

QUANTITATIVE ABILITY - 65 (SOLUTION)

1. (C) Let cost price of steam engine is x .

ATQ,

$$x \times \frac{125}{100} \times \frac{115}{100} \times \frac{110}{100} = 5060$$

$$x = \frac{5060 \times 100 \times 100 \times 100}{125 \times 115 \times 110} = ₹ 3200$$

2. (B) $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) + 1$
 $= 2(1 + 3\sin^2 \theta \cdot \cos^2 \theta) - 3(1 + 2\sin^2 \theta \cdot \cos^2 \theta) + 1$
 $= 2 + 6\sin^2 \theta \cdot \cos^2 \theta - 3 + 6\sin^2 \theta \cdot \cos^2 \theta + 1 = 0$

3. (C) $3 + 4 + 8 + 9 + 13 + 14 + \dots$ upto 16 terms
 $= 7 + 17 + 27 + \dots$ upto 8 terms

$$= \frac{8}{2} [7 \times 2 + (8 - 1) \times 10] = 4 [14 + 70] = 336$$

4. (A)

5. (B) Given that

$$\frac{L}{M} + \frac{M}{N} + \frac{N}{L} = 0$$

Then, $\frac{L}{M} + \frac{M}{N} = -\frac{N}{L}$

Squaring both sides,

$$\left(\frac{L}{M} + \frac{M}{N}\right)^2 = \left(-\frac{N}{L}\right)^2$$

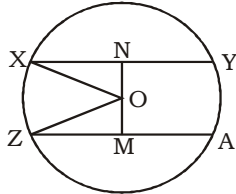
$$\frac{L^2}{M^2} + \frac{M^2}{N^2} + 2 \frac{L}{M} \cdot \frac{M}{N} = \frac{N^2}{L^2}$$

Multiplying both sides by $\frac{N}{L}$,

$$\frac{LN}{M^2} + \frac{M^2}{LN} + 2 = \frac{N^3}{L^3}$$

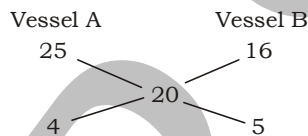
$$\frac{LN}{M^2} + \frac{M^2}{LN} - \frac{N^3}{L^3} = -2$$

6. (D) Given, $XY = 14$ cm
Then, $XN = 7$ cm



In ΔXNO ,
 $(ON)^2 = (XO)^2 - (XN)^2$
 $(ON)^2 = (25)^2 - (7)^2$
 $(ON)^2 = 625 - 49$
 $(ON)^2 = 576$
 $ON = 24$ cm
 Then,
 $OM = MN - ON$
 $OM = 44 - 24$
 $OM = 20$
 So that in ΔZMO ,
 $(ZM)^2 = (OZ)^2 - (OM)^2$
 $(ZM)^2 = 625 - 400$
 $(ZM)^2 = 225$
 $ZM = 15$ cm
 $ZA = 2ZM = 2 \times 15 = 30$ cm

7. (C)
- | | Milk | Water | |
|----------|------|-------|----------------------------|
| Vessel A | 5 | 3 | $)_{8 \times 5} = 25 : 15$ |
| Vessel B | 2 | 3 | $)_{5 \times 8} = 16 : 24$ |
- ATQ,



Required ratio = 4 : 5

8. (C) It must be multiple of 3.

9. (A) α and β are roots of equation $ax^2 + bx + c = 0$ So, $\alpha + \beta = -\frac{b}{a}$

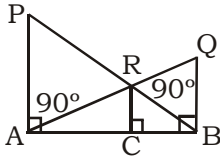
$$\alpha\beta = \frac{c}{a}$$

$$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$$

$$= \left(-\frac{b}{a}\right)^2 - 2 \times \frac{c}{a}$$

$$= \frac{b^2}{a^2} - \frac{2ac}{a^2} = \frac{b^2 - 2ac}{a^2}$$

10. (D)



$$\triangle BRC \sim \triangle BPA$$

$$\frac{x}{y} = \frac{BC}{AB} \dots\dots\dots(i)$$

$$\triangle ARC \sim \triangle AQB$$

$$\frac{y}{z} = \frac{AC}{AB} \dots\dots\dots(ii)$$

$$\frac{y}{x} + \frac{y}{z} = \frac{BC}{AB} + \frac{AC}{AB}$$

$$y \left(\frac{z+x}{xz} \right) = \frac{BC+AC}{AB} = \frac{AB}{AB}$$

$$y = \frac{xz}{x+z}$$

$$yx + yz = xz$$

11. (D)

$$\angle ACB = \angle PAB = 80^\circ$$

$$\angle ACQ = 180^\circ - 80^\circ = 100^\circ$$

$$\angle CAQ = \angle ABC = 30^\circ$$

$$\angle AQC = 180^\circ - (\angle ACQ + \angle CAQ) = 180^\circ - (100^\circ + 30^\circ) = 50^\circ$$

12. (B)

Let the obstruction remained for A minutes only.

\therefore Part of cistern filled in A minutes + Part of cistern filled in 3 minutes = cistern filled.

$$\left[\left(\frac{7}{8} \times \frac{A}{12} \right) + \left(\frac{5}{6} \times \frac{A}{16} \right) + \left(\frac{3}{12} + \frac{3}{16} \right) \right] = 1$$

$$\frac{12A}{96} + \frac{7}{16} = 1$$

$$A = 4.5 \text{ minutes}$$

13. (B)

$$\sin^6 A + \cos^6 A + 3 \sin^2 A \cos^2 A$$

$$= (\sin^2 A)^3 + (\cos^2 A)^3 + 3 \sin^2 A \cos^2 A (\sin^2 A + \cos^2 A)$$

$$= (\sin^2 A + \cos^2 A)^3$$

$$= (1)^3 = 1$$

14. (A)

$$\frac{100}{100} \cdot \frac{100+x\%}{100-x}$$

$$\frac{10,000}{10,000} \cdot \frac{10000-x^2}{10,000-x^2} \rightarrow 1$$

$$\frac{10,000}{10,000-x^2}$$

15. (D) Let the mixture of two containers be added together in the ratio of $x : y$.

$$\left(\frac{\frac{2}{3}x + \frac{4}{5}y}{x + y} \right) \times 100 = 70$$

$$\frac{10x + 12y}{15(x + y)} \times 10 = 7$$

$$100x + 120y = 105x + 105y$$

$$5x = 15y$$

$$x : y = 3 : 1$$

16. (B) Arithmetic = $10 \times \frac{70}{100} = 7$

$$\text{Algebra} = 30 \times \frac{40}{100} = 12$$

$$\text{Geometry} = 35 \times \frac{60}{100} = 21$$

$$\text{Total marks} = 7 + 12 + 21 = 40$$

$$\text{Passing marks} = 75 \times \frac{60}{100} = 45$$

$$\text{Required marks to pass} = 45 - 40 = 5$$

17. (D) Spirit Water

$$\text{Jar A} \quad 2 : 3)_{\times 6 \times 3} = 36 : 54$$

$$\text{Jar B} \quad 3 : 7)_{\times 3 \times 4} = 36 : 84$$

$$\text{Jar C} \quad 4 : 11)_{\times 2 \times 5} = 40 : 110$$

$$112 : 248$$

$$\text{Ratio of spirit and water in mixture} = 112 : 248 = 14 : 31$$

18. (A) $\frac{x^{ba}}{x^{ca}} \times \frac{x^{cb}}{x^{ab}} \times \frac{x^{ac}}{x^{bc}}$

$$\frac{x^{ba+cb+ac}}{x^{ca+ab+bc}} = x^0 = 1$$

19. (C) Distance between circumcentre and incentre = $\sqrt{R^2 - 2Rr}$

$$R = \frac{5}{2}, r = 1$$

$$\text{Distance} = \sqrt{\left(\frac{5}{2}\right)^2 - 2 \times \frac{5}{2} \times 1}$$

$$= \sqrt{\frac{25}{4} - \frac{10}{2}} = \frac{\sqrt{5}}{2} \text{ cm}$$

20. (C) $l \rightarrow 5 : 3$
 $S \rightarrow 6 : 5$

$$t = \frac{5}{6} : \frac{3}{5}$$

$$t = 25 : 18$$

21. (A) LCM of 4, 6, 8 and 14 = 168
 Required time = 12:00 + 168 sec = 12 : 02 : 48

22. (C) $A : B = 1000 : 960$
 $B : C = 1000 : 950$
 $A : B : C = 10000 : 9600 : 9120$
 $A : C = 500 : 456 = 44 \text{ m}$

23. (C) $\frac{\sin \theta - 2 \sin^3 \theta}{2 \cos^3 \theta - \cos \theta} = \frac{\sin \theta (1 - 2 \sin^2 \theta)}{\cos \theta (2 \cos^2 \theta - 1)}$
 $= \left\{ \begin{array}{l} 1 - 2 \sin^2 \theta = 2 \cos^2 \theta - 1 \\ = \cos^2 \theta \end{array} \right\} = \tan \theta$

24. (B)

$$\text{Required time} = \frac{24}{10-3} = 3\frac{3}{7} \text{ hrs}$$

25. (B) $2 (\cos^2 \theta - \sin^2 \theta) = 1$

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

$$2 \sin^2 \theta = 1 - \frac{1}{2}$$

$$\sin^2 \theta = \frac{1}{4}$$

$$\sin \theta = \frac{1}{2} = \sin 30^\circ$$

$$\theta = 30^\circ$$

26. (D)

$$2 (A+B+C) = 24$$

$$A + B + C = 12 \text{ hrs}$$

$$C = \frac{60}{12-10} = 30 \text{ hrs}$$

$$A = \frac{60}{12-6} = 10 \text{ hrs}$$

$$B = \frac{60}{12-8} = 15 \text{ hrs}$$

27. (B) Ratio of speed = 3 : 5
Ratio of time = 5 : 3
P will run = 500 - 200 = 300 m,

$$t = \frac{300}{3} = 100 \text{ Sec}$$

Q will run = 500 m,

$$t = \frac{500}{5} = 100 \text{ Sec}$$

So, Both reach at the same time

28. (A) $\frac{(1 + \sec \theta - \tan \theta) \cos \theta}{(1 + \sec \theta + \tan \theta)(1 - \sin \theta)}$

$$\begin{aligned} &= \frac{\left(1 + \frac{1}{\cos \theta} - \frac{\sin \theta}{\cos \theta}\right) \cos \theta}{\left(1 + \frac{1}{\cos \theta} + \frac{\sin \theta}{\cos \theta}\right)(1 - \sin \theta)} = \frac{\left(\frac{\cos \theta + 1 - \sin \theta}{\cos \theta}\right) \cos \theta}{\frac{(\cos \theta + 1 + \sin \theta)(1 - \sin \theta)}{\cos \theta}} \\ &= \frac{\frac{\cos \theta + 1 - \sin \theta}{\cos \theta + 1 + \sin \theta - \sin \theta \cdot \cos \theta - \sin \theta - \sin^2 \theta}}{\frac{\cos \theta + 1 - \sin \theta}{\cos \theta}} = \frac{\cos \theta + 1 - \sin \theta}{\cos \theta + 1 - \sin^2 \theta - \sin \theta \cdot \cos \theta} \\ &= \frac{\cos \theta + 1 - \sin \theta}{\cos \theta + \cos^2 \theta - \sin \theta \cdot \cos \theta} \quad (\because 1 - \sin^2 \theta = \cos^2 \theta) \\ &= \frac{\cos \theta + 1 - \sin \theta}{\cos \theta (\cos \theta + 1 - \sin \theta)} = 1 \end{aligned}$$

29. (A) $\frac{\sqrt{7}}{\sqrt{9+7+2 \times 3\sqrt{7}} - \sqrt{9+7-2 \times 3 \times \sqrt{7}}}$

$$= \frac{\sqrt{7}}{(3+\sqrt{7}) - (3-\sqrt{7})} = \frac{\sqrt{7}}{3+7-3+\sqrt{7}} = \frac{1}{2}$$

30. (A) Let A = 30° and B = 45°

Then, P = $\frac{1}{\sqrt{2}}$ and q = $\frac{\sqrt{3}}{\sqrt{2}}$ and tan A = $\frac{1}{\sqrt{3}}$

Now, $\pm \frac{p}{q} \sqrt{\frac{q^2-1}{1-p^2}} = \frac{1/\sqrt{2}}{\sqrt{3}/\sqrt{2}} = \frac{1}{\sqrt{3}} = \tan A$

31. (C) $2 - \cos x + \sin^2 x$
 $= 2 - \cos x + 1 - \cos^2 x - (\cos^2 x + \cos x) + 3$
 $= \left[\left(\cos x + \frac{1}{2} \right)^2 - \frac{1}{4} \right] + 3 = \frac{13}{4} - \left(\cos x + \frac{1}{2} \right)^2$

\therefore Maximum value occurs at $\cos x = -\frac{1}{2}$ and it is $\frac{13}{4}$ and minimum value occurs at $\cos x = 1$ and it is 1

\therefore the required ratio is $\frac{13}{4}$

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

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

Number of swan inside the pond = 2

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

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

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

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

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

On solving, $x = 16$

Number of swans = 16

33. (D) $\frac{y+7+7}{3} = 3, \frac{x-3+9}{3} = 4$

$\Rightarrow y = -5, x = 6$

$\Rightarrow (x, y) = (6, -5)$

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

$= \frac{1}{2} [6(-7+7) - 3(7+5) + 9(-5-7)] = 72 \text{ unit}^2$

34. (B) Let rate of population increase = $R\%$ per annum

So, $4800 = 3600 \left(1 + \frac{R}{100} \right)^3$

$\frac{4}{3} = \left(1 + \frac{R}{100} \right)^3$

Now, the population after 3 years = $4800 \left(1 + \frac{R}{100} \right)^3$

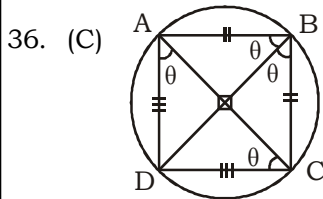
$= 4800 \times \frac{4}{3} = 6400$



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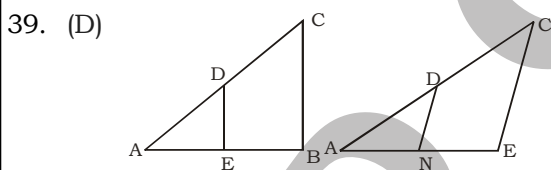
35. (A) Interior - exterior = 108
Interior + exterior = 180
 Interior = $\frac{180+108}{2} = 144$
 Exterior = 36
 So, $\frac{180(n-2)}{n} = 144$
 $n = 10$



$\angle DAC = \angle DCA = \theta$
 $\angle DBC = \angle DAC = \theta$
 $\angle ACD = \angle ABD = \theta$
 $\therefore \angle ABC = 2\theta$

37. (A) $BE \parallel DF$
 $\angle ACE = \angle CDF = 70^\circ$
 $\angle ACB = 80^\circ - \angle ACE = 110^\circ$
 $\angle ABC = 180^\circ - 20^\circ - 110^\circ = 50^\circ$

38. (B) $\angle BIC = 90^\circ + \frac{A}{2} = 90^\circ + 30^\circ = 120^\circ$

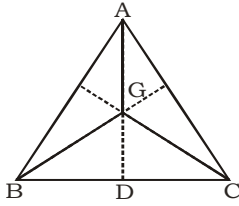


In $\triangle ABC$,
 $DE \parallel BC$
 $\frac{AD}{DC} = \frac{AE}{EB} = \frac{4}{5} = 4 : 5 \dots\dots\dots (i)$

In $\triangle AEC$,
 $EC \parallel ND$
 $\frac{AN}{NE} = \frac{AD}{DC} = \frac{4}{5} = 4 : 5 \dots\dots\dots (ii)$

Let $AE = 40$
 $EB = 50$ and $EN = 40 \times \frac{5}{9} = \frac{200}{9}$
 $EN : EB = \frac{200}{9} : 50 = 4 : 9$

40. (D)



$$\text{Area of } \triangle ABC = 6 \times \text{ar}(\triangle BGD) = 6 \times 6 = 36 \text{ sq.cm}$$

41. (A) Let the remaining portion be sell at $x\%$ profit.

$$\text{Total profit} = -\frac{1}{3} \times 20\% + \frac{2}{3} \times \frac{2}{3} \times 25\% + \frac{2}{9} \times x\%$$

$$20\% = -\frac{60}{9}\% + \frac{100}{9}\% + \frac{2x}{9}\%$$

$$\frac{2x}{9}\% = \frac{14}{9}\%$$

$$x = 70$$

Hence, he would sell the remaining portion at 70% profit.

$$\text{Selling price of the remaining portion} = \frac{17}{10} \times \frac{2}{9} \times 72000 = 27200$$

42. (C) Let CP = 100

$$\text{Purchase} = 75$$

$$\text{MP} = 140 \quad (40\% \text{ above of CP})$$

$$\text{Discount on MP} = 140 \times \frac{80}{100} = 112$$

$$\text{Profit \%} = \frac{112 - 75}{75} \times 100 = 49\frac{1}{3}\%$$

43. (D) $\left(\frac{x^a}{x^b}\right)^{a+b} \left(\frac{x^b}{x^c}\right)^{b+c} \left(\frac{x^c}{x^a}\right)^{c+a}$

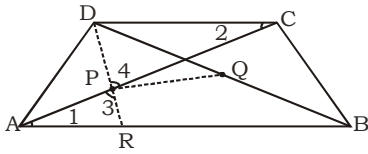
$$(x^{a-b})^{a+b} (x^{b-c})^{b+c} (x^{c-a})^{c+a}$$

$$x^{(a-b)(a+b)} \cdot x^{(b-c)(b+c)} \cdot x^{(c-a)(c+a)}$$

$$x^{a^2-b^2} \cdot x^{b^2-c^2} \cdot x^{c^2-a^2}$$

$$x^{a^2 - b^2 + b^2 + c^2 + c^2 - a^2} x^0 = 1$$

44. (C)



In $\triangle APR$ and $\triangle DPC$,

$$\angle 1 = \angle 2 \text{ (alternate angles)}$$

$$AP = CP \text{ (}\because \text{ P is mid-point of AC) and } \angle 3 = \angle 4 \text{ (vertically opposite angles)}$$

So, $\triangle APR \cong \triangle DPC$ (ASA)

$$\Rightarrow AR = DC \text{ and } PR = DP$$

Again, P and Q are the mid -points of sides DR and DB respectively. In $\triangle DRB$

$$PQ = \frac{1}{2} BR$$

$$\therefore PQ = \frac{1}{2} (AB - BR)$$

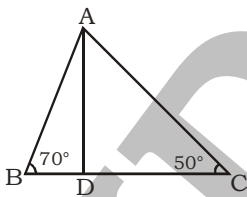
$$\therefore PQ = \frac{1}{2} (AB - DC) \text{ (}\because \text{ AR = DC)}$$

45. (D) $PA \times PC = PB \times PD$

$$\Rightarrow 14 \times 9 = (7 + x) \times 7$$

$$\Rightarrow 18 = 7 + x \Rightarrow x = 11 \text{ m}$$

46. (A)



$$\angle A + 70^\circ + 50^\circ = 180^\circ$$

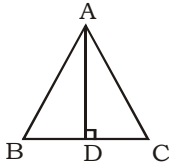
$$\Rightarrow \angle A = 60^\circ$$

$$\therefore \frac{AB}{AC} = \frac{BD}{DC}$$

AD is the bisector of $\angle BAC$

$$\angle BAD = \frac{1}{2} \angle BAC = \frac{1}{2} \times 60^\circ = 30^\circ$$

47. (D)



$$AB = AC = \frac{5}{6} BC$$

$$AB + BC + AC = 544$$

$$\frac{5}{6} BC + BC + \frac{5}{6} BC = 544$$

$$\frac{5BC + 6BC + 5BC}{6} = 544$$

$$\frac{16BC}{6} = 544$$

$$BC = \frac{544 \times 6}{16} = 204$$

$$AB = AC = \frac{5}{6} \times 204 = 170 \text{ cm}$$

$$\text{Area of } \triangle ABC = \frac{b}{4} \sqrt{4a^2 - b^2} \quad (\text{where } a = \text{equal side and } b = \text{base})$$

$$= \frac{204}{4} \sqrt{4(170)^2 - (204)^2} = 51 \sqrt{115600 - 41616}$$

$$= 51 \sqrt{73984} = 51 \times 272 = 13872 \text{ cm}^2$$

48. (A) In a rhombus,

$$4a^2 = d_1^2 + d_2^2$$

$$4a^2 = 8^2 + 6^2$$

$$a^2 = \frac{100}{4} = 25$$

\therefore Area of square = 25 cm^2

49. (C) 90 (total work)

| | |
|--------|---|
| A → 18 | 5 |
| B → 15 | 6 |

B's 10 day's work = $6 \times 10 = 60$ units

work left = $90 - 60 = 30$ units

A does 30 unit in = $\frac{30}{5} = 6$ days

50. (B) Principal Amount

$$\begin{array}{ccc} 6000 & & 7200 \\ & \curvearrowright +1200 & \end{array}$$

By using formula

$$\text{Rate \%} = \frac{1200}{6000} \times \frac{100}{4} = 5\%$$

$$\text{New rate \%} = 5 \times \frac{3}{2} = 7.5\%$$

$$\text{Interest after 5 years} = \frac{6000 \times 7.5 \times 5}{100} = ₹2250$$

$$\text{Hence Amount} = ₹(6000 + 2250) = ₹ 8250$$

51. (A)

$$\begin{array}{ccc} x & : & y & : & z \\ \times \downarrow & & 5 & : & 4 & : & 4 \\ & & \underline{5} & & 5 & & 4 \\ & & 25 & : & 20 & : & 16 \end{array}$$

$$\begin{aligned} \therefore \text{Runs scored by } A + B + C &= x + y + z \\ &= 25x + 20x + 16x = 61x \\ A + B + C &= 1098 \text{ (given)} \end{aligned}$$

$$\therefore x = \frac{1098}{61} = 18$$

$$\text{Runs covered by } A = 25x = 25 \times 18 = 450$$

$$\text{Run scored by } B = 20x = 20 \times 18 = 360$$

$$\text{Run scored by } C = 16x = 16 \times 18 = 288$$

52. (A)

$$p : q \quad r : s \quad t : u \\ 4 : 3 \quad 4 : 3 \quad 4 : 3$$

$$\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{4}{3}$$

$$\text{Let } P = 4x, q = 3x$$

$$r = 4x, S = 3x$$

$$t = 4x, u = 3x$$

$$\frac{mp + nr + ot}{mq + ns + ou} = \frac{4xm + 4xn + 4xo}{3xm + 3xn + 3xo}$$

$$= \frac{m \cdot 4x + n \cdot 4x + o \cdot 4x}{m \cdot 3x + n \cdot 3x + o \cdot 3x} = \frac{4x(m + n + o)}{3x(m + n + o)} = \frac{4}{3} = 4 : 3$$

53. (C)

$$\text{Let C.P} = ₹100$$

$$\text{M.P} = 100 \times 140\% = ₹140$$

$$\text{After Discount S.P} = 80\% \times 140$$

$$= \frac{80}{100} \times 140 = ₹112$$

$$\% \text{ Profit} = \frac{112 - 100}{100} \times 100 = 12\%$$

54. (A)
$$\frac{12(\text{total unit})}{\begin{array}{l|l} A \rightarrow 4 & 3 \text{ (efficiency)} \\ B \rightarrow 12 & 1 \end{array}}$$

Pipe A will fill 3 unit till 11 A.M

unit left = $12 - 3 = 9$

Now both pipe will fill and they will take = $\frac{9}{4} = 2\frac{1}{4}$ hours.

so, $\left(11 + 2\frac{1}{4}\right)$, tank will be filled at 1: 15 P.M

55. (D) Let HCF = x

\therefore LCM = $20x$

Sum of HCF + LCM = 2520

$x + 20x = 2520$

$21x = 2520$

$x = 120$

\therefore HCF = 120

LCM = $120 \times 20 = 2400$

One number = 480

Let another number = y

$\therefore y \times 480 = 120 \times 2400$

$y = \frac{120 \times 2400}{480} = 600$

56. (A) Let the total time = 8 years.

Let the total capital = 20 units

| | | | | | |
|-----------------------|----|---|----|---|----|
| | A | : | B | : | C |
| Capital \rightarrow | 5 |) | 4 |) | 11 |
| Time \rightarrow | 2 |) | 4 |) | 8 |
| Profit \rightarrow | 10 | : | 16 | : | 88 |

$5 : 8 : 44$

According to the question,

$(5 + 8 + 44)$ units = ₹1140

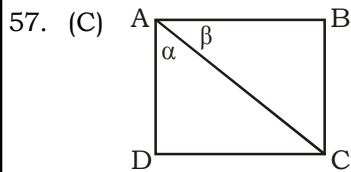
57 units = ₹1140

1 units = ₹ $\frac{1140}{57} = ₹20$

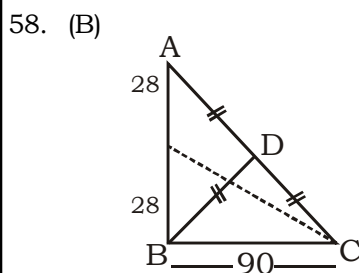
Profit of A = $20 \times 5 = ₹100$

Profit of B = $20 \times 8 = ₹160$

Profit of C = $44 \times 20 = ₹880$



$$\begin{aligned}
 & (\tan^2 \alpha + 1) \sin^2 \beta \\
 & (\tan^2 45^\circ + 1) \sin^2 45 \\
 & = (1 + 1) \left(\frac{1}{\sqrt{2}} \right)^2 = 2 \times \frac{1}{2} = 1
 \end{aligned}$$



$$\begin{aligned}
 & BD = 53 \text{ cm} \\
 & AD = CD = BD = 53 \text{ cm} \\
 \therefore & AC = 2 \times 53 = 106 \text{ cm} \\
 & AB + BC + AC = 2 \times 126 \text{ cm} = 252 \text{ cm} \\
 & AB + BC = 146 \text{ cm} \\
 & \text{Let } AB = x \text{ cm} \\
 & BC = (146 - x) \text{ cm} \\
 & AB^2 + BC^2 = AC^2 \\
 & x^2 + (146 - x)^2 = (106)^2 \\
 & x^2 + 21316 + x^2 - 292x = 11236 \\
 & 2x^2 - 292x + 10080 = 0 \\
 & x^2 - 146x + 5040 = 0 \\
 & x^2 - 90x - 56x + 5040 = 0 \\
 & x = 90, 56
 \end{aligned}$$

$$\text{Area} = \frac{1}{2} \times 28 \times 90 = 1260 \text{ cm}^2$$

59. (B)

$$\begin{aligned}
 & \pi r^2 = 3 \\
 & r = \sqrt{3} \\
 & DE = 2r^2 - 2r^2 \cos 120^\circ
 \end{aligned}$$

$$DE = r^2 \quad (\because \sqrt{3} = r)$$

But, $AB = 2DE$

$$AB = 2r^2$$

$$AB = 2 \times (\sqrt{3})^2$$

$$AB = 6$$

$$\text{Perimeter of triangle} = 3 \times 6 = 18 \text{ unit}$$

60. (B) Total number of failure students = $640 \times \frac{40}{100} + 360 \times \frac{20}{100}$

= $256 + 72 = 328$

Total students = 1000

Required percentage = $\frac{328}{100} \times 100 = 32.8\%$

61. (C) Increased metro fare = $\frac{120}{100} \times 30 = 36$

Increased bus fare = $\frac{110}{100} \times 20 = 22$

Ratio = $36 : 22 = 18 : 11$

62. (C) $A = P \left(1 + \frac{R}{100}\right)^T$

$\frac{27}{8}x = x \left(1 + \frac{R}{100}\right)^3$

$\frac{1}{2} = \frac{R}{100}$

R = 50%

63. (D)

64. (B) Distance covered in 2nd minute = $90 - 50 = 40$

Distance covered in 3rd minute = $130 - 90 = 40$ meter

Required distance = $50 + 560 = 610$ meter

65. (C) $\frac{\sqrt{2}}{12} a^3 = \frac{\sqrt{2}}{12} \times 6 \times 6 \times 6 = 18\sqrt{2}$ cu.cm

66. (D) $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$... (i)

$\frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$... (ii)

$-\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$... (iii)

Adding (i), (ii) and (iii)

$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 3$... (iv)

$\frac{x^2}{a^2} = 1 \Rightarrow x = \pm a$

$\frac{y^2}{b^2} = 1 \Rightarrow y = \pm b$

$\frac{z^2}{c^2} = 1 \Rightarrow z = \pm c$

67. (B) $\frac{2x^4 - 162}{(x^2 + 9)(2x - 6)}$

$$\frac{2(x^4 - 81)}{2(x^2 + 9)(x - 3)} = \frac{(x^2 + 9)(x^2 - 9)}{(x^2 + 9)(x - 3)}$$

$$\frac{x^2 - 9}{x - 3} = \frac{(x + 3)(x - 3)}{(x - 3)}$$

$$= x + 3$$

68. (B) $[\sin\theta + \cos\theta]^2 = \left[\frac{b}{a}\right]^2$

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

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

$$\frac{a + 2c}{a} = \frac{b^2}{a^2}$$

$$a^2 - b^2 + 2ac = 0$$

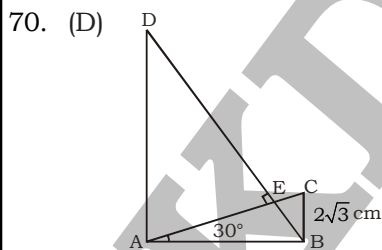
69. (C) Radius of outer circle = $\frac{1}{2} \times 2.4$ cm

Radius of inner circle = 1.2 cm - 0.2 cm

Area of the circular circle = $\pi (R^2 - r^2) = \pi (R + r) (R - r)$

$$= \frac{22}{7} \times 2.2 \times 0.2 = \frac{9.68}{7} \text{ cm}^2$$

Weight of lead = $\frac{9.68 \times 3.5 \times 11.4 \times 100}{7 \times 1000}$ kg = 5.5 kg



In ΔABC ,

$$\tan 30^\circ = \frac{2\sqrt{3}}{AB}$$

$$\frac{1}{\sqrt{3}} = \frac{2\sqrt{3}}{AB}$$

$$AB = 6 \text{ cm}$$

In $\triangle BAD$,

$$\tan 60^\circ = \frac{AD}{AB}$$

$$\frac{\sqrt{3}}{1} = \frac{AD}{AB}$$

$$AD = 6\sqrt{3} \text{ cm}$$

71. (A) Average sale of the branches B1 and B4 = $\frac{20+80}{2} = 50$ thousand

Average sale of the branches B3 and B5 = $\frac{55+45}{2} = 50$ thousand

72. (D) Average sale of all the branches = $\frac{300}{6} = 50$

\therefore The sale of branches B1, B2 and B5 are less than the average sale.

73. (D) New sale of books from branch B2 = $\frac{40 \times 130}{100} = 52$ thousand

New sale of books from branch B4 = $\frac{80 \times 90}{100} = 72$ thousand

New sales = 304

Then percentage increase from all the branches = $\frac{4}{300} \times 100 = 1.33\%$

74. (B) Required total sale = $\frac{300 \times 102}{100} = 306$ thousand

75. (B) 1st Group 2nd Group 3rd Group
= B1 + B4 = B2 + B6 = B3 + B5 = 100

Then (i) B3 - B5 = 55 - 45 = 10 Thousand

(ii) B6 - B2 = 60 - 40 = Thousand

(iii) B4 - B1 = 80 - 20 = 60 thousand

\therefore Minimum difference = 10

76. (A) $4ab(a^2 + b^2) = 2 \times ab \times 2(a^2 + b^2)$

$$= 2 \times \left\{ \frac{(a+b)^2 - (a-b)^2}{4} \right\} \times \{(a+b)^2 + (a-b)^2\} = 2 \times \frac{\sqrt{3}^2 - \sqrt{2}^2}{4} \times (\sqrt{3}^2 + \sqrt{2}^2)$$

$$= 2 \times \frac{1}{4} \times 5 = \frac{5}{2}$$

77. (A) $\sin \theta + \cos \theta = 1$

On squaring both sides,

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

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

$$2 \sin \theta \cos \theta = 0$$

$$\sin \theta \cos \theta = 0$$

78. (C) AE is an exterior angle bisector

Let $CE = x$, $BE = BC + EC = 12 + x$

$$\frac{12+x}{x} = \frac{10}{6}$$

$$(12 + x) 6 = 10x$$

$$72 + 6x = 10x$$

$$4x = 72$$

$$x = 18 \text{ cm}$$

79. (C) Given, $AB = AC$

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

$$\angle BAC = 180^\circ - (50 + 50) = 80^\circ$$

$$\angle BDC = \angle BAC = 80^\circ \text{ (angles in the same segment)}$$

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

Now, for $x = 1$

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

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

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

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

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

Then,

Number of students in each row = $\frac{x}{y}$.

Case : (I)

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

$$2y^2 - 4y = x \quad \dots \text{(i)}$$

Case : (II)

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

$$y^2 + 4y = x \quad \dots \text{(ii)}$$

From eqn (i) & (ii)

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

$$y(y - 8) = 0$$

$$y = 8$$

Total number of students $x = 2(8)^2 - 4 \times 8 = 128 - 32 = 96$

82. (B) Let = CP = 100

| CP | SP | MP |
|-----|-----|-----|
| 100 | 135 | 180 |

$$3 \times 1200 \text{ gm} \text{ ————— CP } 1000 \text{ gm} \times 3 = 3000$$

$$4 \times 900 \text{ gm} \text{ ————— SP } 1350 \text{ gm} \times 4 = 5400$$

$$\text{Profit\%} = \left(\frac{2400}{3000} \times 100 \right) = 80\%$$

83. (A) $5.\bar{6} + 7.\bar{3} + 8.\bar{7} + 6.\bar{1}$

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

$$= 26 + \frac{17}{9} = 26 + 1 + \frac{8}{9}$$

$$= 27\frac{8}{9} = 27.\bar{8}$$

84. (C) $A + B + C = 84 \times 3 = 252 \text{ kg}$

$$A + B + C + D = 80 \times 4 = 320 \text{ kg}$$

$$D\text{'s weight} = 320 - 252 = 68 \text{ kg}$$

$$E\text{'s weight} = 68 + 3 = 71 \text{ kg}$$

$$(E + B + C + D) = 79 \times 4 = 316 \text{ kg}$$

Then,

$$A - E = 320 - 316 = 4 \text{ kg}$$

$$A = 4 + E = 4 + 71 = 75 \text{ kg}$$

85. (D) $\left(1 + \cos \frac{\pi}{8}\right) \left(1 + \cos \frac{3\pi}{8}\right) \left(1 + \cos \left(\pi - \frac{3\pi}{8}\right)\right) \left(1 + \cos \left(\pi - \frac{\pi}{8}\right)\right)$

$$= \left(1 + \cos \frac{\pi}{8}\right) \left(1 + \cos \frac{3\pi}{8}\right) \left(1 - \cos \frac{3\pi}{8}\right) \left(1 - \cos \frac{\pi}{8}\right)$$

$$= \left(1 - \cos^2 \frac{\pi}{8}\right) \left(1 - \cos^2 \frac{3\pi}{8}\right)$$

$$= \left(\sin^2 \frac{\pi}{8}\right) \left(\sin^2 \frac{3\pi}{8}\right)$$

$$= \left(\sin^2 \frac{\pi}{8}\right) \left(\sin^2 \left(\frac{\pi}{2} - \frac{\pi}{8}\right)\right)$$

$$= \left(\sin^2 \frac{\pi}{8}\right) \left(\cos^2 \frac{\pi}{8}\right)$$

$$= \frac{1}{4} \left(\frac{1}{4} \sin^2 \frac{\pi}{8} \cos^2 \frac{\pi}{8}\right)$$

$$= \frac{1}{4} \left(\sin \frac{\pi}{4}\right)^2 = \frac{1}{4} \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{8}$$

86. (C) $\frac{x \times 8 \times 1}{100} + \frac{(20000 - x) \frac{7}{3} \times 1}{100} = 800$

$$\frac{2x}{25} + \frac{20000 - x}{75} = 800$$

$$5x + 20000 = 800 \times 75$$

$$x = \frac{40000}{5} = ₹ 8000$$

87. (C) Let total votes = x

$$x \times \frac{(60 - 40)}{100} = 298$$

$$x \times \frac{1}{5} = 298$$

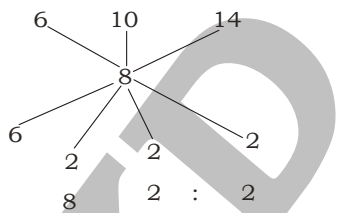
$$x = 298 \times 5 = 1490$$

88. (B) SP of mixture = 11.20 per kg

Profit% = 40

$$11.20 \times \frac{100}{140} = ₹ 8 \text{ per kg}$$

By alligation method,



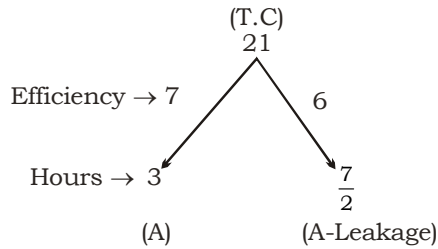
Required ratio = 4 : 1 : 1

89. (C) C.P. of motor car = ₹ 17,000

$$\text{M.P. of motor car} = ₹ 17,000 \times \frac{100}{85} = ₹ 20000$$

$$\text{After successive discount, C.P} = ₹ 20000 \times \frac{95}{100} \times \frac{90}{100} = ₹ 17100$$

90. (B)



A's efficiency is 7 units/hr

A's efficiency after leakage 6 units/hr

Leakage efficiency = 7 - 6 = 1 units/hr

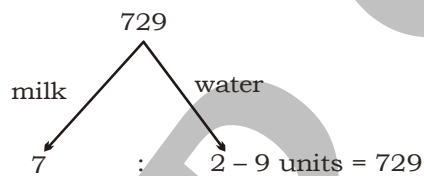
Leakage will empty the fully filled tank

$$\frac{\text{T.C}}{\text{Efficiency}} = \frac{21}{1} = 21 \text{ hours}$$

91. (D) Average speed for whole Journey = $\frac{2s_1s_2}{s_1 + s_2}$

$$= \frac{2 \times 20 \times 30}{20 + 30} = \frac{2 \times 20 \times 30}{50} = 24 \text{ km/hr}$$

92. (D)



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M : W

Initial → 7 : 2
After adding water 7 : 3) 1 unit

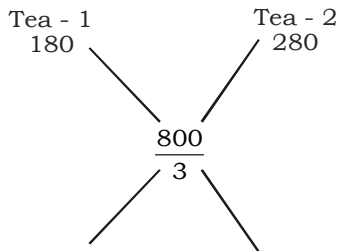
Always milk will be same, i.e. 1 unit of water will be added = 1

unit = 81 ml.

93. (D) SP of the mixture = ₹ 320
Gain = 20%

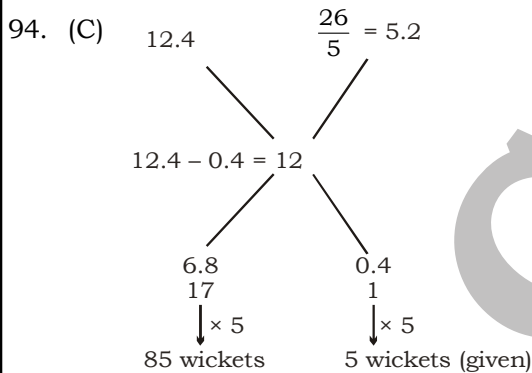
$$\therefore \text{C.P of the mixture} = 320 \times \frac{100}{120} = ₹ \frac{800}{3}$$

Now using allegation method,



$$280 - \frac{800}{3} = \frac{40}{3} \quad \frac{800}{3} - 180 = \frac{260}{3}$$

$$\text{Required ratio} = 40 : 260 = 2 : 13$$



The number of wickets taken by him till the last match was = 85 + 5 = 90

95. (B) Let the initial expenditure = 100 units

$$\begin{array}{l} 100 \\ \downarrow -20\% \\ 80 \end{array}$$

$$\text{Increase in consumption} = \frac{20}{80} = \frac{1}{4}$$

$$\begin{array}{l} 1 \rightarrow \text{New} \\ 4 \rightarrow \text{Original} \end{array}$$

$$\text{Original Price} = \frac{36 \times 1000}{4 \times 500} = ₹ 18/\text{kg}$$

96. (B) Corresponding angle of average expenditure = $\frac{360^\circ}{5} = 72^\circ = \text{cement}$

97. (A) Required ratio = $36^\circ : 72^\circ : 54^\circ = 2 : 4 : 3$

98. (B) Largest sector angle = 108°

\therefore Required percentage = $\frac{108^\circ}{360} \times 100 = 30\%$

99. (C) Part of the expenditure on labour = $\frac{90^\circ}{360^\circ} = \frac{1}{4}$

100. (C) Required percent = $\frac{36^\circ + 54^\circ}{360^\circ} \times 100 = 25\%$

QUANTITATIVE ABILITY - 65 (ANSWER KEY)

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