SSC MAINS (MATH) - 09 (SOLUTION)

1. (A) If $a + b + c = 0$, then
$a^3 + b^3 + c^3 = 3abc$
As, $22 + (-15) + (-7) = 0$
$\therefore\ 22^3 + (-15)^3 + (-7)^3 = 3 \times 22 \times -15 \times -7$
$= 6930$

2. (C) Required change $= \frac{10^2}{100}$ % decrease
$= 1\%$ decrease

3. (D) Let cost of 100 m cloths be ₹ 100.

CP of 80 m $= \frac{100}{120} \times 800$

$= ₹\ \frac{400}{6}$

SP of 80 m = ₹ 80

Profit $= 80 - \frac{400}{6}$

$= ₹\left(\frac{80}{6}\right)$

Profit percentage $= \dfrac{\frac{80}{6}}{\frac{400}{6}} \times 100$

$= 20\%$

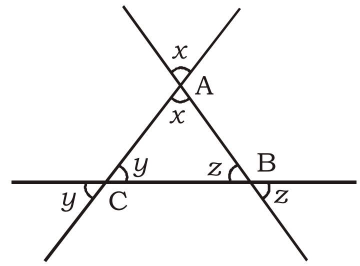
4. (D) $\dfrac{1\frac{7}{9} \text{ of } \frac{27}{64}}{\frac{11}{12} \times 9\frac{9}{11}} \div \dfrac{4\frac{4}{9} \text{ of } \frac{21}{160}}{2\frac{5}{6} \div 2\frac{2}{15}}$

$= \dfrac{\frac{16}{9} \text{ of } \frac{27}{64}}{\frac{11}{12} \times \frac{108}{11}} \times \dfrac{\frac{17}{6} \div \frac{32}{15}}{\frac{32}{7} \times \frac{21}{160}}$

$= \dfrac{\frac{3}{4}}{\frac{9}{1}} \times \dfrac{\frac{17}{6} \times \frac{15}{32}}{\frac{3}{5}} = \frac{3}{4 \times 9} \times \frac{5}{3} \times \frac{17}{2} \times \frac{5}{32}$

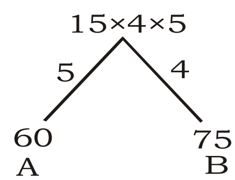
$= \frac{425}{2304}$

5. (D)



In ΔABC
Let $\angle A = x$
$\angle B = z$
$\angle C = y$
$\angle A + \angle B + \angle C = 180^\circ$
$\therefore\ x + y + z = 180^\circ$
$\therefore$ Sum of the interior angles $= 180^\circ$

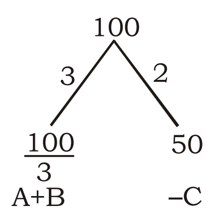
6. (B)



$A + B = \frac{15 \times 4 \times 5}{5 + 4}$ minutes

$= \frac{15 \times 4 \times 5}{9}$ minutes

$= \frac{100}{3}$ minutes



Required time $= \frac{100}{3 - 2}$ minutes
$= 100$ minutes

7. (A) Let exterior angle $= x$
$\therefore$ Interior angle $= 2x^\circ$
$2x + x = 180$
$\therefore\ x = 60^\circ$
Let the number of sides $= n$

Exterior angle $= \frac{360^\circ}{n}$

$\Rightarrow\ 60^\circ = \frac{360^\circ}{n}$

$\Rightarrow\ n = 6$

8. (D) $\frac{x^2 \times x}{yz \times x} + \frac{y^2 \times y}{zx \times y} + \frac{Z^2 \times z}{xy \times z}$

$\Rightarrow \frac{x^3 \times y^3 + z^3}{xyz}$

$\Rightarrow \frac{3xyz}{xyz}$

$\Rightarrow 3$

9. (D) LCM of 3, 5, 8 is 120

	Acid	Water	Total
I	[2 :	1	= 3]×40
II	[3 :	2	= 5]×24
II	[5 :	3	= 8]×15

Taking LCM of 3, 5 and 8 and multiplying according to get the same quantity of all three mixtures.

	A	W
I	80	40
II	72	48
III	75	45
	227	133

$\therefore \frac{W}{A} = \frac{133}{227}$

10. (C) Let the number of student be $2x$, $3x$, and $5x$.

ATQ,

$\Rightarrow \frac{2x+20}{3x+20} = \frac{4}{5}$

$\Rightarrow 2x = 20$

$\Rightarrow x = 10$

Total number of students = $10x$

$= 10 \times 10$

$= 100$

11. (C) Ratio of 50 paise, 25 paise and 10 paise coins = 1 : 2 : 3

$\therefore$ Ratio of values of 50 paise, 25 paise and 10 paise

= 50 × 1 : 25 × 2 : 10 × 3 = 50 : 50 : 30

= 5 : 5 : 3

$\therefore 5x + 5x + 3x = 6.50$

$13x = 6.50$

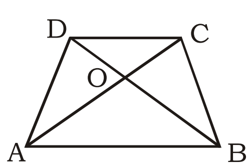
$x = \frac{6.50}{13} = 0.50$

$\therefore$ Value of 10 paise coins = 3 × 0.5

= ₹ 1.50 = 150 paise

$\therefore$ Number of 10 paise coins = $\frac{150}{10} = 15$

12. (B)



AB = 2CD

AB||CD

In ΔAOB and ΔCOD

$\angle$AOB = $\angle$COD – (Vertically opp. $\angle$s)

$\angle$OAB = $\angle$OCD (Alternate interior $\angle$s)

$\therefore \Delta AOB \sim \Delta COD$

$\therefore \frac{ar(\Delta AOB)}{ar(\Delta COD)} = \frac{(AB)^2}{(CD)^2} = \frac{(2CD)^2}{CD^2}$

$= \frac{4CD^2}{CD^2} = \frac{4}{1}$

13. (B) Let the monthly salary = ₹ x

Money spent on food = $\frac{40}{100} \times x = \frac{2x}{5}$

Remaining = $x - \frac{2x}{5} = \frac{3x}{5}$

Money spent on transport = $\frac{1}{3} \times \frac{3x}{5}$

$= \frac{x}{5}$

Remaining amount = $\frac{3x}{5} - \frac{x}{5} = \frac{2x}{5}$

ATQ,

$\frac{1}{2} \times \frac{2x}{5} = 4500$

$x = \frac{4500 \times 5 \times 2}{2} = ₹22500$

14. (B) $80\% = \frac{4}{5}$

Gold	Silver	Total
4	1	5
$\downarrow^{\times 10}$	$\downarrow^{\times 10}$	$\downarrow^{\times 10}$
40 gm	10 gm	50 gm

Let x gm of gold is added.

$\therefore \frac{40+x}{50+x} \times 100 = 95$

$\Rightarrow 800 \times 20x = 950 + 19x$

$x = 150$ gm

15. (B) $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta}$

$= \frac{\tan\theta}{1-\frac{1}{\tan}} + \frac{\cot\theta}{1-\tan\theta}$

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

$= \dfrac{1-\tan^3\theta}{\tan\theta(1-\tan\theta)}$

$= \dfrac{(1-\tan\theta)(1+\tan^2\theta+\tan\theta)}{\tan\theta(1-\tan\theta)}$

$= \dfrac{1}{\tan\theta} + \tan\theta + 1$

$= 1 + \tan\theta + \cot\theta$

16. (B) Ratio of interior angles of a pentagon $= 2 : 3 : 3 : 5 : 5$
Let the angles be $2x$, $3x$, $3x$, $5x$, $5x$,.
Sum of angles of a pentagon = 540°
$\Rightarrow 2x + 3x + 3x + 5x + 5x = 540°$
$\Rightarrow 18x = 540°$
$\Rightarrow x = 30°$
$\therefore$ Shortest angle = 2 × 30° = 60°

17. (D) Diameter of spherical drop = 0.1 cm
$\therefore$ Radius = 0.05 cm
Let Diameter of the rim of conical glass = d cm
$\therefore$ Radius = $\dfrac{d}{2}$ cm
Height of conical glass = Diameter = d cm
ATQ,

$32000 \times \dfrac{4}{3} \times \pi \times (0.05)^3$

$= \dfrac{1}{3} \times \pi \times \left(\dfrac{d^3}{2}\right)^2 d$

$\Rightarrow 8 \times 4 \times 4 \times 1000\,(0.05)^3 = \dfrac{d^3}{4}$

$\Rightarrow d^3 = 8 \times 4 \times 4 \times 4 \times 1000\,(0.05)^3$

$\Rightarrow d = 2 \times 4 \times 10 \times 0.05$

$= 4$ cm

18. (B) ATQ,
$2 \times 3 + 3 \times 4$
$\Rightarrow 3 \times 2 + 2 \times 3 + 3 \times 3 + 2 \times 4$
$\Rightarrow 6 + 6 + 9 + 8$
$\Rightarrow 29$

19. (A) Volume of rectangular block $= 21 \times 77 \times 24$ cm^2
Let the radius of sphere = r cm.
ATQ,

$21 \times 77 \times 24 = \dfrac{4}{3}\pi r^3$

$\Rightarrow \dfrac{21\times77\times24\times3\times7}{4\times22} = r^3$

$\Rightarrow r = 21$ cm

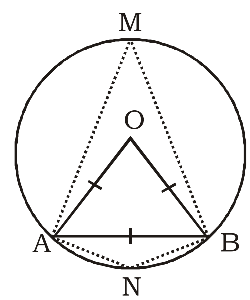
20. (D) $x - y = 2$, $xy = 24$
$x^2 + y^2 = (x-y)^2 + 2xy$
$= 2^2 + 2 \times 24$
$= 4 + 48 = 52$

21. (B) $x^3 - 27 = x^3 - 3^3 = (x-3)(x^2 + 9 + 3x)$
As HCF is a quadratic polynomial.
$\therefore$ $x^2 + a + 3x$ is the HCF.

$x^2+3x+9\overline{)\,x^3+4x^2+12x+K\,}(x+1$
x^3+3x^2+9x
$-\quad -\quad -$
x^2+3x+K
x^2+3x+9
$-\quad -\quad -$
$K-9$

Remainder must be O.
$\therefore$ K − 9 = 0
9 $\Rightarrow$ K = 9

22. (A)



In ΔOAB, OA = OB = AB
$\therefore$ $\angle$AOB = 60°

$\angle AMB = \dfrac{60}{2} = 30°$

$\angle ANB + \angle AMB = 180°$
So, $\angle ANB = 180° - 30°$
$= 150°$

23. (A) $(x^{b+c})^{b-c}\,(x^{c+a})^{c-a}\,(x^{a+b})^{a-b}$

$= x^{b^2-c^2}\quad x^{c^2-a^2}\quad x^{c^2-b^2}$

$= x^{b^2-c^2+c^2-a^2+a^2-b^2}$

$x^o = 1$

24. (C) $\sqrt{(x^2+y^2+z)(x+y-3z)} \div \sqrt[3]{xy^2z^2}$

$x = 1$, $y = -3$, $z = -1$

So,$= \dfrac{\sqrt{\left(1^2+(-3)^2+(-1)\right)\left(1+(-3)-3(-1)\right)}}{\sqrt[3]{1\times(-3)^3\times(-1)^2}}$

$= \sqrt{\dfrac{9\times1}{\sqrt[3]{-27}}} = \dfrac{3}{-3} = -1$

25. (D) $x - a$ is factor of $x^3 - 3x^2 - 3x + 9$

Put $x = a$

$a^3 - 3a^2 - 3a + 9 = 0$

$\Rightarrow a^2(a-3) - 3(a-3) = 0$

$\Rightarrow (a^2 - 3)(a - 3) = 0$

$\Rightarrow a^2 - 3 = 0,\ a - 3 = 0$

$\Rightarrow a^2 = 3,\ a = 3$

$\Rightarrow a = \sqrt{3}, -\sqrt{3},\ a = 0$

$\therefore$ a can have three values.

26. (D) Volume of pyramid

$= \frac{1}{3}$ Area of base × height

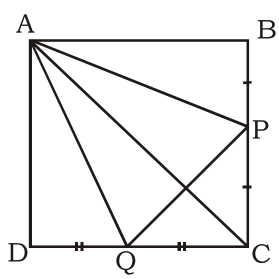
$= \frac{1}{3} \times \frac{\sqrt{1152}}{\sqrt{2}} \times 6$

$= \frac{1}{3} \times 576 \times 6$

$= 576 \times 2$

$= 1152\ m^3$

27. (C)



ar (ΔABC) $= \frac{1}{2}$ ar. (11gm ABCD)

$\therefore$ ar (11gm ABCD) $= 2 \times 12$

$= 24\ cm^2$

ar (ΔAPQ) $= \frac{3}{8}$ ar. (11 gm ABCD)

$= \frac{3}{8} \times 24 = 9\ cm^2$

28. (C) $x = a \sec\alpha \cos\beta$

$\Rightarrow \frac{x}{a} = \sec\frac{x}{a}\cos\beta$

Similarly, $\frac{y}{b} = \sec\alpha\sin\beta$

$\frac{z}{c} = \tan\alpha \quad \frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}$

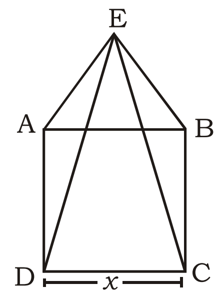
$= (\sec\alpha\cos\beta) + (\sec\alpha\sin\beta)^2 - \tan^2\alpha$

$= \frac{\sin^2\beta}{\cos^2\alpha} + \frac{\sin^2\beta}{\cos^2\alpha} - \frac{\sin^2\alpha}{\cos^2\alpha}$

$= \frac{\cos^2\beta + \cos^2\beta - \sin^2\alpha}{\cos^2\alpha}$

$= \frac{1 - \cos^2\alpha}{\cos^2\alpha} = \frac{\cos^2\alpha}{\cos^2\alpha} = 1$

29. (A)



A square base right pyramid is given.

Let side of base = x m

Slant height = 4 m

$\therefore$ Total slant surface $= 4 \times \frac{1}{2} \times x \times 4$

$= 8x\ m^2$

$\therefore 8x = 12$

$x = \frac{12}{8} = 1.5$

$\therefore \frac{\text{Total slant surface}}{\text{Area of base}} = \frac{12}{1.5 \times 1.5} = \frac{16}{3}$

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

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

Applying Componendo and Dividendo

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

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

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

$\Rightarrow \sqrt{a} + \sqrt{b} = \sqrt{3} \times \sqrt{a} - \sqrt{3} \times \sqrt{b}$

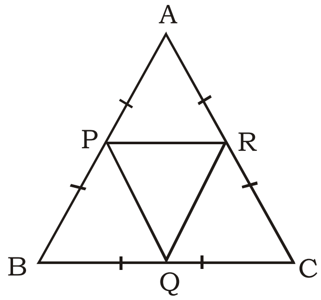
$\Rightarrow (\sqrt{3}+1)\sqrt{b} = (\sqrt{3}-1)\sqrt{a}$

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

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

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

31. (A)



In ΔABC,
P and R are mid points of AB an AC.

$\therefore$ PR = $\frac{1}{2}$ BC .... (i)

Similarly, QR = $\frac{1}{2}$ AB .... (ii)

PQ = $\frac{1}{2}$ AC ..... (iii)

In ΔABC, AB = BC = CA .... (iv)
From (i), (ii), (iii), (iv)
PR = PQ = QR
$\therefore$ ΔPQR is equilateral Δ.

32. (D) Let A be $6a$, and B be a.
Required percentage

$= \frac{6a - a}{6a} \times 100$

$= \frac{5}{6} \times 100$

$= \frac{250}{3}$

$= 83\frac{1}{3}\%$

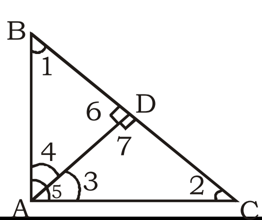
33. (B) $\sec\theta + \tan^3\theta \ \text{cosec}\theta$

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

$= \frac{1}{\cos^3\theta} = \sec^3\theta = \left(\sqrt{1+\tan^2\theta}\right)^3$

$= \left(\sqrt{1+1-e^2}\right)^3 = \left(2-e^2\right)^{\frac{1}{2}}$

34. (C)



In ΔABC and ΔBDA
$\angle 5 = \angle 6 = 90°$
$\angle 1 = \angle 1$ (common)
$\therefore$ $\Delta ABC \sim \Delta DBA$ ....(i)
Similarly, $\Delta ABC \sim \Delta DAC$ .... (ii)
From (i) and (ii)
$\Delta ABC \sim \Delta DAC \sim \Delta DBA$

35. (C) CP of House = $\frac{1}{80} \times 100$

$= \frac{5}{4}$ lakhs

CP of Shop = $\frac{1}{120} \times 100$

$= \frac{5}{6}$ lakhs

Total CP = $\frac{5}{4} + \frac{6}{5}$

$= 5\left(\frac{6+4}{24}\right)$

$= 5 \times \frac{5}{12}$

Total SP = 1 lakh + 1 lakh

= 2 lakhs

Loss = $\frac{25}{12} - 2$

$= \frac{25-24}{12}$ lakhs

$= \frac{1}{12}$ lakhs

36. (A) $3\sin^2\alpha + 7\cos^2\alpha = 4$
$\Rightarrow 3\sin^2\alpha + 3\cos^2\alpha + 4\cos^2\alpha = 4$
$\Rightarrow 3 + 4\cos^2\alpha = 4$
$\Rightarrow 4\cos^2\alpha = 1$
$\Rightarrow \cos^2\alpha = \frac{1}{2}$
$\therefore \alpha = 60°$
$\therefore \tan\alpha = \tan 60° = \sqrt{3}$

37. (A) Ratio of expenses = $18 \times 4 : 25 \times 2 : 28 \times 5 : 21 \times 3$

= 72 : 50 : 140 : 63

$\xrightarrow{5}$ 360

So, rent of pasture = 325 × 5

= ₹ 1625

38. (D) Doremon : Nobita

8 Jumps : 6 Jumps

Length of 7 jumps : Length of 5 Jumps

Let 1 Jump of Doremon = 1m.

$\therefore$ Length of 1 Jump of Doremon = $\frac{5}{7}$ m

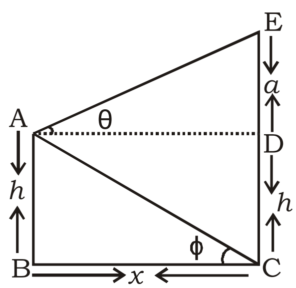
Doremon : Nobita

$8 \times \frac{5}{7} : 6 \times 1$

40 : 42

$\therefore$ Ratio of speed = 20 : 21

39. (D) Let the height of DE be a metres and distance between both houses (BC) is x metres.



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

$\tan\theta = \frac{a}{x}$ [$\because$ BC = AD]

Required height = $a + h$

$= x\tan\theta + x\tan\phi$

$= x(\tan\theta + \tan\phi)$

$= \frac{h}{\tan\phi}(\tan\theta + \tan\phi)$

$= h(\tan\theta\ \cot\phi + 1)$

40. (A) Let the speed of faster train = x m/s

Let the speed of slower train = y m/s

When running in same direction –

Relative speed = $(x - y)$ m/s

$\therefore \frac{100+80}{x-y} = 18$

$\Rightarrow x - y = 10$ ….. (i)

When running in opp. direction-

Relative speed = $(x - y)$ m/s

$\therefore \frac{100+80}{x+y} = 9$

$x + y = 20$ …….. (ii)

From (i) and (ii)

$2x = 30 = x = 15$

$y = 5$

41. (B) 6 (8M + 12W) = 10(4M + 9W)

$\Rightarrow$ 24M + 36W = 20M + 45W

$\Rightarrow$ 4M = 9W

$\Rightarrow$ M : W = 9 : 4

Let the required days.

(20M + 15W)D = 6 (8M + 12W)

(20 × 9 + 15 × 4)D = 6 (8 × 9 + 12 × 4)

$D = \frac{6(72+48)}{(180+60)}$

$D = \frac{6\times120}{240}$

= 3 days

42. (D) Ratio of investment = 5 : 7

Let their investment be x.

ATQ,

$$\left[\left(\frac{x}{2}\times\frac{70}{100}\right)+\left(\frac{x\times30}{100}\times\frac{7}{12}\right)\right]$$

$$-\left[\left(\frac{x}{2}\times\frac{70}{100}\right)+\left(\frac{x\times30}{100}\times\frac{5}{12}\right)\right] = 90$$

$$\Rightarrow \left[\frac{7x}{20}+\frac{7x}{40}\right]-\left[\frac{7x}{20}+\frac{x}{8}\right] = 90$$

$$\Rightarrow \left[7x\left(\frac{2+1}{40}\right)\right]-\left[\frac{14x+5x}{40}\right] = 90$$

$$\Rightarrow \frac{21x}{40}-\frac{19x}{40} = 90$$

$$\Rightarrow \frac{21x-19x}{40} = 90$$

$\Rightarrow 2x = 90 \times 40$

$\Rightarrow x = ₹1800$

43. (D) Required loss percentage = $16\frac{2}{3}\%$

44. (A) In a triangle, any side is greater than the difference of other two sides and it is also less than the sum of other two sides.

$\therefore (15 - 8) < x < (15 + 8)$

$7 < x < 23$

45. (A) $(a^2 - b^2)\sin\theta + 2\cos\theta = a^2 + b^2$

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

$= \cos\theta = 1$

As, $\sin^2\theta + \cos^2\theta = 1$

By comparing, $\sin\theta = \dfrac{a^2-b^2}{a^2+b^2}$,

$\cos\theta = \dfrac{2}{a^2+b^2}$

$\therefore \tan\theta = \dfrac{\sin\theta}{\cos\theta} = \dfrac{\frac{a^2-b^2}{a^2+b^2}}{\frac{2}{a^2+b^2}} = \dfrac{a^2-b^2}{2}$

46. (C) $x + \dfrac{1}{2x} = 2$

or $2x + 2 \times \dfrac{1}{2x} = 2 \times 2$

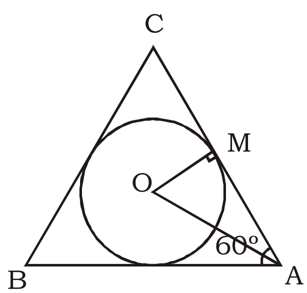
$\Rightarrow 2x + \dfrac{1}{x} = 4$

$\Rightarrow 8x^3 + \dfrac{1}{x^3} = 4^3 - 3 \times 2x \times \dfrac{1}{x} \times 4$

$= 64 - 24$

$= 40$

47. (B)



ΔABC is equilateral Δ.

$\angle BAC = 60°$

$\angle OAM = \dfrac{60°}{2} = 30°$

$AC = \sqrt{3}$ unit

$AM = \dfrac{AC}{2} = \dfrac{\sqrt{3}}{2}$ unit

In ΔOAM, $\tan\angle OAM = \dfrac{OM}{AM} \Rightarrow \tan 30°$

$= \dfrac{OM}{\frac{\sqrt{3}}{2}}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{2OM}{\sqrt{3}}$

$\Rightarrow OM = \dfrac{1}{2}$ units

48. (A) CP of first cooler $= \dfrac{2970}{110} \times 100$

$= ₹2700$

CP of second cooler $= \dfrac{2970}{90} \times 100$

$= ₹ 3300$

Total CP = ₹ 6000

Total SP = ₹ 5940

Loss $= \dfrac{60}{6000} \times 100$

$= 1\%$

49. (C) Speed of train = 45 km/hour

$= \dfrac{45 \times 1000}{3600}$

$= \dfrac{25}{2}$ m/sec

Time = 4 hours = 4 × 3600 = 14400 sec

Distance between poles = 50m

$\therefore$ Distance covered by train

$= \dfrac{25}{2} \times 14400$

$\therefore$ Number of poles crossed

$= \dfrac{\frac{25}{2} \times 14400}{50} + 1$

$= \dfrac{25 \times 14400}{2 \times 50} + 1$

= 3600 + 1 = 3601

50. (A) Let his CP = 100%

then, SP $= 100 \times \dfrac{120}{100} = 120$

ATQ,

50% = 60

$25\% = \dfrac{120}{4} \times \dfrac{80}{100} = 24$

$25\% = \dfrac{120}{4} \times \dfrac{60}{100} = 18$

Total SP = 60 + 24 + 18

= 102

So, his gain = 2%

51. (A) $a^2 + b^2 = (a + b)(a^2 + b^2 - ab)$

$\Rightarrow \dfrac{(0.73)^3 + (0.27)^3}{(0.73)^2 + (0.27)^2 - (0.73) \times (0.27)}$

$$\Rightarrow \frac{\left[(0.73+0.27)+(0.73)^2+(0.27)^2-(0.73)(.27)\right]}{(0.73)^2+(0.27)^2-(0.73)\times(0.27)}$$

$\Rightarrow$ [0.73+0.27]

$\Rightarrow$ 1

52. (B) Total decrease = 11 × 2
= 22 months
or 1 year 10 months
Total age of the new player
= (17 + 20) years – 1year 10 months
= 35 years 2 months
Required average = 17 years 7 months

53. (D) $(3M)1 = (8W)\ \frac{3}{4} = (18C)\ \frac{1}{2}$

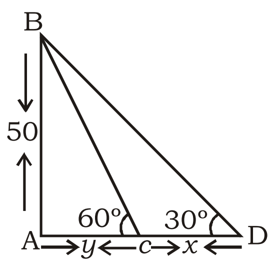
ATQ,
M : W : C = 6 : 3 : 2
Let x part of work be completed.

$$\Rightarrow \frac{(3W+3C)\times 1}{x} = \frac{3\times 6}{1}$$

$$x = \frac{3\times 5}{3\times 6}$$

$$x = \frac{5}{6}$$

54. (A)



Let the difference be x.

$$\tan 30^\circ = \frac{50}{x+y}$$

$$\frac{1}{\sqrt{3}} = \frac{50}{x+y}$$

$x + y = 50\sqrt{3}$ .... (i)

$$\tan 60^\circ = \frac{50^\circ}{y}$$

$$\frac{\sqrt{3}}{1} = \frac{50}{y}$$

$y = \frac{50}{\sqrt{3}}$ .... (ii)

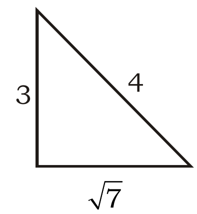
then,

$$x, = 50\sqrt{3} - \frac{50}{\sqrt{3}}$$

$$= \frac{150-50^\circ}{\sqrt{3}}$$

$$= \frac{100}{\sqrt{3}}\ \text{m}$$

55. (B)



$$\sqrt{\frac{\text{coec}^2\theta-\cot^2\theta}{\text{coe}^2\theta-1}}$$

$$\Rightarrow \sqrt{\frac{\frac{1}{\sin^2\theta}-\frac{\cos^2\theta}{\sin^2\theta}}{\frac{1-\cos^2\theta}{\cos^2\theta}}}$$

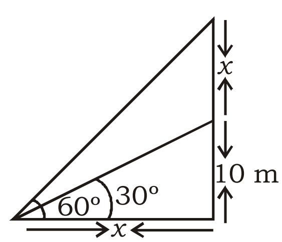
$$\Rightarrow \sqrt{\frac{1-\cos^2\theta}{\sin^2\theta}\div\frac{1-\cos^2\theta}{\sin^2\theta}}$$

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

$\Rightarrow \cot\theta$

$$\Rightarrow \frac{\sqrt{7}}{3}$$

56. (D)



Let the height of helicopter be x m
From the top of house.

$$\tan 30^\circ = \frac{10}{x}$$

$$\frac{1}{\sqrt{3}} = \frac{10}{y}$$

$$y = 10\sqrt{3}\ \text{m}$$

$$\tan 60^\circ = \frac{x+10}{y}$$

$$\Rightarrow \frac{\sqrt{3}}{1} = \frac{x+10}{y}$$

$\Rightarrow \sqrt{3} \times 10\sqrt{3} = x + 10$

$\Rightarrow \quad x = 20$ m

Required height = 10 + 20

= 30 m

57. (D) $\dfrac{(6.25)^{\frac{1}{2}} \times (0.0144)^{\frac{1}{2}} + 1}{(0.027)^{\frac{1}{3}} \times (81)^{\frac{1}{4}}}$

$\Rightarrow \dfrac{2.5 \times 0.12 + 1}{.3 \times 3}$

$\Rightarrow \dfrac{.300 + 1}{.9}$

$\Rightarrow \dfrac{1.3}{.9}$

$\Rightarrow 1.\overline{4}$

58. (B) Neha's saving = 100% – 80%

= 20%

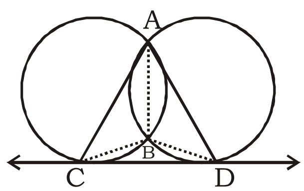
$\big\downarrow {\scriptstyle 75}$

1500

her salary $\Rightarrow$ 100% × 75

= ₹ 7500

59. (A)



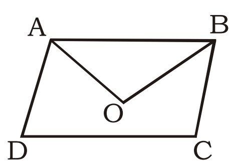
$\angle CAB = \angle BCD$
$\angle DAB = \angle CDB$ [Angles in alternate segments]

$\angle CAD = \angle CAB + \angle DAB$

$= \angle BCD + \angle CDB$

So, $\angle CAD + \angle CBD = 180^\circ$

60. (D)



$\angle DAB + \angle CBA = 180^\circ$

then $\angle AOB = 180 - \dfrac{180}{2}$

$= 90^\circ$

61. (B) Let the number of boys be x.

$x + \dfrac{120}{100}x = 66$

$\Rightarrow x + \dfrac{6}{5}x = 66$

$\Rightarrow \quad 11x = 66 \times 5$

$\Rightarrow \quad x = 30$

$\therefore$ Number of girls = 66 – 30

= 36

Required ratio = 30 : (36 + 4)

= 30 : 40

= 3 : 4

62. (C) $\dfrac{x}{a} = (b - c)$

$\dfrac{y}{b} = (c - a)$

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

Again,

$b - c + c - a + a - b = 0$

$\therefore \left(\dfrac{x}{a}\right)^3 + \left(\dfrac{y}{b}\right)^3 + \left(\dfrac{z}{c}\right)^3 = 0$

$\Rightarrow (b - c)^3 + (c - a)^3 + (a - b)^3 = 0$

$\Rightarrow 3\,(b - c)\,(c - a)\,(a - b) = 0$

$\Rightarrow \dfrac{3xyz}{abc}$

63. (A) If A covers the distance of 1 km in x seconds, B covers the distance of 1 km in $(x + 25)$ seconds. If A covers the distance of 1 km, then in the same time C covers only 725 metres.

If B covers 1 km in $(x + 25)$ seconds, then C covers 1 km in $(x + 55)$ seconds.

Thus in x seconds, C covers the distance of 725 m.

$\therefore \dfrac{x}{725} \times 1000$

$= x + 55 \Rightarrow x = 145$

$\therefore$ A covers the distance of 1 km in 2 minutes 25 seconds.

64. (C) $\dfrac{1}{\sqrt{2}+1} + \dfrac{1}{\sqrt{3}+\sqrt{2}} + \dfrac{1}{\sqrt{4}+\sqrt{3}} + \dfrac{1}{\sqrt{5}+\sqrt{4}} + \dfrac{1}{\sqrt{6}+\sqrt{5}} + \dfrac{1}{\sqrt{7}+\sqrt{6}} + \dfrac{1}{\sqrt{8}+\sqrt{7}} + \dfrac{1}{\sqrt{9}+\sqrt{8}}$

Rationalizing the terms -

$= \dfrac{1}{\sqrt{2}+1} \times \dfrac{\sqrt{2}-1}{\sqrt{2}-1} + \dfrac{1}{\sqrt{3}+\sqrt{2}} \times \dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}} + \dfrac{1}{\sqrt{4}+\sqrt{3}} \times \dfrac{\sqrt{4}-\sqrt{3}}{\sqrt{4}-\sqrt{3}} + \dfrac{1}{\sqrt{5}+\sqrt{4}} \times \dfrac{\sqrt{5}-\sqrt{4}}{\sqrt{5}-\sqrt{4}} + \dfrac{1}{\sqrt{6}+\sqrt{5}} \times \dfrac{\sqrt{6}-\sqrt{5}}{\sqrt{6}-\sqrt{5}} + \dfrac{1}{\sqrt{7}+\sqrt{6}} \times \dfrac{\sqrt{7}-\sqrt{6}}{\sqrt{7}-\sqrt{6}} + \dfrac{1}{\sqrt{8}+\sqrt{7}} \times \dfrac{\sqrt{8}-\sqrt{7}}{\sqrt{8}-\sqrt{7}} + \dfrac{1}{\sqrt{9}+\sqrt{8}} \times \dfrac{\sqrt{9}-\sqrt{8}}{\sqrt{9}-\sqrt{8}}$

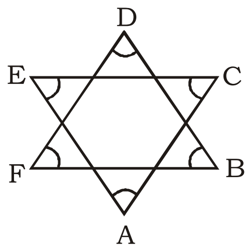
$= \dfrac{\sqrt{2}-\sqrt{1}}{2-1} + \dfrac{\sqrt{3}-\sqrt{2}}{3-2} + \dfrac{\sqrt{4}-\sqrt{3}}{4-3} +$

$$\frac{\sqrt{5}-\sqrt{4}}{5-4} + \frac{\sqrt{6}-\sqrt{5}}{6-5} + \frac{\sqrt{7}-\sqrt{6}}{7-6} + \frac{\sqrt{8}-\sqrt{7}}{8-7} + \frac{\sqrt{9}-\sqrt{8}}{9-8}$$

$= \sqrt{2} - 1 + \sqrt{3} - \sqrt{2} + \sqrt{4} - \sqrt{3} + \sqrt{5} - \sqrt{4} + \sqrt{6} - \sqrt{5} + \sqrt{7} - \sqrt{6} + \sqrt{8} - \sqrt{7} + \sqrt{9} - \sqrt{8}$

$= \sqrt{9} - 1 = 3 - 1 = 2$

65. (A)



In ΔAEC,

$\angle A + \angle E + \angle C = 180^\circ$ .... (i)

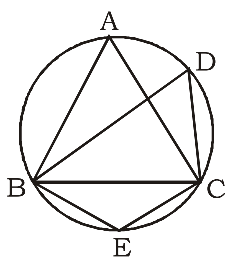
In ΔBFD,

$\angle B + \angle F + \angle D = 180^\circ$ .... (ii)

Adding (i) and (ii)

$\angle A + \angle B + \angle C + \angle D + \angle E + \angle F = 360^\circ$

66. (C)



$\angle ABC = \angle ACB = 50^\circ$

$\angle BAC = \angle BDC$ [angle on some chord]

$\angle BDC = 80^\circ$

67. (C) $x^2 + y^2 + z^2$

$= r^2 \sin^2\theta . \cos^2\phi + r^2 \sin^2\theta . \sin^2\phi + r^2 \cos^2\theta$

$= r^2 \sin^2\theta\ (\cos^2\phi + \sin^2\phi) + r \cos^2\theta$

$= r^2 (\sin^2\theta + \cos^2\theta)$

$= r^2$

68. (B) Four years ago let the age of A and B be $2x$ and $3x$ years.

ATQ,

$$\frac{2x+8}{3x+8} = \frac{5}{7}$$

$x = 16$

Let their present age = 32 years & 48 years

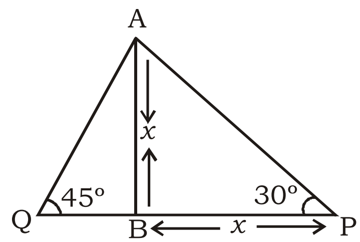
69. (B) $2 = x + \cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{4}}}$

$\Rightarrow 2 = x + \cfrac{1}{1+\cfrac{4}{13}}$

$\Rightarrow 2 = x + \frac{13}{17}$

$\Rightarrow x = \frac{21}{17}$

70. (A)



Let the height of the tree be h and BP be x m.

$\tan 45^\circ = \frac{h}{QB}$

$1 = \frac{h}{QB}$

$100 - x = h$ .... (i)

$\tan 30^\circ = \frac{h}{x}$

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

$x = \sqrt{3}\,h$

or $100 - \sqrt{3}\,h = h$

$h(\sqrt{3}+1) = 100$

$h = \frac{100}{\sqrt{3}+1}$

or $50(\sqrt{3}-1)$ m

71. (B) LCM of number $= \frac{4107}{37}$

$= 111$

So, numbers are 111 and 37.

72. (D) Let the third number be 100%

then the first number = 20%, & second = 50%

Required percent $= \frac{20}{50} \times 100$

$= 40\%$

73. (D) Side of field = 10 m

Require cost = 10 × 10 × 20

= 2000

74. (B) Let number of boys = x

Let number of girls = y

ATQ –

$x^2 - y^2 = 28$

$(x - y)(x + y) = 28$ ...... (i)

And $y + 2 = x$

$\Rightarrow$ $y + 2 = 2$ .... (ii)
Put $x - y = 2$ in .... (i)
$2(x + y) = 28$
$x + y = 14$ .... (iii)
From equation (ii) and (iii)
$2x = 16 \Rightarrow x = 8$
$y = 6$
$\therefore$ Total number of boys and girls = 8 + 6 = 14

75. (C) $\sqrt{a+b+c}$
$= \sqrt{3+4+9} = \sqrt{16}$
$= \pm 4$

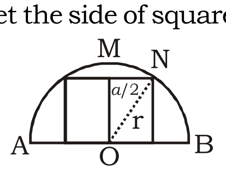
76. (C) In 1 hour the inlet of 2 cm diameter can fill $\frac{1}{9}$ of the tank.
$\therefore$ In 1 hour the inlet of 3 cm diameter can fill $\frac{1}{9} \times \frac{(3)^2}{(2)^2} = \frac{1}{4}$ of the tank.
$\therefore$ In 1 hour the inlet of 4 cm diameter can fill $\frac{1}{9} \times \frac{(4)^2}{(2)^2}$
$= \frac{4}{9}$ of the tank.
$\therefore$ In 1 hour the three inlets together will fill $\frac{1}{9} + \frac{1}{4} + \frac{1}{9} = \frac{4+9+16}{36}$
$= \frac{29}{36}$ of the tank.
Hence, the whole tank will get filled in $\frac{36}{29}$
$= 1\frac{7}{29}$ hours.

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

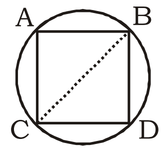
Glycerine	Adulteration	Total
4	1	5
$\downarrow \times 10$	$\downarrow \times 10$	$\downarrow \times 10$
40 Ltr	10 Ltr	50 Ltr

Let x Ltr of Pure Glycerine is added.
$\therefore \frac{40+x}{50+x} \times 100 = 95$
$\Rightarrow$ $800 \times 20x = 950 + 19x$
$x = 150$ Ltr

78. (B) Let the side of square in semi-circle be a cm².



$OM^2 + MN^2 = ON^2$
$\Rightarrow a^2 + \left(\frac{a}{2}\right)^2 = r^2$
$\Rightarrow a^2 = \frac{4r^2}{5}$



Area of inscribed square in semi-circle = $\frac{4r^2}{5}$
$\Rightarrow$ So, area of inscribed square in a circle
$= \frac{1}{2} \times (2r)^2 = 2r^2$
$\therefore$ Required ratio = $\frac{4r^2}{5} : 2r^2$
$= 2 : 5$

79. (D)

	Zinc	Tin		Total
A	(5	2	=	7) × 1
B	(3	4	=	7) × 3
A	5	2	=	7
B	9	12	=	21

A : B = 14 : 14
= 1 : 1
$\therefore$ Ratio of Zinc and Tin in new all a y = 1:1

80. (D) Let Perimeter of base $6a$.
$132\sqrt{3} = 6a + 10\sqrt{3} + 2 \times 6 \times \frac{\sqrt{3}}{4} a^2$
$132 = 60a + 3a^2$
$a^2 + 20a - 44 = 0$
$a = 2$
Volume $= 6 \times \frac{\sqrt{3}}{4} \times 2 \times 2 \times 10\sqrt{3}$
$= 180$ cm³

81. (C) Let the initial investments of A and B be $3x$ and $5x$.
A : B : C = $3x \times 12) : (5x \times 12) : (5x \times 6)$
$= 36x : 50x : 30x$
$= 6 : 10 : 15$

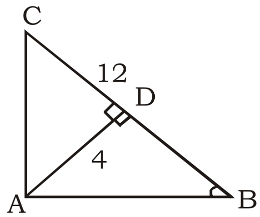
82. (D) M : F = 2 : 1
M : C = 2 : 1
M : F : C = 2 : 4 : 1
Let x female can do it completely.
ATQ,
$(x\,F)\ 7 = 6\ (3M + 4F + 6C)$
$\Rightarrow 7x \times 4 = 6\ (3 \times 2 + 4 \times 4 + 6 \times 1)$
$\Rightarrow x = \frac{6 \times 28}{7 \times 4}$ days
$= 6$ days

83. (C) $\sin^3\theta \cdot \cos^3\theta$
$\Rightarrow \frac{8\sin^3\theta.\cos^3\theta}{8}$

$= \frac{(2\sin\theta.\cos\theta)^3}{8}$

$\Rightarrow$ minimum value $= -\frac{1}{8}$

84. (A)



cot B + cot C

$\frac{BD}{4} + \frac{CD}{4} = \frac{BD+CD}{4}$

$= \frac{12}{3}$

$= 3$ cm

85. (C) If $x = 2 + 2^{\frac{1}{3}} - 2^{\frac{2}{3}}$
$x^3 - 6x^2 + 18x = 2^3 - 2^2 + 2 + 3 \times 4$
$= 8 - 4 + 2 + 12$
$= 22 - 4$
$= 18$

86. (D) ATQ,

$800 = \frac{1}{3} \times 40 \times 40 \times h$

$\Rightarrow \frac{2400}{1600} = h$

$h = 1.5$ cm

87. (A) 16 in not a factor of 136, it follows that there does not exist any pair of numbers with HCF 16 and LCM 136.

88. (D) Ram & Mohan = $3x : 2x$

$\Rightarrow \frac{3x \times 5 + \frac{3x}{2} \times 7}{2x \times 12}$

$\Rightarrow \frac{30x + 21x}{2 \times 24x}$

$\Rightarrow \frac{51x}{48x}$

Ram's share =

$\frac{51}{99} \times 1650$

= ₹ 850

89. (A) Let the number of keepers be x.
Total number of heads = $(50+45+8+x)$
$= 103 + x$
Total number of feet
$= (45 + 8) \times 4 + (50 + x) \times 2$
$= (312 + 2x)$
ATQ, $(312 + 2x) - (103 + x) = 24$
$\Rightarrow x = 15$

90. (B) Let the CP of mobile phone be 100%.
ATQ,

$P = 100 \times \frac{112}{100}$
$= 112\%$

$Q = 100 \times \frac{96}{100}$
$= 96\%$

$Q : P = 96 : 112$
$= 6 : 7$

91. (D) Let the amounts invested in 2014 in companies P and Q be Rs. $8x$ and Rs. $9x$ respectively.
Then, interest received after one year from Company P

= ₹ (6% of $8x$) = ₹ $\frac{48}{100}x$

and interest after one year from Company Q

= ₹(4% of $9x$) = ₹ $\frac{36}{100}x$.

$\therefore$ Required ratio $= \left(\frac{\frac{48}{100}x}{\frac{36}{100}x}\right) = \frac{4}{3}$,

92. (D) Let ₹ x lakhs be invested in Company P in 2012, then amount invested in Company Q in 2012 = ₹ $(30 - x)$ lakhs.
Total interest from the two Companies after 1 year
= ₹ [(7.5% of x) + (9% of $(30 - x)$] lakhs

= ₹ $\left[27 - \left(\frac{1.5x}{100}\right)\right]$ lakhs

$\therefore \left[27 - \left(\frac{1.5x}{100}\right)\right] = 2.43 \Rightarrow x = 18.$

i.e., amount invested in Company P = ₹18 lakhs.

93. (D) Difference = ₹ [(10% of 4.75) – (8% of 4.75)] lakhs.
= ₹ (2% of 4.75) lakhs = ₹ 0.095 lakhs
= ₹ 9500

94. (C) Amount received from Company P after one year (*i.e.*, in 2010) on investing ₹ 12 lakhs in it = ₹ [12 + (8% of 12)] lakhs
= ₹ 12.96 lakhs.
Amount received from Company P after one year on investing ₹12.96 lakhs in the Appreciation received on investment during the period of two years.
= ₹ (14.256 –12) lakhs = ₹ 2.256 lakhs
= ₹2,25,600

95. (B) Amount received from Company Q after one year on investment of ₹ 5 lakhs in the year 2008 = ₹ [5 + (6.5 of 5) lakhs
= ₹ 5.325 lakhs.

Amount received from Company P after one year on investment of ₹ 5.325 lakhs in the year 2009 = ₹ [15.325 + (9% of 5.325)] lakhs = ₹ 5,80,425.

96.(D) Total sales of branches B1, B2 and B5 for both the years (in thousand numbers)
= (80 + 105) + (95 + 110) + (75 + 96)
= 560.

97. (C) Required Percentage

$$= \left[\frac{(70+80)}{(95+95)} = 100\right]\% = \left(\frac{150}{205}\times 100\right)\%$$

= 73.17%

98. (B) Average sales of all the six branches (in thousand numbers) for the year

$$2013 = \frac{1}{6} \times (80 + 75 + 95 + 85 + 75 + 70]$$
$$= 80$$

99. (A) Required ratio $= \frac{(65+55)}{(85+95)}$

$$= \frac{120}{180} = \frac{2}{3}$$

100. (D) Average sales (in thousand numbers) of branches B1 B3 and B6 in 2013

$$= \frac{1}{3} \times (80 + 95 + 70) = \left(\frac{245}{3}\right)$$

Average sales (in thousand numbers) of branches B1, B2 and B3 in 2014

$$= \frac{1}{3} \times (105 + 65 + 110) = \left(\frac{280}{3}\right)$$

$$\therefore \text{ Required Percentage } = \left[\frac{\left(\frac{245}{3}\right)}{\left(\frac{280}{3}\right)}\times 100\right]\%$$

$$= \left(\frac{245}{280}\times 100\right)\%$$
$$= 87.5\%$$

SSC MAINS-09 (ANSWER KEY)

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

Note : If your opinion differs regarding any answer please message the mock test and question no to 886030003

For any issues related to Result Processing, kindly contact us on 9313111777.