===

SSC (T-II) 2014, MTP - 14 (SOLUTION)

1.(B) $\sqrt{\dfrac{0.00001225}{0.00005329}} = \sqrt{\dfrac{1225}{5329}} = \dfrac{35}{73}$ Ans.

2.(A) $\sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+\sqrt{49}}}}}$

$= \sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+7}}}}$

$= \sqrt{5+\sqrt{11+\sqrt{19+6}}}$

$= \sqrt{5+\sqrt{11+5}}$

$= \sqrt{5+4}$ = 3 Ans.

3.(C) $\left(\dfrac{16}{625}\right)^{\frac{3}{4}} \times \left(\dfrac{1}{243}\right)^{-\frac{2}{5}} \times (512)^{-\frac{1}{3}}$

$= \left(\dfrac{2}{5}\right)^{4 \times 3/4} \times (243)^{2/5} \times \dfrac{1}{(512)^{1/3}}$

$= \left(\dfrac{2}{5}\right)^{3} \times 3^{5 \times 2/5} \times \dfrac{1}{8^{3 \times 1/3}}$

$= \dfrac{8}{125} \times 3^2 \times \dfrac{1}{8} = \dfrac{9}{125}$ Ans.

4.(C) Let the two digit number be $10x + y$.
Then,
$$x + y = 12 \quad \text{...... (i)}$$
ATQ,
$$10x + y - 18 = 10y + x$$
$\Rightarrow \quad 9x - 9y = 18 \quad \text{...... (ii)}$
$\Rightarrow \quad x - y = 2$
On solving (i) & (ii), we have
$$x = 7, \, y = 5$$
∴ The two digit no. = 10 × 7 + 5 = 75 Ans.

5. (D) unit's digit of $2^{12n} - 6^{4n}$
= unit's digit of 2^{12n} – unit's digit of 6^{4n}
= unit's digit of $[(2^6)]^{2n}$ – unit's digit of $[(6^2)]^{2n}$
= unit's digit of $[64]^{2n}$ – unit's digit of $[(36)]^{2n}$
= unit's digit of 4^{2n} – unit's digit of 6^{2n}
= 6 – 6
= 0 Ans.

6. (C) Since
32 – 10 = 22
40 – 18 = 22
72 – 50 = 22
Therefore the least number of pebbles in the heap is the L.C.M. of 32, 40 and 72 – 22.

∵ L.C.M. of 32, 40, 72 = 1440
∴ Required no. of pebbles = 1440 – 22
= 1418 Ans.

7. (C) L.CM of $7^{-3}, 7^{-13}, 7^{-11}, 7^{-18}$
= 7^{-3} Ans.

8. (A) The required no. will be the L.C.M of 12, 16, 24 and 30 + 7.

LCM =
2	12, 16, 24, 30
2	6, 8, 12, 15
2	3, 4, 6, 15
3	3, 2, 3, 15
	1, 2, 1, 5

∴ L.C.M = 2 × 2 × 2 × 2 × 15
= 240
∴ Required no. = 240 + 7 = 247 Ans.

9. (B) S → Total students
F → Students playing football
C → Students playing cricket

n(S) = 450, n(F) = 325, n(C) = 175, n(F∩C)' =50
∵ n(F∩C)' = n(S) – n(F∪C)
50 = 450 – n(F∪C)
⇒ n(F∪C) = 400

Now, n(F∪C) = n(F) + n(C) = 175 – n(F∩C)
400 = 325 + 175 – n(F∩C)
⇒ n(F∩C) = 100 Ans.

ANOTHER METHOD:-
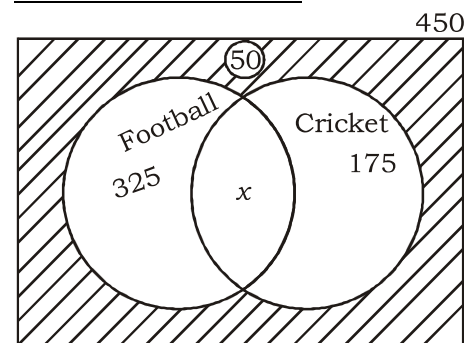
450 = 325 + 175 – x + 50
⇒ x = 550 – 450 = 100 Ans.

10.(B) Here n = 100%
A = 40%
B = 50%
A∩B = 10%
Now, Percentage of people who do not read any newspaper = n(S)–n(A∪B)

===

= n(S) – [n(A) + n(B) – n(A∩B)]

= 100 – [40 + 50 –10]

= 100 – 80

= 20% Ans.

11.(B)
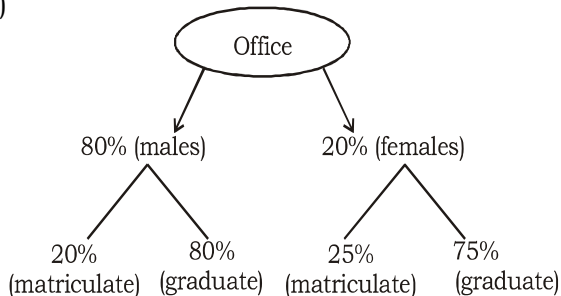
20% of total = 600

$$x = \frac{600 \times 100}{20} = 3000$$

Total graduates

= 80% of 80% of 3000 + 75% of 20% of 3000

$$= \frac{80 \times 80 \times 3000}{100 \times 100} + \frac{75 \times 20}{100 \times 100} \times 3000$$

= 1920 + 450 = 2370 Ans.

12. (A) Given,

The population of the town = 10000

10% increases during Ist year

20% decreases during IInd year

30% increases during IIIrd year

then,

Population after 3 years

$$= 10000 \times \left(1 + \frac{10}{100}\right)\left(1 - \frac{20}{100}\right)\left(1 + \frac{30}{100}\right)$$

$$= 10000 \times \frac{11}{10} \times \frac{4}{5} \times \frac{13}{10} = 11,440 \text{ Ans.}$$

13. (A) Given,

Total amount of mixture = 60l

From question,

amount of milk = $\frac{60 \times 20}{100} = 12l$

Let the amount of water to be added in the mixture = x litre

∴ New amount of the mixture = $(60 + x)$ litre

From question,

$$\Rightarrow (60 + x) \times \frac{15}{100} = 12$$

$$\Rightarrow 60 + x = 80$$

$$\Rightarrow x = 20l$$

∴ 20 litres water should be added. Ans.

14. (A) Given, quantity of the alloy = 200 gm.

& Cu : Zn = 2 : 3

∴ quantity of Cu = $200 \times \frac{2}{5} = 80$ gm. & quantity

of Zn = $200 \times \frac{3}{5} = 120$ gm.

∴ From question, $\frac{80 + x}{120} = \frac{3}{2}$

80 + x = 180

x = 100 gm

∴ The quantity of Cu to be added is 100 gm. Ans.

15. (B) Let total no. of workers = x

∴ Total salary = $x \times 95$ ..... (i)

again,

Total salary = 15 × 525 + (x – 15) × 85 ..... (ii)

From (i) & (ii)

⇒ $x \times 95$ = 15 × 525 + (x –15) × 85

⇒ 95x – 85x = 7875 – 1275

∴ 10x = 6600

∴ x = 660 Ans.

16.(C) Let number = x

∴ True answer = number × 6 = 6x

& Wrong answer = number. ÷ 6 = $\frac{x}{6}$

∴ % of the error committed on the basis of correct answer

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

$$= \frac{x(36 - 1)}{6 \times 6x} \times 100$$

$$= \frac{35}{6 \times 6} \times 100$$

$$= \frac{1750}{18}$$

= 97.22

= 97% (Approximately) Ans.

17.(C) d = 25% (Discount)

r = 25% (Profit)

C.P. = ₹ 1440

$$\text{S. P.} = \text{C. P.} \left(1 + \frac{r}{100}\right)$$

$$= 1440 \left(1 + \frac{25}{100}\right)$$

$$= 1440 \times \frac{5}{4}$$

===

$\therefore$ S.P. = ₹ 1800

$\Rightarrow$ M.P. = $\dfrac{\text{S. P.}}{\left(1 - \dfrac{d}{100}\right)} = \dfrac{1800}{\left(1 - \dfrac{25}{100}\right)} = \dfrac{1800 \times 4}{3}$

= Rs. 2400 Ans.

18. (A) Given

S.P of 32 oranges = ₹ 1

$\therefore$ S.P of an orange = ₹ 1/32

and Loss% = 40%

then, C.P. = $\dfrac{\text{S.P}}{\left(1 - \dfrac{\text{Loss\%}}{100}\right)}$

$= \dfrac{1/32}{\left(1 - \dfrac{40}{100}\right)}$

or, CP of an orange = ₹ 5/96

and profit = 20%

$\therefore$ New, S.P. of an orange = C.P. $\left(1 + \dfrac{\text{profit\%}}{100}\right)$
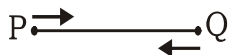
$= \dfrac{5}{96}\left(1 + \dfrac{20}{100}\right)$

= ₹ 1/16

$\therefore$ No. of Oranges whose S.P is ₹ 1 = $1 \div \dfrac{1}{16}$

= 16 Ans.

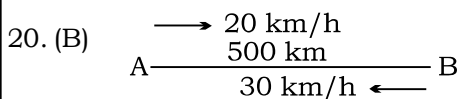19. (D) Let x km be the distance between P & Q.

P $\longrightarrow$ $\longleftarrow$ Q

For 1st train, $x = 8 \times \dfrac{7}{2} = 28km$

$\therefore$ For 2nd train, speed = $\dfrac{28}{24/5} = \dfrac{28}{24} \times 5$

$= \dfrac{35}{6} = 5\dfrac{5}{6}$ km/hr Ans.

20. (B)

A $\underset{30 \text{ km/h} \longleftarrow}{\overset{\longrightarrow 20 \text{ km/h}}{\underline{\overline{500 \text{ km}}}}}$ B

Let the both train will meet after time 't' then,

$20 \times t + 30 \times t = 500$

or, $(20 + 30)t = 500 \Rightarrow$ t = 10h

$\therefore$ The distance of crossing point of the two trains From A = $20 \times t$

= 20 × 10

= 200 km Ans.

21. (C) Here, A = 20 days and B = 15 days

Work done by A & B in 6 days

$= \left(\dfrac{A + B}{A \times B}\right) \times 6$

$= \dfrac{20 + 15}{20 \times 15} \times 6$

$= \dfrac{35}{10 \times 5} = 7/10$

$\therefore$ Remaining work = $1 - \dfrac{7}{10} = \dfrac{3}{10}$

From question

Work done by A & C in 4 days = $\left(\dfrac{A+C}{A \times C}\right) \times 4 = \dfrac{3}{10}$

or, $\left(\dfrac{20 + C}{20 \times C}\right) \times 4 = \dfrac{3}{10}$

$\Rightarrow$ 40 + 2c = 3c

$\Rightarrow$ c = 40 days Ans.

22. (D) $\because$ time $\alpha \dfrac{1}{\text{speed}}$

$\therefore$ Required ratio = $\dfrac{1}{2} : \dfrac{1}{3} : \dfrac{1}{4} = 6 : 4 : 3$ Ans.

23. (D) $\dfrac{b + c}{a} = \dfrac{3}{1}$ & $\dfrac{a + b}{c} = \dfrac{7}{5}$

$3a = b + c$ & $c = \dfrac{5}{7}(a + b)$

$\Rightarrow \dfrac{5}{7}(a + b) = 3a - b$

$\Rightarrow 5a + 5b = 21a - 7b$

$\Rightarrow 12b = 16a$

$\Rightarrow \dfrac{a}{b} = \dfrac{3}{4}$

Also,

$c = 3a - b$

$= 3a - \dfrac{4}{3}a$

$= \dfrac{9a - 4a}{3} = \dfrac{5a}{3}$

Now, b : (c + a)

$= \dfrac{4a}{3} : \left(\dfrac{5a}{3} + a\right)$

===

$= \dfrac{4a}{3} : \dfrac{8a}{3} = 1 : 2$ Ans.

24.(D) Let Q completes the work in x days

∴ From question

Time taken by P = $\dfrac{2}{3}x$ days

Again, from question

$\dfrac{P + Q}{PQ} = \dfrac{1}{15}$

or, $\dfrac{\dfrac{2}{3}x + x}{\dfrac{2}{3}x \times x} = \dfrac{1}{15}$

or, $x = \dfrac{75}{2}$ days

∴ Time taken by $P = \dfrac{2}{3}x$

$= \dfrac{2}{3} \times \dfrac{75}{2}$

= 25 days Ans.

25.(C) From question,

work done by (P + Q) in a day = 1/8.......(i)
work done by (Q + R) in a day = 1/6.......(ii)
work done by (R + P) in a day = 1/10.......(iii)
eqn. (i) + (ii) + (iii) ⇒
work done by 2 (P + Q + R) in a day

$= \left(\dfrac{1}{8}\right) + \left(\dfrac{1}{6}\right) + \left(\dfrac{1}{10}\right) = \dfrac{47}{120}$

∴ Work done by (P + Q + R) in a day

$= \dfrac{47}{120}$

∴ Required no. of days $= \dfrac{240}{47} = 5\dfrac{5}{47}$ Ans.

26. (A) Let the cost price of a pen & a book be Rs. x & Rs. y respectively.

Case (I):-
15% of y – 5% of x = 7
⇒ $15y - 5x = 700$
⇒ $3y - x = 140$ .... (i)

Case (II):-
5% of x + 10% of y = 13
$5x + 10y = 1300$ .... (ii)
$x + 2y = 260$

On solving (i) & (ii),
y = Rs. 80
The actual price of the book = Rs. 180 Ans.

27. (A) Let the CP = Rs. 100
then, SP = Rs. 120
90% of MP = Rs. 120

$MP = Rs. \dfrac{120 \times 100}{90}$

New SP = 80% of MP

$= Rs. \dfrac{80}{100} \times \dfrac{120 \times 100}{90} = Rs. \dfrac{320}{3}$

Gain % $= \dfrac{320}{3} - 100 = \dfrac{20}{3}$ % Ans.

28. (B) Let the normal speed of Ram = x m/min and time taken = t min.

Now, new speed = $\dfrac{3}{4}x$ m/min

& Time taken = $(t + 20)$ min
ATQ,

∴ $x \times t = \dfrac{3}{4}x \times (t + 20)$

$4t = 3t + 60$
$t = 60$ min Ans.

29. (C) Speed of the truck $= \dfrac{550}{1}$ m / min

$= 550$ m/min

Speed of the bus $= \dfrac{33,000}{45}$ m / min

$= \dfrac{2200}{3}$ m/ min.

∴ Required ratio $= \dfrac{550}{\dfrac{2200}{3}}$

= 3 : 4 Ans.

30. (C) Part of tank filled by A & B alternately in

2 hours $= \dfrac{1}{2}\left(\dfrac{1}{4} + \dfrac{1}{6}\right) = \dfrac{5}{24}$

∴ Part of tank filled by (A+B) alternately

in $4h = \dfrac{5}{24} \times 4 = \dfrac{5}{6}$ ....(i)

Remaining part $= 1 - \dfrac{5}{6} = \dfrac{1}{6}$

∴ Time taken by A to filled 1/6 part of tank
$= 4 \times 1/6 = 2/3$ h.......................(ii)
∴ Total time taken by (A+B) alternately to

filled the tank $= 4h + \dfrac{2}{3}h = 4\dfrac{2}{3}h$ Ans.

31.(A) Let P = Rs. x , r = 7%, t = 2 years

∴ S.I. $= \dfrac{p \times r \times t}{100} = \dfrac{x \times 7 \times 2}{10050} = \dfrac{7x}{50}$

==

ATQ,

$$\Rightarrow \quad \frac{7x}{50} = \frac{1750 \times 5 \times 4}{100}$$

$$\Rightarrow \quad 7x = 1750 \times 10$$

$$x = \frac{175 \times 100}{7}$$

$x = ₹ 2500$ Ans.

32.(C) P = ₹ 800

S. I. = ₹ 920 – ₹ 800 = ₹ 120

t = 3 years

by. S. I. $= \dfrac{p \times r \times t}{100}$

or, $r_1 = \dfrac{S.~I. \times 100}{p \times t} = \dfrac{120 \times 100}{800 \times 3}$

$r_1 = 5\%$

If rate is increased by 3%

then $r_2 = r_1 + 3 = 5 + 3 = 8\%$ & $t = 3$ years

Now, S. I. $= \dfrac{p \times r \times t}{100}$

$= \dfrac{800 \times 8 \times 3}{100}$

$= 64 \times 3$

$= ₹ 192$

∴ Total amount = ₹ 800 + ₹ 192

= ₹ 992 Ans.

33.(A) Let, Profit =Rs. x

At first Kapil received money = Rs. $\dfrac{x}{10}$

∴ Remaining money = Rs. $\left(x - \dfrac{x}{10} \right)$

$= Rs. \dfrac{9x}{10}$

∴ From question,

share of Kapil = Rs. $\left(\dfrac{x}{10} + \dfrac{9x}{10} \times \dfrac{4}{9} \right)$

$= \dfrac{x}{10} + \dfrac{2x}{5} = Rs.~\dfrac{x}{2}$

Again, from question $\dfrac{x}{2}$ = ₹ 325

$\Rightarrow x = ₹ 630$

∴ Share of Sudheer = $x - \dfrac{x}{2} = \dfrac{x}{2}$ = ₹ 325 Ans.

34.(A) Given,

C.P. of cooler = ₹ 4042

Let each installment =Rs. x

From the question,

$$\Rightarrow x\left(1 + \frac{5}{10}\right)^2 + x\left(1 + \frac{5}{100}\right) + x$$

$$= (4042 - 1520)\left(1 + \frac{5}{100}\right)^3$$

or, x = ₹ 926.10 Ans.

35.(B) Given,

P = ₹ 2000

A = ₹ 2662

$n = ₹~1\dfrac{1}{2}$ year = 3 half year

then, rate = $\dfrac{r}{2}\%$

ATQ,

$$\Rightarrow \left(1 + \frac{\frac{r}{2}}{100}\right)^n = \frac{A}{P}$$

or, $\left(1 + \dfrac{r}{200}\right)^3 = \dfrac{2662}{2000}$

or, $\left(1 + \dfrac{r}{200}\right) = \left(\dfrac{11}{10}\right)^3$

or, $1 + \dfrac{r}{200} = \dfrac{11}{10}$

∴ $r = 20\%$

36. (B) $\dfrac{M_1 \times D_1}{W_1} = \dfrac{M_2 \times D_2}{W_2}$

$\dfrac{100 \times 60}{1/5} = \dfrac{x \times 120}{1 - \dfrac{1}{5}}$

$x = 200$

or, Required workers= 200 – 100

= 100 Ans.

37. (D) Let the total income of the man be Rs. x.
Then,

90% of 70% of 80% of x = 10080

$\Rightarrow x = \dfrac{10080 \times 100 \times 100 \times 100}{90 \times 70 \times 80}$

= Rs. 20,000 Ans.

38.(B) Let share of C = Rs. x

ATQ,

Share of B = $x + \dfrac{20x}{100} = \dfrac{6x}{5}$

& Share of A = $\dfrac{6x}{5} + \dfrac{6x}{5} \times \dfrac{25}{100} = \dfrac{3}{2}x$

Again, from question,

==

$\Rightarrow \dfrac{3x}{2} + \dfrac{6x}{5} + x = 740$

$\therefore \qquad\qquad x = ₹\,200$ Ans.

39. (C) Let the 3rd number be x.

Then, Ist $= \dfrac{70}{100}x$

2nd $= \dfrac{63}{100}x$

Required % $= \dfrac{\dfrac{7x}{100}}{\dfrac{63x}{100}} \times 100$

$\qquad = \dfrac{7}{100} \times \dfrac{100}{63} \times 100 = \dfrac{100}{9}\%$

$\qquad = 11.11\%$ Ans.

40.(C) M.P. = ₹ 125

Discount% 'd' = 31%

Profit % r = 15%

S. P. = M. P $\left(1 - \dfrac{d}{100}\right)$

$\qquad = 125 \times \left(1 - \dfrac{31}{100}\right) = ₹\,86.25$

$\therefore$ C. P. $= \dfrac{\text{S. P.}}{\left(1 + \dfrac{r}{100}\right)} = \dfrac{86.25}{\left(1 + \dfrac{15}{100}\right)} = ₹\,75$

41.(D) Let the amount of the whole property = Rs. x

From question,

$\dfrac{1}{4}$ of $\dfrac{14}{25}$ of $\dfrac{5x}{7}$ = 25,000

or, $\dfrac{1}{4} \times \dfrac{14}{25} \times \dfrac{5x}{7}$ = 25,000

$\therefore$ x = ₹ 2,50,000 Ans

42. (B) Given, A : B : C = 2 : 3 : 4

Let, A = $2k$, B = $3k$, C = $5k$

Now,

$\dfrac{B+C}{A} : \dfrac{C+A}{B} : \dfrac{A+B}{C}$

$= \dfrac{3k+5k}{2k} : \dfrac{5k+2k}{3k} : \dfrac{2k+3k}{5k}$

$= \dfrac{8}{2} : \dfrac{7}{3} : \dfrac{5}{5}$

$= 4 : \dfrac{7}{3} : 1$

$= 12 : 7 : 3$ Ans.

43. (D) Let M.P. = Rs. x

$\therefore$ From question,

S. P. = Rs. $\dfrac{2x}{5}$

Loss% = 25%

$\therefore$ C.P = $\dfrac{\text{S.P}}{\left(1 - \dfrac{\text{Loss\%}}{100}\right)}$

or, C.P = $\dfrac{\dfrac{2x}{5}}{\left(1 - \dfrac{25}{100}\right)}$

C.P = $\dfrac{8x}{15}$

$\therefore$ ratio = $\dfrac{\text{M.P.}}{\text{C.P.}} = \dfrac{x}{\dfrac{8x}{15}}$

$= 15 : 8$ Ans.

44. (C) Let the orignal no. of workers was x

Workers　　　　Days
x　　　　　　　22
$(x-3)$　　　　24

$(x-3) : x :: 22 : 24$

$\Rightarrow 22 \times x = 24\,(x-3)$

$\Rightarrow 22x = 24x - 72$

$\Rightarrow 2x = 72$

$\therefore x = 36$

$\therefore$ The original no. of workers was 36. Ans.

45. (D) P : Q : R = 24000 : 33000 : 48000

$\qquad = 24 : 33 : 48$

$\qquad = 8 : 11 : 16$

Let total profit = x

$\therefore \dfrac{7x}{8} \times \dfrac{8}{35} + \dfrac{x}{8} = ₹390$

or, $x = ₹ 1200$ Ans.

46.(B) Let, the correct average = x

$\therefore$ sum of 5 numbers = $5 \times x = 5x$

From question,

$5x = 5 \times 52 - 54 + 45$

or, $5x = 260 - 9$

or, $5x = 251$

$\therefore x = 50.2$ Ans.

47. (A) Let maximum score = x

$\therefore$ minimum score = $x - 172$

Now, From question

$40 \times 50 - (x + x - 172) = 38 \times 48$

$\Rightarrow x = 174$ Ans.

48.(A) Let his actual speed $= x$ and time taken $= t$

∴ Distance $= x \times t$ ....(i)

Again, from question

New speed $= \left(\dfrac{3}{4}\right)x$

& New time $= t + 10$ minutes

∴ distance $= \left(\dfrac{3}{4}x\right) \times (t + 10)$ ....(ii)

From (i) & (iii)

$x \times t = \left(\dfrac{3}{4}x\right) \times \left(t + 10\right)$

$\Rightarrow t = 30$ minutes Ans.

49. (B) Let the fixed distance $= x$

& fixed time $= t$

$\Rightarrow$ Speed $= \dfrac{x}{t}$

if distance $= \dfrac{x}{2}$ then, time taken $= 2t$

$\Rightarrow$ Speed $= \dfrac{\frac{x}{2}}{2t} = \dfrac{1}{4}\left(\dfrac{x}{t}\right)$

∴ Required Ratio $= \dfrac{\left(\dfrac{x}{t}\right)}{\dfrac{1}{4}\left(\dfrac{x}{t}\right)} = \dfrac{4}{1} = 4:1$ Ans.

50. (C) Given, efficiency of Asha : efficiency of Babu

$= \dfrac{7}{4} : 1 = 7 : 4$

$\Rightarrow$ time taken by Asha : time taken by Babu $= 4 : 7$

So, Let time taken by Asha & Babu be $4x$ & $7x$ respectively.

∴ From question,

$\Rightarrow \dfrac{4x \times 7x}{4x + 7x} = 7 \Rightarrow \dfrac{4x^2}{11x} = 1$

$x = 11/4$

∴ Time taken by Asha

$= 4x = 4 \times \dfrac{11}{4} = 11$ days Ans.

51.(C) $x = \dfrac{z(b-c)(b+c-2a)}{(a-b)(a+b-2c)}$

$y = \dfrac{z(c-a)(c+a-2b)}{(a-b)(a+b-2c)}$

$x + y = \dfrac{z(b-c)(b+c-2a)(c-a)(c+a-2b)}{(a-b)(a+b-2c)}$

$= \dfrac{z[b^2 + bc - 2ab - bc - c^2 + 2ac + c^2 + ac - 2bc - ac - a^2 + 2ab]}{(a-b)(a+b-2c)}$

$= \dfrac{z(b^2 - a^2 - 2bc + 2ac)}{(a-b)(a+b-2c)}$

$= \dfrac{z[(b-a)(b+a) - 2c(b-a)]}{(a-b)(a+b-2c)}$

$= \dfrac{z(b-a)(a+b-2c)}{(a-b)(a+b-2c)}$

$= -z$

∴ $x + y + z = 0$ Ans.

52. (A) $x+y+z = 6$ ....(i)

$xy+yz+zx = 11$ ....(ii)

$x^3+y^3+z^3-3xyz = (x+y+z)\{x^2+y^2+z^2-(xy+yz+zx)\}$ ....(iii)

From eqn. (i)

$(x+y+z)^2 = 36$

or, $x^2+y^2+z^2+2(xy+yz+zx) = 36$

or, $x^2+y^2+z^2+2\times11=36$ [using (ii)]

or, $x^2+y^2+z^2 = 36-22$

$x^2+y^2+z^2 =14$ ....(iv)

using (i), (ii), (iv) in (iii), we get

$x^2+y^2+z^2-3xyz = 6 (14 -11)$

$= 6 \times 3 = 18$ Ans.

53. (B) $\dfrac{x^2 - 3x + 2}{x^2 - 5x + 6} \div \dfrac{x^2 - 5x + 4}{x^2 - 7x + 12}$

$= \dfrac{(x-1)(x-2)}{(x-2)(x-3)} \div \dfrac{(x-1)(x-4)}{(x-3)(x-4)}$

$= \dfrac{(x-1)}{(x-3)} \div \dfrac{(x-1)}{(x-3)} = 1$ Ans.

54. (B) $\dfrac{a^2 - b^2 - 2bc - c^2}{a^2 + b^2 + 2ab - c^2}$

$= \dfrac{a^2 - \left(b^2 + 2bc + c^2\right)}{\left(a + b\right)^2 - c^2}$

$= \dfrac{a^2 - \left(b + c\right)^2}{\left(a + b\right)^2 - c^2}$

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

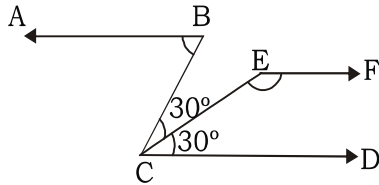$= \dfrac{(a-b-c)}{(a+b-c)}$ Ans.

55. (C)
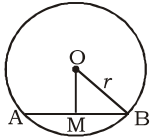
∵ OM ⊥ AB

$\Rightarrow$ AM = MB = $\dfrac{1}{2}$ AB = $\dfrac{1}{2} \times \sqrt{3}r$

$\therefore$ OM^2 = OB^2 – MB^2 = $r^2 - \dfrac{3}{4}r^2 = \dfrac{r^2}{2}$
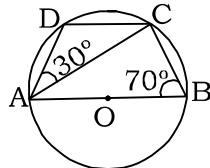
$\Rightarrow$ OM = $\dfrac{r}{2}$ Ans.

56.(C)

∵ CD || EF & EC works as a transversal.

$\therefore \angle$ ECD + $\angle$ CEF = 180° [co-interior angles are supplementary]

$\Rightarrow$ 30° + $\angle$ CEF = 180°

$\therefore \angle$CEF = 150° Ans.

57.(A)

In Cyclic qurdailateral ABCD,

$\angle$ADC + $\angle$ABC = 180°

or, $\angle$ADC + 70° = 180°

or, $\angle$ADC = 110°..........................(i)

Now, in $\triangle$ ADC

$\angle$CAD + $\angle$ADC + $\angle$ACD = 180°

or, 30° + 110° + $\angle$ACD = 180° [usig (i)]

$\angle$ACD = 40° Ans.

58. (D) $\angle$BOD = 180° – $\angle$AOD

= 180° – 106° = 74°

∵ $\angle$BOD = 2$\angle$BCD [central angle is always twice the inscribed angle]

$\Rightarrow$ 74° = 2$\angle$BCD

$\therefore \angle$BCD = 37° Ans.

59. (A) $\sin \alpha \sin \beta - \cos \alpha \cos \beta = -1$

$\Rightarrow -\cos(\alpha + \beta) = -1$

$\Rightarrow \cos(\alpha + \beta) = 1$

$\Rightarrow \alpha + \beta = 0$ [for particular case]

$\Rightarrow \alpha = -\beta$

Now,

$\cot \alpha . \tan \beta = \cot \alpha (-\tan \alpha) = -1$ Ans.

60. (B) $\cos x = \dfrac{2\cos y - 1}{2 - \cos y}$

$\Rightarrow \cos y = \dfrac{2\cos x + 1}{2 + \cos x}$

Now, $\tan \dfrac{x}{2} \cot \dfrac{y}{2} = \dfrac{\sin \dfrac{x}{2}.\cos \dfrac{y}{2}}{\cos \dfrac{x}{2}.\sin \dfrac{y}{2}}$

$= \dfrac{\sqrt{1-\cos x}}{\sqrt{1+\cos x}} \times \dfrac{\sqrt{1+\cos y}}{\sqrt{1-\cos y}}$

$\Rightarrow \dfrac{\sqrt{1-\cos x}}{\sqrt{1+\cos x}} \times \dfrac{\sqrt{1+\dfrac{2\cos x+1}{2+\cos x}}}{\sqrt{1-\dfrac{2\cos x+1}{2+\cos x}}}$

$\Rightarrow \dfrac{\sqrt{1-\cos x}}{\sqrt{1+\cos x}} \times \dfrac{\sqrt{3\cos x+3}}{\sqrt{1-\cos x}}$

$\Rightarrow \dfrac{\sqrt{1-\cos x}}{\sqrt{1+\cos x}} \times \sqrt{3}\dfrac{\sqrt{1+\cos x}}{\sqrt{1-\cos x}}$

$\therefore \sqrt{3} \times 1 = \sqrt{3}$ Ans.

61.(D) $\sin \theta = 3\sin(\theta + 2\alpha)$

so, $\dfrac{\sin \theta}{\sin(\theta + 2\alpha)} = \dfrac{3}{1}$

or, $\dfrac{\sin \theta + \sin(\theta + 2\alpha)}{\sin \theta - \sin(\theta + 2\alpha)} = \dfrac{3+1}{3-1}$

$\dfrac{2\sin(\theta + \alpha)\cos \alpha}{2\cos(\theta + \alpha)\sin(-\alpha)} = \dfrac{4}{2}$

$\tan(\theta + \alpha).\left(-\dfrac{1}{\tan \alpha}\right) = 2$

$\tan(\theta + \alpha) = -2\tan \alpha$

$\tan(\theta + \alpha) + 2\tan \alpha = 0$ Ans.

62. (C) $\sin^2 \alpha + \sin^2 \beta - \sin^2 \gamma$

$\dfrac{1-\cos 2\alpha}{2} + \dfrac{1-\cos 2\beta}{2} - \sin^2 \gamma$

$1 - \dfrac{1}{2}[\cos 2\alpha + \cos 2\beta] - \sin^2 \gamma$

===

$1 - \dfrac{1}{2} [2\cos(\alpha + \beta)\cos(\alpha - \beta)] - (1 - \cos^2\gamma)$

$1 - [\cos(\pi + \gamma)\cos(\alpha - \beta)] - 1 + \cos^2\gamma$
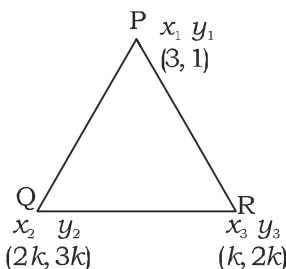
$\cos\gamma\cos(\alpha - \beta) + \cos^2\gamma$

$\cos\gamma[\cos(\alpha - \beta) + \cos(\pi - \overline{\alpha + \beta})]$

$\cos\gamma[\cos(\alpha - \beta) - \cos(\alpha + \beta)]$

$\cos\gamma \times 2\sin\alpha\sin\beta$

$2\sin\alpha\sin\beta\cos\gamma$ Ans.

63. (B)

P $x_1\ y_1$
(3, 1)

Q $x_2\ y_2$
(2k, 3k)

R $x_3\ y_3$
(k, 2k)

Area $= \Delta = \dfrac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

$= \dfrac{1}{2}[3(3k - 2k) + 2k(2k - 1) + k(1 - 3k)]$

$= \dfrac{1}{2}[3k + 4k^2 - 2k + k - 3k^2]$

$= \dfrac{1}{2}[2k + k^2]$ sq. units

64. (C)

A

F O E

B 30° D C
   2
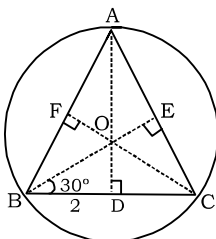
Let side of Equilateral triangle = a
Given, area of Equilateral triangle

$\dfrac{\sqrt{3}}{4}a^2 = 4\sqrt{3}$ cm^2

or, a = 4 = BC

∴ BD = 2

In △ODB
cos 30° = 2/OB

or, $\sqrt{3}/2 = 2/OB$

∴ OB = $4/\sqrt{3}$ = radius of circum circle. ∴

area = πr^2

$= \dfrac{16}{3}\pi = 5\dfrac{1}{3}\pi$ cm^2 Ans.

65. (B) Required area
= Area of the rectangle – area of the road along length – area of the road along breadth + area of the central square
= 72 × 48 – 72 × 2 – 48 × 2 + 2 × 2
= 3456 – 144 – 96 + 4
= 3220 m^2 Ans.

66. (A) Let perimeters of circles be 23x, 22x respectively.

r_1
r_2
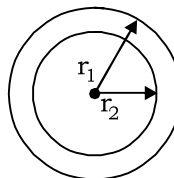
∴ $2\pi r_1 = 23x$................(i)
& $2\pi r_2 = 22x$..................(ii)

∴ $\dfrac{r_1}{r_2} = \dfrac{23}{22}$ (using (i) & (ii))

⇒ $r_1 = \dfrac{23}{22}r_2$ ....(iii)

also given, $r_1 - r_2 = 5$.............(iv)
on using (iii) in (iv), we get

$\dfrac{23}{22}r_2 - r_2 = 5$

∴ $r_2 = 110$ m Ans.

67. (C)   Given,
The radius of the sphere $r_1 = 10.5$ cm
& radius of cone $r_2 = 3.5$ cm & height of cone = 3 cm

∴ Volume of the sphere $= \dfrac{4}{3}\pi r_1^3$

& Volume of a cone $= \dfrac{1}{3}\pi r_2^2 h$

∴ No. of cones that can be formed $= \dfrac{\dfrac{4}{3}\pi r_1^3}{\dfrac{1}{3}\pi r_2^2 h}$

$= \dfrac{4r_1^3}{r_2^2 h} = \dfrac{4 \times (10.5)^3}{(3.5)^2 \times 3} = 126$ Ans.

68. (A)   Given,

$a = \dfrac{x}{x + y}$ ....(i)

$b = \dfrac{y}{x - y}$ ....(ii)

From (i) & (ii)

$$a\,b = \left(\frac{x}{x+y}\right)\left(\frac{y}{x-y}\right)$$

$$a\,b = \frac{xy}{x^2-y^2} \;..............(iii)$$

$$\&\; a+b = \frac{x}{x+y}+\frac{y}{x-y}$$

$$= \frac{x(x-y)+y(x+y)}{(x+y)\,(x-y)}$$

$$= \frac{x^2-xy+xy+y^2}{x^2-y^2}$$

$$or,\quad a+b = \frac{x^2+y^2}{x^2-y^2} \;..............(iv)$$

From (iii) & (iv)

$$\frac{ab}{a+b} = \frac{xy}{x^2+y^2} \;\;Ans.$$

69. (C) $x^2 - 4x + 1 = 0$

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

$$x+\frac{1}{x} = 4$$

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

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

$$64 - 12 = x^3+\frac{1}{x^3}$$

$$52 = x^3+\frac{1}{x^3} \;Ans.$$

70. (C) Given,
$x = a(b-c)$
$y = b(c-a)$
$z = c(a-b)$

then, $\left(\frac{x}{a}\right)^3+\left(\frac{y}{b}\right)^3+\left(\frac{z}{c}\right)^3$

$= (b-c)^3 + (c-a)^3 + (a-b)^3$
$= 3.(b-c)(c-a)(a-b)$ $\;[\because (b-c)+(c-a)+(a-b)=0]$

$= 3.\left(\frac{x}{a}\right)\left(\frac{y}{b}\right)\left(\frac{z}{c}\right)$

$$= \frac{3xyz}{abc}\;Ans.$$

71. (D) Given
$a + b + c = 0............(i)$
From (i)
$(a + b + c)^2 = 0$
or, $a^2+b^2+c^2+2(ab+bc+ca)=0$
or, $a^2+b^2+c^2 = -2(ab+bc+ca)$
or, $(a^2+b^2+c^2)^2 = 4(ab+bc+ca)^2$
or, $(a^2+b^2+c^2)^2 = 4[a^2b^2+b^2c^2+c^2a^2+2(a+b+c).abc]$
or, $(a^2+b^2+c^2)^2 = 4(a^2b^2+b^2c^2+c^2a^2)$
$(\because a+b+c=0$ from (i))

$$or,\; \frac{\left(a^2+b^2+c^2\right)^2}{\left(a^2b^2+b^2c^2+c^2a^2\right)} = 4 \;\;Ans.$$

72. (D) $\sin^6\theta + \sin^4\theta.\cos^2\theta-\sin^2\theta.\cos^4\theta-\cos^6\theta$
$= \sin^6\theta + \sin^4\theta(1-\sin^2\theta)-(1-\cos^2\theta)\cos^4\theta-\cos^6\theta$
$= \sin^6\theta + \sin^4\theta-\sin^6\theta-\cos^4\theta+\cos^6\theta-\cos^6\theta$
$= \sin^4\theta - \cos^4\theta$
$= (\sin^2\theta+\cos^2\theta)(\sin^2\theta-\cos^2\theta)$
$= \sin^2\theta - \cos^2\theta$ Ans.

73. (C) $\tan720°-\cos270°-\sin150°.\cos120°$
$= \tan(2\times360°+0°)-\cos(270°+0°)-\sin(180°-30°).\cos(90°+30°)$
$= \tan0°-\sin0°+\sin30°.\sin30°$
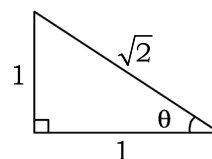$= 0-0+\sin^2 30°$
$= (1/2)^2$
$= \frac{1}{4}$ Ans.

74. (A) Given,

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

$$\sin\theta = \frac{1}{\sqrt2}$$

$$\cos\theta = \frac{1}{\sqrt2}$$

Now, $\dfrac{8\sin\theta+5\cos\theta}{\sin^3\theta-2\cos^3\theta+7\cos\theta}$

$$= \frac{8\frac{1}{\sqrt{2}} + 5\frac{1}{\sqrt{2}}}{\left(\frac{1}{\sqrt{2}}\right)^3 - 2.\left(\frac{1}{\sqrt{2}}\right)^3 + 7.\frac{1}{\sqrt{2}}}$$

$$= \frac{\frac{13}{\sqrt{2}}}{\frac{1}{2\sqrt{2}} - \frac{1}{\sqrt{2}} + \frac{7}{\sqrt{2}}}$$

$$= \frac{13/\sqrt{2}}{\left(\frac{1}{2} - 1 + 7\right)/\sqrt{2}}$$

$$= \frac{13}{13/2}$$

= 2 Ans.

75. (A) Given, $\dfrac{\sin^2\theta}{\tan^2\theta - \sin^2\theta} = 3$

or, $\dfrac{\sin^2\theta}{\sin^2\theta\left(\dfrac{1 - \cos^2\theta}{\cos^2\theta}\right)} = 3$

or, $\dfrac{\cos^2\theta}{\sin^2\theta} = 3$

or, $\tan\theta = \dfrac{1}{\sqrt{3}}$

∴ θ = 30°

∴ $\cos\theta = \cos 30° = \dfrac{\sqrt{3}}{2}$ Ans.

76. (A)
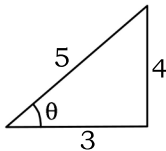
Given
sec θ + tan θ = 3...........(i)
Let, tan θ = 4/3
∴ sec θ = 5/3
then, from (i),

$\dfrac{5}{3} + \dfrac{4}{3} = 3$

or, 9/3 = 3
or, 3 = 3
   L.H.S = R.H.S

Clearly, sec θ = $\dfrac{5}{3}$ Ans.

77. (B)

$x_1\ y_1$ A•————————•B $x_2\ y_2$
(2,1)   (3,5)
m_1=2
m_2=3 (Externally Divide)

∴ $h = \dfrac{m_1 x_2 - m_2 x_1}{m_1 - m_2}$

∴ $h = \dfrac{2\times 3 - 3\times 2}{2 - 3} = \dfrac{6 - 6}{-1} = 0$

& $k = \dfrac{m_1 y_2 - m_2 y_1}{m_1 - m_2} = \dfrac{2\times 5 - 3\times 1}{2 - 3}$

$= \dfrac{10 - 3}{-1} = \dfrac{7}{-1} = -7$

∴ required coordinates of point = (h, k)
                                = (0, –7) Ans.

78. (C)
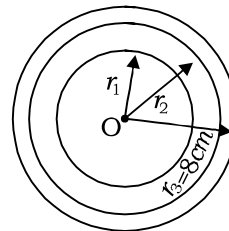
Area of the circle whose radius is 8 cm = $\pi(8)^2$

$= 64\pi$

From question,

Area of the circle whose radius is $r_1 = \dfrac{64}{3}\pi$

or, $\pi r_1^{\ 2} = \dfrac{64}{3}\pi$

or, $r_1 = \dfrac{8}{\sqrt{3}}$ cm ....(i)

Also, area of the circle whose radius is $r_2 =$

$2\times\dfrac{64}{3}\pi$

or, $\pi r_2^{\ 2} = 2\times\dfrac{64}{3}\pi$

or, $r_2 = \dfrac{8\sqrt{2}}{\sqrt{3}}$ cm ....(ii)

∴ Required ratio = $r_1 : r_2 : r_3$

$= \dfrac{8}{\sqrt{3}} : \dfrac{8\sqrt{2}}{\sqrt{3}} : 8$
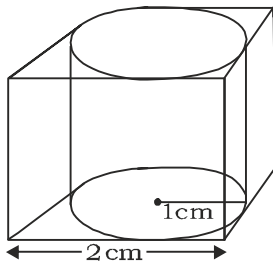
$= 1 : \sqrt{2} : \sqrt{3}$ Ans.
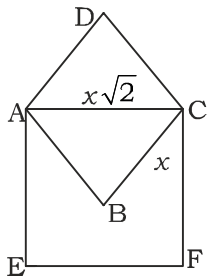
79. (D)

Required ratio = $\dfrac{4 \times x}{4 \times x\sqrt{2}}$

$= \dfrac{1}{\sqrt{2}} = 1 : \sqrt{2}$

80. (A)

Volume fo cube = (side)^3
$= 2^3$
$= 8$ cm^3

Volume fo cylinder $= \pi\, rh$

$= \dfrac{22}{7} \times 1 \times 2$

$= \dfrac{44}{7}$ cm^3

Remaining part of wood $= 8 - \dfrac{44}{7}$

$= \dfrac{12}{7}$ cm^3 Ans.

81. (A)
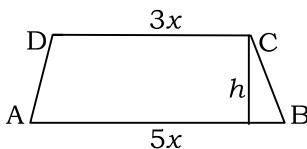
Area of the trapezium = 1440 m^2
h = 24 m
a = 3x
b = 5x
∴ a + b = 8x

∴ area $= \dfrac{1}{2} \times (a+b) \times h = 1440$

or, $\dfrac{1}{2} \times 8x \times 24 = 1440$

∴ x = 15
∴ length of longer parallel side = 5x
= 5 × 15 = 75 m Ans.

82. (C)
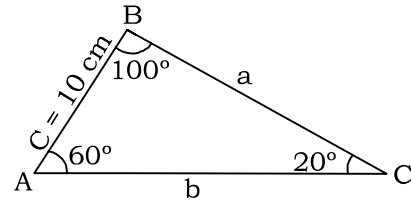
$\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

or, $\dfrac{\sin 100°}{AC} = \dfrac{\sin 20°}{10}$

∴ AC $= \dfrac{10\sin 100°}{\sin 20°}$ Ans.

83. (C)
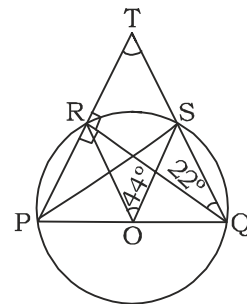
$\angle RQS = \dfrac{1}{2}\angle ROS$

$= \dfrac{1}{2} \times 44° = 22°$

$\angle QRT = 90°$
In ΔTRQ,
$\angle RTQ = 180° - 90° - 22° = 68°$ Ans.

84. (C)
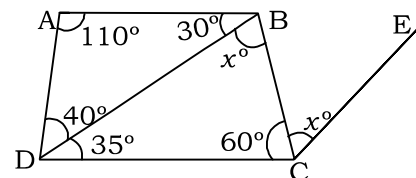
Given, CE ∥ BD
∠BAD = 110°
∠ABD = 30°
∠ADC = 75°...........................(i)
∠BCD = 60°
In ΔABD,

$\angle$ BAD + $\angle$ ABD + $\angle$ BDA = 180°

or, 110° + 30° + $\angle$ BDA = 180°

or, $\angle$ BDA = 40°...................(ii)

From (i) & (ii)

$\angle$ BDC = 75° – 40° = 35°

∵ CE BD

∴ $\angle$ CBD = x° (Alternate angle)

Now, in ΔBCD

$x° + 60° + 35° = 180°$

or, $x° = 85°$ Ans.

85. (C) $\frac{1}{2} \times Q \times h = Q^2$

⇒ h = 2Q Ans.

86. (B) r = 18m

∴ Area of circle = $\pi (18)^2$

= 324 π sqm.

Area of flower bed =324π – $(18-3)^2 \pi$

= 324π – 225π

= 99π sq. m.Ans.

87. (A)
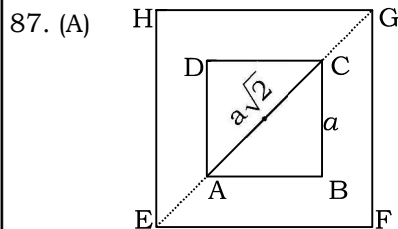
Area of ABCD = a^2

From question,

EG = $2a\sqrt{2}$

∴ EF = $\frac{2a\sqrt{2}}{\sqrt{2}}$ = 2a

∴ Area of EFGH = $(2a)^2$

= $4a^2$

= 4(area of ABCD)

∴ Area becomes 4 times of the previous square. Ans.

88. (B) Diameter of the iron ball = 14 cm

∴ radius r_1= 7 cm

Let the radius of base of cylinder = r_2

Given, height of cylinder = $2\frac{1}{3} = \frac{7}{3}$ cm

∴ From question, $\frac{4}{3}\pi r_1^3 = \pi r_2^2 h$

or, $\frac{4}{3}r_1^3 = r_2^2 .h$

or, $\frac{4}{3}.(7)^3 = r_2^2 \times \frac{7}{3}$

∴ r_2 = 14 cm

∴ Diameter = 28 cm Ans.

89. (D)
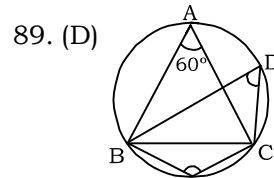
Since Δ ABC is equilateral.

∴ $\angle$BAC = 60°

⇒ $\angle$BDC = $\angle$BAC = 60°

∵ (angles made by same chord in the same segment of the circle are same) Ans.

90. (D)
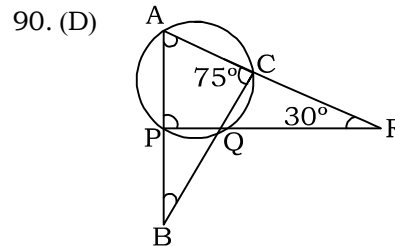
$\angle$PQB = $\angle$CQR = 75° –30° = 45°

& $\angle$APQ =180° – 75° = 105°

∴ $\angle$CBA = 105° –45° = 60° Ans.

91. (C)
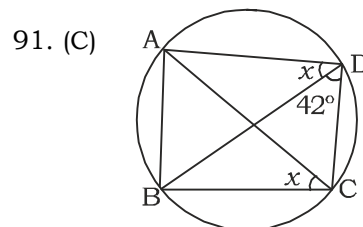
Given $\angle$BDC = 42°

∵ $\angle$ADC = 90°

∴ $x = \angle$ADB = 90°– 42°

or, $\angle$ACB = 48° Ans.

92. (D) % weight of skin = $\frac{\frac{1}{10}}{1} \times 100$

= $\frac{1}{10} \times 100$ = 10% Ans.

93. (D) Required part of protein =

$1 - \left(\frac{1}{3} + \frac{1}{6} + \frac{1}{10} \right)$

===

$$= \quad 1 - \left(\frac{10 + 5 + 3}{30}\right) \quad = \quad 1 - \frac{18}{30} \quad = 1 - \frac{3}{5}$$

$$= \quad \frac{2}{5} \text{ Ans.}$$

94. (B) Required Ratio $= \frac{1}{3} : \frac{1}{6}$

$$= 2 : 1 \text{ Ans.}$$

95. (B) Required angle $= 360 \times \dfrac{(16 + 14)}{100}$

$$= 360 \times \frac{30}{100}$$

$$= 108° \text{ Ans.}$$

96. (A) Required amount of water = 70% of 50 kg

$$= 50 \times \frac{70}{100}$$

$$= 35 \text{ kg Ans.}$$

97. (C) Annual average of the total production

$$= \frac{74 + 71 + 75 + 90 + 80 + 86}{6} = 79.33 \approx 80$$

Clearly, this is the production of all types of cars in 2003 Ans.

98. (D) From the table the production of car S has been continuously increasing during the period 1999 to 2004. Ans.

99. (C) In 2003
P + Q = 21 + 12 = 33
R + S = 13 + 20 = 33 Ans.

100. (D)   Given,
Total no of all types of cars = 80

$$25\% \text{ of } 80 = 25 \times \frac{80}{100} = 20$$

Clearly, It is of S type. Ans.

SSC MAINS (MATHS) MOCK TEST -14 (ANSWER SHEET)

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