QUANTITATIVE ABILITY - 69 (SOLUTION)

1. (C) $(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$

Percentage of total failed candidates = 20 +15 + 25 – 5 – 10 –15 + 2 = 32

Percentage of total candidates who passed = 100 – 32 = 68%

2. (A) Let the cost price of Table is T and Fan is F.

125%T + 120%F .....(i)

120%T + 125%F .....(ii)

ATQ,

5%(T – F) = – 60

$F - T = \frac{60}{5} \times 100 = ₹\ 1200$ .....(iii)

F + T = 36580 .....(iv)

Adding (iii) and (iv)

2F = 37780

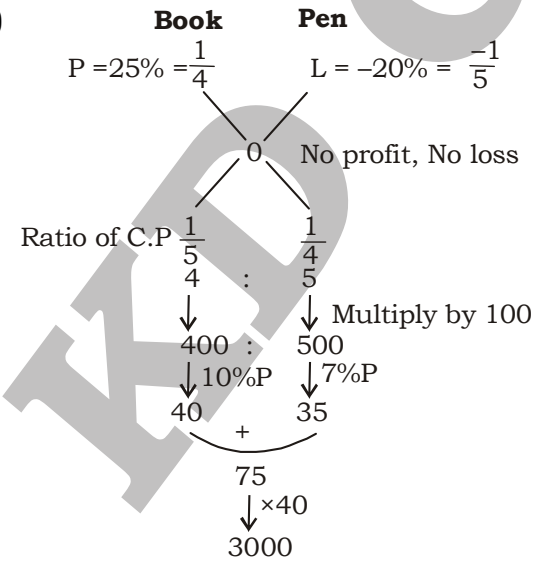
C.P of fan = F = ₹ 18890

Put F = ₹ 18890 in (iv),

18890 + T = 36580

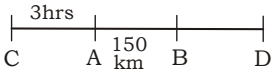
∴ C.P of Table = T = ₹ 17690

3. (A)



C.P of Book = 400×40 = ₹ 16,000

C.P of Pen = 500×40 = ₹ 20,000

4. (D) 

1st case: Train is late by = (4 –1) = 3 hours

∴ Scheduled time between A and D = 3 × 3 = 9 hours

$$\frac{\text{Initial time}}{\text{Total time due to delay}} = \frac{3}{4}$$

2nd case: During Travelling train is late by = $3\frac{1}{2} - 1 = 2\frac{1}{2}$ hours

∴ Scheduled time between B and D = $3 \times \frac{5}{2} = 7\frac{1}{2}$ hours

Time taken between A and B = $\left(9 - 7\frac{1}{2}\right) = 1\frac{1}{2}$ hours

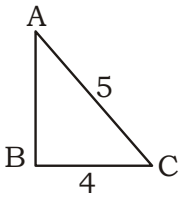
Distance covered = 150 km

Speed of train = $\frac{150}{1\frac{1}{2}} = 150 \times \frac{2}{3} = 100$ km/hr

Total distance between C and D = (3 + 9) × 100 = 1200 km

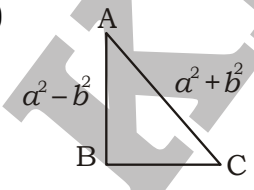
5. (C) $4\sec\theta = 5$

$$\sec\theta = \frac{5}{4}$$



AB = $\sqrt{5^2 - 4^2} = \sqrt{9} = 3$

$$\frac{3\sin\theta - 4\sin^3\theta}{4\cos^3\theta - 3\cos\theta} = \frac{3\times\frac{3}{5} - 4\times\left(\frac{3}{5}\right)^3}{4\times\left(\frac{4}{5}\right)^3 - 3\times\frac{4}{5}} = \frac{\frac{9}{5} - \frac{4\times 27}{125}}{\frac{4\times 64}{125} - \frac{12}{5}} = \frac{225-108}{256-300} = -\frac{117}{44}$$

6. (A) 

BC = $\sqrt{\left(a^2+b^2\right)^2 - \left(a^2-b^2\right)^2} = \sqrt{a^4 + b^4 + 2a^2b^2 - \left(a^4 + b^4 - 2a^2b^2\right)}$

= $\sqrt{2a^2b^2 + 2a^2b^2} = \sqrt{4a^2b^2} = 2ab$

∴ $\tan\theta = \frac{a^2 - b^2}{2ab}$

7. (D) ATQ,

₹ 150 = 2.5 kg Rice

4 kg Rice = 7 kg Sugar

14 kg Sugar = 3 kg Tea

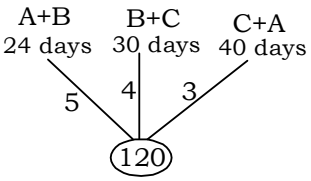
9 kg Tea = 7 kg Coffee

21 kg Coffee = ₹ x

$x = \frac{150}{2.5} \times \frac{4}{7} \times \frac{14}{3} \times \frac{9}{7} \times 21 =$ ₹ 4320

$\therefore$ Required cost = ₹ 4320

8. (A)



Efficiency of (A + B + C) = $\frac{A+B+B+C+C+A}{2} = \frac{5+4+3}{2} = \frac{12}{2} = 6$ units

Efficiency of A = 6 - (B + C) = 6 - 4 = 2

Efficiency of B = 6 - (A + C) = 6 - 3 = 3

Efficiency of C = 6 - (A + B) = 6 - 5 = 1

$\therefore$ Required time taken by A = $\frac{120}{2}$ = 60 days ; B = $\frac{120}{3}$ = 40 days ; C = $\frac{120}{1}$ = 120 days

9. (D) Let the length of the train traveling at a speed of 90 km/hr be x m and length of bridge be y m.

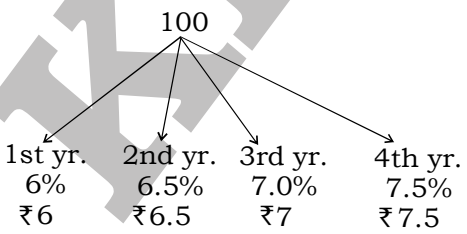
$\therefore$ Length of another train = (x – 100) m

$x + y = 90 \times \frac{5}{18} \times 36 = 5 \times 180 = 900$ m

Length of another train + bridge = 800 m

$\therefore$ Time taken by another train to cross a bridge = $\frac{800}{45 \times \frac{5}{18}}$ sec = 64 seconds

10. (A) Let the principal be = ₹ 100



Total S.I. = ₹ (6 + 6.5 + 7+ 7.5) = ₹ 27

$\because$ 27 unit = ₹ 3375 (given)

$\therefore$ 100 unit = 125 × 100 = ₹ 12500

The amount taken as a loan by her = ₹ 12500

11. (C) $\frac{a}{b} = \frac{\frac{\sqrt{5}+1}{\sqrt{5}-1}}{\frac{\sqrt{5}-1}{\sqrt{5}+1}} = \frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}-1} = \frac{\left(\sqrt{5}+1\right)^2}{\left(\sqrt{5}-1\right)^2}$

$= \frac{5+1+2\sqrt{5}}{5+1-2\sqrt{5}} = \frac{6+2\sqrt{5}}{6-2\sqrt{5}} = \frac{2\left(3+\sqrt{5}\right)}{2\left(3-\sqrt{5}\right)} = \frac{3+\sqrt{5}}{3-\sqrt{5}}$

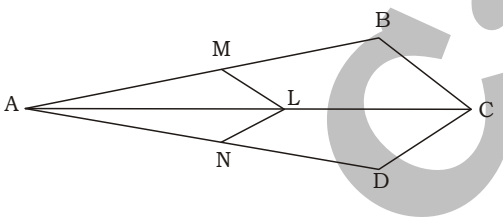
Applying componendo and dividendo, we have $\frac{a+b}{a-b} = \frac{3+\sqrt{5}+3-\sqrt{5}}{\left(3+\sqrt{5}\right)-\left(3-\sqrt{5}\right)}$

$= \frac{6}{2\sqrt{5}} = \frac{3}{\sqrt{5}}$

$\therefore \left(\frac{a-b}{a+b}\right)^2 = \left(\frac{\sqrt{5}}{3}\right)^2 = \frac{5}{9}$

12. (C) Let the total number of benches = x
ATQ,
$6(x+1) = 7x - 5$
$6x + 6 = 7x - 5$
$x = 11$
Total number of bench in class = 11
Total number of students in class = 6 (11 + 1) = 72

13. (D)



Given: LM $\parallel$ CB and LN $\parallel$ CD

In Δ ABC,

LM $\parallel$ CB, using Basic Proportionality Theorem

$\therefore \frac{AM}{AB} = \frac{AL}{AC}$ ..... (i)

Also in Δ ADC,

LN $\parallel$ CD, using basic proportionality

$\therefore \frac{AN}{AD} = \frac{AL}{AC}$ .....(ii)

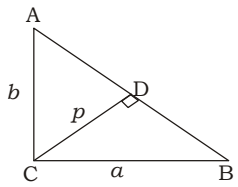
From (i) and (ii),

$\frac{AM}{AB} = \frac{AN}{AD}$

14. (C) Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)} = \sqrt{9\times4\times3\times2} = 6\sqrt{6}\,\text{cm}^2$

$\therefore$ R = $\frac{abc}{4\Delta} = \frac{5\times6\times7}{4\times6\sqrt{6}} = \frac{35}{4\sqrt{6}}$ cm

15. (D)



BC = a , AC = b

AB = $\sqrt{AC^2 + BC^2} = \sqrt{b^2 + a^2}$

Area of Δ ABC = $\frac{1}{2} \times$ BC × AC = $\frac{1}{2}ab$

Area of Δ ABC = $\frac{1}{2} \times$ AB × CD = $\frac{1}{2} \times \sqrt{a^2 + b^2} \times p$

$\therefore \quad \frac{1}{2}ab = \frac{1}{2} \times \sqrt{a^2 + b^2} \times p$

$a^2b^2 = (a^2 + b^2)p^2$

$\frac{1}{p^2} = \frac{a^2 + b^2}{a^2b^2}$

$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

16. (A) $12\frac{1}{2}\% = \frac{1}{8} \xrightarrow{\times 4} 4 \xrightarrow{\times 4} 32$

Now he can purchase 32 mangoes for ₹1.

Earlier he used to purchase = 32 – 4 = 28 mangoes for ₹1.

New price = ₹$\frac{1}{32}$; Old price = ₹$\frac{1}{28}$

17. (C) Initial amount = ₹1400

In the 1st year, he deposited = $\frac{30}{100} \times 1400 = 420$

In 2nd year, he deposited = $\frac{40}{100} \times (1400 + 420) = 728$

Total amount present in his locker = 1400 + 420 + 728 = ₹ 2548

18. (D) $1 - \cfrac{1}{1 - \cfrac{1}{1 - \cfrac{1}{1 - \frac{1}{x}}}} \left.\vphantom{\cfrac{1}{1}}\right\} \frac{x-1}{x} = 1 - \cfrac{1}{1 - \cfrac{1}{1 - \cfrac{1}{\frac{x-1}{x}}}} \left.\vphantom{\cfrac{1}{1}}\right\} 1 - \frac{x}{x-1} = \frac{x-1-x}{x-1} = \frac{-1}{x-1}$

$= 1 - \cfrac{1}{1 - \frac{x-1}{-1}} = 1 - \frac{1}{1 + x - 1} = 1 - \frac{1}{x} = \frac{x-1}{x}$

19. (C) Principal 50000 75000

2 years 2 years

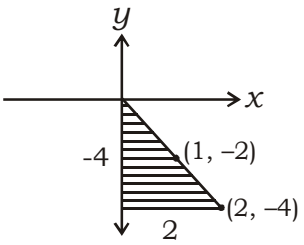
Ratio = 50000 : 75000 = 2 : 3

∴ P : IInd year amount must also be in the ratio of 2 : 3.

$$\frac{P}{50000} = \frac{2}{3}$$

$$P = \frac{100000}{3} = ₹\ 33333.33$$

20. (D)



∴ Area of shaded part = $\frac{1}{2} \times 2 \times 4 = 4$ units

21. (B) $\sin 17^\circ = \frac{x}{y}$

$$\cos 17^\circ = \sqrt{1-\sin^2 17^\circ} = \sqrt{1-\frac{x^2}{y^2}} = \sqrt{\frac{y^2-x^2}{y^2}} = \frac{\sqrt{y^2-x^2}}{y}$$

$$\sec 17^\circ = \frac{y}{\sqrt{y^2-x^2}}$$

$\sin 73^\circ = \sin(90^\circ - 17^\circ) = \cos 17^\circ$

$$\therefore \sec 17^\circ - \sin 73^\circ = \frac{y}{\sqrt{y^2-x^2}} - \frac{\sqrt{y^2-x^2}}{y} = \frac{x^2}{y\sqrt{y^2-x^2}}$$

22. (D) $\cot 30^\circ = \cot(90^\circ - 60^\circ) = \tan 60^\circ$

$\cot 75^\circ = \cot(90^\circ - 15^\circ) = \tan 15^\circ$

$$\therefore \frac{\cot 30^\circ - \cot 75^\circ}{\tan 15^\circ - \tan 60^\circ}$$

$$\frac{\tan 60^\circ - \tan 15^\circ}{\tan 15^\circ - \tan 60^\circ} = -1$$

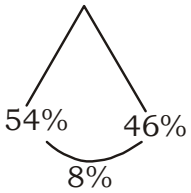
23. (A) 100 ← Total voters

↓ –10% (votes not cast)

90 ← votes cast

↓ –10% (invalid votes)

81 ← valid votes



8% of 81 $\rightarrow$ 1620

$\frac{8}{100} \times 81 \rightarrow 1620$

$\therefore$ $100 \rightarrow \frac{1620}{8 \times 81} \times 100 \times 100 = 25{,}000$

The number of voters enrolled in voter list = 25000

24. (A) Distance between A and B = $\frac{150}{(75-60)} \times (75 + 60) = 2025$ km

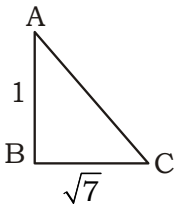
25. (B) Let the total number of books be x.

Then, $x \times \frac{80}{100} \times \frac{75}{100} \times \frac{70}{100} = 29400$

$x = 70000$

$\therefore$ Total number of books = 70000

26. (D) $\tan\theta = \frac{1}{\sqrt{7}}$



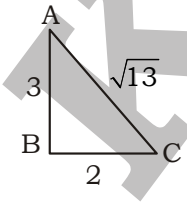
$AC = \sqrt{1^2 + \left(\sqrt{7}\right)^2} = \sqrt{8} = 2\sqrt{2}$

$$\frac{\cos ec^2\theta - \sec^2\theta}{\cos^2\theta + \sec^2\theta} = \frac{\left(2\sqrt{2}\right)^2 - \left(\frac{2\sqrt{2}}{\sqrt{7}}\right)^2}{\left(\frac{\sqrt{7}}{2\sqrt{2}}\right)^2 + \left(\frac{2\sqrt{2}}{\sqrt{7}}\right)^2} = \frac{8 - \frac{8}{7}}{\frac{7}{8} + \frac{8}{7}}$$

$$= \frac{56-8}{7} \times \frac{56}{49+64} = \frac{48}{7} \times \frac{56}{113} = \frac{384}{113}$$

27. (A) $3\cot\theta = 2$

$\cot\theta = \frac{2}{3}$



$AC = \sqrt{3^2 + 2^2} = \sqrt{9+4} = \sqrt{13}$

$$\frac{4\sin\theta - 3\cos\theta}{2\sin\theta + 6\cos\theta} = \frac{4 \times \frac{3}{\sqrt{13}} - 3 \times \frac{2}{\sqrt{13}}}{2 \times \frac{3}{\sqrt{13}} + 6 \times \frac{2}{\sqrt{13}}} = \frac{\frac{12-6}{\sqrt{13}}}{\frac{6+12}{\sqrt{13}}} = \frac{6}{18} = \frac{1}{3}$$

28. (D) Area of field = 31684 sq m

Perimeter = $\sqrt{31684}$ × 4 m = 178 × 4

Length of each circuit = $178 \times 4 \times \frac{105}{100}$

Since the wire goes round 4 times,

∴ Total length of wire required = $178 \times 4 \times \frac{105}{100} \times 4$ m = 2990.4 m

29. (B) Here a = 50 metres, b = 78 metres, c = 112 metres

∴ s = $\frac{1}{2}(50 + 78 + 112)$ m = $\frac{1}{2} \times 240$ = 120 m

$s - a$ = (120 – 50) m = 70 m

s – b = (120 – 78) m = 42 m

$s - c$ = (120 – 112) m = 8 m

Area = $\sqrt{120 \times 70 \times 42 \times 8}$ = 1680 sq. m

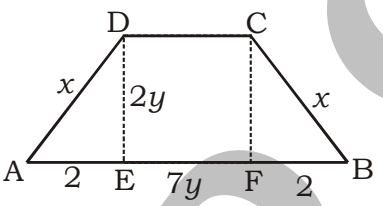
Perpendicular = $\frac{2 \times \text{Area}}{\text{Base}} = \frac{1680 \times 2}{112}$ = 30 m

30. (A) Area = $\frac{1}{2}$ × height × (sum of parallel sides)

250 = $\frac{1}{2}$ × height × (15 + 10)

height = $\frac{250 \times 2}{25}$ = 20 m

31. (D)



H = (6y +7y) $\frac{2}{13} \Rightarrow$ H = 2y

Area = $\frac{1}{2}(6y + 7y)2y$

$208 = 13y^2 \Rightarrow y = 4$

$AC^2 = 26^2 + 8^2$

$AC^2 = 676 + 64$

$AC^2 = 740$

32. (C) $x = a(\sin\theta + \cos\theta)$

$y = b(\sin\theta - \cos\theta)$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{a^2(\sin\theta + \cos\theta)^2}{a^2} + \frac{b^2(\sin\theta - \cos\theta)^2}{b^2}$$

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

33. (B) Required ratio = $\dfrac{\frac{5}{8}\times 4+\frac{1}{3}\times 3}{\frac{3}{8}\times 4+\frac{2}{3}\times 3} = \dfrac{\frac{5}{2}+1}{\frac{3}{2}+2} = \dfrac{\frac{7}{2}}{\frac{7}{2}} = 1 : 1$

34. (B) $\dfrac{5x^2-3y^2}{xy} = \dfrac{11}{2} \Rightarrow 5\dfrac{x}{y} - 3\dfrac{y}{x} = \dfrac{11}{2}$

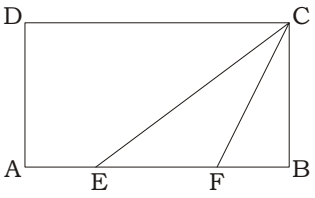
$10\left(\dfrac{x}{y}\right)^2 - 11\left(\dfrac{x}{y}\right) - 6 = 0$

$\left(2\dfrac{x}{y}-3\right)\left(5\dfrac{x}{y}+2\right) = 0$

$\dfrac{x}{y} = \dfrac{3}{2}$ or $-\dfrac{2}{5}$

$\dfrac{x}{y}$ is a positive value. So answer will be $\dfrac{3}{2}$

35. (B)

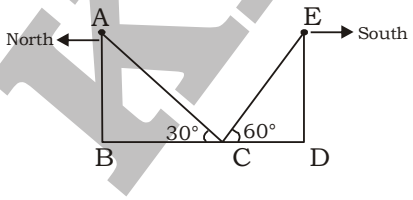


Let BC = y and AB = x

The area of Δ CEF = area of Δ CEB – area of Δ CFB = $\dfrac{1}{2}\left(\dfrac{2x}{3}\right)y - \dfrac{1}{2}\left(\dfrac{x}{3}\right)y = \dfrac{xy}{3} - \dfrac{xy}{6} = \dfrac{xy}{6}$

Ratio of area of Δ CEF and area of $\square$ ABCD is $\dfrac{xy}{6} : xy = 1 : 6$

36. (C)



Distance travelled by the sparrow in 2 minutes = BD

= $50\sqrt{3}$ cot 30° + $50\sqrt{3}$ cot 60° = 150 + 50 = 200 m

Speed of the sparrow = $\dfrac{200}{2}\times\dfrac{60}{1000} = 6$ km/hr

37. (B) Let the length of diagonal be d cm and $2d$ cm and each side be a cm.

Area = $\frac{1}{2} \times 2d \times d$

$160 = \frac{1}{2} \times 2d^2$

$d = 4\sqrt{10}$ cm

Now, $a = \frac{1}{2}\sqrt{\left(4\sqrt{10}\right)^2 + \left(8\sqrt{10}\right)^2} = \frac{1}{2}\sqrt{160+640} = \frac{1}{2}\sqrt{800}$

$= \frac{1}{2} \times 10 \times 2\sqrt{2} = 10\sqrt{2}$ cm

38. (B)

39. (C) $\frac{1+\frac{1}{2}}{1-\frac{1}{2}} \div \frac{4}{7}\left(\frac{2}{5}+\frac{3}{10}\right)$ of $\frac{\frac{1}{2}+\frac{1}{3}}{\frac{1}{2}-\frac{1}{3}} = \frac{\frac{3}{2}}{\frac{1}{2}} \div \frac{4}{7}\left(\frac{7}{10}\right)$ of $\frac{\frac{5}{6}}{\frac{1}{6}} = \frac{3}{1} \div \frac{4}{10}$ of $\frac{5}{1}$

$= \frac{3}{1} \div \left(\frac{4}{10} \times \frac{5}{1}\right) = \frac{3}{1} \div \frac{2}{1} = \frac{3}{2}$

40. (D) ATQ,

$2x + 3x + 5x = 180° - (15° + 15° + 15°)$

$10x = 135°$

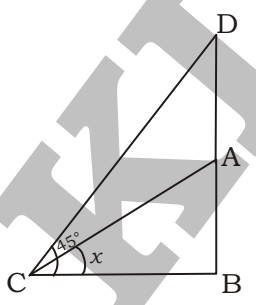
$5x = 67.5°$

Greatest angle = $67.5° + 15° = 82.5° = 82.5° \times \frac{\pi}{180°} = \frac{11}{24}\pi$

41. (A) ATQ,

Required Area of paper used = $2\pi rh = 2 \times \frac{22}{7} \times 125 \times 28 = 22000$ cm²

42. (B)



Height of the building = h m

ATQ,

BC = AB × cot $x°$ = h cot x

BD = BC × tan 45° = h cot x

Height of the chimney = (h cot$x$ – h) m

43. (A) Let A's income be = $4x$

Therefore, A's expenses, = $4x - 25$

Let B's income be = $5x$

Therefore, B's expenses = $5x - 50$

The ratio of their expenses = 5 : 6 (given)

$$\frac{4x-25}{5x-50} = \frac{5}{6}$$

$24x - 150 = 25x - 250$

Therefore, $x = 100$

A's income $\equiv 4x$ = ₹ 400

B's income $\equiv 5x$ = ₹ 500

44. (C)

A + B	8		3
B	12	24	2
C	12		2

Work done by A and B in 4 days = 3 × 4 = 12 units

Work done by B in next 2 days = 2 × 2 = 4 units

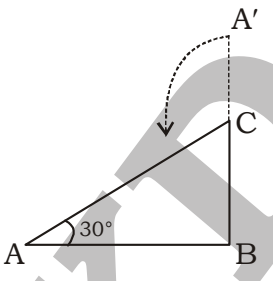
Remaining units of work = 24 – 12 – 4 = 8 units

Time required by C to finish the job = $\frac{8}{2}$ = 4 days

45. (A) Area of a regular hexagon = 6 × Area of an equilateral triangle

$$= 6\times \frac{\sqrt{3}}{4}x^2 = \frac{9}{2\sqrt{3}}x^2 \text{ square unit}$$

46. (C)



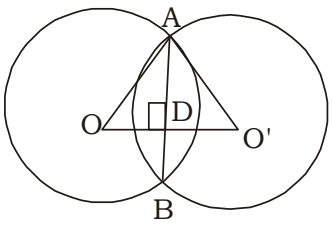
Length of AB = $8\sqrt{3}$ m

BC = AB tan 30° = $8\sqrt{3} \times \frac{1}{\sqrt{3}} = 8$ m

$$AC = \frac{BC}{\sin 30^\circ} = \frac{8\times 2}{1} = 16 \text{ m}$$

Height of post = BC + AC = (8 + 16) = 24 m

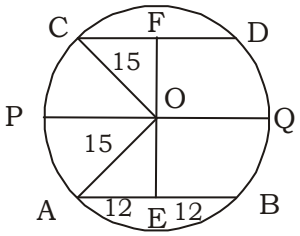
47. (A) ATQ,



Given that,
OO' = 12 cm
OD = O'D = 6 cm and, AB = 16
∴ AD = BD = 8 cm

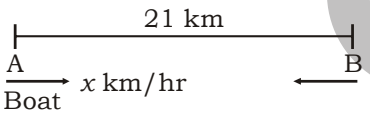
Hence, Radius of circle (OA = O'A) = $\sqrt{8^2+6^2}$ = 10 cm

48. (B) ATQ,



OE = $\sqrt{15^2-12^2}$ = 9 cm
Given that,
EF = 21 cm and, OF = EF – OE = 21– 9 = 12 cm
Hence, FC = $\sqrt{15^2-12^2}$ = 9
∴ Length of second chord (CD) = 2 × FC = 2 × 9 = 18 cm

49. (D)

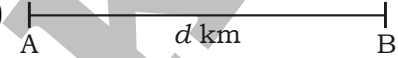


Let the speed of the boat is x km/hr in still water.
ATQ,

$$\frac{21}{x+2.5}+\frac{21}{x-2.5}=\frac{230}{60}$$

Now help from option put x = 11.5 km/hr, then both sides will be equal so, option (D) is correct.
Speed of boat in still water = 11.5 km/hr

50. (A)



Let the distance between two points A and B is d km. And the speed of the motorboat in still water is x km/hr and the speed of the stream is y km/hr.
From question,
Condition (i);

$$\frac{d}{(x+y)}+\frac{d}{(x-y)}=5 \qquad \text{...(i)}$$

[$\because$ 20% = $\frac{1}{5}$ original time $\Rightarrow$ 5 New time $\Rightarrow$ 1]

Condition (ii); when speed of boat is doubled

$$\frac{d}{(2x+y)} + \frac{d}{(2x-y)} = 1 \qquad \ldots(ii)$$

Now, form equation (i) & (ii) :

From (i): $d[x + y + x - y] = 5(x^2 - y^2)$

$$d = \frac{5(x^2-y^2)}{2x} \qquad \ldots(iii)$$

From (ii) $d[2x + y + 2x - y] = 4x^2 - y^2$

$$d = \frac{4x^2-y^2}{4x} \qquad \ldots(iv)$$

Distance would be equal in both the cases:

$$\frac{5(x^2-y^2)}{2x} = \frac{4x^2-y^2}{4x}$$

$10x^2 - 10y^2 = 4x^2 - y^2$

$6x^2 = 9y^2$

$$\frac{x^2}{y^2} = \frac{9}{6} \Rightarrow \frac{x^2}{y^2} = \frac{3}{2}$$

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

51. (B) Age of mother – age of daughter = 31 years .....(i)
Age of father – age of son = 30 years ....(ii)
Age of father – age of daughter = 34 years ...(iii)
From (i) and (iii),
Age of father – age of mother = 3 years
Age of mother = 30 – 3 = 27 years

52. (B) ATQ,

$$\left(1-\frac{5}{x}\right)^5 = \frac{32}{211+32} = \frac{32}{243} = \left(\frac{2}{3}\right)^5$$

$$1 - \frac{5}{x} = \frac{2}{3} \Rightarrow \frac{5}{x} = \frac{1}{3}$$

$x = 15$ litres

Initial amount of milk in the container = 15 litres

53. (A) $5x \times 12 : 4x \times 4 + (4x + 1000) \times 8 : 3x \times 8 + (3x + 2000) \times 4 = 15 : 14 : 11$

$$\therefore \quad \frac{5x \times 12}{4x \times 4 + (4x+1000) \times 8} = \frac{15}{14}$$

$$\frac{4x \times 15}{16x + 32x + 8000} = \frac{15}{14}$$

$56x - 48x = 8000$

$x = 1000$

Investment of C in the beginning = 3 × 1000 = ₹ 3000

54. (A) Expenditure = $\frac{\text{Income}}{\left[\frac{\text{Profit \%}}{100}+1\right]}$

ATQ,

$$\frac{I_1}{\frac{35}{100}+1} = \frac{I_2}{\frac{40}{100}+1}$$

$$\frac{I_1}{I_2} = \frac{135}{140}$$

$\therefore$ $I_1 : I_2 = 27 : 28$

55. (D) Given,

(Income – Expenditure = 1.5 lakh)

$\because$ Profit % = $\frac{\text{Income} - \text{Exp}}{\text{Exp}} \times 100 = \frac{1.5}{\text{exp}} \times \frac{100}{10} = 40$

Expenditure = $\frac{15}{4}$ = 3.75 lakh

56. (C) Profit % = $\left[\frac{\text{Income}}{\text{Exp.}} - 1\right] \times 100$

Income = $\left[\frac{\text{Profit \%}}{100}+1\right]$ Exp.

ATQ,

Exp. A $\left[\frac{50}{100}-1\right]$; Exp. B $\left[\frac{30}{100}+1\right]$

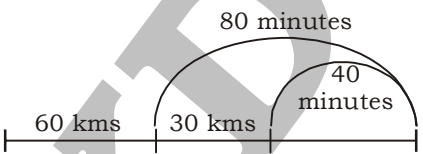
$$\frac{\text{Exp. A}}{\text{Exp. B}} = \frac{130}{150}$$

Exp A : Exp B = 13 : 15

57. (A) $\frac{\text{Company A}}{\text{Company B}} = \frac{30}{45}$

Required ratio = 2 : 3

58. (A)



S = $\frac{2}{3}$; S = $\frac{2}{3}$ =

T = $\frac{3}{2}$; T = $\frac{3}{2}$

Now,

$\left(\frac{3}{2}-1\right)$ unit $\rightarrow$ 40, $\left(\frac{3}{2}-1\right)$ unit $\rightarrow$ 20

$\frac{1}{2}$ unit $\rightarrow$ 40, $\frac{1}{2}$ unit $\rightarrow$ 20

1 unit $\rightarrow$ 80, 1 unit $\rightarrow$ 40

$\because$ In 40 minutes it is covering 30 kms.

$\therefore$ $\frac{40}{60}$ hours it is covering 30 kms.

$\therefore$ 1 hour = $\frac{30\times3}{2}$ = 45 kms

Speed = 45 km/hr

Total distance = 60 + 30 + (distance covered in 40 minutes) = 60 + 30 + 30 = 120 km

59. (B) Length of journey = 150 km

$\frac{1}{3}$rd of journey = 150 × $\frac{1}{3}$ = 50 km

Remaining $\frac{2}{3}$ of journey = 150 – 50 = 100 km

$\therefore$ Average speed = $\frac{\text{Total Distance}}{\text{Total Time}}$ = $\frac{150}{\frac{50}{30}+\frac{100}{45}}$

= $\frac{150}{\frac{5}{3}+\frac{20}{9}}$ = $\frac{150}{35}\times9$ = $\frac{270}{7}$ kmph = $38\frac{4}{7}$ kmph

60. (D) $x_1 = 2$, $x_2 = 3$ and $y_1 = 5$, $y_2 = 9$, $m = 3$, $n = 4$

P = $\frac{(mx_2+nx_1)}{m+n}, \frac{(my_2+ny_1)}{m+n}$ = $\frac{[(3\times3+4\times2)]}{7}, \frac{[(3\times9+4\times5)]}{7}$

= $\frac{9+8}{7}, \frac{27+20}{7}$ = $\left(\frac{17}{7}, \frac{47}{7}\right)$

61. (D) Let the number of ₹ 2 rupee coins is $6x$ and number of ₹ 5 coin is $11x$.
If the number of ₹ 5 coins is halved, then he will have an amount of ₹ 395.
ATQ,

$6x \times 2 + \left(\frac{11}{2}x\right)5 = 395$

$39.5\,x = 395$

$x = 10$

$\therefore$ Number of ₹ 2 coins that Shweta has = $6x = 6 \times 10 = 60$

62. (C) A do the work for 3 days + 3 days = 6 days, B work for 3 days and C work for 3 days.

$\frac{6}{18} + \frac{3}{12} + \frac{3}{C} = 1$

$\frac{3}{C} = 1 - \frac{1}{3} - \frac{1}{4}$

Three days work of C = $\frac{3}{C}$ = $\frac{12-4-3}{12}$

A : B : C = $\frac{6}{18} : \frac{3}{12} : \frac{5}{12}$

Ratio of share = 12 : 9 : 15 = 4 : 3 : 5

Share of C = $\frac{5}{12}$ × 24000 = ₹ 10,000

63. (B) Seats in executive class = 10% of 500 = 50
Seats in chair car = 500 – 50 = 450
Booking seats in total = 85% of 500 = 425
Booking in executive class = 96% of 50 = 48
Booking in chair class = (425 – 48) = 377
∴ Empty seats in chair class = 450 – 377 = 73

64. (A) 12 men can complete the work in 36 days.
12 × 36 men can complete the work in 1 day.
Again,
18 women can complete the work in 60 days.
18 × 60 women can complete the work in 1 day.
Now, 12 × 36 men = 18 × 60 women
2 men = 5 women
Now, 8 men + 20 women = (4 × 5 + 20) women = 40 women
18 women complete the work in 60 days.

40 women's 20 days' work = $\frac{40 \times 20}{18 \times 60} = \frac{20}{27}$

Remaining work = $1 - \frac{20}{27} = \frac{7}{27}$

18 × 60 women do 1 work in 1 day.

1 woman does = $\frac{1}{18 \times 60}$ Work in 1 day

1 woman does in 4 days = $\frac{1}{18 \times 60} = \frac{1}{18 \times 15}$ Work

$\frac{1}{18 \times 15}$ work is done in 4 days by 1 woman

∴ $\frac{7}{27}$ work is done in 4 days by = $\frac{18 \times 15 \times 7}{27}$ = 70 women

65. (D) We have $\frac{1}{x+1} + \frac{2}{y+2} + \frac{1009}{z+1009} = 1$

$\frac{1}{x+1} - 1 + \frac{2}{y+2} - 1 + \frac{1009}{z+1009} - 1 = 1 - 3$

$-\frac{x}{x+1} - \frac{y}{y+2} - \frac{z}{z+1009} = -2$

$\frac{x}{x+1} + \frac{y}{y+2} + \frac{z}{z+1009} = 2$

66. (A) $\frac{20x^3 + 12x + 3 + 5x^2}{10x^3 + 3 + 5x^2 + 6x} = \frac{4x(5x^2+3) + 1(3+5x^2)}{5x^2(2x+1) + 3(2x+1)}$

$= \frac{(5x^2+3)(4x+1)}{(2x+1)(5x^2+3)} = \frac{4x+1}{2x+1} = \frac{4 \times 9 + 1}{2 \times 9 + 1} = \frac{37}{19} = 1\frac{18}{19}$

67. (B) $\sqrt{\frac{x}{y}}+\sqrt{\frac{y}{z}}=\frac{10}{3}$

$\left(\sqrt{\frac{x}{y}}+\sqrt{\frac{y}{x}}\right)^2=\left(\frac{10}{3}\right)^2=\frac{x}{y}+2+\frac{y}{x}=\frac{100}{9}$

$(x+y)^2=\frac{100}{9}xy$

$xy=9$ $[\because x+y=10]$

68. (D) $\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2=(\sqrt{3})^2$

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

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

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

$1^3=x^3+\frac{1}{x^3}+3\times 1$

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

69. (C) $(u)^3+(-2v)^3+(-3w)^3=3\times(-2)(-3)uvw$
$\therefore\ u+(-2v)+(-3w)=0$
$u-2v-3w=0\Rightarrow u-2v=3w$

70. (D)

71. (D) Number of workers in scale V = 12% of 1500 = 180
Number of working male in scale V =12% of 800 = 96
Number of working female in scale V = 180 – 96 = 84

72. (B) **In scale VII:**
Total number of workers = 8% of 1500 = 120
Number of male workers = 10% of 800 = 80
Number of female workers = 120 - 80 = 40
Required ratio = 80 : 40 = 2 : 1

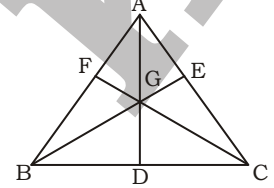
73. (A) Number of females in scale I = 330 – 192 = 138
Number of females in scale VI = 210 – 72 = 138
Number of females are same in scale I and VI.

74. (D) Average of working females in all scales = $\frac{138+81+157+62+84+138+40}{7}$

$=\frac{700}{7}=100$

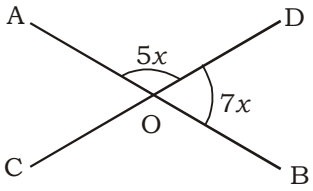
$\therefore$ Required number of scales = 4 (II, IV, V, VII)

75. (B)



Area of BDGF = Area of (ΔBDG) + Area of (ΔBGF) = $\frac{1}{2}$[Area of (ΔBGC)+Area of (ΔABG)]

$=\frac{1}{2}(\frac{1}{3}\times 120+\frac{1}{3}\times 120)=40$ sq.cm

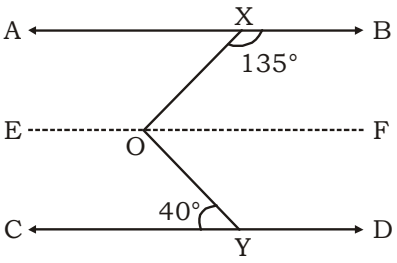
76. (C) 

$\angle AOD + \angle BOD = 180°$ [Angles of linear pair]

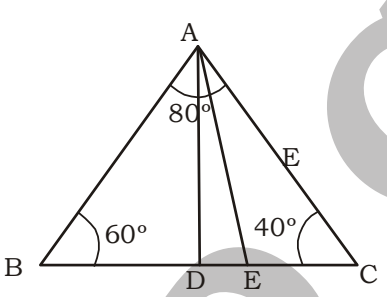
$\angle AOD = \frac{5}{12} \times 180° = 75°$

$\angle BOD = \frac{7}{12} \times 180° = 105°$

Now, $\angle BOD = \angle AOC = 105°$ (Vertically opposite angles)
and $\angle AOD = \angle BOC = 75°$ (Vertically opposite angles)

77. (A) 

Now, AB||EF and EF||CD
$\angle XOF = 180° - 135° = 45°$
And $\angle YOF = 40°$ (EF||CD, Alternate angles)
$\angle XOY = \angle XOF + \angle YOF = 45° + 40° = 85°$

78. (A) 

$\angle EAD = \frac{\angle B - \angle C}{2} = \frac{60° - 40°}{2} = 10°$

79. (C) Let the contribution of P, Q, R and S be ₹ p, ₹ r and ₹ s respectively.
$p + q + r + s = 56$
Since contribution of Q, R and S together is 460% that of P, alone
$q + r + s$ = 460% of p
$56 - p$ = 460% of p
p = ₹ 10 lakhs
P contributed ₹ 10 lakhs
Since contribution of P, R and S together is 366.66% that of Q's contribution
$p + r + s$ = 366.66% of q
$56 - q$ = 366.66% of q
q = ₹ 12 lakhs
Q contributed ₹ 12 lakhs
Since contribution of R is 40% that of P, Q and S together

r = 40% of ($p + q + s$)
r = 40% of (56 – r)
r = ₹ 16 lakh
R contributed ₹ 16 lakh
The contribution of S = 56 – (10 + 12 + 16) = ₹ 18 lakh

80. (A) Let C.P. = ₹x, then S.P. = $₹105 \times \frac{x}{100}$

Now C.P. = $\frac{95x}{100}$ and gain = 10% of $\frac{95x}{100} = \frac{95x}{1000}$

S.P. = $\frac{95x}{100} + \frac{95x}{1000} = \frac{1045x}{1000}$

$\frac{1045x}{1000} - \frac{1050x}{1000} = -2$
x = ₹ 400

81. (B) Shekher - 45 — 8 (working efficiency)
360
Sandeep - 40 — 9 (efficiency)

Total work to be done = 360 unit

Shekher work for 56 day with the half efficiency then work done = $56 \times \frac{8}{2} = 224$

Remaining work = 360 – 224 = 136

This work is done by both Shekher and Sandeep together then time taken = $\frac{136}{8+9} = 8$

Shekher and Sandeep work together for 8 days.

82. (D) A : B

$\frac{5}{7}$ $\frac{7}{13}$

$\frac{8}{13}$

$\frac{1}{13}$ $\frac{9}{91}$

So ratio = 7 : 9

83. (D) $x^2 + 4x + 3 = 0$
$x^2 + 3x + x + 3 = 0$
$(x + 3)(x + 1) = 0$
$x = -3, -1$

So, put $x = -1$ in $\frac{x^3}{x^6 + 27x^3 + 27} = \frac{-1}{1 + 27(-1)^3 + 27} = \frac{-1}{1 - 27 + 27} = -1$

84. (D) Let age of Heer be H.
Age of Ranjha be R.
$H \times R = 240$
$(H + 4) + (R - 10) = 25$
$H + R - 6 = 25$
$H + R = 31$ ...(i)
$(H + R)^2 - (H - R)^2 = 4RH$
$961 - 4 \times 240 = (H - R)^2$
$961 - 960 = (H - R)^2$
$H - R = 1$ ...(ii)
Solving equation (i) and (ii),
$H + R = 31$
$H - R = 1$
$- \quad + \quad -$
$2R = 30$
$R = 15$ years (Age of Ranjha)

85. (D)

	24 (total work)
A ⟶	6 | 4
B ⟶	8 | 3

with help of C they can do work in 3 days $= \frac{24}{A+B+C} = \frac{24}{4+3+x} = 3$

$x = 1$ (efficiency of C)
24 unit = 32,000

1 unit $= \frac{32,000}{24}$

3 unit $= \frac{32,000}{24} \times 3 =$ ₹ 4000

86. (B) $a\cos\theta + b\sin\theta = p$ .....(i)
$a\sin\theta - b\cos\theta = q$ .....(ii)
on squaring and adding equation (i) and (ii),
$a^2\cos\theta + b^2\sin^2\theta + 2ab\sin\theta\cos\theta + a^2\sin^2\theta + b^2\cos^2\theta - 2ab\sin\theta\cos\theta = p^2 + q^2$
$a^2\cos^2\theta + a^2\sin^2\theta + b^2\sin^2\theta + b^2\cos\theta = p^2 + q^2$
$a^2(\cos^2 + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta) = p^2 + q^2$
$a^2 + b^2 = p^2 + q^2$

87. (B) $2\,\text{cosec}^2 30^\circ + x\sin^2 60^\circ - \frac{3}{4}\tan^2 30^\circ = 10$

$2 \times (2)^2 + x \times \left(\frac{\sqrt{3}}{2}\right)^2 - \frac{3}{4} \times \left(\frac{1}{\sqrt{3}}\right)^2 = 10$

$8 + \left(\frac{3x}{4}\right) - \frac{3}{4} \times \frac{1}{3} = 10$

$\frac{3x}{4} = 10 + \frac{1}{4} - 8$

$x = 3$

88. (C) Let C.P of 1000 gms = ₹ 100
C.P of 800 gms = ₹ 80
800 gms used instead of 1000 gms
S.P of 800 gms = ₹ 100 (Same as C.P of 1000 gm)
∴ Profit = ₹ 20

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

89. (A) Let the M.P $= x$

$$S.P = x - 16\frac{2}{3}\% \text{ of } x \left(\text{Discount} = 16\frac{2}{3}\%\right) = \frac{5x}{6}$$

$$P\% = 10\%$$

$$C.P = \frac{100}{100 + P\%} \times S.P = \frac{100}{100+10} \times \frac{5x}{6} = \frac{25x}{33}$$

$$\text{If C.P} = \frac{25x}{33} \text{ then, M.P} = x$$

$$\text{If C.P} = 550, \text{ then M.P} = \frac{33x}{25x} \times 550 = ₹\,726$$

90. (B) Let C.P of 100m cloth = ₹ 100
Because of faulity scale, C.P of 110m cloth = ₹ 100

$$\text{C.P of 90 m} = \frac{100}{110} \times 90 = ₹\,\frac{900}{11}$$

Discount on purchased price = 10%

$$\text{S.P of 90m cloth} = \frac{90}{100} \times 100 = ₹\,90$$

$$\text{Profit} = S.P - C.P = 90 - \frac{900}{11} = ₹\,\frac{90}{11}$$

$$\text{Profit\%} = \frac{\frac{90}{11}}{\frac{900}{11}} \times 100 = 10\%$$

91. (A) Let radius of circular garden is R.
Circumference of garden $2\pi R = 1012\ m^2$

$$R = \frac{1012}{2\pi} m = \frac{1012 \times 7}{2 \times 22} m = 161\ m$$

Outer radius of circular path = 161 + 3.5 = 164.5 m
Area of path = $\pi (164.5)^2 - \pi(161)^2 = \pi \times 325.5 \times 3.5 = 3580.50\ m^2$
∴ Cost of gravelling = 3580.5 × 0.32 = ₹ 1145.76

92. (A) Required number of poles $= \frac{\text{Perimeter}}{\text{Distance between any two adjacent poles}} = \frac{84}{1.5} = 50$

93. (C) Let α and β be the two roots of the equation.
$\alpha + \beta = -p, \quad \alpha\beta = q$
$\alpha + \beta = \alpha^2 + \beta^2$ [given]
$-p = (\alpha + \beta)^2 - 2\alpha\beta$
$-p = p^2 - 2q$
$p^2 + p = 2q$

94. (A) Let the two numbers be a and b.

$a \times b = 24\ (a - b)$ .....(i)

$a + b = 14$ ..... (ii)

$b = 14 - a$ ..... (iii)

$a \times (14 - a) = 24\ (a-14+a)$

$14a - a^2 = 48a - 336$

$a^2 - 34a - 336 = 0$

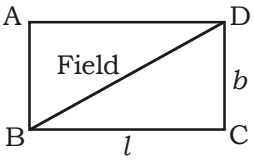
$a^2 + 42a - 8a - 336 = 0$

$a(a+42) - 8(a+42) = 0$

$(a + 42)(a - 8) = 0$

$a + 42 = 0$	$a-8 = 0$
$a = -42$	$a = 8$
$b = 56$	$b = 6$
It can't be consider	So, large number is 8.

95. (C)



Distance travelled by A = BD

$$\sqrt{l^2 + b^2} = \frac{52 \times 15}{60} = 13 \text{ m}$$

Distance travelled by B = BC + CD

$$l + b = \frac{68 \times 15}{60} = 17 \text{ m}$$

$(l + b)^2 = l^2 + b^2 + 2lb$

$17^2 = 13^2 + 2lb$

$2lb = 289 - 169 = 120$

$(l - b)^2 = l^2 + b^2 - 2lb$

$(l - b)^2 = 169 - 120 = 49$

$l - b = \sqrt{49} = 7$ cm

$l + b = 17$

$l - b = 7$

$l = 12$ cm

$b = 17 - 12 = 5$ cm

Area of field = $12 \times 5 = 60$ cm^2

96. (B) Ratio of B and current = 5 : 2 : 2

Ratio of current and B_2 = 3 : 3 : 4

Ratio of B_1 : current : B_2 = 15 : 6 : 8

Ratio of B_1 : B_2 = 15 : 8

97. (A) Area of circle = $\pi r^2 = \frac{22}{7} \times 35 \times 35 = 3850$ Cm^2

Length of $\overset{\frown}{AB} \Rightarrow 36 = \frac{\theta}{360} 2\pi r$

Area of $\overset{\frown}{AB} = \frac{\theta}{36} \times 2\pi r \times \frac{r}{2}$

$= 36 \times \frac{35}{2} = 630$ cm^2

Area of shaded part = $3850 - 630 = 3220$ cm^2

98. (D) $\sqrt{\frac{x-a}{x-b}} + \frac{a}{x} = \sqrt{\frac{x-b}{x-a}} + \frac{b}{x}$

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

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

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

$$\frac{(x-a-x+b)^2}{x^2 - ax - bx + ab} = \left(\frac{a-b}{x}\right)^2$$

$$\frac{(b-a)^2}{x^2 - ax - bx + ab} = \frac{(b-a)^2}{x^2}$$

$x^2 = x^2 - ax - bx + ab$

$ab = x(a + b)$

$x = \frac{ab}{a+b}$

99. (B) 50% increase in 5 years = $1 + \frac{50}{100} = \frac{3}{2}$ times

If 10 year = $\left(\frac{3}{2}\right)^2$ times and 15 years = $\left(\frac{3}{2}\right)^3$ times

And in 20 years = $\left(\frac{3}{2}\right)^4$ times

$\therefore \quad x\left(\frac{3}{2}\right)^2 = y\left(\frac{3}{2}\right)^3 = z\left(\frac{3}{2}\right)^4 = K$

$x = \frac{4}{9}K$, $y = \frac{8}{27}K$, $z = \frac{16}{81}K$

$x : y : z = \frac{4}{9}K : \frac{8}{27}K : \frac{16}{81}K = 9 : 6 : 4$

100. (C)

Coins	₹ 1	₹ 0.50	₹ 0.25
Values	13	11	7
No. of coins	13	22	28

Total coins → 63

× 6 ↓

378

Required number of Coins = 22 $\xrightarrow{\times 6}$ 132

QUANTITATIVE ABILITY - 69 (ANSWER KEY)

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