QUANTITATIVE ABILITY - 86 (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) $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1$
$= 2(1 + 3\sin^2\theta.\cos^2\theta) - 3(1 + 2\sin^2\theta.\cos^2\theta) + 1$
$= 2 + 6\sin^2\theta.\cos^2\theta - 3 + 6\sin^2\theta.\cos^2\theta + 1 = 0$

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

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

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

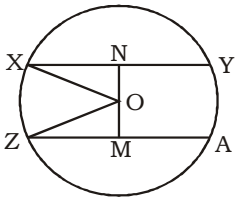
Multiplying both sides by $\frac{N}{L}$,

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

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

6. (D) Given, XY = 14 cm

Then, XN = 7 cm



In Δ XNO,

$(ON)^2 = (XO)^2 - (XN)^2$

$(ON)^2 = (25)^2 - (7)^2$

$(ON)^2 = 625 - 49$

$(ON)^2 = 576$

ON = 24 cm

Then,

OM = MN – ON

OM = 44 – 24

OM = 20

So that in Δ ZMO,

$(ZM)^2 = (OZ)^2 - (OM)^2$

$(ZM)^2 = 625 - 400$

$(ZM)^2 = 225$

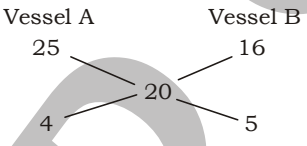
ZM = 15 cm

ZA = 2ZM = 2 × 15 = 30 cm

7. (C)

	Milk		Water	
Vessel A	5	:	3	$)_{8\times5}$ = 25 : 15
Vessel B	2	:	3	$)_{5\times8}$ = 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, $\alpha + \beta = -\frac{b}{a}$

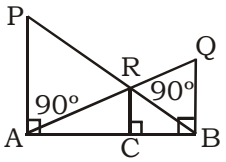
$\alpha\beta = \frac{c}{a}$

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

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

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

10. (D)



$\Delta BRC \sim \Delta BPA$

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

$\Delta ARC \sim \Delta AQB$

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

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

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

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

$yx + yz = xz$

11. (D) $\angle ACB = \angle PAB = 80°$

$\angle ACQ = 180° - 80° = 100°$

$\angle CAQ = \angle ABC = 30°$

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

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.

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

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

$A = 4.5$ minutes

13. (B) $\sin^6A + \cos^6A + 3\sin^2A\cos^2A$

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

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

$= (1)^3 = 1$

14. (A)

$$\begin{array}{cc} 100 & 100 + x\% \\ 100 & 100 - x \\ \hline 10{,}000 & 10000 - x^2 \longrightarrow 1 \\ \downarrow \times 1 & \times 1 \\ 10{,}000 - x^2 & 10{,}000 - x^2 \end{array}$$

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

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 $= 10 \times \frac{70}{100} = 7$

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

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

Total marks = 7 + 12 + 21 = 40

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

Required marks to pass = 45 – 40 = 5

17. (D)

	Spirit		Water	
Jar A	2	:	$3)_{\times 6 \times 3}$	=36 : 54
Jar B	3	:	$7)_{\times 3 \times 4}$	= 36 : 84
Jar C	4	:	$11)_{\times 2 \times 5}$	= 40 : 110
				112 : 248

Ratio of spirit and water in mixture = 112 : 248 = 14 : 31

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

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

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

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

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

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

20. (C) $l \to 5 : 3$

$S \to 6 : 5$

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

$t = 25 : 18$

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

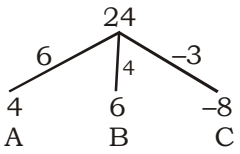
A : B : C = 10000 : 9600 : 9120

A : C = 500 : 456 = 44 m

23. (C) $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$

$= \left\{\begin{matrix} 1 - 2\sin^2\theta = 2\cos^2\theta - 1 \\ = \cos^2\theta \end{matrix}\right\} = \tan\theta$

24. (B)



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

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

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

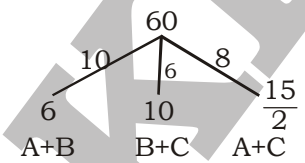
$2\sin^2\theta = 1 - \frac{1}{2}$

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

$\sin\theta = \frac{1}{2} = \sin 30°$

$\theta = 30°$

26. (D)



2 (A+B+C) = 24

A + B + C = 12 hrs

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

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

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

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

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

Q will run = 500 m,

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

So, Both reach at the same time

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

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

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

$$= \frac{\cos\theta+1-\sin\theta}{\frac{\cos\theta+\cos^2\theta-\sin\theta\cdot\cos\theta}{\cos\theta}} \qquad (\because\ 1-\sin^2\theta=\cos^2\theta)$$

$$= \frac{\cos\theta+1-\sin\theta}{\frac{\cos\theta(\cos\theta+1-\sin\theta)}{\cos\theta}} = 1$$

29. (A) $\frac{\sqrt{7}}{\sqrt{9+7+2\times3\sqrt{7}}-\sqrt{9+7-2\times3\times\sqrt{7}}}$

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

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

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

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

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

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

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

On solving, $x = 16$

Number of swans = 16

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

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

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

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

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

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

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

35. (A) Interior – exterior = 108

Interior + exterior = 180

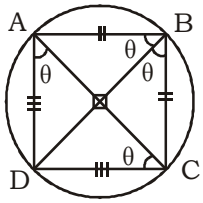
$$\text{Interior} = \frac{180+108}{2} = 144$$

Exterior = 36

$$\text{So, } \frac{180(n-2)}{n} = 144$$

$n = 10$

36. (C)



$\angle DAC = \angle DCA = \theta$

$\angle DBC = \angle DAC = \theta$

$\angle ACD = \angle ABD = \theta$

$\therefore \quad \angle ABC = 2\theta$

37. (A) BE ||DF

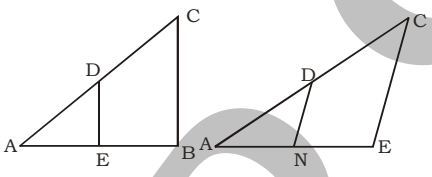
$\angle ACE = \angle CDF = 70°$

$\angle ACB = 80° - \angle ACE = 110°$

$\angle ABC = 180° - 20° - 110° = 50°$

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

39. (D)



In ΔABC,

DE || BC

$$\frac{AD}{DC} = \frac{AE}{EB} = \frac{4}{5} = 4:5 \text{ ..... (i)}$$

In ΔAEC,

EC || ND

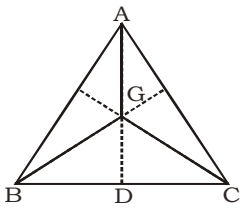
$$\frac{AN}{NE} = \frac{AD}{DC} = \frac{4}{5} = 4:5 \text{ ..... (ii)}$$

Let AE = 40

$$\text{EB} = 50 \text{ and EN} = 40 \times \frac{5}{9} = \frac{200}{9}$$

$$\text{EN : EB} = \frac{200}{9} : 50 = 4:9$$

40. (D)



Area of $\Delta ABC = 6 \times ar(\Delta BGD) = 6 \times 6 = 36$ 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

Purchase = 75

MP = 140 (40% 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) $\left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a}$

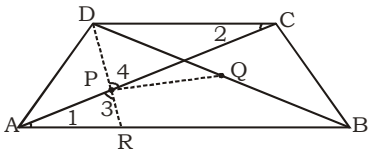
$(x^{a-b})^{a+b}\,(x^{b-c})^{b+c}\,(x^{c-a})^{c+a}$

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

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

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

44. (C)



In ΔAPR and ΔDPC,

$\angle 1 = \angle 2$ (alternate angles)

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

So, ΔAPR $\cong$ ΔDPC (ASA)

$\Rightarrow$ AR = DC and PR = DP

Again, P and Q are the mid -points of sides DR and DB respectively. In ΔDRB

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

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

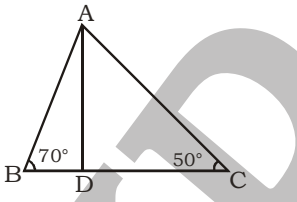
$$\therefore \quad PQ = \frac{1}{2}(AB - CD) \ (\because \ AR = DC)$$

45. (D) PA × PC = PB × PD

$\Rightarrow$ 14 × 9 = (7 + x) × 7

$\Rightarrow$ 18 = 7 + x $\Rightarrow$ x = 11 m

46. (A)



$\angle A + 70° + 50° = 180°$

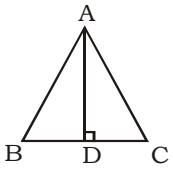
$\Rightarrow$ $\angle A = 60°$

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

AD is the bisector of $\angle BAC$

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

47. (D)



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

$AB + BC + AC = 544$

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

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

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

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

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

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

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

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

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 cm²

49. (C)

	90 (total work)
A→18	5
B→15	6

B's 10 day's work = 6 × 10 = 60 units

work left = 90 – 60 = 30 units

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

50. (B) Principal Amount
6000 $\xrightarrow{+1200}$ 7200

By using formula

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

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

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

Hence Amount = ₹(6000 +2250) = ₹ 8250

51. (A)

	x	:	y	:	z
× ↓	5	:	4	:	4
	5		5		4
	25	:	20	:	16

$\because$ Runs scored by $A + B + C = x + y + z$

$= 25x + 20x + 16x = 61x$

$A + B + C = 1098$ (given)

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

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

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

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

52. (A) $p : q$ $r : s$ $t : u$

4 : 3 4 : 3 4 : 3

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

Let $P = 4x$, $q = 3x$

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

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

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

$= \frac{m \cdot 4x + n \cdot 4x + 0.4x}{m \cdot 3x + n \cdot 3x + 0.3x} = \frac{4x(m + n + 0)}{3x(m + n + 0)} = \frac{4}{3} = 4 : 3$

53. (C) Let C.P = ₹100

M.P = 100 × 140% = ₹140

After Discount S.P = 80% × 140

$= \frac{80}{100} \times 140 =$ ₹112

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

54. (A)

	12(total unit)
A → 4	3 (efficiency)
B → 12	1 ,,

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 × 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 →	5		4		11
Time →	2	:	4	:	8
Profit →	10	:	16	:	88

5 : 8 : 44

According to the question,

(5 + 8 + 44) units = ₹1140

57 units = ₹1140

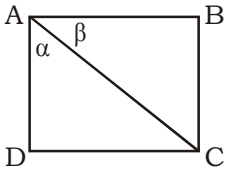
1 units = $₹\frac{1140}{57}$ = ₹20

Profit of A = 20 × 5 = ₹100

Profit of B = 20 × 8 = ₹160

Profit of C = 44 × 20 = ₹880

57. (C)

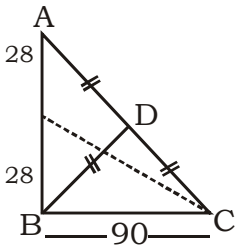


$(\tan^2 a + 1)\sin^2\beta$

$(\tan^2 45° + 1)\sin^2 45$

$= (1 + 1)\left(\frac{1}{\sqrt{2}}\right)^2 = 2 \times \frac{1}{2} = 1$

58. (B)



BD = 53 cm

AD = CD = BD = 53 cm

$\because$ AC = 2 × 53 = 106 cm

AB + BC + AC = 2 × 126 cm = 252 cm

AB + BC = 146 cm

Let AB = x cm

BC = $(146 - x)$ cm

$AB^2 + BC^2 = AC^2$

$x^2 + (146 - x)^2 = (106)^2$

$x^2 + 21316 + x^2 - 292x = 11236$

$2x^2 - 292x + 10080 = 0$

$x^2 - 146x + 5040 = 0$

$x^2 - 90x - 56x + 5040 = 0$

$x = 90, 56$

Area = $\frac{1}{2} \times 28 \times 90 = 1260$ cm²

59. (B) $\pi r^2 = 3$

$r = \sqrt{3}$

$DE = 2r^2 - 2r^2 \cos 120°$

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

But, AB = 2DE

$AB = 2r^2$

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

AB = 6

Perimeter of triangle = 3 × 6 = 18 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), (i) and (iii)

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

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

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

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

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

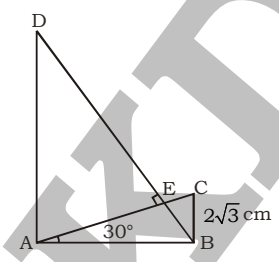
Radius of inner circle = 1.2 cm – 0.2 cm

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

70. (D)



In ΔABC,

$$\tan 30° = \frac{2\sqrt{3}}{AB}$$

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

AB = 6 cm

In ΔBAD,

$\tan 60° = \frac{AD}{AB}$

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

AD = $6\sqrt{3}$ 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

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

73. (D) New sale of books from branch B2 = $\frac{40\times130}{100}$ = 52 thousand

New sale of books from branch B4 = $\frac{80\times90}{100}$ = 72 thousand

New sales = 304

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

74. (B) Required total sale = $\frac{300\times102}{100}$ = 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
∴ Minimum difference = 10

76. (A) $4ab\,(a^2+b^2) = 2\times ab\times2\,(a^2+b^2)$

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

$= 2\times\frac{1}{4}\times5 = \frac{5}{2}$

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

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

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

$72 + 6x = 10x$

$4x = 72$

$x = 18$ cm

79. (C) Given, AB = AC

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

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

$\angle BDC = \angle BAC = 80^\circ$ (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)

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

$2y^2 - 4y = x$ … (i)

Case : (II)

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

$y^2 + 4y = x$ … (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 gm ——— CP 1000 gm $_{\times 3}$ = 3000

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

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

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

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

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

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

84. (C) A + B + C = 84 × 3 = 252 kg

A + B + C +D = 80 × 40 = 320 kg

D's weight = 320 – 252 = 68 kg

E's weight = 68 + 3 = 71 kg

(E + B + C + D) = 79 × 4 = 316 kg

Then,

A – E = 320 – 316 = 4 kg

A = 4 + E = 4 + 71 = 75 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

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

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

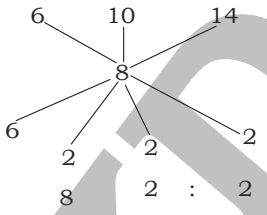
$x = 298 \times 5 = 1490$

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

Profit% = 40

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

By alligation method,



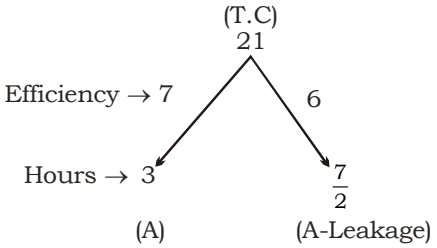
Required ratio = 4 : 1 : 1

89. (C) C.P. of motor car = ₹ 17,000

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

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

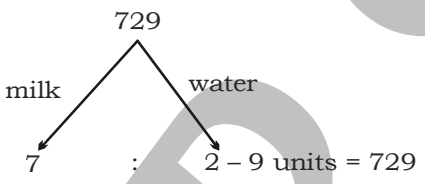
Leakage will empty the fully filled tank

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

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

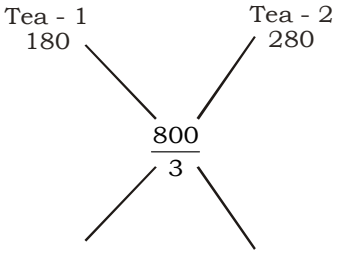
Always milk will be same, i.e. 1 unit of water will be added = 1

unit = 81 m*l*.

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

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

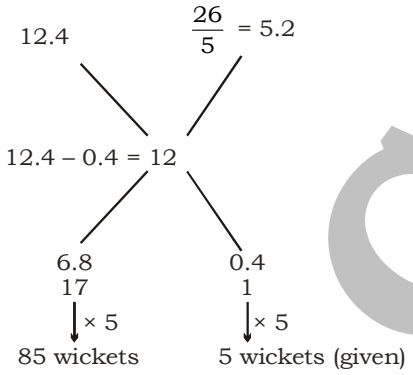
Now using allegation method,



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

Required ratio = 40 : 260 = 2 : 13

94. (C)



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

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

100
↓ – 20%
80

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

$\frac{1}{4} \rightarrow$ New
$\frac{}{4} \rightarrow$ Original

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

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

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

98. (B) Largest sector angle = 108^o

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

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

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

QUANTITATIVE ABILITY - 86 (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)