SSC MAINS (MATHS) - 27 (SOLUTION)

1. (C) $8.3\dot{1} = \frac{748}{90}$, $0.\dot{6} = \frac{6}{9}$ and $0.00\dot{2} = \frac{2}{900}$

$\therefore\ 8.3\dot{1} + 0.\dot{6} + 0.00\dot{2} = \frac{748}{90} + \frac{6}{9} + \frac{2}{900}$

$= \frac{7480 + 600 + 2}{900}$

$= 8.9\dot{7}9$

2. (A) $999\frac{998}{999} \times 999 = 998999$

3. (D) Let the number of boys = x.
& number of girls = $85 - x$
So,
$x \times 4 + (85 - x) \times 5 = 380$
$x = 45$

4. (D) 3 18 12 72 66 396 **390**
$\times 6\ -6\ \times 6\ -6\ \times 6\ -6$

5. (B) $2\sqrt[3]{40} = 4\sqrt[3]{5}$, $4\sqrt[3]{320} = 16\sqrt[3]{5}$
$3\sqrt[3]{625} = 15\sqrt[3]{5}$, $3\sqrt[3]{5} = 3\sqrt[3]{5}$
$2\sqrt[3]{40} - 4\sqrt[3]{320} + 3\sqrt[3]{625} - 3\sqrt[3]{5}$
$= 4\sqrt[3]{5} - 16\sqrt[3]{5} + 15\sqrt[3]{5} - 3\sqrt[3]{5}$
$= 0$

6. (D) $2x - 5y = 9$ ... (i)
and $8x - 20y = 36$
$\Rightarrow\ 2x - 5y = 9$ ... (ii)
Thus, there is only one equation in two variable. So, the given equation have infinite number of solutions.

7. (A) Area bounded by $(|x| + |y| = k) = 2k^2$.
$\therefore$ Area bounded by $(|x| + |y| = 6) = 2(6)^2$
$= 72$

8. (B) Slope of PQ_8, $m_1 = \frac{5-5}{4-3} = 0$

Slope of PR, $m_2 = \frac{6-5}{4-3} = 1$

$\therefore\ \tan\theta = \left|\frac{m_1 + m_2}{1 + m_1 m_2}\right| = \left|\frac{0-1}{1+0}\right| = 1$

So, $\theta = 45^\circ$

9. (A) $x^2 - 4 = (x+2)(x-2)$
$x^2 - 5x - 6 = x^2 - 6x + x - 6$
$= (x-6)(x+1)$
and
$x^2 + x - 6 = x^2 + 3x - 2x - 6$
There is no common factor.

10. (D) $\frac{1}{2ab} + \frac{1}{2ab} = \frac{1+1}{2ab} = \frac{2}{2ab}$

$= \frac{1}{ab} = \frac{a}{b^2} \times \frac{b}{a^2}$

11. (D) $p^q = q^p \Rightarrow p^{q/p} = q$
$(p)^{9p/p} = 9p \Rightarrow p^9 = 9p$
$p^8 = 9 \Rightarrow p = \sqrt[8]{9}$

12. (A) Length of linger train = D, shorter train d.
D = $2d$, therefore

$D + d = 15\left((60+48) \times \frac{5}{18}\right)$

$3d = 450 \Rightarrow d = 150$
$D = 300$
In order to cross bridge, the train has to traverse the distance being equal to the sum of the length of the longer train and the length of the bridge.
Let the length of the bridge is B.

$D + B = 51\left(60 \times \frac{5}{18}\right) = 850$

$B = 550$
Length of bridge = 550 m

13. (A) If men have to finish work in one day, then men required = 12 × 10 = 120.
If women to finsih work in one day, then women required = 20 × 12 = 240

$\left(\begin{matrix}\text{Work done}\\ \text{by 120 men}\end{matrix}\right) = \left(\begin{matrix}\text{Work done}\\ \text{by 240 women}\end{matrix}\right)$

or 1 man = 2 woman
8 m + 4w = 20 w
Number of women × Numbers of days = 240
ATQ, $(20 \times 9) + [(20 + 10) \times d] = 240$
$d = 2$

14. (C) S $\rightarrow$ Speed of train
W $\rightarrow$ Number of wagons in the train

$S = 45 - k\sqrt{w}$ $k \rightarrow$ constant

$\therefore 30 = 45 - k\sqrt{9} \Rightarrow k = 5$
Number of wagons attached

$0 = 45 - 5\sqrt{9}$
$w = 81$
So, maximum number of wagons attached = 80

15. (D) A : B = 3 : 4
B : C = 3 : 4
C : D = 3 : 4
A : B : C : D = 27 : 36 : 48 : 64

$\therefore$ Share of C $= 1400 \times \frac{48}{27 + 36 + 48 + 64}$
$= 384$

16. (C) Speed of B $= \frac{20}{5} = 4$ m/s

$\frac{\text{Speed of A}}{\text{Speed of B}} = \frac{100}{60} \Rightarrow \text{Speed of A} = \frac{20}{3}$ m/s

Required time by A to run 200 m $= \frac{200}{\frac{20}{3}}$
$= 30$ sec

17. (B) Woman will travel = $8 \times \frac{4}{5+4}$ = 36 miles

18. (A) Let the number be n, then

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

$$\frac{n^2+1}{n} = \frac{3(n^2-1)}{n}$$

$$n^2 = 2$$

$$n = \pm\sqrt{2}$$

19. (A) Number which are divisible by 9 are 9, 18, 27, ..., 297
i.e. 9 × 1, 9 × 2, 9 × 3, ..., 9 × 23
Thus from 10 to 300 there are only 32 number which are divisible by 9.

20. (D) Ratio of S.P. to C.P. is 5 : 3.
It means C.P. of rasgulla is ₹ 90.
Cost of flour and sugar is $3k$ and $7k$.
Price of ragulla per kg

$$= \frac{5\times 3k + 3\times 7k}{5+3} = 90 \Rightarrow k = 20$$

Price of sugar = $7k$ = ₹140

21. (A) Reduction of price = 20% = $\frac{1}{5}$.

So, the increase in amount of sugar = $\frac{1}{4}$ = 25%

25% = 6 kg, it means original amount = 24 kg

So, the original price of sugar = $\frac{240}{24}$ = ₹ 10 kg

22. (D) A : (B + C + D) = 100 : 460 = 10 : 46
So, A contributed ₹10 lakh
B : (A + C + D) = 100 : 366.66 = 3 : 11 = 12 : 44
So, B contributed ₹12 lakh
C : (A + B + D) = 40 : 100 = 4 : 10 = 16 : 40
So, C contributed ₹16 lakh
So, contribution of D = 56 – (10 + 12 + 16) = ₹18 lakh

23. (D) Let salary of C = ₹100
Then, salary of A = ₹ 80
So, salary of B = ₹ 70
A's salary more than B's by 14.28%.

24. (D) $t_1 \times t_2$ = Distance × $\frac{\text{Difference in time}}{\text{Difference in speed}}$

$$= 1680 \times \frac{6}{14} = 30 \times 24$$

t_1 = 30 and t_2 = 24

25. (B) Let income = ₹ 500

New income = $500 \times \frac{115}{100}$ = ₹ 575

Savings = $\frac{2}{5} \times 500$ = ₹ 200

New Savings = $200 \times \frac{106}{100}$ = ₹ 212

Expenditure = ₹ 300
New expenditure = 575 – 212 = ₹ 363

Increase expenditure = $\frac{363-300}{300} \times 100$
= 21%

26. (C) A → 10: 1, B → 20 : 1 and C → 30 : 1
Maximum earning will be only when he will won on the maximum yielding table i.e. he won on B and C but lost A
= 20 × 200 + 30 × 200 – 1 × 200 = 9800
Minimum earninmg when won the table A and table B and lose on that table C.
= 10 × 200 + 20 × 200 – 1 × 200 = 5800
∴ Required difference = 9800 – 5800
= ₹ 4000

27. (B)

Male	:	**Female**
$55x$	:	$45x$
$10x$	=	72
$100x$	=	720

28. (C) $\frac{40}{100}x + 42 = x$

x = 70.

29. (D) 1425 – 1353 = 72 = 6% of CP.
C.P. = 1200

30. (B)

	Candle	**Bulb**
C.P.	a	c
S.P.	b	d

and C = $2a$
Profit = $10(b-a)$ = 3d
Loss = $10(c-d)$ = $4b$

Profit (%) = $\frac{3d}{10a} \times 100$

Loss (%) = $\frac{4b}{10c} \times 100$

ATQ,

$$\frac{3d}{10a} = \frac{4b}{c} \Rightarrow \frac{3d}{a} = \frac{4b}{2a}$$

$$\frac{b}{d} = \frac{3}{2}$$

31. (C) 600 – 300 = ₹ 300
Interest = 360 – 300 = ₹ 60

$$\therefore \quad 60 = \frac{300}{100} \times \frac{2}{12} \times r$$

r = 120%

32. (B) $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$$\frac{(x-2)x}{1} = \frac{(x+7)(x-10)}{\frac{3}{4}}$$

$3x^2 - 6x = 3x^2 - 12x - 280$

$x^2 - 6x - 280 = 0 \Rightarrow x = 20$

ATQ,

$(20 - 2) \times 20 = (20 + 10) \times D$

$D = 12$ days

33. (B) Time taken to cross the man

$$= \frac{\text{Length of the faster train}}{\text{Relative Speed}}$$

$$18 = \frac{x}{15 \times \frac{5}{18}} \Rightarrow x = 75 \text{ m}$$

Length of faster train = 75 m

34. (B) $a_1 = 119 = 7 \times 17$

$a_n = 113113 = 7 \times 16159$

$n = (16159 - 17) + 1 = 16143$

$$\text{Sum} = \frac{n}{2}(a_1 + a_n)$$

$$= \frac{16143}{2} \times (119 + 113113)$$

$= 91392088$

35. (A) $A = P\left(1 + \frac{R}{100}\right)^T$

$$\therefore \quad 3840 = P\left(1 + \frac{R}{100}\right)^4 \quad \ldots \text{(i)}$$

$$3636 = P\left(1 + \frac{R}{100}\right)^5 \quad \ldots \text{(ii)}$$

Dividing (ii) and (i),

$$\frac{3936}{3840} = 1 + \frac{R}{100} \Rightarrow \frac{R}{100} = \frac{3936}{3840} - 1$$

$$\frac{R}{100} = \frac{96}{3840} \Rightarrow R = \frac{96}{3840} \times 100$$

$R = 2.5\%$

36. (C) $A = P\left(1 + \frac{R}{100}\right)^T \Rightarrow 3 = 1\left(1 + \frac{R}{100}\right)^3$

On squaring both sides

$$9 = 1\left(1 + \frac{R}{100}\right)^6$$

Required time = 6 years

37. (B) Women $= \frac{43}{83} \times 311250 = 161250$

Men $= 311250 - 161250 = 150000$

$\therefore$ Total number of literature person

$$= 161250 \times \frac{8}{100} + 150000 \times \frac{24}{100}$$

$= 48900$

38. (C) Amount Left = ₹ 1400

Amount before gift = ₹(1400 + 120)

= ₹1520

$$\text{Amount spent on transport} = \frac{1520}{95} \times 5$$

= ₹ 80

39. (A) If distance between stations be x km.

$$\text{Then, speed of train} = \frac{x}{\frac{45}{60}} = \frac{4}{3}x \text{ km/hr}$$

ATQ,

$$\frac{x}{\frac{4x}{3} - 5} = \frac{48}{60} \Rightarrow \frac{x \times 3}{4x - 15} = \frac{4}{5}$$

$15x = 16x - 60$

$x = 60$ km

40. (C) C.P. of article = ₹ x

$$\therefore \frac{x \times 108}{100} - \frac{x \times 92}{100} = 28$$

$$\frac{16x}{100} = 28 \Rightarrow x = \frac{28 \times 100}{16} = ₹\ 175$$

41. (C)

Profit		Loss
+10		−10
	+5	
+15	:	+5
3	:	1

If total oranges are 4 than oranges at profit = 3

If total oranges are 12 than oranges at profit

$$= \frac{3}{4} \times 12 = 9 \text{ oranges}$$

42. (A) When n is odd, then $a^n + b^n$ is exactly divisible by $(a + b)$.

Hence, $17^{37} + 29^{37}$ is exactly divisible by $17 + 29 = 46$ i.e. 23 too.

43. (D) Total profit = ₹ x

$$\text{Actual gain} = ₹\frac{9x}{10}$$

$$\text{A's share} = \frac{5}{9} \times \frac{9x}{10} = ₹\frac{x}{2}$$

$$\therefore \quad \frac{x}{2} = 7500$$

$x = ₹\ 15000$

44. (A) Let Mark price = ₹ x

$$\text{Selling price} = x \times \frac{70}{100} = ₹\ \frac{7}{10}x$$

Discount = ₹ 30

ATQ, $30 = x - \frac{7}{10}x$

$x = ₹\ 100$

Now selling price = ₹ 70

45. (D) A (+) 8 — 3
24
B (+) 6 — 4
7

Work done in 2 hours = 7 × 2 = 14 units
Remaining work = 24 – 14 = 10 units

So, required time = $\frac{10}{4} = 2\frac{1}{2}$ hours

46. (C) Relative speed = 11 – 10 = 1 kmph

Distance covered in 6 mins = $\frac{1000}{60} \times 6$
= 100 m

Remaining distance = 200 – 100 = 100 m

47. (B) Required number = 75075

48. (C) 675 = 5 × 5 × 3 × 3 × 3
= $5^2 \times 3^3$
$\therefore$ Required number = 5

49. (A) 35 – 18 = 17
45 – 28 = 17
55 – 38 = 17
LCM of 35, 45 and 55 = 3465
Required no. = 3465 – 17 = 3448

50. (D) Sum of present ages of four boys
= 9 × 4 + 20 = 56 years
Sum of the present ages of five boys
= 15 × 5 = 75 years
$\therefore$ Present age of new boy = 75 – 56
= 19 years

51. (C) $A + B = 90^\circ \Rightarrow A = 90^\circ - B$
$\Rightarrow \sin A = \sin(90^\circ - B) = \cos B$
Similarly,
$\Rightarrow \cos A = \sin B$, $\tan A = \cot B$
$\sin A.\cos B + \cos A.\sin B - \tan A.\tan B + \sec^2 A - \cot^2 B$
$= \cos^2 B + \sin^2 B - \cot B.\tan B + \sec^2 A - \tan^2 A$
= 1 – 1 + 1
= 1

52. (D) $2\sin^2\theta + 3\cos^2\theta = 2\sin^2\theta + 2\cos^2\theta + \cos^2\theta$
$= 2(\sin^2\theta + \cos^2\theta) + \cos^2\theta$
$= 2 + \cos^2\theta$
$\therefore$ least value = 2 + 0 = 2

53. (A) $2 - \cos^2\theta = 3\sin\theta.\cos\theta$
Dividing by $\cos^2\theta$

$\frac{2}{\cos\theta} - 1 = \frac{3\sin\theta.\cos\theta}{\cos^2\theta}$

$2\sec^2\theta - 1 = 3\tan\theta$
$2(1 + \tan^2\theta) - 1 = 3\tan\theta$
$2\tan^2\theta + 2 - 1 = 3\tan\theta$
$2\tan^2\theta - 3\tan\theta + 1 = 0$
$2\tan\theta(\tan\theta - 1) - 1(\tan\theta - 1) = 0$
$(2\tan\theta - 1)(\tan\theta - 1) = 0$

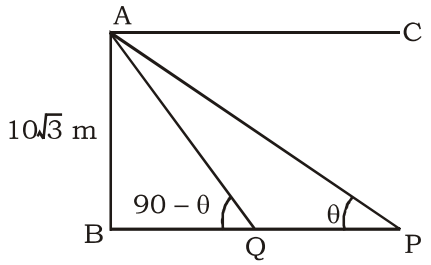
$\tan\theta = \frac{1}{2}$ or 1

54. (D) $\sin\theta + \cos\theta = \sqrt{2}\cos(90 - \theta)$

$\cos\theta = \sqrt{2}\sin\theta - \sin\theta$

$\cot\theta = \sqrt{2} - 1$

55. (C)



AB = $10\sqrt{3}$ m = Building
PQ = 20 m
BQ = x m (let)
If $\angle APB = \theta$, then $\angle AQB = 90^\circ - \theta$
from ΔABP,

$\tan\theta = \frac{AB}{BP} \Rightarrow \tan\theta = \frac{10\sqrt{3}}{x+20}$ ... (i)

from ΔABQ,

$\tan(90^\circ - \theta) = \frac{AB}{BQ} \Rightarrow \cot\theta = \frac{10\sqrt{3}}{x}$ ... (ii)

By multiplying both eqn's

$\tan\theta.\cot\theta = \frac{10\sqrt{3}}{x+20} \times \frac{10\sqrt{3}}{x}$

$\Rightarrow x^2 + 20x = 10 \times 10 \times 3$
$\Rightarrow x^2 + 20x - 300 = 0$
$(x - 10)(x + 30) = 0$
$x = 10, x \neq -30$
$\therefore$ BP = 20 + 10 = 30 m

56. (C) $4x = \sec\theta$, $\frac{4}{x} = \sec\theta$

$4\left(x + \frac{1}{x}\right) = \sec\theta + \tan\theta$ ... (i)

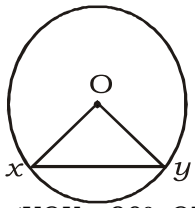
$\left(x - \frac{1}{x}\right) = \sec\theta + \tan\theta$ ... (ii)

Multiply equation (i) and (ii)

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

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

57. (A)



$\angle XOY = 90^\circ$, OX = OY = a radius
$\therefore \Delta XOY$ is a right angled triangle.

$\therefore \frac{1}{2} \times OX \times OY = 32$
$r^2 = 64$
$r = \sqrt{64} = 8$
Area of circle $= \pi r^2 = 64\pi$

58. (C) $\sin^2\alpha + \sin^2\beta = 2$

$\therefore \sin\alpha = \sin\beta = 1$

$\therefore \alpha = \beta = 90°$

$\therefore \cos\left(\frac{\alpha+\beta}{2}\right) = \cos 90° = 0$

59. (C) $\tan\theta \cdot \tan 2\theta = 1$

$\Rightarrow \tan\theta = \frac{1}{\tan\theta} = \cot 2\theta$

$\Rightarrow \tan\theta = \tan(90° - 2\theta)$

$\Rightarrow \theta = 90° - 2\theta$

$\Rightarrow 3\theta = 90° \Rightarrow \theta = 30°$

$\therefore \sin^2 2\theta + \tan^2 2\theta = \sin^2 60° + \tan^2 60°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + (\sqrt{3})^2$

$= \frac{3}{4} + 3 = 3\frac{3}{4}$

60. (D) On y-axis $x = 0$

In $x + 2y = 3$, y intercept $= \frac{3}{2}$

In $3x - 2y = 1$, y intercept $= -\frac{1}{2}$

Required distance $= \frac{3}{2} - \left(-\frac{1}{2}\right)$

$= 2$ units

61. (B) Since $1 < x < 2$, we have

$x - 1 > 0$ and $x - 3 < 0$ or $3 - x > 0$

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

$[\because (x-3)^2 = (3-x)^2]$

$= x - 1 + 3 - x$

$= 2$

62. (D) Given expression

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

$= \frac{x+1}{x} \times \frac{x+2}{x+1} \times \frac{x+3}{x+2} \times \frac{x+4}{x+3}$

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

63. (D) $x^{\frac{1}{3}} = y^{\frac{1}{4}} \Rightarrow \left(x^{\frac{1}{3}}\right)^{12} = \left(y^{\frac{1}{4}}\right)^{12}$

$x^4 = y^3 \Rightarrow (x^4)^5 = (y^3)^5$

$x^{20} = y^{15}$

64. (D) $(x-2)(x-9) = x^2 - 11x + 18 = ax^2 + bx + c$

Minimum value $= \frac{4ac - b^2}{4a} = \frac{-49}{4}$

65. (A) $a + \frac{1}{a} + 1 = 0 \Rightarrow a^2 + a + 1 = 0$

$a^4 - a = a(a^3 - 1)$

$= a(a-1)(a^2 + a + 1)$

$= 0$

66. (D) $x = \frac{4ab}{a+b} \Rightarrow \frac{x}{2a} = \frac{2b}{a+b}$

Applying componendo & dividendo

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

Similarly,

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

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

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

$= \frac{2b-2a}{b-a} = 2$

67. (C) Expression

$\frac{(s-a)^2 + (s-b)^2 + (s-c)^2 + s^2}{a^2+b^2+c^2}$

$= \frac{s^2 - 2sa + a^2 + s^2 + b^2 - 2sb + s^2 - 2sc + c^2 + s^2}{a^2+b^2+c^2}$

$= \frac{4s^2 + a^2 + b^2 + c^2 - 2s(a+b+c)}{a^2+b^2+c^2}$

$= \frac{4s^2 + a^2 + b^2 + c^2 - 4s^2}{a^2+b^2+c^2}$

$= 1$

68. (A) If $a + b + c = 0$

$a^3 + b^3 + c^3 - 3abc = 0$

Expression:

$\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = \frac{a^3+b^3+c^3}{abc}$

$= \frac{3abc}{abc}$

$= 3$

69. (D) $x = \sqrt[3]{2+\sqrt{3}} \Rightarrow x^3 = 2 + \sqrt{3}$

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

$\therefore x^3 + \frac{1}{x^3} = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$

70. (B) $\frac{a}{b} + \frac{b}{a} - 1 = 0 \Rightarrow \frac{a^2+b^2-ab}{ab} = 0$

$a^2 - ab + b^2 = 0$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2) = 0$

71. (C) Smallest side of $\Delta = x$ cm (let)

Second side of $\Delta = 40 - 17 - x = (23 - x)$ cm

Semi perimeter $= s = \frac{40}{2} = 20$ cm

$\therefore \sqrt{s(s-a)(s-b)(s-c)} = 60$

$(20 - x)(x - 3) = 60$

$-x^2 + 23x - 60 = 60$

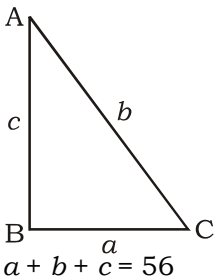
$x^2 - 23x - 120 = 0$

$(x - 15)(x - 8) = 0$

$x = 15, 8$

Smallest side $= 8$ cm

72. (A)



$a + b + c = 56$

$\frac{1}{2}ac = 84 \Rightarrow ac = 168 \text{ cm}^2$

$\therefore \quad b^2 = a^2 + c^2 = (a + c)^2 - 2ac$

$b^2 = (56 - b)^2 - 2 \times 168$

$b^2 = 3136 - 112b + b^2 - 336$

$112b = 2800 \Rightarrow b = 25$

73. (A) Let the parallel sides be $5x$ and $3x$ m.

Area of trapezium $= \frac{1}{2}$(sum of parallel sides) × distance between them

$1440 = \frac{1}{2}(5x + 3x) \times 24$

$x = 15$

Longer parallel side $= 5x = 5 \times 15 = 75$ m

74. (C) Perimeter of regular hexagon = perimeter of equilateral triangle

$\therefore$ If a side of the regular hexagon be x units, then side of triangle $= 2x$ units

$\therefore$ Required ratio $= 6\frac{\sqrt{3}}{4}x^2 : \frac{\sqrt{3}}{4}(2x^2)$

$= 6 : 4$

$= 3 : 2$

75. (B) Volume of tank $= (3 \times 5 \times 1.54) \text{ cm}^3$

Volume of water flowing through pipe per second $= \pi \times \left(\frac{7}{100}\right)^2 \times 5 \text{ cm}^3$

$\therefore$ Required time

$= \frac{3 \times 5 \times 15.4 \times 100 \times 100 \times 7}{22 \times 7 \times 7 \times 5}$

$= 300$ sec

$= 5$ min

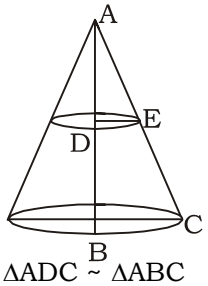
76. (A) Volume of bucket

$= \frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$

$= \frac{1}{3} \times \frac{22}{7} \times 45(28^2 + 7^2 + 28 \times 7)$

$= 48510 \text{ cm}^3$

77. (D)



$\Delta ADC \sim \Delta ABC$

$\therefore \frac{AD}{AB} = \frac{DE}{BC} = \frac{1}{2}$

$AD = DE = \frac{1}{2}BC$

$\therefore$ Required ratio

$= \frac{\frac{1}{3}\pi(DE)^2 \times AD}{\frac{1}{3}\pi BC^2 \times \frac{1}{3}\pi(DE)^2 \times AD}$

$= \frac{DE^2 \times AD}{BD^2 \times AB - DE^2 \times AD}$

$= \frac{\frac{1}{4}BC^2 \times \frac{1}{2}AB}{BC^2 \times AB - \frac{1}{4}BC^2 \times \frac{AB}{2}}$

$= \frac{\frac{1}{8}}{1 - \frac{1}{8}}$

$= 1 : 7$

78. (B) l = arc length = 3.5 cm

r = radius = 5 cm

$\therefore$ Area of sector $= \frac{1}{2}lr$

$= \frac{1}{2} \times 3.5 \times 3.5$

$= 8.75 \text{ cm}^2$

79. (A) Total surface area

= Lateral surface area + 2 × Area of base

= Area of base × height + 2 × Area of base

$\Rightarrow \quad 360 = 30h + 2 \times \frac{1}{2} \times 5 \times 12$

$\Rightarrow \quad 360 - 60 = 30 \times h$

$h = \frac{300}{30} = 10$ cm

80. (B) Rate of flow = 5 kmph m/h

Radius = 7 cm = $\frac{7}{100}$ m

Volume of water filled per hour

$= \pi r^2 h = \frac{22}{7} \times \frac{7}{100} \times \frac{7}{100} \times 5000$

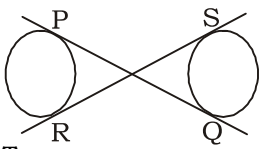
$= 77 \text{ m}^3$

Volume of water to be filled in the tank

$= \frac{50 \times 44 \times 7}{100} = 154 \text{ m}^3$

$\therefore$ Required time $= \frac{154}{77} = 2$ hours

81. (C)



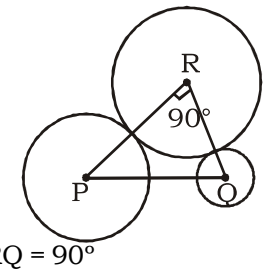
Transverse common tangent

$= \sqrt{d^2 - (r_1 + r_2)^2}$

$= \sqrt{(24)^2 - (5 + 3)^2}$

$= 16\sqrt{2}$ cm

82. (B)



$\angle PRQ = 90°$

$PR = 2 + x, PQ = 17$ and $RQ = 9 + x$

$PR^2 + RO^2 = PQ^2$

$(2 + x)^2 + (9 + x)^2 = 17^2$

$x^2 + 11x - 102 = 0$

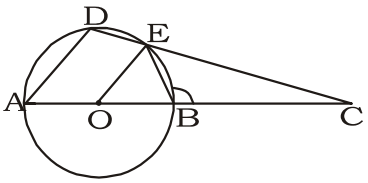
$x = 6$

83. (B) Error = 45°27' – 45° = 27'

$$60' = 1° \Rightarrow 27' = \frac{27°}{60}$$

$$\text{Percent error} = \frac{\frac{27}{60}}{45} \times 100 = \frac{2700}{60 \times 45} = 1\%$$

84. (C)



$\angle AOE = 150°$ and $\angle DAO = 51°$

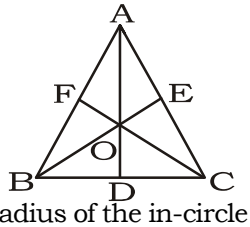
$\angle EOB = 180° - 150° = 30°$

$OE = OB$

$$\therefore \angle OEB = \angle OBE = \frac{150}{2} = 75°$$

$\therefore \angle CBE = 180° - 75° = 105°$

85. (D)



Radius of the in-circle = OE = OD = OF = 3 cm

Area of triangular base

$$= \frac{1}{2} \times \text{Perimeter} \times \text{Inradius}$$

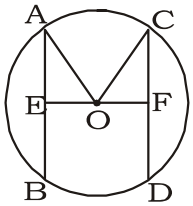
$$= \frac{1}{2} \times 3 \times 15 = \frac{45}{2} \text{ sq. cm}$$

Volume of prism = Area of base × height

$$270 = \frac{45}{2} \times \text{Height}$$

Height = 12 cm

86. (A)



$OE \perp AB$ and $OF \perp CD$

AE = EB = 5 cm

CF = FD = 12 cm

AO = OC = 13 cm

From ΔAOE

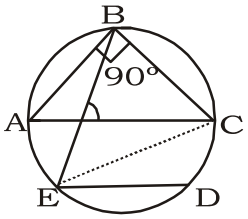
$OE = \sqrt{13^2 - 5^2} = 12$ cm

From ΔCDF,

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

$\therefore EF = OE + OF = 17$ cm

87. (D)



$\angle CBE = 50°$

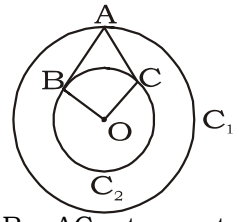
$\angle BAC + \angle BCA = 90°$

$\angle ABE = 90° - 50° = 40°$

$\angle ABE = \angle ACE = 40°$ [angle on same chord]

$\angle ACE = \angle DEC = 40°$ [opposite angle]

88. (C)



AB = AC = tangents from the same point.

OB = OC = 3 cm

OA = 12 cm

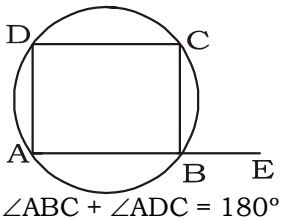
$\angle ABO = 90°$

$$\therefore AB = \sqrt{12^2 - 3^2} = 3\sqrt{15}$$

$$\Delta OAB = \frac{1}{2} \times 3 \times 3\sqrt{15} = \frac{9\sqrt{15}}{2} \text{ cm}^2$$

So, area of $\square ABOC = 9\sqrt{15}$ cm^2

89. (C)



$\angle ABC + \angle ADC = 180°$

$\angle CBE = 50°$

$\angle ABC = 180° - 50° = 130°$

$ADC = 180° - 130° = 50°$

90. (C) $\frac{360°}{n-1} - \frac{360°}{n+2} = 6°$

$$360\left(\frac{n+2-n+1}{(n-1)(n+2)}\right) = 6$$

$(n-1)(n+2) = 180$

$n^2 + n - 182 = 0$

$(n+14)(n-13) = 0$

$n = 13$

91. (B) Required ratio $= \frac{52000 - 5000}{5000} \times 100$
$= 9.4 \times 100 = 940\%$

92. (A) Medical college in 1980 $= \frac{11}{100} \times 32000$
$= 3520$

Medical college in 1990 $= \frac{9}{100} \times 52000$
$= 4680$

Required percentage $= \frac{4680 - 3520}{3520} \times 100$
$= 32.95$

93. (D) We don't have the information about the proportion (share) of engineering college in the given years.

94. (B) Required percentage $= \frac{32000 - 12000}{12000} \times 100$
$= 166.66\%$

95. (B) Number of medical colleges in 1990
$= \frac{52000 \times 9}{100} = 4680$
Increase in the total number of colleges
$= 60,000 - 52,000 = 8,000$
Increase in the number of medical colleges $= \frac{8000}{4} = 2000$
Therefore, percentage of medical colleges in 2001 $= \frac{4680 + 2000}{60000} \times 100 = 11\%$

96. (C) Required percent $= \frac{11000 + 12000}{21000} \times 100$
$= 109.52\%$

97. (C) Required percent $= \frac{27000 - 23000}{23000} \times 100$
$= 17.4\%$

98. (B) Demand = Domestic Production + Imports
Average demand $= \frac{44 + 54.5 + 57}{3}$
≈ 52 million tonnes

99. (C) Required percent $= \frac{30000 - 21000}{21000} \times 100$
$\approx 43\%$

100. (A) Off shore production in 2004
$= 16000 \times 0.875$
$= 14000$ thousand tonnes
On share production
$= 11,000$ thousand tonnes
Demand in 2004
$= 57000 \times 1.02$ thousand tonnes
$= 58140$ thousand tonnes
Imports $= 58140 - (14000 + 11000)$
$= 33140$ thousand tonnes
$= 33.14$ million tonnes

SSC MAINS - 27 (ANSWER KEY)

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