KD Campus
K D Campus Pvt. Ltd
1997, GROUND FLOOR OPPOSITE MUKHERJEE NAGAR POLICE STATION, OUTRAM LINES, GTB NAGAR, NEW DELHI – 09

TEST NO. 54

SSC TIER-II : QUANTITATIVE ABILITIES
(Answer with Explanations)

Answer Key

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

Answer key with explanations

1. (C) $\dfrac{16\times 2^{n+1}-4\times 2^{n}}{16\times 2^{n+2}-2\times 2^{n+2}}$

$= \dfrac{2^{n}(16\times 2-4)}{2^{n}(16\times 4-2\times 4)} = \dfrac{28}{56} = \dfrac{1}{2}$

2. (B) $\dfrac{1}{1+\dfrac{\frac{2}{3}}{\frac{5}{3}+\frac{\frac{8}{9}}{(1/3)}}} = \dfrac{1}{1+\dfrac{\frac{2}{3}}{\frac{5}{3}+\frac{8}{9}\times 3}} = \dfrac{1}{1+\dfrac{\frac{2}{3}}{\frac{13}{3}}}$

$= \dfrac{1}{1+\frac{2}{13}} = \dfrac{13}{15}$

3. (B) Let 13th number = x
A.T.Q,

$15\times 51 = 5\times 43 + 7\times 55 + x + \dfrac{x}{3} + \dfrac{x}{3} - 5$

$\Rightarrow 765 = 215 + 385 + x + \dfrac{2x}{3} - 5$

$\Rightarrow 765 - 215 - 385 + 5 = \dfrac{5x}{3}$

$\Rightarrow 170 = \dfrac{5x}{3} \Rightarrow x = 102$

4. (C) $x^{12} - 2702x^{6} + 1 = 0$

$\Rightarrow x^{6} - 2702 + \dfrac{1}{x^{6}} = 0$

$\Rightarrow x^{6} + \dfrac{1}{x^{6}} - 2 = 2702 - 2$

$\Rightarrow \left(x^{3} - \dfrac{1}{x^{3}}\right)^{2} = 2700$

$\Rightarrow x^{3} - \dfrac{1}{x^{3}} = 30\sqrt{3}$

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

$\Rightarrow x - \dfrac{1}{x} = 2\sqrt{3}$

5. (A) Let C.P = 100
M.P = 115

S.P = $115 \times \dfrac{(100-x)}{100}$

A.T.Q,

$100\times \dfrac{92}{100} = 115 \times \dfrac{100-x}{100}$

$\Rightarrow x = 20$

6. (D) Let Q = 100, P = 125

$R = \frac{100\times100}{75} = \frac{400}{3}$

The required percent $= \frac{\frac{400}{3}-125}{125}\times100$

$= \frac{25}{3\times125}\times100 = \frac{20}{3} = 6\frac{2}{3}\%$

7. (A)
$$\begin{array}{r} 21.3333333 \\ +\ 10.3454545 \\ \hline 31.6787875 \\ -\ 31.3444444 \\ \hline \end{array}$$

Hence, $0.3343434 = 0.3\overline{34}$

8 (D) $a^2 + b^2 + c^2 + 126 = 6(3c - 2b - a)$

$\Rightarrow a^2 + 6a + b^2 + 12b + c^2 - 18c + 126 = 0$

$\Rightarrow a^2 + 6a + 9 + b^2 + 12b + 36 + c^2 - 18c + 81 = 0$

$\Rightarrow (a+3)^2 + (b+6)^2 + (c-9)^2 = 0$

$a + 3 = 0 \Rightarrow a = -3$

$b + 6 = 0 \Rightarrow b = -6$

$c - 9 = 0 \Rightarrow c = 9$

Now, $\sqrt{ab - bc + ca}$

$= \sqrt{-3\times(-6) - (-6)\times9 + 9(-3)}$

$= \sqrt{18 + 54 - 27}$

$= \sqrt{45} = 3\sqrt{5}$

9. (B) $\left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{3-2}{12}\right)\right\}\right]$

$= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{1}{12}\right)\right\}\right]$

$= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{30-1}{12}\right)\right\}\right]$

$= \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{29}{24}\right\}\right]$

$= \left[\frac{13}{4} \div \left\{\frac{30-29}{24}\right\}\right] = \left[\frac{13}{4} \div \frac{1}{24}\right]$

$= \left[\frac{13}{4}\times24\right] = 78$

10. (C) S.P. of 1 article = ₹ 45.

Let marked price of each article be ₹ x.

Then, $\frac{90}{100}x = 45 \Rightarrow x = ₹\left(\frac{45\times100}{90}\right)$

= ₹ 50.

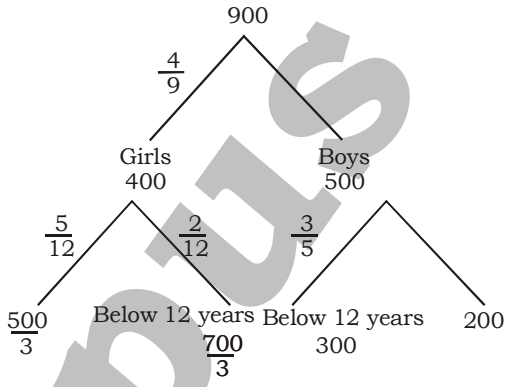
C.P. = ₹ $\left(\frac{100}{150}\times45\right)$ = ₹ 30.

Now, C.P. = ₹ 30, S.P. = ₹ 50.

The required profit% $= \left(\frac{20}{30}\times100\right)\%$

$= 66\frac{2}{3}\%$

11. (C) Let no. students = 900



A.T.Q,

$\frac{700}{3} + 300 \rightarrow 480$

$\Rightarrow \frac{1600}{3} \rightarrow 480$

$\Rightarrow 1 \rightarrow \frac{480\times3}{1600}$

$\Rightarrow 900\times\frac{5}{18} \rightarrow \frac{480\times3}{1600}\times900\times\frac{5}{18}$

$\Rightarrow 250 \rightarrow 225$

$\therefore \frac{5}{18}$ of the total no. of students = 225

12. (D) A ⟶ 15, B ⟶ 20 → 60 (4, 3)

Filled in 4 min = 7×4 = 28

Remaining part = 60 – 28 = 32

Remaining part filled by B = $\frac{32}{2}$ min

= 10 min 40 sec

Total time = 14 min 40 sec.

13. (C) A ⟶ 20, B ⟶ 15 → 60 (3, 4)

(A + B)'s work in 6 days = 6×(3 + 4) = 42

A's work in 4 days = 3×4 = 12

Remainining work = 60 – 42 – 12 = 6 unit

Remaining work (6 units) done by C in 4 days

60 units done by C in = 40 days

14. (C) $104\% = \frac{104}{100} = \frac{26}{25}$

A.T.Q,

Instalment $= \frac{26}{25} \times \frac{26}{26+25} \times 2550$

$= \frac{26}{25} \times \frac{26}{51} \times 2550 = 1352$

15. (B) Ratio of intial investments $= \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

$= 6 : 4 : 3.$

Let their initial investments be $6x$, $2x$ and $3x$ repectively.

A : B : C = $(6x \times 2 + 3x \times 10) : (4x \times 12) : (3x \times 12) = 42 : 48 : 36 = 7 : 8 : 6.$

Hence B's share = ₹ $\left(378 \times \frac{8}{21}\right)$

= ₹ 144.

16. (A) ATQ.,

3 8 5 x 2 8 y 2 is divisible by 44

Means it's divisible by 11 and 4

Applying both divisibility rule.

y = 1, 3, 5, 7, 9 (Because no. divisible by 4) and

$3 + 5 + 2 + 4 = 10 + y$ (11, 13, 15, 17, 19)

$8 + x + 8 + 2 = 18 + x$

Taking $x = 1$ and $y = 9$ is satisfy all

Then, $\sqrt{3(x+y)} = \sqrt{3(1+9)}$

$= \sqrt{30}$

17. (A) Sum of Temperature on 1st, 2nd, 3rd and 4th days = (58×4) = 232 degrees ...(i)

Sum of Temperature on 2nd, 3rd, 4th and 5th days = (60×4) = 240 degrees ...(ii)

Subtracting (i) from (ii), we get :

Temp. on 5th day - Temp. on 1st day = 8 degrees

Let the Temperatures on 1st and 5th days be $7x$ and $8x$ degrees respectively.

Then, $8x - 7x = 8$ or $x = 8$.

Hence Temperature on the 5th day = $8x$ = 64 degrees.

18. (C) LCM of the orders of the surds = LCM of 2, 3, 5 and 7 = 210

$5^{\frac{1}{2}} = 5^{\frac{105}{210}} = \left(5^{105}\right)^{\frac{1}{210}}$

$4^{\frac{1}{3}} = 4^{\frac{70}{210}} = \left(4^{70}\right)^{\frac{1}{210}}$

$2^{\frac{1}{5}} = 2^{\frac{42}{210}} = \left(2^{42}\right)^{\frac{1}{210}}$

$3^{\frac{1}{7}} = 3^{\frac{30}{210}} = \left(3^{30}\right)^{\frac{1}{210}}$

$\therefore$ The largest number = $5^{\frac{1}{2}} = \sqrt{5}$

19. (D) 7 years ago, A's age = 4x years and B's age = 5x years

$\therefore \frac{4x+14}{5x+14} = \frac{5}{6}$

$\Leftrightarrow 25x + 70 = 24x + 84$

$\Leftrightarrow x = 84 - 70 = 14$

$\therefore$ B's present age = $5x + 7 = 5 \times 14 + 7$ = 77 years

20. (C) Equivalent single discount for 25% and 20%

$= \left(25 + 20 - \frac{25 \times 20}{100}\right)\% = 40\%$

Equivalent single discount for 40% and 10%

$= \left(40 + 10 - \frac{40 \times 10}{100}\right)\% = 46\%$

21. (C) Relative speed = (68 + 40) kmph = 108 kmph

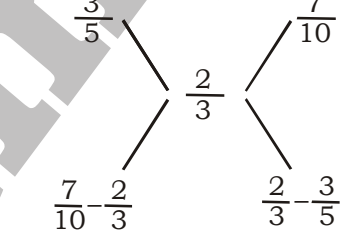
$= \left(\frac{108 \times 5}{18}\right)$ m/sec. = 30 m/sec

Required time

$= \frac{\text{Sum of the lengths of both trains}}{\text{Relative speed}}$

$= \left(\frac{70+80}{30}\right) = 5$ seconds

22. (B) **Milk -I** **Milk -II**



$\frac{7}{10} - \frac{2}{3}$ $\qquad$ $\frac{2}{3} - \frac{3}{5}$

$= \frac{21-20}{30}$ $\qquad$ $= \frac{10-9}{15}$

$= \frac{1}{30}$ $\qquad$ $= \frac{1}{15}$

Required ratio = $\frac{1}{30} : \frac{1}{15}$

= 1 : 2

23. (B) In 32 litres of mixture

Alcohol = $\frac{5}{8} \times 32 = 20$ litre

Water = $\frac{3}{8} \times 32 = 12$ litre

Required ratio = 20 : 20 = 1 : 1

24. (C) Speed of train A = x kmph

Speed of train B = y kmph

Now, $\frac{x}{y} = \sqrt{\frac{t_2}{t_1}}$

$\Rightarrow \frac{45}{y} = \sqrt{\frac{3+\frac{1}{3}}{4+\frac{48}{60}}} = \sqrt{\frac{\frac{10}{3}}{4+\frac{4}{5}}}$

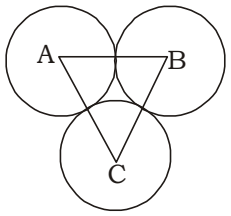
$\Rightarrow \sqrt{\frac{10}{3} \times \frac{5}{24}} = \sqrt{\frac{25}{36}} = \frac{5}{6}$

$\Rightarrow 5y = 45 \times 6 \Rightarrow y = \frac{45 \times 6}{5} = 54$ km/hr

25. (B) Number of 1-rupee coins = x
Number of 25 paise coins = $2x$
Ratio of their values = $x : \frac{4x}{2} : \frac{2x}{4}$
= 2 : 4 : 1
Value of 50-paise coins = $\frac{4}{5} \times 56$
= ₹ 32
Their number = 32 ×2 = 64

26. (B) 10 men = 20 women
1 man = 2 women = 4 children
1 woman = 2 children
5 men + 5 women + 5 children
= 20 + 10 + 5 = 35 children
Now, $M_1D_1 = M_2D_2$
$\Rightarrow 40 \times 7 = 35 \times D_2$
$\Rightarrow D_2 = \frac{40 \times 7}{35} \Rightarrow 8$ months
Required Time = 4 months.

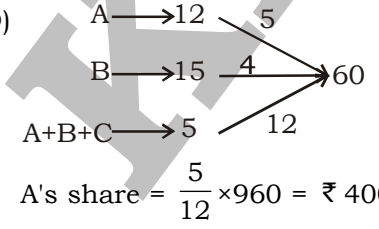
27. (A)



AB = $a + b = x$ (let)
BC = $b + c = y$ (let)
CA = $a + c = z$ (let)
$s = \frac{AB + BC + CA}{2} = a + b + c$
Area of $\Delta ABC = \sqrt{s(s-x)(s-y)(s-z)}$
$= \sqrt{(a+b+c)abc}$

28. (A) A : B : C : D = $\frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{6}$
$= \frac{1}{3} \times 60 : \frac{1}{4} \times 60 : \frac{1}{5} \times 60 : \frac{1}{6} \times 60$
[LCM of 3, 4, 5 and 6 = 60]
= 20 : 15 : 12 : 10
Minimum number of pens
= 20 + 15 + 12 + 10 = 57

29. (D)



A's share = $\frac{5}{12} \times 960$ = ₹ 400

30. (B) Let sum = P
A.T.Q,
$P + \frac{P \times r \times 1}{100} = 6076$
$P + \frac{Pr}{100} = 6076$ ...(i)
and $P + \frac{P \times r \times 4}{100} = 7504$
$P + 4 \times \frac{Pr}{100} = 7504$ ...(ii)
On subtracting eq. (i) from (ii)
$3 \times \frac{Pr}{100} = 7504 - 6076$
$\frac{Pr}{100} = \frac{1428}{100} = 476$ ...(iii)
from eq. (i)
P + 476 = 6076 $\Rightarrow$ P = 5600
from eq. (ii)
$\frac{5600 \times r}{100} = 476$
$r = \frac{426}{56} = 8.5\%$

31. (A) $\left(5\frac{1}{3} \div 2\frac{1}{7} \text{ of } 5\frac{3}{5}\right) \div \left(6\frac{2}{5} \div 4\frac{1}{2} \text{ of } 3\frac{1}{3}\right)$ of $\left(\frac{3}{4} \times 1\frac{1}{3} \div \frac{4}{9} \text{ of } 1\frac{4}{5}\right)$
$\Rightarrow \left(\frac{16}{3} \div \frac{15}{7} \text{ of } \frac{28}{5}\right) \div \left(\frac{32}{5} \div \frac{9}{2} \text{ of } \frac{10}{3}\right)$ of $\left(\frac{3}{4} \times \frac{4}{3} \div \frac{4}{9} \text{of} \frac{9}{5}\right)$
$\Rightarrow \left(\frac{16}{3} \div 12\right) \div \left(\frac{32}{5} \div 15\right)$ of $\left(1 \div \frac{4}{5}\right)$
$\Rightarrow \frac{4}{9} \div \frac{32}{75}$ of $\frac{5}{4}$
$\Rightarrow \frac{4}{9} \div \frac{8}{15} = \frac{5}{6}$

32. (D) Let two numbers = $3x$, $5x$
A.T.Q,
$\frac{3x-13}{5x-13} = \frac{10}{21}$
$63x - 273 = 50x - 130$
$13x = 143$
$x = 11$
Numbers = 33, 55
Now, $\frac{33+15}{55+15} = \frac{48}{70} = \frac{24}{35}$
The required ratio = 24 : 35

33. (C) Time taken to cover 20 km at the speed of 5 km/hr
= 4 hours.
Fixed time = 4 hours – 40 minutes
Time taken to cover 20 km at the speed of 8 km/hr = $\frac{20}{8}$
= 2 hours 30 minutes
Required time = 3 hours
20 minutes – 2 hours 30 minutes
= 50 minutes

34. (A) $\frac{2\sqrt{10}}{\sqrt{5}+\sqrt{2}-\sqrt{7}} - \frac{3}{\sqrt{7}-2} - \sqrt{\frac{\sqrt{5}-2}{\sqrt{5}+2}}$

$\Rightarrow \frac{2\sqrt{10}}{\sqrt{5}+\sqrt{2}-\sqrt{7}} \times \frac{\sqrt{5}+\sqrt{2}+\sqrt{7}}{\sqrt{5}+\sqrt{2}+\sqrt{7}}$

$\frac{-3}{\sqrt{7}-2} \times \frac{\sqrt{7}+2}{\sqrt{7}+2} - \sqrt{\frac{(\sqrt{5}-2)(\sqrt{5}-2)}{(\sqrt{5}+2)(\sqrt{5}-2)}}$

$\Rightarrow \frac{2\sqrt{10}(\sqrt{5}+\sqrt{2}+\sqrt{7})}{5+2+2\sqrt{10}-7} - \frac{3(\sqrt{7}+2)}{7-4}$

$- \frac{\sqrt{5}-2}{1}$

$\Rightarrow \frac{2\sqrt{10}(\sqrt{5}+\sqrt{2}+\sqrt{7})}{2\sqrt{10}} - \frac{3(\sqrt{7}+2)}{3} - \frac{\sqrt{5}-2}{1}$

$\Rightarrow \sqrt{5}+\sqrt{2}+\sqrt{7}-\sqrt{7}-2-\sqrt{5}+2$

$\Rightarrow \sqrt{2}$

(35-39):

35. (C) Required answer

$= \frac{35\times 30}{100} + \frac{35\times 15}{100} + \frac{35\times 15}{100}$

$= \frac{35}{100}(30 + 15 + 15)$

$= \frac{35\times 60}{100}$ = 21 lakhs

36. (D) Percentage variation :

Model A = $\frac{40-30}{30}\times 100 = 33\frac{1}{3}$

Model B = $\frac{20-15}{15}\times 100 = 33\frac{1}{3}$

Model C = $\frac{15-20}{20}\times 100$ = -25%

37. (A) Required difference

$= \frac{44\times 20}{100} - \frac{35\times 15}{100}$

$= \frac{880-525}{100} = \frac{355}{100}$ lakhs

= 355000

38. (B) Required production

$= \frac{44\times 30}{100}$ lakhs

= 1320000

39. (C) Required answer

$= 35\times \frac{10}{100}\times \frac{15}{100} + 44 \times \frac{10}{100}\times \frac{15}{100}$

$= \frac{150}{10000}\times 79$ = 1.1850 lakhs

= 118500

40. (A)

Price	Consumption	Expenditure
100	1	100×1= 100
32% Increase ↓	$8\frac{1}{3}$% Decrease ↓	↓
132	$1\times\frac{275}{300}=\frac{11}{12}$	$132\times\frac{11}{12}$ =121

The required increased percentage = 121 – 100 = 21%

41. (C) Let intial rate = x%

A.T.Q,

$\frac{35000}{4}\times 2\times\frac{x}{100} + \frac{3\times 35000}{4}\times 2\times\frac{(x+5)}{100}$

= 6650

$\Rightarrow 175x + 525x + 2625 = 6650$

$\Rightarrow 700x = 4025$

$\Rightarrow x = 5.75$

Second rate of interest = 5.75 + 5

= 10.75%

42. (B) $\frac{4(x^2+1)-9x}{4x} = 6$

$\Rightarrow x + \frac{1}{x} - \frac{9}{4} = 6$

$\Rightarrow x + \frac{1}{x} = 6 + \frac{9}{4}$

$\Rightarrow (\sqrt{x})^2 + \left(\frac{1}{\sqrt{x}}\right)^2 - 2 = 6 + \frac{9}{4} - 2$

$\Rightarrow \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = \frac{25}{4}$

$\Rightarrow \sqrt{x} - \frac{1}{\sqrt{x}} = \frac{5}{2}$

43. (A) A.T.Q,

$\frac{60}{100}\times\frac{1}{3}\times x = 5\times\frac{32}{100}\times\frac{1}{4}\times y$

$\Rightarrow 20x = 40y$

$\Rightarrow x = 2y$

$\Rightarrow \frac{x}{y}\times 100 = 2\times 100 = 200\%$

Hence x is 100% more than y.

44. (D) Let marks obtained by D = x

$C = x \times \frac{72}{100}$

$B = x \times \frac{72}{100} \times \frac{125}{100} = \frac{9x}{10}$

$A = \frac{9x}{10} \times \frac{115}{100} = \frac{207x}{200}$

A.T.Q

$\Rightarrow \frac{207x}{200} - \frac{72x}{100} = 126$

$\Rightarrow \frac{207x - 144x}{200} = 126$

$\Rightarrow \frac{63x}{200} = 126 \Rightarrow x = 400$

Hence marks obtained by D = 400

(45-49)

45. (A) Percentage decrease

$= \frac{60-40}{60} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

46. (A) Average annual production:

Flavour X $\Rightarrow \frac{1}{6} \times 300 = 50$ lakh bottles

Flavour Y $\Rightarrow \frac{1}{6} \times 325 = 54\frac{1}{6}$ lakh bottles

Flavour Z $\Rightarrow \frac{1}{6} \times 300 = 50$ lakh bottles

47. (C) Required percentage

$= \frac{120}{90} \times 100 = 133.33$

48. (A) Percentage increase/decrease:

Year 2007 $\Rightarrow \frac{60-50}{60} \times 100$

= 16% decrease

Year 2008 $\Rightarrow \frac{55-50}{50} \times 100$

= 10% increase

Year 2008 $\Rightarrow \frac{55-50}{55} \times 100$

= 9% decrease

49. (D) Required difference

$= \frac{1}{3}[(55 + 50 + 55) - (50 + 40 + 55)]$

$= \frac{1}{3}(160 - 145)$

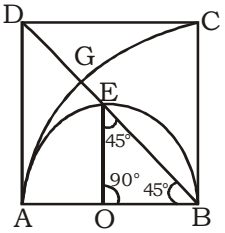
$= \frac{15}{3} = 5$ lakh bottles

50. (A) $\sqrt{19-8\sqrt{3}} + \sqrt{7+4\sqrt{3}}$

$\Rightarrow \sqrt{\left(4-\sqrt{3}\right)^2} + \sqrt{\left(2+\sqrt{3}\right)^2}$

$\Rightarrow 4 - \sqrt{3} + 2 + \sqrt{3} = 6$

51. (B)



Let side of square = a

Area of square ABCD = 196

a = 14 km

Area of leaf having angle 90°

$\Rightarrow$ Area of sector BOE – ar (ΔBOE)

$= \frac{1}{4}\pi(7)^2 - \frac{1}{2}(7 \times 7)$

= 14 cm^2

Area of shaded region AGE

$\Rightarrow \frac{1}{8}\pi(14)^2 - \left[\frac{\pi}{2}(7)^2 - 14\right]$

$\Rightarrow$ 14 cm^2

Required are of seeded part = 14 + 14

= 28 cm^2

52. (A) $Ar(AOB) = \frac{120}{360}\pi\left[2\sqrt{3}\right]^2 - \frac{\sqrt{3}}{4} \times \left(2\sqrt{3}\right)^2$

$= 4\pi - 3\sqrt{3}$

$Ar(COD) == \left(2\sqrt{3}\right)^2 - \left[\frac{\pi}{2}\left(2\sqrt{3}\right)^3 - \left(4\pi - 3\sqrt{3}\right)\right]$

$= 12 - \left(6\pi - 4\pi + 3\sqrt{3}\right)$

$= 12 - 3\sqrt{3} - 2\pi$

Ratio of shaded part

$\frac{COD}{AOB} = \frac{12 - 3\sqrt{3} - 2\pi}{4\pi - 3\sqrt{3}}$

53. (B) Given,

Radius of outer circle $\Rightarrow$ 5

Diameter = 10

Diameter = diagonal of ABCD = $\sqrt{2}$ side

$10 = \sqrt{2}a$ (Let a is radius of outer circle)

$a = 5\sqrt{2}$

So, side of square ABCD = Dia of 2nd circle

$5\sqrt{2} = 2R$ (R is the radius of second circle)

$R = \frac{5}{\sqrt{2}}$

$\therefore$ R is circum radius of triangle EFG

$R = R - \frac{side}{\sqrt{3}} = \frac{5}{\sqrt{2}} \Rightarrow \left[\text{side} = \frac{5\sqrt{3}}{2}\right]$

Radius of inner circle = $\frac{\text{side}}{2\sqrt{3}} = \frac{5}{2\sqrt{2}}$

(i) 8 : 4 : 1 (ii) 50 : $\frac{\sqrt{3}}{4} \times \frac{75}{8} = 64 : 3\sqrt{3}$

(iii) $\frac{1}{2} \times (25\pi - 50) = \frac{25\pi - 50}{2}$

54. (D) Volume of two identical hemispheres whose diagonal is equal to the side of surface of the cube which is base of the hemisphere
So volume of 2 hemispheres

$$2\times\frac{2}{3}\pi r^3 \Rightarrow \frac{4}{3}\times\frac{22}{7}\times(7)^3 \Rightarrow 1437.33\text{cm}^3$$

Volume left ⇒ Volume of cube – volume of 2 hemispheres
⇒ $(14)^3 - 1437.33 \Rightarrow 1306.67$

55. (C) Lateral surface are

$$= \frac{1}{2}\times 30\sqrt{3} \times \text{slant height}$$

Total surface area

$$= 15\sqrt{3}h + \frac{\sqrt{3}}{4}\left(10\sqrt{3}\right)^2$$

$$= 15\sqrt{3}h + 75\sqrt{3}$$

ATQ.,

Total surface area = $270\sqrt{3}$

$\therefore$ $15\sqrt{3}h + 75\sqrt{3} = 270\sqrt{3}$
15h + 75 = 270
Slant height(h) = 13
Height of pyramid ⇒

$$= \sqrt{(13)^2 - \left(\frac{10\sqrt{3}}{2\sqrt{3}}\right)^2}$$

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

56. (C) Let side of square = a
Area = $a^2 = 567$
Area of Rectangle ⇒ $l \times b$
⇒ (a + 4) (a – 4)⇒ $a^2 - 16 \Rightarrow 576 + 16$
⇒ 551 m^2

57. (A) Cube length = a
cuboids l = a/3, b = a, h = a

$$\text{cuboids area} \Rightarrow 2\left(\frac{a^2}{3} + a^2 + \frac{a^2}{3}\right)$$

$$\text{Ratio} = 6a^2 : 2\times\frac{10a^2}{3}$$

= 18 : 20 ⇒ 9 : 10

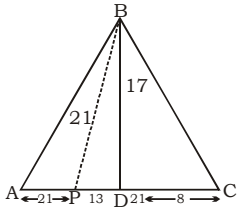
58. (C) $\text{Height} = \dfrac{1731.6}{\frac{1}{2}\times 26\times 9} = 14.8$ cm

59. (D)

	Initial	Final
(Radius)²	5^2	4^2
Height	5	7
	125	112

$$\text{Decrease\%} = \frac{13}{125}\times 100 = 10.4\%$$

60. (B)



$$S = \frac{21+17+13}{2} = \frac{51}{2}$$

Draw a line BP which intersect AC sach that AP = PC

$$\text{Area of } \Delta BPD = \sqrt{S(S-a)(S-b)(S-c)}$$

$$\text{Ar}(\Delta BPD) = \sqrt{\frac{51}{2}\times\frac{9}{2}\times\frac{17}{2}\times\frac{25}{2}}$$

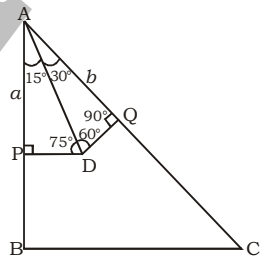
$$= 5 \times 17 \times \frac{3}{4}\sqrt{3}$$

$$13 \rightarrow 85 \times \frac{3\sqrt{13}}{4}$$

$$8 \rightarrow \frac{85}{4}\times\frac{3\sqrt{13}}{13}\times 8$$

= 67.24
Required area of (ΔBDC) = 67.24 cm^2

61. (C) ATQ.,



$$\angle A = \frac{180-90}{2}$$

$\angle A = 45°$
$\angle DAQ = 30°$
In ΔADQ

$$\sin 60° = \frac{AQ}{AD}$$

$$\frac{\sqrt{3}}{2} = \frac{b}{AD}$$

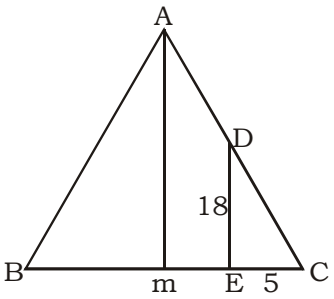
$$AD = \frac{2b}{\sqrt{3}}$$

Now,
In ΔADP

$$\sin 75° = \frac{AP}{AD}$$

$$\sin 75° = \frac{a}{2b}\times\sqrt{3} = \frac{\sqrt{3}a}{2b}$$

62. (A) ATQ.,



$\tan(\angle DCE) = \frac{18}{5} = 3.6$

$\tan\angle ABC = \tan\angle DCE = 3.6$

(So, ΔABC is an isosceles triangle)

ΔAmC ~ ΔDEC

$\frac{Am}{DE} = \frac{AC}{DC} = \frac{mC}{EC}$

$\frac{AC}{DC} = \frac{BC}{2EC}$ [∵ ΔABC isosceles triangle Am bisects the BC]

63. (A) $\frac{x^2+1}{x} = 10 \Rightarrow x + \frac{1}{x} = 10 \Rightarrow x^2 + \frac{1}{x^2} = 98$

Now, $\frac{x^4+3x^3+5x^2+3x+1}{x^4+1}$

$\Rightarrow \frac{x^2+3x+5+\frac{3}{x}+\frac{1}{x^2}}{x^2+\frac{1}{x^2}} \Rightarrow \frac{x^2+\frac{1}{x^2}+3\left(x+\frac{1}{x}\right)+5}{x^2+\frac{1}{x^2}}$

$\Rightarrow \frac{98+30+5}{98} = \frac{133}{98}$

64. (A) $x + \frac{1}{x} = 3$

$\Rightarrow \frac{273x^3}{(2x^2+4x+2)(7x^2+14x+17)(11x^2+6x+11)}$

$\Rightarrow \frac{273}{\left[2\left(x+\frac{1}{x}\right)+4\right]\left[7\left(x+\frac{1}{x}\right)+14\right]\left[11\left(x+\frac{1}{x}\right)+6\right]}$

$\Rightarrow \frac{273}{10\times35\times39} = \frac{1}{50}$

65. (C) $P^2(a^2+b^2+c^2) - 2P(ab+bc+cd) + (b^2+c^2+d^2) \le 0$

$\Rightarrow (Pa)^2 + (Pb)^2 + (Pc)^2 - 2abP - 2bcP - 2cdP + b^2 + c^2 + d^2 \le 0$

$\Rightarrow (Pa - b)^2 + (Pb - c)^2 + (Pc - d)^2 \le 0$

$\Rightarrow P = \frac{b}{a} = \frac{c}{b} = \frac{d}{c}$

66. (A) $\frac{(x+1)(x+2)}{(x+3)(x+4)} = \frac{(x+3)}{(x+7)}$

$\Rightarrow (x+1)(x+2)(x+7) = (x+3)^2(x+4)$

$\Rightarrow (x^2+3x+2)(x+7) = (x^2+6x+9)(x+4)$

$\Rightarrow x^3 + 3x^2 + 2x + 7x^2 + 21x + 14 = x^3 + 6x^2 + 9x + 4x^2 + 24x + 36$

$\Rightarrow 23x + 14 = 33x + 36$

$\Rightarrow 10x = -22 \Rightarrow x = \frac{-11}{5} = -2\frac{1}{5}$

67. (A) $x + y = 8$

$1 \times 7 = 7$

$2 \times 6 = 12$

$3 \times 5 = 15$

$4 \times 4 = 16$

Maximum value of $xy = 16$

68. (C) $(x^3 - 2x^2 + px - q)$

$x^2 - 2x - 3 = 0 \Rightarrow x = 3, -1$ (Put)

$\Rightarrow x^3 - 2x^2 + px - q - x + 6 = 0$

$\Rightarrow 27 - 18 + 3p - q - 3 + 6 = 0$

$\Rightarrow 3p - q = -12$ ...(i)

$\Rightarrow -1 - 2 - p - q + 1 + 6 = 0$

$p + q = 4$ ...(ii)

Solve (i) & (ii)

$3p - q = -12$

$p + q = 4$

$4p = 8$

$p = -2, q = -6$

$(p, q) = (-2, 6)$

69. (C) $\sqrt{a^2+2b\sqrt{a^2-b^2}} - \sqrt{a^2-2b\sqrt{a^2-b^2}}$

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

$= \sqrt{a^2-b^2} + b - \sqrt{a^2-b^2} + b$

$= 2b$

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

$\Rightarrow b^2 + c^2 + 2bc = a^2$

$\Rightarrow b^2 + c^2 - a^2 = -2bc$ ...(i)

Similarly,

$\Rightarrow c^2 + a^2 - b^2 = -2ca$ ...(ii)

$\Rightarrow a^2 + b^2 - c^2 = -2ab$ ...(iii)

Now, $\frac{b+c}{bc}(b^2 + c^2 - a^2) + \frac{c+a}{ac}(c^2 + a^2 - b^2) + \frac{a+b}{ab}(a^2 + b^2 - c^2)$

$\Rightarrow \frac{b+c}{bc}(-2bc) + \frac{c+a}{ac}(-2ac) + \frac{a+b}{ab}(-2ab)$

$\Rightarrow -2b - 2c - 2c - 2a - 2a - 2b$

$\Rightarrow -4(a + b + c) = 0$

71. (A) $x = 2 + \sqrt{3}$, $y = 2 - \sqrt{3}$, $z = 1 \Rightarrow xyz = 1$

Now, $\frac{x}{yz} + \frac{y}{xz} + \frac{z}{xy} + 2\left[\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right]$

$\Rightarrow \frac{x^2 + y^2 + z^2}{xyz} + 2\left[\frac{xy + yz + zx}{xyz}\right]$

$\Rightarrow \frac{x^2 + y^2 + z^2 + 2(xy + yz + zx)}{xyz}$

$\Rightarrow (x + y + z)^2 = \left(2 + \sqrt{3} + 2 - \sqrt{3} + 1\right)^2$

$\Rightarrow (5)^2 = 25$

72. (B) $A = \frac{(x^8 - 1)}{(x^4 + 1)} = \frac{(x^4 - 1)(x^4 + 1)}{(x^4 + 1)}$

$= x^4 - 1 = 2^4 - 1 = 15$

$B = \frac{y^4 - 1}{y^2 + 1} = \frac{(y^2 + 1)(y^2 + 1)}{(y^2 + 1)}$

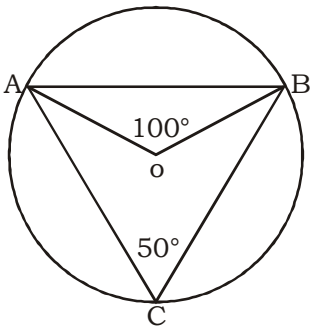
$= y^2 - 1 = 9^2 - 1 = 80$

Now, $A^2 + 2AB + AB^2$

$\Rightarrow A^2 + AB(2 + B)$

$= 225 + 1200 \times 82 = 98625$

73. (A)



$\angle ABC = 110°$

$\angle AOB = 100° \Rightarrow \angle ACB = 50°$

As angle by chord at centre is double of angle subtended by chord at circumference

$\therefore$ In ΔABC

$\angle CAB = 180 - \angle ABC - \angle CAB$

$\angle CAB = 180° - 110° - 50°$

$\angle CAB = 20°$

74. (A) $\frac{7^{21} + 7^{22} + 7^{23} + 7^{24}}{25} = \frac{7^{21}(1 + 7 + 7^2 + 7^2)}{25}$

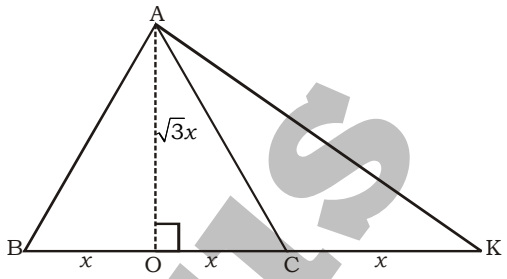
$= \frac{7^{21}(400)}{25} = 0$ Remainder

75. (B) $\sin\theta = \frac{3}{4}$ (Given)

Now, $\sqrt{\frac{\text{cosec}^2\theta - \cot^2\theta}{\sec^2\theta - 1}} = \sqrt{\frac{1}{\tan^2\theta}}$

$= \sqrt{\frac{1}{\left(\frac{3}{\sqrt{7}}\right)^2}} = \sqrt{\frac{7}{9}} = \frac{\sqrt{7}}{3}$

76. (B)



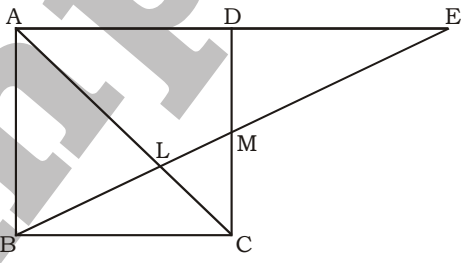
In ΔAOK

$AK^2 = AO^2 + OK^2 = \left(\sqrt{3}x\right)^2 + (2x)^2$

$= 3x^2 + 4x^2 = 7x^2$

$\therefore$ $AK^2 = 7CK^2$ (As $CK = x$)

77. (C)



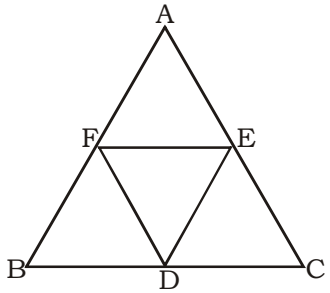
$\Delta BCL \sim \Delta EAL$

$\frac{DL}{EL} = \frac{BC}{AE} \Rightarrow \frac{3.5}{EL} = \frac{AD}{2AD}$

$\Rightarrow \frac{3.5}{EL} = \frac{1}{2}$

$\Rightarrow$ EL = 3.5 × 2 = 7 cm

78. (D)



ar (ΔABC) = 4 × ar (ΔDEF)

= 4 × 14 = 56 cm²

79. (B) $(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow 3^2 = x^2 + y^2 + z^2 + 2(-13)$

$\Rightarrow 9 = x^2 + y^2 + z^2 - 26$

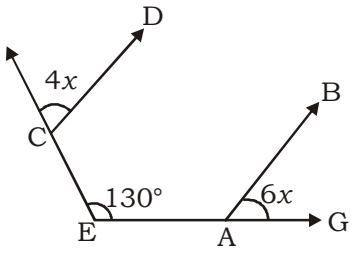
$\Rightarrow x^2 + y^2 + z^2 = 35$

Now, $\sqrt{x^3 + y^3 + z^3 - 3xyz}$

$\Rightarrow \sqrt{(x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)}$

$\Rightarrow \sqrt{3(35 + 13)} = \sqrt{3 \times 48} = \sqrt{144} = 12$

80. (B)



From given diagram
we have, $4x + 6x = 130$
$x = 13°$

81. (A) $\sqrt{\sqrt{\sqrt{577+408\sqrt{2}}}} = \sqrt{\sqrt{\sqrt{(17+12\sqrt{2})^2}}}$

$= \sqrt{\sqrt{(17+12\sqrt{2})}} = \sqrt{3+2\sqrt{2}}$

$= \sqrt{2}+1$

82. (D) $13\overline{)44(3}$

$\underline{39}$

$\underline{5}$ = Remainder

Since 52 is divisible by 13, so we can get the answer directly by dividing 44 by 13.

83. (A) $\dfrac{24^{30.13}\times(243)^{0.07}}{(7)^{0.28}\times(49)^{0.075}\times(343)^{0.2}}$

$= \dfrac{3^{0.65}\times 3^{0.35}}{7^{0.25}\times 7^{0.15}\times 7^{.6}} = \dfrac{3}{7}$

84. (A) Let first term = a and common ratio = r
ATQ.,
$a \times ar^{n-1} = 66$ ...(1)
$ar^2 \times ar^{n-2} = 128$ ....(2)
Solving (1) and (2)
$r = 2$

85. (A) $5.\overline{6}+7.\overline{3}+8.\overline{7}+6.\overline{1}$

$= 5+\dfrac{6}{9}+7+\dfrac{3}{9}+8+\dfrac{7}{9}+6+\dfrac{1}{9}$

$= 26+\dfrac{17}{9} = 26+1+\dfrac{8}{9} = 27.\overline{8}$

86. (B) $\dfrac{\sin\theta+2\sin\theta.\cos\theta}{1+\cos\theta+2\cos^2\theta-1}$

$= \dfrac{\sin\theta(1+2\cos\theta)}{\cos\theta(1+2\cos\theta)} = \tan\theta$

87. (D) $3\cos\theta = 5\sin\theta \Rightarrow \tan\theta = \dfrac{3}{5}$

$\sec\theta = \sqrt{1+\tan^2\theta} = \sqrt{1+\dfrac{9}{25}} = \dfrac{\sqrt{34}}{5}$

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

Dividing numerator and denominator by $\cos\theta$

$\Rightarrow \dfrac{5\sin\theta-2\sec^4\theta+2}{5\sin\theta+2\sec^4\theta-2}$

$\Rightarrow \dfrac{5\times\frac{3}{5}-2\sec^4\theta+2}{5\times\frac{3}{5}+2\sec^4\theta-2} = \dfrac{5-2\sec^4\theta}{1+2\sec^4\theta}$

$\Rightarrow \dfrac{5-2\times\frac{1156}{625}}{1+2\times\frac{1156}{625}} = \dfrac{271}{979}$

88. (D) $(5\sin^2\theta + 10\cos^2\theta + 12\sin\theta\cos\theta)$
$(\sin^2\theta + \cos^2\theta) + [(2\sin\theta)^2 + (3\cos\theta)^2 + 2 \times 2\sin\theta \times 3\cos\theta]$
$= 1 + (2\sin\theta + 3\cos\theta)^2 \geq 0$
then, minimum value = 1

Maximum value $= 1+\left(\sqrt{4+9}\right) = 14$

89. (A) Put $\theta = 45°$

$P = \dfrac{a}{2\sqrt{2}} + \dfrac{3a}{2\sqrt{2}} = \sqrt{2}a$

$Q = \dfrac{a}{2\sqrt{2}} + \dfrac{3a}{2\sqrt{2}} = \sqrt{2}a$

Now, $(P+Q)^{2/3} + (P-Q)^{2/3}$

$= \left(\sqrt{2}a+\sqrt{2}a\right)^{2/2}$

$= \left(2\sqrt{2}a\right)^{2/3} = 2a^{2/3}$

90. (A) $2\sqrt{2}\sin 10^\circ\left(\frac{\sec 5^\circ}{2}+\frac{\cos 40^\circ}{\sin 5^\circ}-2\sin 35^\circ\right)$

$=2\sqrt{2}\sin 10^\circ\left(\frac{1}{2\cos 5^\circ}+\frac{\cos 40^\circ}{\sin 5^\circ}-2\sin 35^\circ\right)$

$=2\sqrt{2}\sin 10$

$\left[\frac{\sin 5^\circ+2\cos 5^\circ.\cos 40^\circ-2\sin 35^\circ.\sin 10^\circ}{\sin 10^\circ}\right]$

$=2\sqrt{2}\ \left[\sin 5^\circ+(\cos 45^\circ+\cos 35^\circ)-(\cos 25^\circ-\cos 45^\circ)\right]$

$=2\sqrt{2}\ \left[\sin 5^\circ+\frac{1}{\sqrt{2}}+\cos 35^\circ+\frac{1}{\sqrt{2}}-\cos 25^\circ\right]$

$=2\sqrt{2}\ \left(\sin 5^\circ+\sqrt{2}-2\sin 30^\circ.\sin 5^\circ\right)$

$=2\sqrt{2}\ (\sin 5^\circ+\sqrt{2}-\sin 5^\circ)=4$

91. (A) If HCF = x, then LCM = $20x$
and LCM + HCF = 2520
$\Rightarrow 21x = 2520 \Rightarrow x = 120$
HCF = 120, LCM = 2400
So, HCF × LCM = 1st number ×2nd number
$\Rightarrow$ 120 × 120 × 20 = 480 × 2nd number
Second Number = 600

92. (D) $\frac{3+\sqrt{6}}{5\sqrt{3}-4\sqrt{3}-4\sqrt{2}+5\sqrt{2}}$

$\Rightarrow \frac{\sqrt{3}\left[\sqrt{3}+\sqrt{2}\right]}{\left[\sqrt{3}+\sqrt{2}\right]}=\sqrt{3}$

93. (A) Suppose x and y are two numbers.
$5x + y = 52$, $x + 8y = 65$
On solving, $x = 9$ and $y = 7$

94. (C) $2^{10} \rightarrow 1024$

95. (C) P = Prime No., P + 2 = Prime No.
So, P = 3, P + 3 = 5
P (P + 2) + 1 = 16
16 is a perfect square of 4.

96. (A)

97. (C) $x=\frac{4^{6123}}{5}=\frac{(-1)^{6123}}{5}=4$

$y=\frac{5^{91}}{3}=\frac{2^{91}}{3}=\frac{(2^2)^{45}\times 2}{3}$

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

Now, $\sqrt{x+6y} \Rightarrow \sqrt{4+6\times 2}$

$\Rightarrow \sqrt{4+12}=\sqrt{16}=4$

98. (B) Let C.P. of 60 kg wheat = Rs. 60
C.P. of 25 kg wheat = Rs. 25
Profit = Rs. 25

Profit percent = $\frac{25}{60}\times 100$

$=41\frac{2}{3}\%$

99. (D) Let speed of train A = A
Speed of train B = B
A.T.Q,

$\frac{531}{A}=\frac{531}{B}+\frac{12}{5}$ ...(i)

$\frac{531}{3A}=\frac{531}{B}-\frac{3}{5}$ ...(ii)

On solving

$\frac{531}{A}\left(1-\frac{1}{3}\right)=\frac{12}{5}+\frac{3}{5}$

$\Rightarrow \frac{531}{A}\times\frac{2}{3}=3$

$\Rightarrow A=\frac{531\times 2}{9}=118$

Hence speed of train A = 118 km/hr

100. (B) $\sec\theta+\tan\theta = P$ ...(i)

$\sec\theta-\tan\theta=\frac{1}{P}$ ...(ii)

On solving

$2\sec\theta = P+\frac{1}{P} \Rightarrow \frac{2}{\cos\theta}=\frac{P^2+1}{P}$

$\Rightarrow \cos\theta=\frac{2P}{P^2+P}$

Now, $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} \Rightarrow \sqrt{\frac{1+\frac{2P}{P^2+1}}{1-\frac{2P}{P^2+1}}}$

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