SSC MAINS - 25 (SOLUTION)

1. (D) $a = \sqrt{3+a}$

$a^2 = 3 + a$

$a^2 - a - 3 = 0$

$a = \frac{1 \pm \sqrt{1+12}}{2} = \frac{1 \pm \sqrt{13}}{2}$

$a = \frac{1-\sqrt{3}}{2} < 0$ (not possible)

or

$a = \frac{1+\sqrt{3}}{2} = \frac{1+3.6}{2} = \frac{4.6}{2} = 2.3$

$\therefore \quad 2 < a < 3$

2. (B)

3. (B) $\sqrt{2} = 1.414$ (given)

Now, $\frac{\sqrt{2}-1}{\sqrt{2}+1} = \frac{(\sqrt{2}-1)(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)} = \frac{(\sqrt{2}-1)^2}{2-1}$

$= (\sqrt{2}-1)^2$

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

$= 1.414 - 1$

$= 0.414$

4. (B) $\sqrt[3]{\sqrt{0.000064}} = \sqrt[3]{0.008} = 0.2$

5. (C) Size of each cask must be equal to greatest capacity. Hence, capacity of cask must be equal to the HCF of 403, 434 and 465.

Capacity of a cask = Required HCF i.e. 31

Required No. of cask $= \frac{403}{31} + \frac{434}{31} + \frac{465}{31}$

$= 13 + 14 + 15 = 42$

6. (B) Let the number be $29x$ and $29y$ respectively where x and y are prime to each other.

$\therefore$ LCM of $29x$ and $29y = 29xy$

Now, $29xy = 4147$

$\therefore \quad xy = 143 = 11 \times 13$

$\therefore$ Numbers are

$29 \times 11 = 319$ and $29 \times 13 = 377$

$\therefore$ Required sum $= 377 + 319 = 696$

7. (D) $\frac{3}{4} = \frac{3\times4}{4\times4} = \frac{12}{16}$, Similarly $\frac{3}{8} = \frac{6}{16}$

$\therefore \frac{6}{16}, \frac{7}{16}, \frac{8}{16}, \frac{9}{16}, \frac{10}{16}, \frac{11}{16}, \frac{12}{16}$

Required rational number $= \frac{9}{16}$

8. (B) Let the number be $= x$

ATQ,

$\frac{x}{5} + 4 = \frac{x}{4} - 10 \Rightarrow \frac{x}{4} - \frac{x}{5} = 10 + 4$

$\frac{5x-4x}{20} = 14$

$x = 20 \times 14 = 280$

9. (D) Unit place of $25^{6251} + 36^{528} + 73^{50}$

$= 5 + 6 + 9 = '0'$

10. (B) Let the number be

$100(2x) + 10y + x = 201x + 10y$ .....(i)

$\therefore \quad 2x + y + x = 18$

$\Rightarrow 3x + y = 18$ ..... (ii)

When the digits are reversed x

Number $= 100x + 10y + 2x$

$= 120x + 10y$ .....(iii)

$\therefore \quad 201x + 10y - 102x - 10y = 396$

$\Rightarrow \quad 99x = 396 \quad \Rightarrow \quad x = 4$

From equation (i)

$3 \times 4 + y = 18 \quad \Rightarrow \quad y = 18 - 12 = 6$

Required difference $= 2x - y = 2 \times 4 - 6 = 2$

11. (C) $\frac{W_1}{M_1D_1} = \frac{W_2}{M_2D_2}$

$\frac{1}{8\times12} = \frac{\frac{1}{2}}{12\times D_2}$

$D_2 = 4$ days

12. (B) ATQ,

$\frac{M+A+S}{3} = 11111$

$M + A + S = 33333$ ... (i)

$M - 11111 = 11111 - S$

$M + S = 22222$

So, value of property of Ambani

$= 33333 - 22222$

$= ₹11111$

13. (C) Total number of passengers $= 10 \times 20$

$= 200$

In 9 compartments the total number of passengers $= 12 + 13 + 14 + 15 + 16 + 17 + 18 + 19 + 20$

$= 144$

So, the number of passengers in 10th coach

$= 200 - 144$

$= 56$

14. (A) Let the initial amount of honey in the jar was k, then

$$512 = k\left(1-\frac{1}{4}\right)^4 \Rightarrow 512 = k\left(\frac{4}{5}\right)^4$$

$$k = \frac{512\times 625}{256} \Rightarrow k = 1250$$

Hence initially the honey in the jar = 1.25 kg

15. (B) Let Renuka age 8 year ago = 3
Now show is 4
3 → 4 1 unit = 8 years
3 × 8 = 24 years
Now 24 + 8 = 32 years

$$\text{Daughter's age} = \frac{32}{8} = 4 \text{ year}$$

16. (C) Let A writes = x pages
ATQ,

$$\frac{810}{x} - \frac{900}{x+21} = 3$$

$$810(x+21) - 900x = 3x(x+21)$$
$$x^2 + 21x + 300x - 270x - 5670 = 0$$
$$(x+105)(x-54) = 0$$
$$x = 54$$

So, A can write 54 pages.

17. (A) $P_1 = k\frac{T}{V}$

$$P_2 = k\frac{1.4T}{0.8} = k\frac{7T}{4V}$$

$$\text{Pressure \% increased} = \frac{P_2 - P_1}{P_1}\times 100$$

$$= \frac{\frac{7}{4}\frac{T}{V} - \frac{T}{V}}{\frac{T}{V}}\times 100$$

$$= \frac{\frac{3}{4}\frac{T}{V}}{\frac{T}{V}}\times 100$$

$$= 75\%$$

18. (A) CP : MP = 2 : 3
Let CP = 200, SP = 300
% profit : % discount = $3x : 2x$
ATQ,

$$\frac{3x}{100}\times 200 + \frac{2x}{100}\times 300 = 100$$
$$x = 8.33\%$$

Discount = $2x$ = 16.66%

19. (B) Let the MP = ₹1 per kg then

Weight	MP	Rate
100	100	1
96	$\frac{80}{SP}$	$\frac{80}{96}$

$$\text{Effective discount} = 1 - \frac{80}{96} = \frac{16}{96}$$

$$\% \text{ discount} = \frac{16}{96}\times 100 = 16.66\%$$

20. (D) Balance price to be paid in installments = 350
At the rate of r % per annum after 5 months, ₹ 350 will amount to

$$₹\left(350 + \frac{350\times 18\times 5}{12\times 100}\right) = \left(350 + \frac{1750\times 18}{1200}\right) \quad \ldots(i)$$

Total amount for 5 installments at the end of 5th month will be

$$₹\left[5x + \frac{18x}{1200}(1+2+3+4)\right] = 5x + \frac{180x}{200}$$

$$= \frac{6180x}{1200} \quad \ldots \text{(ii)}$$

From 1 and 2,

$$\left(350 + \frac{1750\times 18}{1200}\right) = \frac{6182x}{1200}$$
$$x = 73.06$$

21. (C) On the second year (in terms of CI) is

$$\frac{P\left(1+\frac{x}{100}\right)^2}{\left(P+\frac{Px}{100}\right)} = \frac{6}{5} \Rightarrow \left(1+\frac{x}{100}\right) = \frac{6}{5}$$

$$r = 20\%$$

22. (A) A + B + C = 100%
A + B = 70%
B + C = 50%
A = 50%, B = 20% and C = 30%
Hence, A is most efficient.

23. (D) Let the radius be r, then difference in the distance

$$(\pi r - 2r) = r(\pi - 2)$$
$$r\left(\frac{22}{7} - 2\right) = 60 \times 3$$
$$2r = 315 \text{ m}$$

24. (D) One day's wages of the both $= \frac{1}{21} + \frac{1}{28}$

$$= \frac{4+3}{84} = \frac{1}{12}$$

So, the same money is sufficient to pay 12 days wages of both.

25. (A) $CP = \frac{100}{120} = \frac{10}{12}$ (since he purchaser 120g and pays ₹100, by assuming actual CP of 1g = ₹1)

$$SP = \frac{135}{90} = \frac{3}{2} = \frac{18}{12}$$

$$\text{profit \%} = \frac{\frac{18}{12} - \frac{10}{12}}{\frac{10}{12}}\times 100 = 80\%$$

26. (C) $4-\dfrac{5}{1+\dfrac{1}{3+\dfrac{1}{\frac{9}{4}}}}=\dfrac{1}{8}$ [On solving]

Time taken in completing $\frac{1}{8}$th = 10 mins

Time taken in completing $\frac{3}{5}$ $=10\times 8\times\frac{3}{5}$

$= 48$ mins

27. (B) Time $\alpha\dfrac{1}{\text{cross-sectional}}$ area of plpe

Time $\alpha\dfrac{1}{\frac{\pi}{4}d^2}\Rightarrow$ Time $\alpha\dfrac{1}{d^2}$

$\therefore\ \dfrac{t_2}{t_1}=\dfrac{(d_1)^2}{(d_2)^2}$

$\Rightarrow t_2+t_1\left(\dfrac{d_1}{d_2}\right)^2\ t_1=40$ mins, $d_1=d$, $d_2=2d$

$\therefore\ t_2=40\left(\dfrac{d}{2d}\right)^2\Rightarrow t_2=40\left(\dfrac{1}{2}\right)^2$

$t_2 = 10$ mins

28. (B) 1hr 40 min 48 sec = 1hr $\left(40+\dfrac{48}{60}\right)$ min

$=$ 1hr $\left(40+\dfrac{4}{5}\right)$ min $=$ 1hr $\dfrac{204}{5}$ min

$=\left(1+\dfrac{204}{300}\right)$hr $=\dfrac{504}{300}$

$\therefore$ speed $=\dfrac{42}{\frac{504}{300}}=25$ kmph

$\therefore\ \dfrac{5}{7}\times$ usual speed $= 25$

$\therefore$ Usual speed $=\dfrac{25\times 7}{5}$

$= 35$ kmph

29. (B) Let speed of the stream = x km/hr

ATQ,

Related Speed $= (12 + x) + (15 - x)$

$= 27$ km/hr

Required time $=\dfrac{108}{27}=4$ km/hr

30. (D) ATQ,

$3456 = 2000\left(1+\dfrac{r}{100}\right)^3$

$\left(1+\dfrac{r}{100}\right)^3=\left(\dfrac{12}{10}\right)^3\Rightarrow r=\dfrac{1}{5}$

Rate of interest $=\dfrac{1}{5}\times 100 = 20\%$

31. (B) ATQ,

$4\times x = x+(x-20)+(x-40)+\ldots+(x-120)$

$4x = 7x - 140$

$x = 140$

Required number of men = 140

32. (C) Speed of tiger = 40m/min

Speed of deer = 20m/min

Relative speed = 40 – 20 = 20m/min

Difference in Distances = 50 × 8 = 400m

Time taken in catching $=\dfrac{400}{20}$

Distance travelled in 20 min $= 20\times 40$

$= 800$ m

33. (C) Let the number of correct answer be 'a', number of wrong answers be 'b' and number of questions not attempted be 'c'

Thus = a + b + c = 50 .....(i)

$a-\dfrac{b}{3}-\dfrac{c}{6}=32$ .....(ii)

6a – 2b – c = 192 .....(iii)

Adding equation (i) and (ii), we get

$7a - b = 242\Rightarrow a=\dfrac{242+b}{7}$

Since, both 'a' and 'b' are integers. Thus at b = 1, 2, a is not an integer, hence b = 3, we obtain a as are integer

34. (C) $T_3 + T_{15} = T_6 + T_{11} + T_{13}$

$2a + 16d = 3a + 27d$

$a = -11d$

If Tn = 0

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

$-11d + (n - 1)d = 0$

$n = 12$

Hence, 12th term will necessarily be zero.

35. (B) Ring will be bell after = LCM of 3, 4 and 6

= 12 sec

Required number $=\dfrac{24\times 60}{12}+1=121$

36. (B) 10t = 15(t – 2) = distance = t = 6hrs

Distance travelled = $10\times 6 = 60$ or

$15\times 4 = 60$km

But new time is 5hrs, hence required

speed $=\dfrac{60}{5}=12$km/h

37. (A) Since $\frac{1}{4}$th mixture is taken out, therefore remaining amount of milk in the mixture is $80 - \frac{80}{4} = 60l$

Thus, to complete the initial amount of mixture (i.e., $100l$) milkman must have $40l$ water (40 = 100 – 60) is the mixture.

Hence, the required ratio = 40 : 60 = 2 : 3

38. (D) Since time is constant, there face distance is directly proportional to speed.

Hence, $\frac{\text{Karan's Speed}}{\text{Arjun's Speed}} = \frac{100}{90} = \frac{110}{x}$

$\Rightarrow \quad x = 99$

Thus, when Karen runs 110m, Arjun runs only 99m which is 1m less than the length of the race course.

Hence, Karen beats Arjun by 1m

39. (A) If game is held between two girls then

game played $= 45 = \frac{1}{2} \times 9 \times 10$

So, number of girls = 10

If game is held between two boys then

game played $= 190 = \frac{1}{2} \times 19 \times 20$

So, number of boys = 20

Total player = 10 + 20 = 30

Games in which one is boy and other is girl

$= \frac{1}{2} \times 29 \times 30 - 45 - 190$

$= 200$

40. (D) Let l be the number of children is last row.

Now considering the child we have

(a) $l + (l-3) + (l-6) = 630$

l =213 (Hence possible)

(b) $l + (l-3) + (l-6) + (l-9) = 630$

l = 162 (Hence possible)

(c) $l + (l-3) + (l-6) + (l-9) + (l-12) = 630$

l = 132 (Hence possible)

(d) $l + (l-3) + (l-6) + (l-9) + (l-12) + (l-15) = 630$

$l = \frac{225}{2}$

Which is not an intellect number.

41. (C) $81^{\sin x} \times 243^{\cos x} = 3^{4\sin x} \times 3^{\cos x}$

$= 3^{4\sin x + 5\cos x}$

Maximum value of $(3^{4\sin x + 5\cos x})$ will be when $(4\sin x + 5\cos x)$ is maximum.

Maximum value of $4\sin x + 5\cos x$

$= \sqrt{4^2 + 5^2} = \sqrt{41}$

So, maximum value of $81^{\sin x} \times 243^{\cos x}$ is $3^{\sqrt{41}}$.

42. (B) Number can be expressed as $100 + b$

On recrossing the position of digits $10b + a$

As per question $(10b + a) - (10a + b) = 18$

$9(b - a) = 18 \Rightarrow b - a = 2$

Possible number excluding 13 are 24, 35, 46, 57, 68 and 79. Hence option (B) is correct.

43. (C) Sum of ratio must be a prime number

(a) 101 + 88 = 189 is not a prime number

(b) 87 + 100 = 187 is not a prime number

(c) 97 + 84 = 181, is a prime number

(d) 85 + 98 = 183, is not a prime number.

44. (D) Interest of one year = 42

Rate = 5% Time = 1year

$\therefore$ principal $= \frac{\text{Interest} \times 100}{\text{Rate} \times \text{Time}}$

$= \frac{42 \times 100}{5 \times 1} = ₹\,840$

45. (C)

46. (A)

	Speed		
Up	12	———	3
		36	
Down	18	———	2
			5

Average speed $= \frac{36 \times 2}{5} = 14\frac{2}{5}$ km/hr

Shortcut:-

Average speed $= \left(\frac{2xy}{x+y}\right) = \left(\frac{2 \times 12 \times 18}{12+18}\right)$

$= \left(\frac{2 \times 12 \times 18}{30}\right) = 14\frac{2}{5}$ km/h

47. (B) 8A = 12B = 6C

A : B : C = 3 : 2 : 4

B's share $= \frac{2}{3+2+4} \times 864 = ₹192$

48. (B)

Milk		Water
80%		0%
	70%	
70		10

So, water should be added to the given milk in the ratio 10 : 70 or 1 : 7

$\therefore$ Quantity of water to be added $= \frac{1}{7} \times 49$

$= 7$ ltr

49. (D) Let third proportional be x

$9 : 27 :: 27 : x$

$\therefore \quad 9x = 27^2$

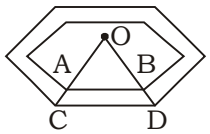
$x = 81$

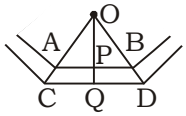
50. (D) Let numbers be 3x and 4x

Then, 1cm of $3x$ and $4x = 3 \times 4 \times x = 12x$

$\therefore \quad 12x = 120 \quad \Rightarrow \quad x = 10$

So, the numbers are $3x$, $4x$ i.e. 30 and 40.

51. (A) 

(I)


(II)

In figure (ii)

$OP = \frac{\sqrt{3}}{2} OA = 4\sqrt{3}$ cm

Again $\frac{OP}{OQ} = \frac{OA}{OC} \Rightarrow \frac{4\sqrt{3}}{6\sqrt{3}} = \frac{8}{OC}$

OC = 12cm [OQ = OP + PQ = $4\sqrt{3} + 2\sqrt{3}$]

∴ Each side of the outer hexagon is 12cm

Required area = (Area of outer hexagon – area of inner hexagon)

$= \frac{3\sqrt{3}}{2} [12^2 - 8^2]$

$= 120\sqrt{3}$ cm^2

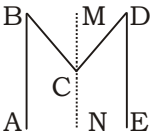
52. (B) ∠PEB = ∠PGD = 80°

∠GHQ = 180° – ∠QHD = 180° – 120° = 60°

∠PQR = ∠PGD – ∠GHQ = 80° – 60° = 20°

53. (C) Required paint $= 90 \times \frac{4 \times 3}{12 \times 9}$

= 10 g

54. (A) 

∠BCD = ∠BCM + ∠DCM = ∠ABC + ∠EDC

= 67° + 23°

= 90°

55. (B) If $x + y + z$ = constant

xyz takes maximum value when each x, y, z takes equal value

∵ a + b + c = 13

∵ (a – 3) + (b – 2) + (c + 1)

= 13 – 3 – 2 + 1 = 9

For maximum value of (a – 3)(b – 2) (c + 1)

= (a – 3) (b – 2) (c + 1) = 3 × 3 × 3 = 27

56. (C) Area of field $= \frac{495 \cdot 72}{36 \cdot 72}$ = 13.5 hec

= 135000 m^2

Now, if $h = x$, $b = 3x$

$\therefore \frac{1}{2} \times b \times h = 135000$

$\frac{1}{2} \times 3x \times x = 135000$

x = 300 m

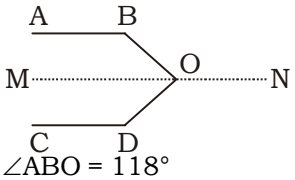
So, height is 300 m and length of base is 900 m.

57. (A) $\frac{1}{x^2} + \frac{1}{y^2} = \frac{x^2 + y^2}{(xy)^2}$

= 194

58. (A) Area of rhombus $= \frac{1}{2} \times 2x \times 5x = 5x^2$

Required Ratio $= 5x^2 : 4x^2 = 5 : 4$

59. (C) 

∠ABO = 118°

∠MOB = 180° – 118° = 62°

∠MOD = 152 – 62 = 90°

∠ODC = 180° – 90 = 90°

60. (C) OA = 13 cm AM = 5 cm

$\therefore$ OM $= \sqrt{13^2 - 5^2}$ = 12 cm

61. (C) $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1 \Rightarrow \frac{bc + ac + ab}{abc} = 1$

abc = bc + ac + ab

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

$= \frac{1}{2} \times (9 - 6) = \frac{3}{2}$

62. (B) $2\pi R \times \frac{75}{360} = 25 \Rightarrow R = \frac{60}{\pi}$

63. (B) AB $= \sqrt{BC^2 + AC^2}$ = 25 cm

$CD = \frac{AC \times BC}{AB} = \frac{15 \times 20}{25}$

= 12 cm

64. (C)
$$\begin{array}{ccc} 5 & p & 9 \\ 3 & 2 & 7 \\ 2 & q & 8 \\ \hline 11 & 1 & 4 \end{array}$$

If $p = 0$, then q's maximum value = 7

65. (B) $2^x = 4^y = 8^z \Rightarrow 2^x = 2^y = 2^{3z}$

$\Rightarrow x = 2y = 3z = k$ (say)

Then $xyz = \frac{k^3}{6} = 288$

$\Rightarrow k = 12 \quad \therefore \quad x = 12, y = 6, z = 4$

$\Rightarrow \frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z} = \frac{11}{96}$

66. (D) There are 4 congruent triangle

So, Area of ΔABC = 6 × 4 = 24 cm^2

67. (D) $(x + 2)^3 - x^2 = 1016 \Rightarrow x = 12$ cm

and $x^3 - (x - 2)^3 = 12^2 - 10^2 = 728$

So, volume decreased by 728 cm^3 and side of cube is 12 cm.

68. (C) $\angle CBA = \frac{1}{2} \angle COA = 60°$

$\therefore \angle CBE = 180° - \angle CBA = 180° - 60$

= 120°

69. (A) $x^2 - 3x + 1 = 0$

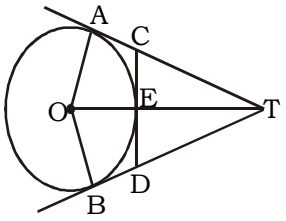
$$x + \frac{1}{x} = 3$$

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

$$= 9 - 2 + 3$$

$$= 10$$

70. (C)



$$AT = \sqrt{(OT)^2 - (OA)^2} = \sqrt{(13)^2 - (5)^2} = 12 \text{ cm}$$

CA and CE are tangent from point C, so both are equal.

Let, $CA = CE = x, CT = 12 - x$

$ET = OT - OE = 13 - 5 = 8$

In ΔCET,

$CE^2 + ET^2 = CT^2$

$x^2 + 8^2 = (12 - x)^2$

$$x = \frac{10}{3} \text{ cm}$$

$$CD = 2 \times CE = \frac{20}{3} \text{ cm}$$

71. (B) $a^2 + b^2 + c^2 - ab - bc - ca = 0$

$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$

$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$

$\therefore a = b = c$

$$\therefore \frac{a + c}{b} = \frac{2b}{b} = 2$$

72. (C) Since b, l and 2 (l + b) are is GP, therefore

$$\frac{l}{b} = \frac{2(l + b)}{l}$$

Suppose $\frac{l}{b} = x$, then $x = 2\left(1 + \frac{1}{x}\right)$

$\Rightarrow x^2 - 2x - 2 = 0 \Rightarrow x = \sqrt{3} + 1$

$$l : b = (\sqrt{3} + 1) : 1$$

73. (D) $\frac{3}{x - 3} = \frac{x - 5}{3x - 19}$

$\Rightarrow x = 8$ or 9

74. (A) $x + y = 2z$

$x = 2z - y$

$x - z = 2z - y - z$

$= z - y$

$$\therefore \frac{x}{x - z} + \frac{z}{y - z} = \frac{x}{x - z} - \frac{z}{z - y}$$

$$= \frac{x}{x - z} - \frac{z}{x - z}$$

$$= \frac{x - z}{x - z}$$

$= 1$

75. (D) $x = 3 + 2\sqrt{2}$, so $\frac{1}{x} = 3 - 2\sqrt{2}$

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

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

$= 6^2 - 2 = 34$

76. (C) Surface area of one cube = $6a^2$ when 6 cubes are fixed on the 6 faces of a cube then only 5 faces of a cube are visible of each cube. Since, central cube is completely covered. So, the only 6 cubes are visible each with 5 faces. Hence, the total surface area of this solid = $5a^2 \times 6$

$$\therefore \text{Required Ratio} = \frac{5a^2 \times 6}{6a^2}$$

$$= \frac{5}{1}$$

$= 5 : 1$

77. (B) $2p + \frac{1}{p} = 4$

$$p + \frac{1}{2p} = 2$$

$$\therefore \left(p + \frac{1}{2p}\right)^3 = p^3 + \frac{1}{8p^3} + 3p \frac{1}{2p} \left(p + \frac{1}{2p}\right)$$

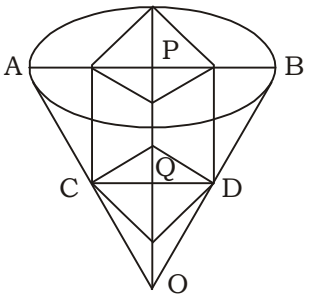
$$8 = p^3 + \frac{1}{8p^3} + \frac{3}{2} \times 2$$

$$p^3 + \frac{1}{8p^3} = 8 - 3$$

$= 5$

78.(B) Let the each side of cube be a

$CD = \sqrt{2}\,a$



$\therefore$ $CQ = \dfrac{a}{\sqrt{2}}$

Let the radius of cone be x and height be h, then $r = h\sqrt{2}$

In ΔAPO and ΔCQO ($\sqcup$ triangle)

$$\frac{AP}{AO} = \frac{CQ}{OQ} = \frac{r}{h}$$

$$= \frac{a/\sqrt{2}}{(h-a)}$$

$$\Rightarrow \frac{a/\sqrt{2}}{(h-a)} = \sqrt{2}$$

$$a = 2\,(h-2)$$

$$\Rightarrow h = \frac{3a}{2}$$

$$\therefore r = \frac{3a}{2} \times \sqrt{2} \text{ and } h = \frac{3a}{2}$$

$$\therefore \text{Volume of cone} = \frac{1}{3}\pi\left(\frac{3a\sqrt{2}}{2}\right)^2 \times \frac{3a}{2}$$

$$= \frac{9}{4}a^3\pi$$

and volume of cube $= a^3$

$$\therefore \text{Required Ratio} = \frac{9}{4}a^3\pi : a^3$$

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

$$= 2.25\,\pi : 1$$

79.(C) $x^2 + y^2 - 4x - 4y + 8 = 0$

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

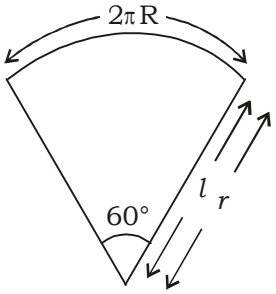
$\Rightarrow (x-2)^2 + (y-2)^2 = 0$

$\Rightarrow x = 2$ and $y = 2$

$\therefore x - y = 2 - 2$

$= 0$

80.(A) $2\pi R = 2\pi r \times \dfrac{60}{360}$



$\Rightarrow l = r$

$$R = \frac{r}{6}$$

$$= \frac{14}{6} = \frac{7}{3}\text{ cm}$$

$\therefore$ Total surface area $= \pi r\,(l + r)$

$$= \frac{22}{7} \times \frac{7}{3}\left(14 + \frac{7}{3}\right)$$

$= 119.78\ \text{cm}^2$

81.(C) Sum of all exterior angle = 360

Sum of interior angles = 4 × 360 = 1440

1440 = (n – 2) × 180

n = 10

82.(C) (tan 1°. tan 89°) (tan 2°. tan 88°) .... tan 45°

= 1 × 1 ×....×1 ×1

= 1

83.(B) π = radian = 180°

$$\therefore 1° \text{ radian} = \frac{180°}{\pi}$$

$$= \frac{180 \times 7}{22}$$

$$= \frac{630}{11}$$

$$= 57\frac{3°}{11}$$

$$= 57\frac{3}{11} \times 60'$$

$$= 57° \frac{180'}{11}$$

$$= 57°\ 16'\ \frac{4}{11} \times 60''$$

$= 57°\ 16'\ 22''$

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

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

$$2\cos^2\theta = 1 + \frac{1}{2} = \frac{3}{2}$$

$$\cos^2\theta = \frac{3}{4}$$

$$\sec^2\theta = \frac{4}{3}$$

$$1 + \tan^2\theta = \frac{4}{3}$$

$$\tan^2\theta = \frac{4}{3} - 1 = \frac{1}{3}$$

$$\tan = \pm\frac{1}{\sqrt{3}}$$

$$\cot\theta = \pm\sqrt{3}$$

85.(C) $\dfrac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$

$\Rightarrow \cos^2\theta = 3\cot^2\theta - 3\cos^2\theta$

$$\Rightarrow 4\cos^2\theta = 3\cot^2\theta = \frac{3\cos^2\theta}{\sin^2\theta}$$

$$\Rightarrow 4\cos^2\theta - \frac{3\cos^2\theta}{\sin^2\theta} = 0$$

$$\Rightarrow \cos^2\theta \left(4 - \frac{3}{\sin^2\theta}\right) = 0$$

$$\therefore 4 - \frac{3}{\sin^2\theta} = 0$$

$\Rightarrow 4\sin^2\theta = 3$

$$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2} = \sin 60°$$

$\theta = 60°$

86.(A) $x \sin 45° = y \operatorname{cosec} 30°$

$$\Rightarrow x \times \frac{1}{\sqrt{2}} = y \times \sqrt{2}$$

$$\Rightarrow \frac{x}{y} = 2\sqrt{2}$$

$$\Rightarrow \frac{x^4}{y^4} = (2\sqrt{2})^4$$

$= 2^4 \times 2^2$
$= 2^6$
$= 4^3$

87.(D) $\sin^2\theta - 3\sin\theta + 2 = 0$

$\sin^2\theta - 2\sin\theta - \sin\theta + 2 = 0$

$\sin\theta(\sin\theta - 2) - (\sin\theta - 2) = 0$

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

$\sin\theta = 1$

$\theta = 90°$

88.(B) $\sec\theta = \dfrac{4x^2+1}{4x}$

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

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

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

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

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

$$\therefore \sec\theta + \tan\theta = \frac{4x^2+1}{4x} + \frac{4x^2-1}{4x}$$

$$= \frac{8x^2}{4x}$$

$= 2x$

89. (B) $\sin(3x - 20°) = \cos(3y + 20°)$

$\Rightarrow \sin(3x - 20°) = \sin(90° - 3y - 20°)$

$\Rightarrow \sin(70° - 3y)$

$\Rightarrow 3x - 20° = 70° - 3y$

$\Rightarrow 3x + 3y = 90°$

$x + y = 30°$

90. (D) $\cot 30° = \cot(90° - 60°) = \tan 60°$

$\cot 75° = \tan 15°$

$$\therefore \frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$$

$$\therefore \frac{\tan 60° - \tan 15°}{\tan 15° - \tan 60°} = -1$$

91. (C) Required number of persons
$= 450 + 250 + 150 + 75 + 50 + 25 = 1000$

92. (B) Required number of persons
$= 250 + 150 = 400$

93. (C) Required Ratio = 250 : 75 = 10 : 3

94. (C) Required Ratio = 450 : 1000 = 9 : 20

95. (D) Required percentage $= \frac{25}{500} \times 100$

$= 5\%$

96. (C) People who plays flute $= 60000 \times \frac{11}{100}$

$= 6600$

Now number of people who plays flute

$= 6600 - 2100$

$= 4500$

Required percentage $= \frac{4500}{60000} \times 100$

$= 7.5\%$

97. (A) Required Difference of percentage

$= (22 + 14) - (20 + 14)$

$= 2\%$

So, required people $= 60000 \times \frac{2}{100} = 1200$

98. (B) People who plays sarod $= 60000 \times \frac{14}{100}$

$= 8400$

99. (D) Required percentage

$= \left(11 + \frac{50}{3} \times \frac{9}{100}\right)\%$

$= 12.5\%$

100. (A) Required people

$= \frac{22 - (11 + 9)}{100} \times 60000$

$= 1200$

SSC MAINS - 25 (ANSWER KEY)

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