money which Murari gets

= 1080 × $\frac{60}{100}$ = ₹ 648

Profit earned by shopkeeper = 945 – 648
= ₹ 297

28. (B) Required percentage

= $\frac{28}{100-28} \times 100 = \frac{28}{72} \times 100 = 38.88\%$

29. (A) Total distance

$= x + 2 \times \frac{x}{2} + 2 \times \frac{x}{4} + 2 \times \frac{x}{8} + \ldots\ldots$

$= 2\left[x + \frac{x}{2} + \frac{x}{4} \ldots . n\,times\right] - x$

$= 2\left[\frac{x\left(1 - \frac{1}{2^n}\right)}{1 - \frac{1}{2}}\right] - x$

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

$\Rightarrow 3x-\frac{x}{2^{n-2}}$

$\Rightarrow \boldsymbol{x\left[3-\frac{1}{2^{n-2}}\right]}$

30. (A) 5ft 10 inch = $5\frac{10}{12}=\frac{35}{6}$ ft (boys)

5ft 2 inch = $5\frac{2}{12}=\frac{31}{6}$ ft (girls)

5ft 8 inch = $5\frac{8}{12}=\frac{34}{6}$ ft (over all)

Using alligation method,

Boys $\frac{35}{6}$ Girls $\frac{31}{6}$

$\frac{34}{6}$

3 1

4 units = 120

3 units = $\frac{120}{3}\times 4 = 90$

$\therefore$ number of boys = 90

31. (B)

100

$-12\frac{1}{2}$ −8

87.5 92

$\downarrow$

$87.5\times\frac{115}{100}=100.625$

Difference = 100.625 – 92 = 8.625

Now, 8.625 units = 207

1 unit = $\frac{207}{8.625}$

$\therefore$ Required CP = $\frac{207}{8.625}\times 100 =$ **₹ 2400**

32. (D) 50 P 25P ₹1

Number $\rightarrow$ 15 10 8

Value $\rightarrow$ 7.5 2.5 8

Now, 18 units = 108

7.5 units = $\frac{108}{18}\times 7.5 = 45$

Now, Number of 50 paise coins

= 45 × 2 = 90

33. (C) Let the numbers be x and $x + 7$.

Now, ATQ,

$3(x+7) = 4x-8$

$\Rightarrow 3x+21 = 4x-8$

$\Rightarrow 4x-3x = 21+8 = 29$

$x = 29$

$\therefore$ Required number = $x + 7 = 36$

34. (B) A.T.Q,

$x^2-3x+1=0$

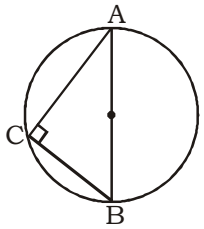
$\Rightarrow x^2+1=3x \Rightarrow x+\frac{1}{x}=3$

Taking cube both sides, we get

$\left(x+\frac{1}{x}\right)^3 = 3^3 \Rightarrow x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=27$

$\Rightarrow x^3+\frac{1}{x^3} = 27-3\times 3 = 18$

35. (B)



Given: AB = 37 m

and, AC – BC = 23 m

Let BC = x, AC = $23 + x$

Using pythagoras,

$x^2+(x+23)^2 = 37^2$

$\Rightarrow x^2+x^2+529+46x = 1369$

$\Rightarrow 2x^2+46x-840 = 0$

$\Rightarrow x^2+23x-420 = 0$

On solving we get, $x = 12$

36. (D) CP of 240 bananas = $\frac{40}{12}\times 240 = 800/-$

$18\frac{1}{8}\%$ profit $\Rightarrow \frac{145}{800}$

i.e., SP = 800 + 145 = 945

Remaining bananas = 240 – 30 = 210

Price per dozen = $\frac{945}{210}\times 12 = ₹54$

37. (A)

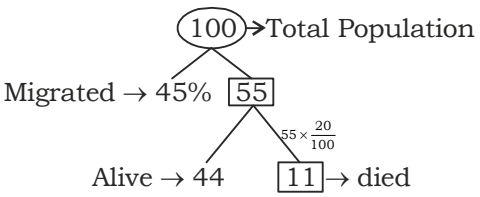
A	B	C	
20	17	17	← 15% Loss
6	6	7	← $16\frac{2}{3}\%$ Profit
120	102	119	

If A has sold it to B for 119/-

then, loss of by A

$= \frac{120-119}{120}\times 100 = \frac{100}{120}=\frac{5}{6}\%$

38. (C)



44 units = 1716

1 unit = $\frac{1716}{44}$

100 units = $\frac{1716}{44} \times 100 = 3900$

$\therefore$ original number of people = 3900

39. (B) Total distance = 270 kms

Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$= \frac{270}{4+3} = \frac{270}{7} = 38\frac{4}{7}$ kms/h

40. (B) Let the velocity of A be a km/h and, that of B be b km/h

A.T.Q,

$a + b = \frac{120}{6}$

$\Rightarrow a + b = 20$ kms/hr .....(i)

and, $\frac{3}{4}a + \frac{1}{2}b = \frac{120}{8}$

$\Rightarrow 3a + 2b = 60$ .....(ii)

On solving equation (i) and (ii) we get,

$a = 20$, $b = 0$

i.e., b doesn't move

$\therefore$ Difference between their speeds = 20 kms/h

41. (C) A + B $\rightarrow x$ days

A $\rightarrow x + 18$ days

B $\rightarrow x + 8$ days

A's one day work + B's one day work = (A + B)´s one day work

$\Rightarrow \frac{1}{x+18} + \frac{1}{x+8} = \frac{1}{x}$

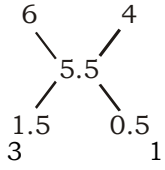
On solving we get $x = 12$

Time taken by A to complete the work = 12 + 18 = 30 days.

42. (A) Simple interest = $\frac{P \times r \times t}{100} \Rightarrow 1100$

$\therefore \frac{20000 \times r \times 1}{100} \Rightarrow r = \frac{11}{2} = 5.5\%$

Using alligation,



$\therefore$ Required amount = $\frac{20,000}{4} \times 3 = ₹15,000$

43. (B) Let the speed of her vehicle be x kms/h

A.T.Q,

$\frac{300}{x} - \frac{300}{x+25} = 2$

On solving, we get $x = 50$ kms/h

44. (B) 585 Changed into 325

i.e, 325 $\longrightarrow$ 585

1 $\longrightarrow \frac{585}{325}$

500 $\longrightarrow \frac{585}{325} \times 500 = 900$

$\therefore$ maximum marks = 900

45. (A) A B

20,000 × 3 35,000 × 8

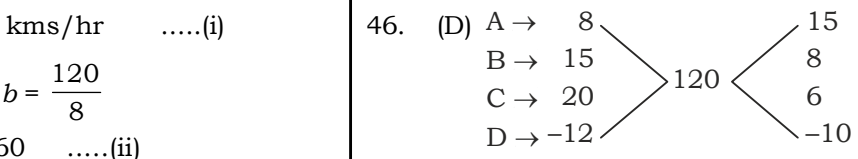
+ 25000 × 9 + 25000 × 4

$\Downarrow$ $\Downarrow$

285,000 380,000

Ratio = 285,000 : 380,000 = 3 : 4

46. (D)



A + C $\rightarrow$ 21

and, B + D $\rightarrow$ 8 – 10 = –2

i.e, 19 unit cistern is filled in 2 hours

×6 ×6

↓ ↓

114 12

Remaining 6 units will be filled in $\frac{6}{21}$ hours.

Total time = $12\frac{2}{7}$ hours

47. (C) Difference between compound interest and simple interest for 3 years

$= P\left[\frac{r}{100}\right]^2\left[3 + \frac{r}{100}\right]$

$\Rightarrow P\left[\frac{5}{100}\right]^2 \times \left[3 + \frac{5}{100}\right] = 122$

On solving we get,

P = ₹ 16,000

48. (A) Ratio of salaries $\Rightarrow$ 3 : 4 : 5

After increment

$\Rightarrow 3 \times \frac{110}{100} : 4 \times \frac{120}{100} : 5 \times \frac{125}{100}$

On simplification,

Ratio $\Rightarrow$ 66 : 96 : 125

49. (B) Let the length of the race x m.

A	B	C
x	$x-12$	$x-20$
x	$x-10$	

Ratio of B's distance and C's distance should be equal.

$$\frac{x-12}{x}=\frac{x-20}{x-10}$$

$\Rightarrow x^2-22x+120=x^2-20x$

$\Rightarrow 2x=120$

$\Rightarrow x=60$ m

50. (B) $\frac{P\times r\times 3}{100}=648$

$\frac{P\times r}{100}=216$ .....(i)

Now compound interest for 2 years

$$\Rightarrow P\left[\left(1+\frac{r}{100}\right)^2-1\right]=449.28$$

$$\Rightarrow P\left[\left(1+\frac{r}{100}+1\right)\left(1+\frac{r}{100}-1\right)\right]=449.28$$

$$\Rightarrow P\left(2+\frac{r}{100}\right)\left(\frac{r}{100}\right)=449.28$$

On putting $\frac{Pr}{100}=216$,

$$2+\frac{r}{100}=\frac{449.28}{216}$$

$$\Rightarrow \frac{r}{100}=\frac{17.28}{216}\Rightarrow r=\frac{1728}{216}=8\%$$

51. (C) Circumradius (R) $=\frac{2h}{3}$

$$\Rightarrow\frac{2h}{3}=24\sqrt{3}\Rightarrow h=36\sqrt{3}$$

and, we know that $h=\frac{\sqrt{3}}{2}a$

$$\Rightarrow\frac{\sqrt{3}}{2}a=36\sqrt{3}\Rightarrow a=72$$

Area $=\frac{\sqrt{3}}{4}\times72\times72=1296\sqrt{3}$ cm^2

52. (A) Given, $h=r+8$

and, $2\pi r(h+r)=330$

$$\Rightarrow 2\times\frac{22}{7}\times r[r+8+r]=330$$

$$\Rightarrow r[2r+8]=\frac{330\times7}{22\times2}$$

$$\Rightarrow 2r^2+8r=\frac{105}{2}$$

$\Rightarrow 4r^2+16r-105=0$

On solving, we get $r=3.5$

Now, volume $=\pi r^2 h$

$$=\frac{22}{7}\times3.5\times3.5\times11.5=442.75\text{ cm}^3$$

53. (C) When a sphere is cut into 4 equal parts, Surface Area of each part

$$=\pi r^2+\frac{\pi r^2}{2}+\frac{\pi r^2}{2}=2\pi r^2$$

Total surface area of 4 parts

$=4\times2hr^2=8\pi r^2$

Total change $=\frac{8-4}{4}\times100=100\%$

54. (D) Ratio of sides $\Rightarrow \frac{1}{3}:\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$

$$\Rightarrow \frac{20}{60}:\frac{15}{60}:\frac{12}{60}:\frac{10}{60}$$

$\Rightarrow 20:15:12:10$

Now, (20 + 15 + 12 + 10) units = 171

1 unit = 3

10 units = 30

$\therefore$ Length of smallest side = 30 cm

55. (A) Volume of the prism

= area of the base × height

$$=\left(\frac{\sqrt{3}}{4}\times6\times6\right)\times6\times15=810\sqrt{3}\text{ cm}^3$$

56. (B) Let the radius of the ball be r cm

A.T.Q

$$\Rightarrow \frac{4}{3}\pi r^3=\pi(R^2-r^2)h$$

$$\Rightarrow \frac{4}{3}r^3=[(8.25)^2-(6.75)^2]\times25$$

$$\Rightarrow \frac{4}{3}r^3=(8.25-6.75)(8.25+6.75)\times25$$

$$\Rightarrow r^3=\frac{3}{4}\times1.5\times15\times25$$

$\Rightarrow r=7.5$ cm

57. (A) Circumference of the circular field

$$=\frac{2376}{27}=88\text{ m}\Rightarrow 2\pi r=88$$

$$\Rightarrow 2\times\frac{22}{7}\times r=88\Rightarrow r=14\text{ m}$$

Area of the circular track

$\Rightarrow \pi(R^2-r^2)$ $[\because R=r+3.5]$

$$\Rightarrow \frac{22}{7}[R-r][R+r]$$

$$=\frac{22}{7}\times3.5\times17.5=192.5\text{ m}^2$$

Total cost = 192.5 × 50 = ₹ 9625

58. (B) Curved surface area of cone
= Curved surface area of cylinder

$\pi r_1 l = 2\pi r_2 h \Rightarrow r_1\sqrt{h^2 + r_1^2} = 2r_2 h$

On squaring both sides

$r_1^2(h^2 + r_1^2) = 4r_2^2h^2$

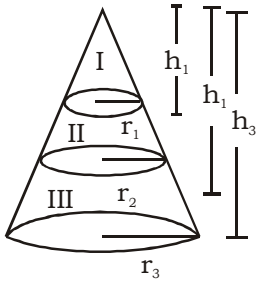
$\Rightarrow r_1^2h^2 + r_1^4 = 4r_2^2h^2$

$\Rightarrow h^2(4r_2^2 - r_1^2) = r_1^4$

$\Rightarrow h^2 = \frac{r_1^4}{4r_2^2 - r_1^2} \Rightarrow h = \frac{r_1^2}{\sqrt{4r_2^2 - r_1^2}}$

59. (B) S cube > S cylinder > S sphere

60. (D)



When a cone is cut by the plane parallel to its axis then ratio of radius and height remains the same.

i.e, $\frac{r_1}{h_1} = \frac{r_2}{h_2} = \frac{r_3}{h_3}$

$\Rightarrow r_1 : r_2 : r_3 = 1 : 2 : 3$ and $h_1 : h_2\ h_3 = 1 : 2 : 3$

Area of I part = $1^2 \times 1 = 1$

Area of I + II part = $2^2 \times 2 = 8$

Area of I + II + III part = $3^2 \times 3 = 27$

Area of I part = 1

Area of II part = 8 – 1 = 7

Area of III part = 27 – 8 = 19

$\therefore$ Required ratio = 1 : 7 : 19

61. (B) Given, $\frac{n_1}{n_2} = \frac{4}{5}$

and, ratio of interior angles = 15 : 16

Then, $\frac{\frac{(n_1 - 2)\times 180^\circ}{n_1}}{\frac{(n_2 - 2)\times 180^\circ}{n_2}} = \frac{15}{16}$

$\Rightarrow \frac{n_1 - 2}{n_2 - 2} = \frac{15}{16} \times \frac{4}{5} = \frac{3}{4}$

Let, $n_1 = 4a$ and $n_2 = 5a$

$\frac{4a - 2}{5a - 2} = \frac{3}{4} \Rightarrow 16a - 8 = 15a - 6$

$\Rightarrow a = 2$

$\therefore n_1 = 8$ and $n_2 = 10$

62. (C) Total surface area of the prism= 560 m^2

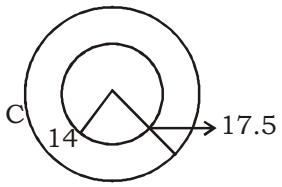
$\Rightarrow$ 2(area of base) + $n \times$ (face area) = 560

$\Rightarrow 2 \times 120 + n \times 40 = 560$

$\Rightarrow 40\ n = 560 - 240 = 320$

$\Rightarrow n = \frac{320}{40} = 8$

63. (D)



Let the height of the embankment be h metre

A.T.Q

Volume of soil on embankment
= volume of soil taken out from well.

$\Rightarrow \pi(R^2 - r^2)h = \pi r^2 h$

$\Rightarrow \pi(17.5^2 - 14^2) \times h = \pi \times 14 \times 14 \times 35$

$\Rightarrow h \times 31.5 \times 3.5 = 14 \times 14 \times 35$

$\Rightarrow h = \frac{14 \times 14 \times 35}{31.5 \times 3.5} = 62.22$ m

64. (A) Let the radius of hemisphere be r_1 and that of sphere be r_2.

Volume of hemisphere and sphere are equal

i.e., $\frac{2}{3}\pi r_1^3 = \frac{4}{3}\pi r_2^3$

$\Rightarrow r_1^3 = 2r_2^3$

$\Rightarrow \left(\frac{r_1}{r_2}\right)^3 = 2 \Rightarrow \frac{r_1}{r_2} = \frac{\sqrt[3]{2}}{1}$

Required ratio = $\sqrt[3]{2}$ **: 1**

65. (D) $(x + 2)^2 = 16$

$\Rightarrow x + 2 \Rightarrow \pm 4$

$\Rightarrow x = 2$ and -6

$(y + 1)^2 = 25$

$\Rightarrow y + 1 = \pm 5 \Rightarrow y = 4$ and 6

Maximum value = $\frac{-6}{-6} = 1$

Minimum value = $\frac{-6}{4} = \frac{-3}{2}$

$\therefore$ Required difference

$= 1 - \left(-\frac{3}{2}\right) = 1 + \frac{3}{2} = 2.5$

66. (B) $x^2 + y^2 + z^2 = 4x + 6y - 13$

$\Rightarrow x^2 + y^2 + z^2 - 4x - 6y + 13 = 0$

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

$\Rightarrow$ i.e., $x = 2$, $y = 3$, $z = 0$

$\Rightarrow x + y + z = 2 + 3 + 0 = 5$

67. (B) $x^2 - \sqrt{3}x + 1 = 0$

$x^2 + 1 = \sqrt{3}x$

On dividing by x on both sides

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

Taking cube of both the sides,

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

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

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

$\Rightarrow x^6 + 1 = 0$

$\Rightarrow x^6 = -1$

On putting $x^6 = -1$ in the equation

$(x^6)^4 + (x^6)^3 + (x^6)^2 + x^6 + 1$

$= (-1)^4 + (-1)^3 + (-1)^2 + (-1) + 1$

$= 1 - 1 + 1 - 1 + 1 = 1$

68. (A) $a^3 + b^3 + c^3 - 3abc$

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

$= \frac{1}{2}[471 + 472 + 473][(-1)^2 + (-1)^2 + 2^2]$

$= \frac{1}{2} \times 6 \times 1416$

$= 4248$

69. (C) $x = \frac{\sqrt{a+1} + \sqrt{a-1}}{\sqrt{a+1} - \sqrt{a-1}}$

Applying C and D method,

$\frac{x+1}{x-1} = \frac{\sqrt{a+1}}{\sqrt{a-1}}$

On squaring both sides

$\frac{(x+1)^2}{(x-1)^2} = \frac{a+1}{a-1}$

Again, applying C and D method

$\frac{2(x^2 + 1^2)}{4x} = a$

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

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

$\Rightarrow x(x - 2a) = -1$

70. (B) $a = 3 + 2\sqrt{2}$

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

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

& $ab = 1$

$\frac{a^2}{b} + \frac{b^2}{a} = \frac{a^3 + b^3}{ab} = \frac{(a+b)^3 - 3ab(a+b)}{ab}$

On putting the values of (a + b) & ab

$= \frac{(6)^3 - 3 \times 1 \times 6}{1} = 216 - 18 = 198$

71. (A) Let $3^x = 5^y = 15^z = k$

Then,

$3 = k^{\frac{1}{x}}$ .....(i)

$5 = k^{\frac{1}{y}}$ .....(ii)

$15 = k^{\frac{1}{z}}$ .....(iii)

Multiply (i) & (ii)

$3 \times 5 = k^{\frac{1}{x}} \times k^{\frac{1}{y}}$

$\Rightarrow 15 = k^{\frac{1}{x} + \frac{1}{y}}$

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

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

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

$\Rightarrow zx + zy = xy$

$\Rightarrow z(x + y) - xy = 0$

72. (A) $\frac{a+b}{\sqrt{ab}} = \frac{4}{1} \Rightarrow \frac{a+b}{2\sqrt{ab}} = \frac{2}{1}$

On applying componendo and dividendo,

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

$\frac{(\sqrt{a} + \sqrt{b})^2}{(\sqrt{a} - \sqrt{b})^2} = \frac{3}{1}$

On taking square root both the sides

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

Again, applying componendo and dividendo, $\frac{\sqrt{a}}{\sqrt{b}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$

On squaring both sides,

$\frac{a}{b} = \frac{4 + 2\sqrt{3}}{4 - 2\sqrt{3}} = \frac{2 + \sqrt{3}}{2 - \sqrt{3}}$

73. (D) $\cos\theta + \cos^2\theta + \cos^3\theta = 1$

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

$\Rightarrow \cos\theta(1 + \cos^2\theta) = \sin^2\theta$

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

On squaring both sides,

$\cos^2\theta(2 - \sin^2\theta)^2 = \sin^4\theta$

$\Rightarrow (1 - \sin^2\theta)\,(4 + \sin^4\theta - 4\sin^2\theta) = \sin^4\theta$

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

$\Rightarrow \sin^6\theta - 4\sin^4\theta + 8\sin^2\theta = 4$

74. (B) LCM of 15, 18, 21 and 24

= 2520

2520 × 1 – 9 = 2511 (Not divisible by 43)

2520 × 2 – 9 = 5031 (divisible by 43)

$\therefore$ Required number = ₹5031

75. (A) $\tan(A + B) = \dfrac{\tan A + \tan B}{1 - \tan A \tan B}$

Here, $\tan (A + B) = \tan (180° - C)$

$= -\tan C$

and, $-\tan C = \dfrac{\tan A + \tan B}{1 - \tan A \tan B}$

$\Rightarrow \tan A + \tan B = -\tan C + \tan A.\tan B.\tan C$

$\Rightarrow \tan A + \tan B + \tan C = \tan A.\tan B.\tan C$

76. (B) In triangles, equilateral triangle has the maximum area

Perimeter = 18 cm

Each side = $\dfrac{18}{3}$ = 6 cm

Area = $\dfrac{\sqrt{3}}{4}a^2 = \dfrac{\sqrt{3}}{4} \times 6 \times 6 = 9\sqrt{3}$ cm²

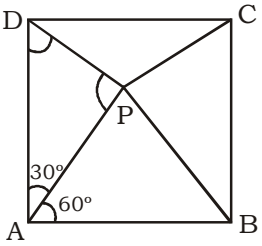
77. (B) No. of diagonals of a polygon

$= \dfrac{n(n-3)}{2} \Rightarrow \dfrac{n(n-3)}{2} = 90$

On solving, we get n = 15

$\therefore$ Required number of sides = 15.

78. (C)



$\angle BAD = 90°$

[$\because$ ABCD is a square]

and, $\angle PAB = 60°$

[$\because$ PAB is an equilateral triangle]

$\angle DAP = 90° - 60° = 30°$

and, $\angle APD = 75°$ [$\because$ AP = AD]

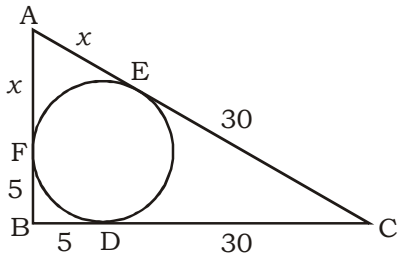
Similarly, $\angle BPC = 75°$

$\angle DPC = 360° - [75° + 75° + 60°] = 150°$

79. (D) FB = BD

DC = EC and

AE = AF



In Δ ABC,

Using pythagoras,

$(x + 5)^2 + 35^2 = (30 + x)^2$

$\Rightarrow x^2 + 25 + 10x + 1225 = 900 + x^2 + 60x$

$\Rightarrow 50x = 350$

$\Rightarrow x = 7$

So, AB = 12, BC = 35, AC = 37

Inradius of circle = $\dfrac{12 + 35 - 37}{2}$ = 5 cm

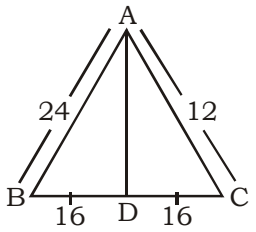
Area = $\pi r^2 = 25\pi$ cm²

and,

Area of triangle = $\dfrac{1}{2} \times b \times h$

= $\dfrac{1}{2} \times 12 \times 35 = 210$ cm²

80. (B)



Using appolonius theorem,

$\Rightarrow AB^2 + AC^2 = 2(AD^2 + BD^2)$

$\Rightarrow 24^2 + 12^2 = 2(AD^2 + 16^2)$

$\dfrac{576 + 144}{2} = AD^2 + 256$

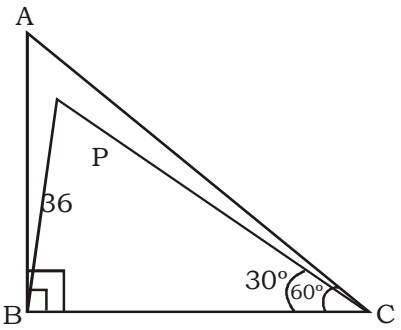
$\Rightarrow 360 - 256 = AD^2$

$\Rightarrow AD^2 = 104$

$\Rightarrow AD = 2\sqrt{26}$ cm

81. (B) $\sec^4A - \sec^2A = 1$
$\Rightarrow \sec^2A(\sec^2A - 1) = 1$
$\Rightarrow (1 + \tan^2A)\tan^2A = 1$
$\Rightarrow \tan^2A + \tan^4A = 1$

82. (A)



Here BP is the height of house
In Δ BPC,

$$\tan30^\circ = \frac{36}{BC}$$

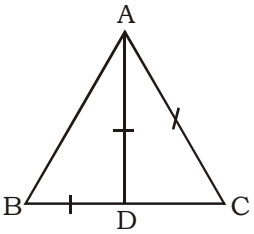
$$\frac{1}{\sqrt{3}} = \frac{36}{BC} \Rightarrow BC = 36\sqrt{3}$$

In Δ ABC,

$$\tan60^\circ = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{AB}{36\sqrt{3}}$$

$\Rightarrow$ AB = 108 m
$\therefore$ Length of house = 108

83. (B)



Using Appolonius theorem
$AB^2 + AC^2 = 2(AD^2 + BD^2)$
$\Rightarrow AB^2 + AC^2 = 2(AC^2 + AC^2)$
$\Rightarrow AB^2 = 3AC^2$

$$\Rightarrow \frac{AB}{AC} = \frac{\sqrt{3}}{1}$$

and, AB : AC = $\sqrt{3}$: 1

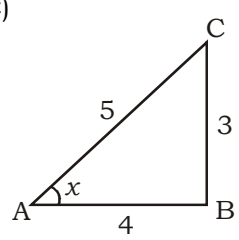
84. (A) Area of the quadrilateral

$= \frac{1}{2}\times$ Product of diagonals $\times$ (sine of angle between them)

$$= \frac{1}{2} \times 24 \times 18 \times \sin45$$

$$= \frac{1}{2} \times 24 \times 18 \times \frac{1}{\sqrt{2}} = 108\sqrt{2}\ cm^2$$

85. (C)



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

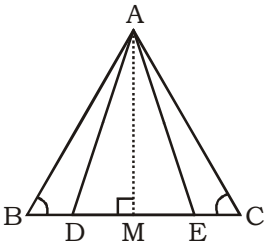
$$\frac{\sin x + \tan x}{\cos x + \cot x}$$

$$= \frac{\frac{3}{5} + \left(\frac{-3}{4}\right)}{\left(\frac{-4}{5}\right) + \left(\frac{-4}{3}\right)}$$

$$= \frac{\frac{-3}{20}}{\frac{-32}{15}} = \frac{15 \times 3}{20 \times 32} = \frac{9}{128}$$

86. (B) We know that
$\angle BAT = \angle BCA$
and, $\angle BAT + \angle BCA = 90$
$\Rightarrow 2\angle BAT = 90^\circ$
$\Rightarrow \angle BAT = 45^\circ$

87. (A)



BC = 12 cm

$$DE = \frac{12}{3} = 4\ cm$$

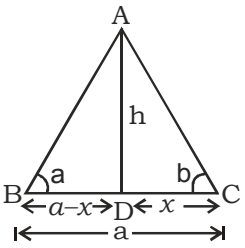
$$ME = \frac{4}{2} = 2\ cm$$

Height of equilateral triangle

$$AM = \frac{\sqrt{3}}{2} \times a = \frac{\sqrt{3}}{2} \times 12 = 6\sqrt{3}\ cm$$

In Δ AME,
$AE^2 = AM^2 + ME^2$
$AE^2 = (6\sqrt{3})^2 + 2^2$
$AE^2 = 108 + 4 = 112$
$AE = 2\sqrt{23}$ cm
Perimeter of Δ ADE = AD + AE + DE
$= 2\sqrt{23} + 2\sqrt{23} + 4 = 4[\sqrt{23} + 1]$cm

88. (B)



In ΔABD,

$\tan\alpha = \frac{h}{a-x}$

$\Rightarrow a - x = \frac{h}{\tan\alpha}$ ....(i)

In ΔADC,

$\tan\beta = \frac{h}{x}$

$\Rightarrow x = \frac{h}{\tan\beta}$ .....(ii)

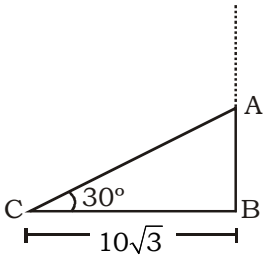
On adding equation (i) & (ii), we get

$a = \frac{h}{\tan\alpha} + \frac{h}{\tan\beta}$

$h\left(\frac{\tan\alpha+\tan\beta}{\tan\alpha\tan\beta}\right)$

$\Rightarrow h = \frac{a\tan\alpha.\tan\beta}{\tan\alpha+\tan\beta}$

89. (C)



In ΔABC,

$\tan 30° = \frac{AB}{10\sqrt{3}}$

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

$\Rightarrow AB = 10m$

and, $\sin 30° = \frac{AB}{AC}$

$\Rightarrow \frac{1}{2} = \frac{AB}{AC}$

$\Rightarrow AC = 20m$

length of tree = AB + AC = 30m

90. (B) $x = \sqrt{2} - 1$

then, $\frac{1}{x} = \sqrt{2} + 1$

$x + \frac{1}{x} = 2\sqrt{2}$ and $x - \frac{1}{x} = -2$

According to the question,

$$\frac{x^2+5x+1}{x^2+3x-1} = \frac{x+\frac{1}{x}+5}{x-\frac{1}{x}+3} = \frac{2\sqrt{2}+5}{-2+3} = 2\sqrt{2}+5$$

91. (A) $3\cos^2\theta - 2\sqrt{3}\sin\theta\cos\theta - 3\sin^2\theta = 0$

$\Rightarrow 3\cos^2\theta - 3\sqrt{3}\sin\theta\cos\theta + \sqrt{3}\sin\theta\cos\theta - 3\sin^2\theta = 0$

$\Rightarrow 3\cos\theta(\cos\theta - \sqrt{3}\sin\theta) + \sqrt{3}\sin\theta(\cos\theta - \sqrt{3}\sin\theta) = 0$

$\Rightarrow (3\cos\theta + \sqrt{3}\sin\theta)(\cos\theta - \sqrt{3}\sin\theta) = 0$

$\Rightarrow \cos\theta = \sqrt{3}\sin\theta$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$

$\theta = 30°$

92. (D) $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} .... + \frac{1}{\sqrt{15}+\sqrt{16}}$

On rationalization,

$\sqrt{2}-1+\sqrt{3}-\sqrt{2}+\sqrt{4}-\sqrt{3}+.....+\sqrt{16}-\sqrt{15}$

$= \sqrt{16} - 1 = 4 - 1 = 3$

93. (A) $\frac{\sin x + \sin 2x}{1+\cos x+\cos 2x} = \frac{\sin x + 2\sin x\cos x}{1+\cos x+2\cos^2 x-1}$

$= \frac{\sin x(1+2\cos x)}{\cos x(1+2\cos x)} = \tan x$

94. (B) $\tan\theta + \cot\theta = 3$

On squaring both sides,

$\tan^2\theta + \cot^2\theta + 2\tan\theta.\cot\theta = 9$

$\Rightarrow \tan^2\theta + \cot^2\theta = 7$

Again squaring both the sides

$\tan^4\theta + \cot^4\theta + 2\tan^2\theta.\cot^2\theta = 49$

$\Rightarrow \tan^4\theta + \cot^4\theta$

$= 49 - 2 = 47$

95. (B) $\frac{(0.25)^3}{1-0.25} + \frac{(1-0.25)[1+0.25+(0.25)^2]}{1-0.25}$

$= \frac{(0.25)^3 + 1^3 - (0.25)^3}{1-0.25} = \frac{1}{1-0.25} = \frac{1}{0.75} = \frac{4}{3}$

96. (A) Population of village C in 2016

$= 5000 \times \frac{120}{100} = 6000$

Total population of village D & F
= 30 + 25 = 55

A.T.Q,

25% = 6000

$1\% = \frac{6000}{25}$

$55\% = \frac{6000}{25} \times 55 = 13200$

97. (C 100% = 25500

Then,

Sum of population of village A & B = 15%

$\Rightarrow 15\% = \frac{25500}{100} \times 15 = 3825$

98. (C) Given,

25% = 5000

1% = 200

Population of village E in 2016

$\Rightarrow 5\% = 5 \times 200 = 1000$

$16\frac{2}{3}\%$ decrease $\Rightarrow \frac{1}{6}$

$\therefore$ Required population

$= \frac{1000 \times 6}{5} = 1200$

99. (B) 100% subtends an angle of 360°

Then, angle subtended by 30%

$= \frac{360°}{100} \times 30 = 108°$

100. (A) Total population = 32400

Population of village B

$= \frac{32400}{100} \times 5 = 1620$

Population of village D

$= \frac{32400}{100} \times 25 = 8100$

2000 people come in village B

Then, Population of B = 1620 + 2000
= 3620

2000 people migrate from village D

Then, population of village D

= 8100 – 2000 = 6100

Difference = 6100 – 3620 = 2480