SSC MAINS TEST - 13 (T-II) 2013 (SOLUTION)

1. (*) $\frac{9}{13}, \frac{2}{3}, \frac{8}{11}, \frac{5}{7}$

$= \frac{9\times40}{13\times40}, \frac{2\times180}{3\times180}, \frac{8\times45}{11\times45}, \frac{5\times72}{7\times72}$

$= \frac{360}{520}, \frac{360}{540}, \frac{360}{495}, \frac{360}{504}$

In the above fractions, numerators are equal, so the fraction with the greater denominator will have the least value of ratio and the fraction with the lowest value of denominator will have the highest value of ratio.

$\Rightarrow \frac{360}{540} < \frac{360}{520} < \frac{360}{504} < \frac{360}{495}$

$\Rightarrow \frac{2}{3} < \frac{9}{13} < \frac{5}{7} < \frac{8}{11}$

[The required ascending order of the given fractions] Ans.

2. (D) $(28-10\sqrt{3})^{\frac{1}{2}} - (7+4\sqrt{3})^{-\frac{1}{2}}$

$\Rightarrow \left[5^2+(\sqrt{3})^2-2.5.\sqrt{3}\right]^{\frac{1}{2}} - \left[2^2+(\sqrt{3})^2+2.2.\sqrt{3}\right]^{-\frac{1}{2}}$

$\Rightarrow 5-\sqrt{3}-(2+\sqrt{3})^{-1}$

$\Rightarrow 5-\sqrt{3}-\frac{1}{2+\sqrt{3}}$

$\Rightarrow 5-\sqrt{3}-\frac{2-\sqrt{3}}{4-3}$

$\Rightarrow 5-\sqrt{3}-(2-\sqrt{3})$

$\Rightarrow 5-\sqrt{3}-2+\sqrt{3} = 3$ Ans

3. (B) Let x be a +ve integer.

Now, for $x = 1$

(A) $\frac{x}{x} = 1,$

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

(C) $\frac{x}{x+1} = \frac{1}{2} = 0.5$

and (D) $\frac{x+2}{x+3} = \frac{3}{4} = 0.75$

$\therefore$ (B) $\frac{x+1}{x}$ has the greatest value. Ans.

4. (D) Let the total number of swans be x.

The number of swans playing on the shore of the pond $= \frac{7}{2}\sqrt{x}$

Number of swans inside the pond = 2

$\therefore \quad x = \frac{7}{2}\sqrt{x}+2$

$\Rightarrow 2(x-2) = 7\sqrt{x}$

$\Rightarrow 4(x^2-4x+4) = 49x$

$\Rightarrow 4x^2-16x+16-49x = 0$

$\Rightarrow 4x^2-65x+16 = 0$

On solving $x = 16$

Number of swans = 16 Ans.

5. (B) $\frac{7^{84}}{342}$

$\Rightarrow \frac{(7^3)^{28}}{342}$

$\Rightarrow \frac{(343)^{28}}{342}$

According to remainder theroem,

$\frac{(343)^{28}}{342}$ will have the same remainder as $\frac{(1)^{28}}{342} \Rightarrow 1$ Ans.

6. (A) Let x represents number of students & y represents the number of rows.

Then,

No. of students in each row $= \frac{x}{y}$

Case : (I)

$\left(\frac{x}{y}+4\right) \times (y-2) = x$

$2y^2-4y = x \quad \ldots$ (i)

Case : (II)

$\left(\frac{x}{y}-4\right) \times (y+4) = x$

$y^2+4y = x \quad \ldots$ (ii)

From eqn (i) & (ii)

$2y^2-4y = y^2+4y$

$y(y-8) = 0$

$y = 8$

Total no. of students

$x = 2(8)^2 - 4 \times 8$

$= 128 - 32$

$\Rightarrow \quad x = 96$ Ans.

7. (C) Let the numbers be x and $4x$.

Then, $84 \times 21 = x \times 4x$

$\Rightarrow \quad 4x^2 = 1764$

$\Rightarrow \quad x^2 = 441$

$\Rightarrow \quad x = 21$

Hence, the largest number is $4x = 84$. Ans.

8. (A) Total one-digit number = 9, No. of digits = 9

Total two-digit number = 90, No. of digits = 180

Total three-digit number = 900, No. of digits = 2700

Let there are x-4 digits numbers.

According to question,

$90 + 180 + 2700 + 4 \times x = 3189$

$x = \dfrac{3189 - 2889}{4} = 75$

$\therefore$ Number of pages

$= 9 + 90 + 900 + 75 = 1074$ Ans.

9. (*) $S_n = \dfrac{n}{2}[2a + (n-1)d]$

$S_{40} = 20[2\times4 + 39 \times 4]$

$= 20 \times 164 = 3280$ Ans.

10. (A) nth term of a GP $= ar^{n-1}$

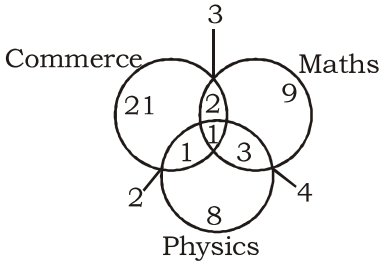
$\therefore$ 8th term $= 5 \times (2)^{8-1}$

$= 5 \times (2)^7$

$= 5 \times 128$

$= 640$ Ans.

11. (A)



Total students who are studying at least one subject $= 21 + 1 + 2 + 1 + 9 + 3 + 8$

$= 45$

Students who are not studying any of the three subjects. $= 80 - 45 = 35$ Ans.

12. (C) Let the average of 12 innings be x.

Also, $\dfrac{12x + 96}{13} = x + 5$

$\Rightarrow \quad 12x + 96 = 13x + 65$

$\Rightarrow \quad x = 31$

$\Rightarrow$ His new average

$= \dfrac{12 \times 31 + 96}{13}$

$= \dfrac{468}{13} = 36$ Ans.

13. (A) No. of workers = x, No. of officers = y.

Case : (I)

$x + y = 400$ ... (i)

Case : (II)

$2000 \times x + 10000 \times y = 400 \times 3000$

$x + 5y = \dfrac{400 \times 3000}{2000}$

$\Rightarrow \quad x + 5y = 600$ ... (ii)

Substracting (ii) from (i)

$(x + 5y) - (x + y) = 200$

$y = 50$

No. of officers $= y = 50$

No. of workers $= x = 400 - 50 = 350$ Ans.

14. (A) Let their ages be x and y.

$\therefore \quad \dfrac{1}{x} + \dfrac{1}{y} = 5\left(\dfrac{1}{x} - \dfrac{1}{y}\right)$

$\Rightarrow \quad y + x = 5(y - x)$

$\Rightarrow \quad 6x = 4y$

$\Rightarrow \quad \dfrac{x}{y} = \dfrac{2}{3}$ ... (i)

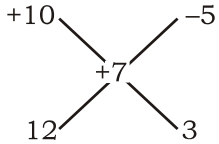
Now, $\dfrac{xy}{x+y} = \dfrac{14.4}{1}$

$\Rightarrow \quad xy = 14.4(x + y)$ ... (ii)

From Eqs. (i) and (ii),

$x = 24$ yrs. and $y = 36$ yrs.

15. (D) By the rule of alligation,



$\therefore$ Quantity of rice sold at 10% gain

$= \dfrac{12}{12+3} \times 50 = 40$ kg

Quantity of rice sold at 5% loss

$= \dfrac{3}{12+3} \times 50 = 10$ kg Ans.

16. (A) Quantity of nitric acid $= 10 \times \dfrac{1}{10}$

$= 1$ litre

Water $= 10 - 1 = 9$ litre

Suppose x litre water is added in the solution.

Then, $(10 + x) \times \dfrac{4}{100} = 1$

$\Rightarrow \quad x = 15$ litre Ans.

17. (A) Let the average speed be x km/h.

Time taken by aircraft (t) $= \frac{800}{x}$

ATQ,

$$t - \frac{40}{60} = \frac{800}{x+40}$$

$$\Rightarrow \frac{800}{x} - \frac{800}{x+40} = \frac{2}{3}$$

$$\Rightarrow \frac{32000}{x(x+40)} = \frac{2}{3}$$

$$\Rightarrow x(x+40) = 48000$$

$$\therefore x = 200 \text{ km/h Ans.}$$

18. (C) Mohan can reach the middle in 12.5 min.
Puran can reach the middle in 25 min.
So, required time = 25 – 12.5
= 12.5 min Ans.

19. (D) Speed of X = $\frac{3}{2}$Y

Distance covered by Y before catching = D m

$$\frac{3}{2}D = D + 300$$

$$\frac{1}{2}D = 300$$

$$\Rightarrow D = 600 \text{ m}$$

Total distance = 600 + 300 = 900 m Ans.

20. (C) Selling price of first shopkeeper

$$= 700 \times \frac{70}{100} \times \frac{94}{100} = ₹\ 460.60$$

Selling price of second shopkeeper

$$= 700 \times \frac{80}{100} \times \frac{84}{100} = ₹\ 470.40$$

Required difference
= 470.40 – 460.60 = ₹ 9.80

21. (D) Let the original value of fridge be ₹ x.

Then, cost price $= \frac{15}{16}x$

Selling price $= \frac{110}{100}x$

$$\therefore \text{Gain percent} = \frac{\frac{110x}{100} - \frac{15}{16}x}{\frac{15}{16}x} \times 100$$

= 17.33% Ans.

22. (D) Let the rate of flow of river be x km/h.
Then, downward speed = (10 + x) km/h.
ATQ,

$$\frac{91}{(10+x)} + \frac{91}{(10-x)} = 20$$

On solving, we have $x = 3$.
Hence, speed of flow of river is 3 km/h.

23. (A) Let the rate of filling tank be x m^3/min.
Then, the rate of empting the tank
= $(x + 10)$ m^3/min
ATQ,

$$\therefore \frac{2400}{x} - \frac{2400}{x+10} = 8$$

$$\Rightarrow 2400\left[\frac{10}{x(x+10)}\right] = 8$$

$$\Rightarrow x(x+10) = 3000$$

$$\Rightarrow x = 50 \text{ m}^3\text{/min Ans.}$$

24. (C) Let first pipe can fill the tank in x h.
Second pipe can fill the tank in $(x – 5)$ h
Third pipe can fill the tank in $(x – 9)$ h
ATQ,

$$\frac{1}{x} + \frac{1}{x-5} = \frac{1}{x-9}$$

$$\Rightarrow \frac{x \times (x-5)}{x+x-5} = x - 9$$

$$\Rightarrow x^2 - 5x = 2x^2 - 23x + 45$$

$$\Rightarrow (x-15)(x-3) = 0$$

$$\Rightarrow x = 15 \text{ h as } x = 3 \text{ h is not possible. Ans.}$$

25. (B) Number of men $= \frac{2}{5} \times 25 = 10$

Number of women $= \frac{3}{5} \times 25 = 15$

Amount distributed among men and women
= 275 × 80%
= ₹ 220

Let the wages paid to a man be ₹ $5x$ and to a woman be ₹ $4x$, then

$$\Rightarrow 10 \times 5x + 15 \times 4x = 220$$

$$\Rightarrow 50x + 60x = 220$$

$$\Rightarrow x = 2$$

$\therefore$ Wages recieved by a woman
= 2 × 4 = ₹ 8 Ans.

26. (C) 10% of profit = $\frac{10}{100} \times 800 = ₹\ 80$

Remaining Rs. 720 is divided in the ratio
= 1500 : 900 = 5 : 3

Share of Y = $\frac{3}{8} \times 720 + 80 = ₹\ 350$ Ans.

27. (A) According to question,

$$\left(8\frac{1}{2}\% - 5\%\right) \text{ of sum} = 350$$

$$\text{sum} = \frac{350}{3.5} \times 100$$

= ₹ 10000 Ans.

28. (D) Cash price, CP = ₹ 39000
Cash down payment, DP = ₹ 17000
Balance due, after Ist instalment,
BD = ₹ 22000
P = value of instalment = ₹ 4800
n = no. of instalments = 5
R = rate of interest
ATQ,

$$\left(1+\frac{nR}{1200}\right)\text{BD} = \left\{1+\frac{(n-1)R}{2400}\right\}\text{nP}$$

$$\Rightarrow \left(1+\frac{5R}{1200}\right)22000 = \left\{1+\frac{4R}{2400}\right\}5 \times 4800$$

$$\Rightarrow \left(1+\frac{5R}{1200}\right)11 = \left\{1+\frac{4R}{2400}\right\}12$$

$$\Rightarrow 11 + \frac{55R}{1200} = 12 + \frac{24R}{1200}$$

$$\Rightarrow \frac{55R}{1200} - \frac{24R}{1200} = 1 \Rightarrow \frac{31R}{1200} = 1$$

$$\Rightarrow R = \frac{1200}{31} = 38.71\% \text{ Ans.}$$

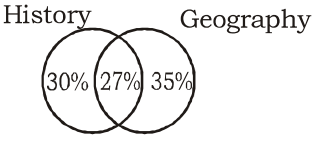
29. (B)

	Anu	Bimla
Investment ⟶	₹ 5000	₹ 6000
₹ 110 → 12.5% ⟶	₹ 110	
₹ 880 Profit → 87.5% ⟶	₹ 350	₹ 420
₹ 770		

Profit received by Anu = ₹ 110 + Rs. 350
= ₹ 460
& Profit received by Bimla = ₹ 420

30. (A) Required % = $5 + 5 + \frac{5\times5}{100}$
= 10.25% Ans.

31. (B) Venn–Diagram of Failed Students



Percentage of failed students
= 30% + 35% – 27% = 38%
⇒ Percentage of passed students
= 100% – 38% = 62%
Now, Let total number of students be x.
⇒ 62% of x = 248

$$\therefore \quad x = 248 \times \frac{100}{62} = 400 \text{ Ans.}$$

32. (C) Let the maximum marks be x.
Then,

$$296 - 259 = 5\% \text{ of } x$$

$$\Rightarrow \frac{5}{100}x = 37$$

$$\Rightarrow x = 740 \text{ Ans.}$$

33. (C) Let Ram's monthly income be ₹ x.

$$\text{Total savings} = x \times \frac{80}{100} \times \frac{85}{100} \times \frac{70}{100}$$

$$\Rightarrow x = 9520 \times \frac{100}{80} \times \frac{100}{85} \times \frac{100}{70}$$

= ₹ 20000

34. (B) Total candidates = 2000
No. of boys = 900
No. of girls = 1100
No. of students who passed

$$= \frac{32\times900}{100} + \frac{38\times1100}{100}$$

= 288 + 418 = 706
No. of students who failed
= 2000 – 706 = 1294
Required percentage

$$= \frac{1294}{2000} \times 100 = 64.7\% \text{ Ans.}$$

35. (D) Only the option (d) gives the difference of votes between two candidates as 308. Ans.

36. (B) Let the cost price of colour printer and computer system be ₹ x and ₹ y respectively.
According to question,

$$x \times \frac{120}{100} + y \times \frac{90}{100} = x + y$$

$$\Rightarrow 0.2x = 0.1y \quad \ldots\ldots \text{(i)}$$

$$x \times \frac{85}{100} + y \times \frac{105}{100} = x + y - 800$$

$$\Rightarrow 0.05y = 0.15x - 800$$

From Eqs. (i) and (ii),
x = ₹ 16000 Ans.

37. (D) Let the cost price of book be ₹ x.
Then, $(1.2x - 18) - 0.8x = 0.25 \times 0.08x$

$0.4x - 18 = 0.20x$

$\Rightarrow \quad x = \frac{18}{0.20} = ₹\ 90$ Ans.

38. (A) Cost price of transistor = ₹ 320

Selling price of transistor
$= 320 \times 1.15 = ₹\ 368$

Marked price of transistor
$= 368 + 32 = ₹\ 400$

$\therefore$ Required percentage of profit

$= \frac{400 - 320}{320} \times 100 = 25\%$ Ans.

39. (A) Let the cost price of 12 apples be ₹ 100.
Then, selling price of 100 apples will be ₹ 800.

$\therefore$ CP of 1 apple $= \frac{100}{12} = ₹\ \frac{25}{3}$

and SP of 1 apple $= \frac{800}{100} = ₹\ 8$

$\text{Loss} = \left(\frac{25}{3} - 8\right) = ₹\ \frac{1}{3}$

$\text{Loss percent} = \frac{\text{Loss}}{\text{CP}} \times 100$

$= \frac{\frac{1}{3}}{\frac{25}{3}} \times 100$

$= \frac{1}{3} \times \frac{3}{25} \times 100 = 4\%$ Ans

40. (A) Let the distance covered by the first train be x km/h.
As both trains have travelled for same time.

$\therefore \quad \frac{x}{50} = \frac{x + 120}{60}$

$\Rightarrow \quad 60x = 50x + 6000$

$\Rightarrow \quad x = 600$

$\therefore$ Total distance $= x + (x + 120)$
$= 1320$ km Ans.

41. (D) Let the speed of train be x km/h.
As both the persons are walking in the same direction of train.

So, $(x - 4.5) \times 8.4 = (x - 5.4) \times 8.5$

$\Rightarrow \quad 0.1x = 8.1$

$\Rightarrow \quad x = 81$ km/h Ans.

42. (A) Let Ashokan can finish the work in x days.
Then,
Nitin can finish the work in $3x$ days.

$3x - x = 40$

$\Rightarrow \quad x = 20$ days

and $3x = 60$ days

So, together they can finish the work in

$\left(\frac{20 \times 60}{20 + 60}\right)$ days $= 15$ days Ans.

43. (D) Men : Women : Boys = 15 : 24 : 36
= 5 : 8 : 12

Convert women and boys in terms of men

8 women = 5 men

12 women $= \frac{5}{8} \times 12 = \frac{15}{2}$ men

12 boys = 5 men

6 boys $= \frac{5}{12} \times 6 = \frac{5}{2}$ men

Total women and boys in terms of men

$= \frac{5}{12} + \frac{5}{2} = \frac{20}{2} = 10$ men

Let the number of men required = x

Then, $(x + 10) = \frac{15 \times 12 \times 8 \times 2.25}{30 \times 6} = 18$

$\Rightarrow \quad x + 10 = 18$

$\Rightarrow \quad x = 8$ men Ans.

44. (B) Let they make x pieces per day.

Then, $\frac{360}{x} - \frac{360}{x+4} = 1$

$\Rightarrow \quad 360\left[\frac{4}{x(x+4)}\right] = 1$

$\Rightarrow \quad x(x + 4) = 1440 = 36 \times 40$

$\Rightarrow \quad x = 36$

$\therefore$ Required number of days

$= \frac{360}{36} = 10$ days Ans.

45. (C) LCM of (3 + 2), (7 + 3)
and (11 + 4) is 30.
Let the capacity of each container be 30 l

$\therefore$ Quantity of milk after mixing

$= \left(\frac{3}{5} + \frac{7}{10} + \frac{11}{15}\right) \times 30 = 61\ l$

Quantity of water after mixing

$= \left(\frac{2}{5} + \frac{3}{10} + \frac{4}{15}\right) \times 30$

$= 29\ l$

$\therefore$ Required ratio = 61 : 29 Ans.

46. (D) As the sum of money that are to be divided among A, B and C and between E and F are not given. So, the amount that B receive cannot be determined. Ans.

47. (D) New ratio $= 3 \times \frac{150}{100} : 5 \times \frac{160}{100} : 7 \times \frac{150}{100}$

$= \frac{9}{2} : 8 : \frac{21}{2} = 9 : 16 : 21$ Ans.

48. (B) 18 carat gold = $\frac{3}{4}$ pure gold = $\frac{3}{4} \times 24 = 18$

20 carat gold = $\frac{5}{6}$ pur gold = $\frac{5}{6} \times 24 = 20$

$\therefore$ Required ratio = 18 : 20 = 9 : 10 Ans.

49. (D) Let the income of two persons be ₹ $4x$ and ₹ $5x$ and their expenses be ₹ $7y$ and ₹ $9y$ respectively.

Then,

$4x - 7y = 50$ .... (i)

and $5x - 9y = 50$ .... (ii)

On solving Eqs. (i) and (ii), we get

$x = 100$ and $y = 50$

$\therefore$ The income of persons are ₹ 400 and ₹ 500. Ans.

50. (C) 2 5 9 14 20 27

+3 +4 +5 +6 +7

Hence, the next number of the series will be 27. Ans.

51. (B) $\frac{x}{\sqrt{8}} = \frac{2\sqrt{3}}{\sqrt{3}+\sqrt{2}}$

On applying componendo and dividendo:-

$\frac{x+\sqrt{8}}{x-\sqrt{8}} = \frac{3\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ ... (i)

Again, $\frac{x}{\sqrt{12}} = \frac{2\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$\frac{x+\sqrt{12}}{x-\sqrt{12}} = \frac{3\sqrt{2}+\sqrt{3}}{\sqrt{2}-\sqrt{3}}$ ... (ii)

From Eqs. (i) + Eqn (ii)

$\frac{x+\sqrt{8}}{x-\sqrt{8}} + \frac{x+\sqrt{12}}{x-\sqrt{12}} = \frac{3\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} - \frac{3\sqrt{2}+\sqrt{3}}{\sqrt{3}-\sqrt{2}}$

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

$= \frac{2(\sqrt{3}-\sqrt{2})}{\sqrt{3}-\sqrt{2}} = 2$ Ans.

52. (A) $a = 3 + 2\sqrt{2}$

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

$= \frac{3-2\sqrt{2}}{9-8} = 3 - 2\sqrt{2}$

$a + \frac{1}{a} = 6$

$\frac{a^6+a^4+a^2+1}{a^3} = a^3 + a + \frac{1}{a} + \frac{1}{a^3}$

$= \left(a^3 + \frac{1}{a^3}\right) + \left(a + \frac{1}{a}\right)$

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

$\therefore 6^3 - 3 \times 6 + 6 = 216 - 18 + 6 = 204$ Ans.

53. (A) $x = 997$, $y = 998$, $z = 999$

Now,

$x^2 + y^2 + z^2 - xy - yz - zx =$

$\frac{1}{2}\{(x-y)^2 + (y-z)^2 + (z-x)^2\}$

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

$= \frac{1}{2}(1 + 1 + 4) = 3$ Ans.

54. (D) $5a + \frac{1}{3a} = 5$

Multiplying both sides by $\frac{3}{5}$

$3a + \frac{1}{5a} = 3$

Squaring both sides

$9a^2 + \frac{1}{25a^2} + 2 \times 3a \times \frac{1}{5a} = 9$

$\Rightarrow 9a^2 + \frac{1}{25a^2} = 9 - \frac{6}{5} = \frac{39}{5}$ Ans.

55. (C) $x^2 + \frac{1}{x^2} + 2 = 3$

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

$\Rightarrow x^4 + 1 = x^2$

$\therefore x^4 - x^2 + 1 = 0$

Now, $x^{206} + x^{200} + x^{90} + x^{84} + x^{18} + x^{12} + x^6 + 1$

$= x^{200}(x^6 + 1) + x^{84}(x^6 + 1) + x^{12}(x^6 + 1) + 1(x^6 + 1)$

$= (x^6 + 1)(x^{200} + x^{84} + x^{12} + 1)$

$= (x^2 + 1)(x^4 - x^2 + 1)(x^{200} + x^{84} + x^{12} + 1)$

$\therefore$ 0 Ans.

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

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

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

$$= \frac{1}{2}(3^2 + 5^2 + 1^2)$$

$$= \frac{1}{2} \times 35 = 17.5 \text{ Ans.}$$

57. (A) If $\frac{x^2}{y^2} + tx + \frac{y^2}{4}$ is a perfect square

It must be equal to

$$\left(\frac{x}{y}\right)^2 + \left(\frac{y}{2}\right)^2 \pm 2 \times \frac{x}{y} \times \frac{y}{2}$$

$$= \left(\frac{x}{y}\right)^2 + \left(\frac{y}{2}\right)^2 \pm x$$

On comparing, we have

$tx = \pm x$

$t = \pm 1$ Ans.

58. (D) $8x^3 - ax^2 + 54x + b$

$(2x-3)^3 = 8x^3 - 3 \times 2x \times 3(2x-3) - 27$

$= 8x^3 - 36x^2 + 54x - 27$

On comparing with the given expression

$a = 36,\ b = -27$ Ans.

59. (B) $a = 3b - 7$ .... (i)

$a - 3b = -7$

$a + 3 = 3(b + k) - 7$

$a + 3 = 3b - 3k - 7$

$a - 3b = 3k - 10$

$-7 = 3k - 10$

$\therefore\ k = 1$ Ans.

60. (C) $y = |x| - 5$

$|x| - y - 5 = 0$

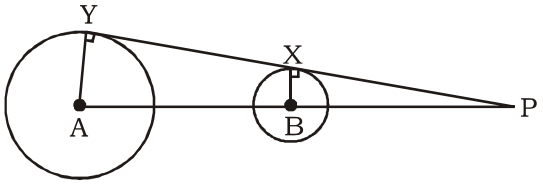
Area of two traingles formed by

$|x| - y - 5 = 0$

$$= 2\left|\left(\frac{c^2}{2ab}\right)\right| = \frac{c^2}{ab} = \frac{(5)^2}{1 \times 1}$$

$= 25$ Sq. unit Ans.

61. (D)



In ΔAPY and ΔBPX

$\angle X = \angle Y = 90°$

A tangent is always perpendicular to the radius through the point of contact.

$\Delta APY \sim \Delta BPX$

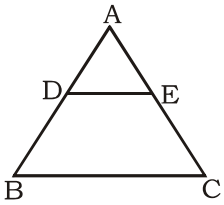
[By AA similarity]

$$\therefore \frac{AY}{BX} = \frac{AP}{PB}$$

$$\frac{5}{2} = \frac{AP}{PB}$$

P divides AB externally in the ratio of 7 : 2.

62. (D) DE || BC (given)



$\because$ ΔADE and ΔABC are similar.

$$\frac{ar(ADE)}{ar(ABC)} = \left(\frac{AD}{AB}\right)^2$$

$$\Rightarrow \sqrt{\frac{1}{2}} = \frac{AD}{AB}$$

$$\Rightarrow \frac{AD}{AB} = \sqrt{\frac{1}{2}}$$

$$\therefore \frac{AD}{BD} = \frac{1}{\sqrt{2} - 1} \text{ Ans.}$$

63. (C) Length of the common tangent

$$= \sqrt{d^2 - (6+3)^2}$$

$$\therefore\ 8 = \sqrt{d^2 - (6+3)^2}$$

or $d^2 = 64 + 81 = 145$

$\therefore\ d = \sqrt{145}$ cm Ans.

Distance between their centres = $\sqrt{145}$ cm

64. (B) Let the number of sides in polygon = n

The sum of interior angles

$= (n-2) \times 180°$

ATQ,

$5 \times 172° + (n-5) \times 160° = 180°n - 360°$

$860° + 160°n - 800° = 180°n - 360°$

$60° + 360° = 180°n - 160°n$

$20°n = 420°$

$n = 21$ Ans.

65. (C) ∵ The sum of any two sides of a triangle is greater than the 3rd side.

$2 + 3 > 5$, which is wrong.

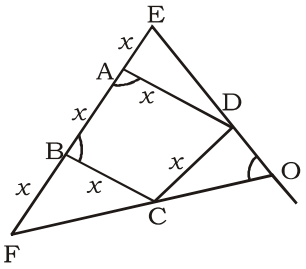
$2 + 3 > 6$, which is wrong.

∴ (2, 3, 5) or (2, 3, 6) will not form a triangle.

Triplets (3, 5, 6) & (2, 5, 6) are true for the sides of a triangle.

= 2 triangles Ans.

66. (C)



In ΔADE,

$AE = AB \Rightarrow AE = AD$

$\therefore \angle E = \angle D = \theta$ (say)

$\angle A = \theta + \theta = 2\theta$

Similarly, In ΔBCF,

$BF = AB \Rightarrow BF = BC$

$\angle C = \angle F = \phi$ (say)

$\angle B = 2\phi$

In ΔOEF,

$\angle A + \angle B = 180°$

$2\theta + 2\phi = 180°$

$\theta + \phi = 90°$

$\therefore \angle EOF = 90°$

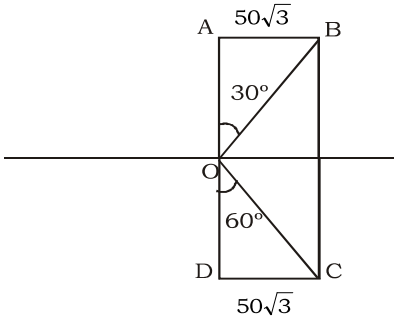
$\Rightarrow$ ED $\perp$ CF Ans.

67. (B) BC = AD

Distance = BC

In ΔAOB,

$\tan 30° = \dfrac{50\sqrt{3}}{AO}$



$\dfrac{1}{\sqrt{3}} = \dfrac{50\sqrt{3}}{AO}$

AO = 150 m

AD = 300 m

$\text{Speed} = \dfrac{300}{2} = 50$ m/min

$= \dfrac{5}{2}$ m/s

= 9 km/h Ans.

68. (B) Let the shortest side be x m.

The hypotenuse = $(2x + 3)$m

Let third side = y m

$\therefore x + y + 2x + 3 = 6x$

$\therefore y = (3x - 3)$ m

Now, $(x)^2 + (3x - 3)^2 = (2x + 3)^2$

$\Rightarrow x^2 + 9x^2 + 9 - 18x = 4x^2 + 9 + 12x$

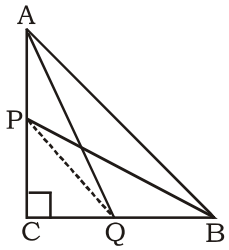
$\Rightarrow 6x^2 - 30x = 0$

$\therefore x = 5$ m

as $x \neq 0$

∴ Three sides are 5 m, 12 m and 13 m.

69. (B) In ΔAQC,



$AQ^2 = AC^2 + CQ^2$

In ΔPCB,

$BP^2 = PC^2 + CB^2$

$\therefore AQ^2 + BP^2 = AC^2 + CQ^2 + PC^2 + CB^2$

$= (AC^2 + CB^2) + (CQ^2 + PC^2)$

$= AB^2 + PQ^2$

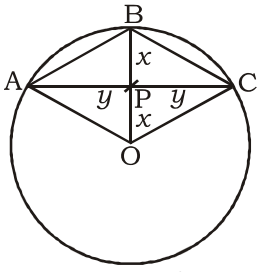
$= AB^2 + \left(\dfrac{1}{2}AB\right)^2$

$\Rightarrow AQ^2 + BP^2 = \dfrac{4AB^2 + AB^2}{4}$

$\therefore 4(AQ^2 + BP^2) = 5AB^2$ Ans.

70. (B) OABC is a rhombus with centre O.

Let diagonal of the rhombus be



OB = $2x$ and AC = $2y$

Radius of the circle = OB = OA = OC = $2x$

In ΔPOC,

$OC^2 = OP^2 + PC^2$

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

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

$\Rightarrow 3x^2 = y^2 \Rightarrow x = \frac{y}{\sqrt{3}}$

Also, area of rhombus

$\frac{1}{2} \times (2x)(2y) = 32\sqrt{3}$

$\Rightarrow x = 4$

$\therefore$ Radius of circle $= 2 \times 4 = 8$ m Ans.

71. (C) $a \sin\theta + b \cos\theta = c$

On squaring,

$a^2 \sin^2\theta + b^2 \cos^2\theta + 2ab \sin\theta \cos\theta = c^2$ ...(i)

Let $a \cos\theta - b \sin\theta = k$

$\Rightarrow a^2 \cos^2\theta + b^2 \sin^2\theta - 2ab \sin\theta \cos\theta = k^2$ ... (ii)

From equation (i) & (ii),

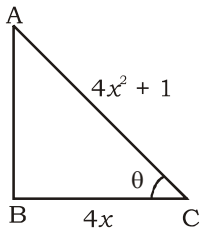
$a^2(\sin^2\theta + \cos^2\theta) + b^2(\sin^2\theta + \cos^2\theta) = c^2 + k^2$

$k^2 = a^2 + b^2 - c^2$

$k = \pm\sqrt{a^2 + b^2 - c^2}$ Ans.

72. (D) $\sec\theta = \frac{4x^2+1}{4x}$

$\therefore b = 4x,\ h = 4x^2 + 1$



Then,

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

$= \sqrt{16x^4 + 8x^2 + 1 - 16x^2}$

$= \sqrt{16x^4 - 8x^2 + 1}$

$= 4x^2 - 1$

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

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

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

73. (B) $\cos\theta\left(\frac{1}{1-\sin\theta} + \frac{1}{1+\sin\theta}\right) = 4$

$\cos\theta\left(\frac{1+\sin\theta+1-\sin\theta}{1-\sin^2\theta}\right) = 4$

$\cos\theta\left(\frac{2}{\cos^2\theta}\right) = 4$

$\cos\theta = \frac{1}{2}$

$\cos\theta = \cos 60°$

$\theta = 60°$ Ans.

74. (D) $u_n = \cos^n\alpha + \sin^n\alpha$

Now,

$2u_6 - 3u_4 + 1$

$= 2(\cos^6\alpha + \sin^6\alpha) - 3(\sin^4\alpha + \cos^4\alpha) + 1$

$= 2(\cos^2\alpha + \cos^2\alpha)^3 - 3\sin^2\alpha\cos^2\alpha$

$(\sin^2\alpha + \cos^2\alpha) - 3\{(\sin^2\alpha + \cos^2\alpha)^2$

$- 2\sin^2\alpha\cos^2\alpha)\} + 1$

$= 2 - 6\sin^2\alpha.\cos^2\alpha + 6\sin^2\alpha\cos^2\alpha - 3 + 1$

$= 2 - 3 + 1 = 0$ Ans.

75. (B) $(a^2 - b^2)\sin\theta + 2ab\cos\theta = a^2 + b^2$

$\frac{a^2-b^2}{a^2+b^2}\sin\theta + \frac{2ab}{a^2+b^2}\cos\theta = 1$

Let $\frac{a^2-b^2}{a^2+b^2} = \sin\theta$ & $\frac{2ab}{a^2+b^2} = \cos\theta$

Then, above equation becomes

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

$\sin\theta = \frac{a^2-b^2}{a^2+b^2}$

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

$\therefore \tan\theta = \frac{a^2-b^2}{2ab} = \frac{1}{2ab}(a^2 - b^2)$ Ans.

76. (D) $\frac{\cos^4\alpha}{\cos^2\beta} + \frac{\sin^4\alpha}{\sin^2\beta} = 1$

By taking

$\alpha = \beta$, it satisfies the above equation

$\therefore \frac{\cos^4\beta}{\cos^2\alpha} + \frac{\sin^4\beta}{\sin^2\alpha} = 1$ Ans.

77. (B) $l\cos^2\theta + m\sin^2\theta = \dfrac{\cos^2\theta}{\cot^2\theta}\left(\dfrac{1+\sin^2\theta}{\sin^2\theta}\right)$

$l\cos^2\theta + m - m\cos^2\theta = 1 + 1 - \cos^2\theta$

$l\cos^2\theta + \cos^2\theta - m\cos^2\theta = 2 - m$

$\cos^2\theta = \dfrac{2-m}{l-m+1}$

or, $\sec^2\theta = \dfrac{l-m+1}{2-m}$

or, $\tan^2\theta + 1 = \dfrac{l-m+1}{2-m}$

or, $\tan^2\theta = \dfrac{l-m+1-2+m}{2-m}$

or, $\tan^2\theta = \dfrac{l-1}{2-m}$

$\therefore \tan\theta = \sqrt{\dfrac{l-1}{2-m}}$ Ans.

78. (C) $x\sin a - y\cos a = 0$

$\Rightarrow x\sin a = y\cos a$

$\Rightarrow \dfrac{\sin\alpha}{\cos\alpha} = \dfrac{y}{x}$

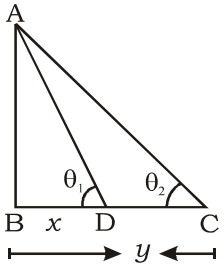
$\Rightarrow xy^3 + yx^3 = xy$

$\Rightarrow xy(y^2 + x^2) = xy$

$\therefore x^2 + y^2 = 1$ Ans.

79. (C) $\theta_1 + \theta_2 = 90$

$\theta_2 = 90 - \theta_1$



In ΔABC, $\tan\theta_1 = \dfrac{AB}{BD}$

$\tan\theta_1 = \dfrac{AB}{x}$ ... (i)

In ΔABC, $\tan\theta_2 = \dfrac{AB}{y}$

$\tan(90 - \theta_1) = \dfrac{AB}{y}$

$\cot\theta_1 = \dfrac{AB}{y}$

$\tan\theta_1 = \dfrac{y}{AB}$ ... (ii)

from equation (i) and (ii),

$\dfrac{AB}{x} = \dfrac{y}{AB}$

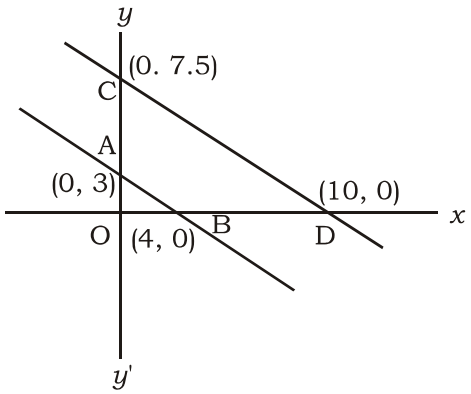
$(AB)^2 = xy$

$AB = \sqrt{xy}$ Ans.

80. (A) $3x + 4y = 12$

$x = 0,\ y = 3$ A(0, 3)

$y = 0,\ x = 4$ B(4, 0)



$6y + 8y = 60$

$x = 0,\ y = 7.5$ C(0, 7.5)

$y = 0,\ x = 10$ D(10, 0)

Area of Trapezium

= Area of ΔCOD – Area of ΔAOB

$= \dfrac{1}{2}\times 10 \times 7.5 - \dfrac{1}{2}\times 4 \times 3$

= 37.5 – 6 = 31.5 Ans.

81. (A) Curved surface area of a frustum

$= \pi(r + R)L$

Here, $R = \dfrac{8}{2} = 4$m, $r = \dfrac{4}{2} = 2$ m

and $l = \sqrt{h^2 + (R-r)^2}$

$l = \sqrt{6^2 + 2^2} = \sqrt{40}$

$\therefore$ Curved surafce area

$= \dfrac{22}{7}\times(2 + 4)\times\sqrt{40}$

= 119.26 = 118.4 m^2 (approx.) Ans.

82. (C) Required difference = $(l \times b \times h) - \pi r^2 h$

$= 10 \times 10 \times 21 - \dfrac{22}{7}\left(\dfrac{10}{2}\right)^2 \times 21$

= 2100 – 1650 = 450 cm^3 Ans.

83. (A) Total surface area of prism

= lateral surface area + 2 × (area of base)

Here, $s = \frac{a+b+c}{2} = \frac{21+20+13}{2} = 27$

$\therefore$ Required area = $(21 + 20 + 13) \times 30 + 2 \times \sqrt{27(27-21)(27-20)(27-13)}$

$= 54 \times 30 + 2\sqrt{27 \times 6 \times 7 \times 14}$

$= 1620 + 2 \times 126$

$= 1872$ sq. m Ans.

84. (C) Curved surface area of cone = Area of sector of circle

$\pi r l = \pi R^2 \times \frac{120}{360}$

Here, $l = R$

$\therefore \quad r = 15 \times \frac{120}{360} = 5$ cm

$\therefore \quad h = \sqrt{225-25} = 10\sqrt{2}$ cm

Volume of cone = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 25 \times 10\sqrt{2}$

$= 250\sqrt{2}\ \pi/3$ cm^3 Ans.

85. (B) The error percent in area

$= +5 - 6 - \frac{5 \times 6}{100} = -1.3\%$ Ans.

86. (D) Volume of the ball = Volume of raised water

$\Rightarrow \quad \frac{4}{3}\pi r^3 = \pi \times (12)^2 \times (6.75)$

$\therefore \quad r^3 = 729$

$r = 9$ cm Ans.

87. (C) Let the diameter of third ball be $2r$.

$\frac{4}{3}\pi \times \left(\frac{3}{2}\right)^3 = \frac{4}{3}\pi \times \left[\left(\frac{1.5}{2}\right)^3 + \left(\frac{2}{2}\right)^3 + \left(\frac{2r}{2}\right)^3\right]$

$\Rightarrow \frac{27}{8} = \frac{27}{64} + 1 + r^3$

$\Rightarrow r^3 = \frac{27}{8} - \frac{27}{64} - 1$

$\Rightarrow r^3 = \frac{216-27-64}{64} = \frac{125}{64}$

$\Rightarrow r = \frac{5}{4}$ cm

$\therefore \quad 2r = \frac{10}{4} = 2.5$ cm

88. (D) Total number of smaller cubes

$= \frac{4 \times 4 \times 4}{1 \times 1 \times 1} = 64$

Increase in surface area

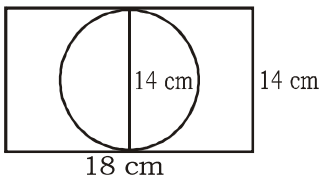
$= 64 \times 6 \times (1)^2 - 6 \times (4)^2$

$= 384 - 96 = 288$ cm^2

$\Rightarrow$ Required percentage

$= \frac{288}{96} \times 100 = 300\%$ Ans.

89. (B) Radius of the circle = $\frac{14}{2} = 7$ cm



$\therefore$ Area of circle = $\frac{22}{7} \times 7 \times 7 = 154$ cm^2 Ans.

90. (B) Volume of cube = $\frac{1}{2} \times 25 \times 20 \times 4$

$= 1000$ cm^3

$\therefore$ Side of cube = 10 cm

Total surface area = $6 \times (10)^2$

$= 600$ cm^2

91. (B) Ratio of processing cost of water for industrial, energy and domestic usage = 3 : 5 : 2

In 2006, water usage for industrial, energy and domestic = 25, 26 and 35 trillion litres

In 2009, water usage for industrial, energy and domestic

= 49, 35. 30 trillion litres.

$\therefore$ Ratio of processing cost for above mentioned usage in 2006 to that in 2009

$= \frac{25 \times 3 + 26 \times 5 + 35 \times 2}{49 \times 3 + 35 \times 5 + 30 \times 2}$

$= \frac{75+130+70}{137+175+60} = \frac{275}{382} = 0.72$ Ans.

92. (A) Usage in energy related sector in 2006 = 26 trillion litres

Usage in energy related sector in 2009 = 35 trillion litres

Required percentage increase

$= \frac{35-26}{26} \times 100 = 34.6\%$ Ans.

93. (C) Required percentage

$$= \frac{490}{490+49+35+30+25} \times 100$$

$$= \frac{490}{629} \times 100 = 77.90\% \text{ Ans.}$$

94. (D) Required difference

$$= \frac{30}{\text{Total water usage in 2009}} \times 100 - \frac{35}{\text{Total water usage in 2006}} \times 100$$

$$= \frac{30}{629} \times 100 - \frac{35}{531} \times 100$$

$= 4.77\% - 6.59\%$

$= 1.82\%$ (Ignore –ve) Ans.

95. (B) Percentage increase in usage from 2006 to 2009.

Domestic $= \frac{30}{629} \times 100 - \frac{35}{531} \times 100$

$= 4.77 - 6.59 = -1.82\%$ [ignore –ve]

Industrial $= \frac{49}{629} \times 100 - \frac{25}{531} \times 100$

$= 7.79 - 4.71 = 3.08\%$

Others $= \frac{25}{629} \times 100 - \frac{35}{531} \times 100$

$= 3.97 - 6.59 = -2.62\%$ [ignore –ve]

Energy $= \frac{25}{629} \times 100 - \frac{26}{531} \times 100$

$= 5.56 - 4.89 = 0.66\%$ Ans.

96. (C) One lakh Ans.

97. (A) Required factor $= \frac{320}{400} = 0.8$ Ans.

98. (D) In 1990 it shows the least increasing over the preceding year. Ans.

99. (A) Average sales

$$= \frac{340+320+400+420+440+400}{6}$$

$$= \frac{2320}{6} = 386.66$$

Sales are above average in 1988, 1989, 1990 and 1991 and below average in 1986 and 1987

$\therefore$ Required ratio = 4 : 2 = 2 : 1 Ans.

100. (A) Average sales from 1988 to 1991

$$= \frac{400+420+440+400}{4}$$

$= 415$ Ans.

SSC MAINS (MATHS) MOCK TEST -13 (ANSWER SHEET)

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

CORRECTIONS FOR MOCK TEST - 12

11. (C) Let the five consecutive odd nos. be $x, x+2, x+4, x+6$ & $x+8$.
So, ATQ,
$5x + 2 + 4 + 6 + 8 = 41 \times 5$
or, $5x = 205 - 20$
$\Rightarrow x = \frac{185}{5} = 37$
So, product of 1st & last terms (A & E)
$= 37 \times (37 + 8) = 1665$ Ans.

37. (B) In the solution given,
Duration of time = 16 hours
(which is correct)
and point of time = 3 pm + 16 hours
= 7 am Ans.

42. (D) A + B + C = 15 × 3 = 45
& B + C + D = 16 × 3 = 48
$\Rightarrow$ D – A = 3
or, 19 – A = 3
$\Rightarrow$ A = 16

So, The required % = $\frac{16}{16} \times 100\% = 100\%$ Ans.

68. (D) or, $x = 2 + 2^{\frac{2}{3}} + 2^{\frac{1}{3}}$

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

So,

$$(x-2)^3 = \left(2^{\frac{2}{3}}\right)^2 + \left(2^{\frac{1}{3}}\right)^3 + 3.2^{\frac{2}{3}}.2^{\frac{1}{3}}\left(2^{\frac{2}{3}} + 2^{\frac{1}{3}}\right)$$

or, $(x-2)^3 = 4 + 2 + 3.2(x-2)$
or, $(x-2)^3 = 6 + 6(x-2)$
or, $x^3 - 6x^2 + 12x - 8 - 6 - 6x - 12 = 0$
or, $x^3 - 6x^2 + 6x - 26 = 0$
$\Rightarrow x^3 - 6x^2 + 6x = 26$ Ans.

CORRECTIONS FOR MOCK TEST - 10

69. (*) $\Rightarrow (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
or, $(1)^2 = x^2 + y^2 + z^2 + 2(-1)$
$\Rightarrow x^2 + y^2 + z^2 = 3$ Ans.

76. (C) The given solution is totally correct. but the correct option is 'C' (12 cm). Ans.

88. (A) Correct question should be "$\cos 2\theta + 2\cos\theta$" & according to this question the correct option is A. Ans.

CORRECTIONS FOR MOCK TEST - 9

21. (B) Quantity of dry fruits (without water) in 100 kg fresh fruit = 32% of 100 kg = 32 kg.
So, required quantity of dry fruit ($\because$ dry fruit contains 80% fruit and 20% water)
$= \frac{32 \times 100}{80}$ kg = 40 kg Ans.

46(B).

	B : C
Ratio of speed	= 3 : 1
So, Ratio of time taken	= 1 : 3

Now, $\because$ C takes 1 hour 54 minutes = 114 min
So, time taken by B to cover the same Distance = $\frac{114}{3}$ min = 38 min. Ans.

CORRECTIONS FOR MOCK TEST - 8

54. (C) In the given question please read polynomial $2x^4 - 3x^3 - 2x^2 + 6x + 2$ as polynomial $2x^4 - 3x^3 - 3x^2 + 6x - 2$ and according to the correct polynomial, the correct answer will be option (C).

89. (*) The given solution is correct, according to which the answer is $4000 m^3$, which is present as both the options (A) & (B)

97. (D) Can not be determind as the population is not known.

100. (D) Can not be determind as the population is not known.