QUANTITATIVE ABILITY - 74 (SOLUTION)

1. (A) As the roots of the equation

$(a^2 + b^2)\,x^2 + 2(b^2 + c^2)x + (b^2 + c^2) = 0$ are real.

$[2(b^2 + c^2)]^2 - 4(a^2 + b^2)\,(b^2 + c^2)] \geq 0$

$(b^2 + c^2) - (a^2 + b^2) \geq 0$

$c^2 \geq a^2$

2. (A) $(2)^{1040/131} = (2^8)^{130/131} = (256)^{130/131}$

The remainder of a number of the form a^n, divided by n + 1 (where n + 1 is prime and is relatively prime to a) is always 1.

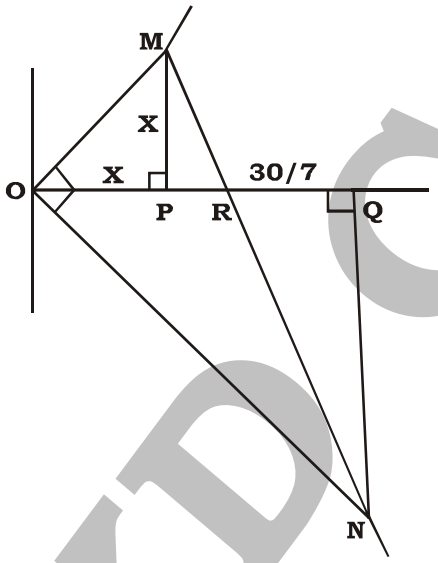
Hence, the remainder of 2^{1040} divided by 131 is 1.

3. (C) Let OP = x.

PM = x

$OR = \dfrac{40}{7}$

QN = 10 $\qquad \left(OQ = 10,\ RQ = \dfrac{30}{7}\right)$



We have,

$\dfrac{PM}{PR} = \dfrac{QN}{QR}$

i.e. $\dfrac{x}{\frac{40}{7} - x} = \dfrac{10}{\frac{30}{7}} = \dfrac{7}{3} \Rightarrow \dfrac{7x}{40 - 7x} = \dfrac{7}{3}$

$21x = 280 - 49x$

$x = 4$

4. (B) $(b^2 + c^2)^2 = (a^2 + b^2)(a^2 + c^2)$

$b^4 + c^4 + 2b^2c^2 = a^4 + a^2b^2 + a^2c^2 + b^2c^2$

$b^4 + c^4 + b^2c^2 = a^4 + a^2b^2 + a^2c^2$

$b^2(b^2 + c^2) + c^4 = a^2(b^2 + c^2) + a^4$

$(b^2 - a^2)(b^2 + c^2) = a^4 - c^4$

Hence, $b^2 - a^2 = \dfrac{a^4 - c^4}{b^2 + c^2}$

5. (B) Since, $\dfrac{p^6 - p}{p - 1} = p^5 + p^4 + p^3 + p^2 + p$; the equation can also be written as $p^5 + p^4 + p^3 + p^2 + p = m(m + 1) + 6$. The RHS is even as m or m + 1 is even, the first term is even and the second term is even. Since, the only even prime is 2, we have p = 2.

Substituting, we get $m^2 + m - 56 = 0$

$(m + 8)(m - 7) = 0$

$m = -8$ or 7

But m is a positive integer $\Rightarrow$ m = 7

Thus, p = 2 and m = 7 is the only solution.

6. (C) $a = \dfrac{x}{y+z}, b = \dfrac{y}{z+y}, c = \dfrac{z}{x+y}$

$x = a(y + z)$, $y = b(x + z)$, $z = c(x + y)$ .....(i)

Statement I. $\dfrac{b+c-1}{yz} + \dfrac{a+c-1}{xz} + \dfrac{a+b-1}{yx} = 1$

$= \dfrac{bx + cx - x + ay + cy - y + az + bz - z}{xyz}$

$= \dfrac{a(y+z) + b(x+z) + c(x+y) - (x+y+z)}{xyz} = 0$ [Form Equation (i)]

Statement I is not true.

Statement II.

Consider $\dfrac{x^2}{a(1-bc)}$

Now, $(1-bc)\dfrac{x^2 + yx + xz}{(x+z)(x+y)}$

$a(1-bc) = \dfrac{x^2 + yx + xz}{(x+z)(x+y)} \times \dfrac{x}{y+z}$

$= \dfrac{x^2(x+y+z)}{(x+z)(x+y)(y+z)}$

$\dfrac{x^2}{a(1-bc)} = \dfrac{(x+z)(x+y)(y+z)}{x+y+z}$

Similarly, we get

$$\frac{y^2}{b(1-ac)} = \frac{(x+z)(x+y)(y+z)}{x+y+z} - \frac{z^2}{c(1-ab)}$$

Statement II is true.

Statement III.

$(x + y + z)(xy + xz + yz)$

$= x^2y + x^2z + xyz + xy^2 + xyz + y^2z + xyz + xz^2 + yz^2$

$= 3xyz + xy(x + y) + yz(y + z) + xz(z + x)$

$$\text{RHS} = \frac{2(x+y+z)(xy+xz+yz) - 6xyz}{(x+y)(y+z)(z+x)}$$

$$= \frac{2\left[xy(x+y) + yz(y+z) + xz(z+x)\right]}{(x+y)(y+z)(z+x)}$$

$$= 2\left[\frac{xy}{(y+z)(z+x)} + \frac{yz}{(x+y)(x+z)} + \frac{xz}{(x+y)(y+z)}\right]$$

$= 2[ab + bc + ac] = ac + bc + ab + ac + ab + bc$

$= (a + b)c + (b + c)a + (a + c)b$

Statement III is also true.

7. (C) The coefficient of x in the new equation is $-\left[\left(\alpha+\frac{\alpha}{\beta}\right)+\left(\beta+\frac{\beta}{\alpha}\right)\right]$

$$= -\left[\alpha+\beta+\frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}\right]$$

$$= -\left[10+\frac{100-30}{15}\right] = -\left[\frac{150+70}{15}\right]$$

$$= -\left[\frac{200}{15}\right] = \frac{-44}{3}$$

And the constant term of the equation = $\left(\alpha+\frac{\alpha}{\beta}\right)\times\left(\beta+\frac{\beta}{\alpha}\right)$

$= \alpha\beta + \alpha + \beta + 1 = 15 + 10 + 1 = 26$

The required equation is $x^2 - \frac{44}{3}x + 26 = 0$ i.e., $3x^2 - 44x + 78 = 0$

8. (D) Let, PQ = x

When B overtakes A for the first time, both of them cover $\frac{3x}{10}$.

When B meets A after that, it (B) covers $\frac{7x}{10} + \frac{7x}{30} = \frac{28x}{30}$,

while A covers $\frac{23x}{30} - \frac{9x}{30} = \frac{14x}{30}$

Therefore, B is twice as fast as A.

A starts 1 h after B, it catches up with in 1 h.

Therefore, B covers 0.3x in 1 h or x in $\frac{10}{3}$ or $3\frac{1}{3}$h.

9. (B) Let the first and second numbers be x and y respectively.

ATQ,

$$x \times \frac{1}{4} \times \frac{2}{3} = y \times \frac{40}{100}$$

$$\therefore \quad x = y \times \frac{40}{100} \times \frac{4 \times 3}{2} = 2.4y$$

10. (A) Let the radius of the circle and the height of the right angled triangle be r and h respectively.

$$\therefore \quad r = \frac{(100 + 20)}{100} h$$

And, area of triangle = $\frac{1}{2} \times h \times 36 = 18h$

Area of the circle = $18h$

$\pi r^2 = 18h$

$$\frac{22}{7} r^2 = \frac{18 \times 100 \times r}{120}$$

$$r = \frac{18 \times 100 \times 7}{120 \times 22} = 4.77$$

Area of circle = $\pi r^2 = \frac{22}{7} \times 4.77 \times 4.77 = 71.509$ sq. cm $\approx$ 72 sq. cm

11. (B) Let the average of runs made by other six batsman be x.

Runs made by the captain = $x + 30$

Now according to the question,

$x + 30 + 6x = 310$

$7x = 280$

$x = 40$

$\therefore$ Number of runs scored by the captain = 40 + 30 = 70

12. (B) Share of each daughter = ₹ 1.25 lakh

Share of grandchild = $\frac{1}{10} \times 1.25$ = ₹ 0.125 lakh

And share of each son = 0.125 × 8 = ₹ 1 lakh

Money received by three sons and two daughters = 3 × 1 + 2 × 1.25 = ₹ 5.5 lakh

Money received by his wife = $\frac{40}{100} \times 5.5$ = ₹ 2.2 lakh

Money received by his wife and three grand- children = ₹ (2.2 + 3 × 0.125) lakh

= ₹ 257500

13. (A) A : B : C = 8 : 14 : 22

$= 8 \times \frac{3}{2} : 14 \times \frac{3}{2} : 22 \times \frac{3}{2} = 12 : 21 : 33$

B : C : D = 21 : 33 : 44

A : B : C : D = 12 : 21 : 33 : 44

14. (C) Total maximum marks in four subjects = 120 + 140 + 100 + 180 = 540

60% of total maximum marks = $\frac{3}{5} \times 540 = 324$

Marks obtained in three subjects = $120 \times \frac{2}{5} + 140 \times \frac{11}{20} + 100 \times \frac{9}{20}$

= 48 + 77 + 45 = 170

Required Marks in Maths = 324 – 170 = 154

15. (C) S.I = 956 – 800 = ₹ 156

Rate = $\frac{156 \times 100}{800 \times 3}$ = 6.5% per annum

New rate = 10.5%

S.I = $\frac{800 \times 3 \times 10.5}{100}$ = ₹ 252

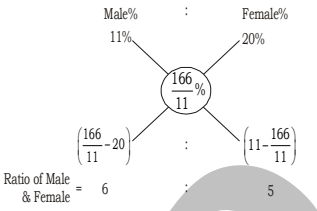
Amount = 800 + 252 = ₹ 1052

16. (A) Population of the village = 5500

After increment new population of the village = 6330

Increment% = $\frac{(6330 - 5500)}{5500} \times 100$

$= \frac{830}{55} = \frac{166}{11}\%$



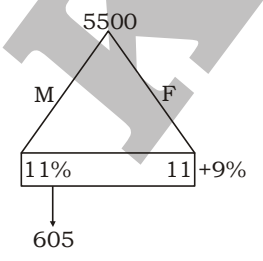
According to the question,

11 units = 5500

1 unit = 500

Number of females = 500 × 5 = 2500

Short trick:-



9% = 225

Number of females = $\frac{225}{9} \times 100 = 2500$

17. (C) Let the total valid votes be 100%
Then second candidate got = (100 – 52 – 12)% = 36%
According to the question,
36% = 28800

$$100\% = 28800 \times \frac{100}{36} = 80{,}000$$

Hence total valid votes = 80,000
Total votes polled = 80,000 + 10,000 = 90,000

$$\text{Total number of votes} = \frac{10}{9} \times 90{,}000 = 1{,}00{,}000$$

18. (B) Total weight of section A = 42 × 25 = 1050 kg
Total weight of group B = 28 × 40 = 1120 kg
Total weight of whole class = 2170 kg

$$\text{Average weight of whole class} = \frac{2170}{70} = 31 \text{ kg}$$

19. (C) According to the question,

	Man	:	Woman	:	Girl
Efficiency →	6	:	3	:	1

$$\text{Money received by (woman + girl)} = \frac{10000}{10} \times 4 = ₹\,4000$$

20. (C) $4\% = \frac{1}{25}$, $5\% = \frac{1}{20}$, $6\% = \frac{3}{50}$

25 —— 26
20 —— 21
50 —— 53
25,000 —— 28938
×2 ↓ ×2
50,000 57876

CI = 57876 – 50000 = ₹ 7876

21. (A)

C.P		S.P	
100		110	4 more
5% less → 95	20% Profit →	114	↓
			7 (given)

$$\text{C.P of suitcase} = \frac{7}{4} \times 100 = ₹\,175$$

22. (D) They left with 85% money it means they spent 15%.
By alligation method,

Nitya : Purnima
12% 20%
15%
Ratio of sum → 5 : 3

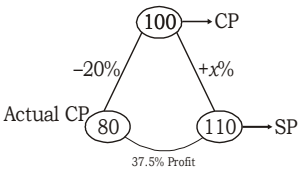
Amount of Nitya = $\frac{1200}{8} \times 5 = ₹\ 750$

Amount of Purnima = $\frac{1200}{8} \times 3 = ₹\ 450$

After spending of 12%, amount left with Nitya = $\frac{750 \times 88}{100} = ₹\ 660$

23. (D) The remainder will be same.
On dividing 9 by 6, remainder = 3
On dividing 81 by 6, remainder = 3

24. (A)



Let the initial weight = 100 unit and the cost price of 1 unit weight is ₹ 1
According to the question,

Gain % = $37\frac{1}{2}\% = \frac{3}{8} \rightarrow$ Profit
$\rightarrow$ CP

C.P = 8 units S.P = 11 units
↓×10 ↓×10
80 110

$x\% = \frac{(110-100)}{100} \times 100 = 10\%$

25. (D)

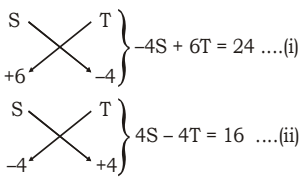
	No. of Pen		Rupees
Buy	4	⟶	15
	or 12	⟶	45
Sell	6	⟶	25
	or 12	⟶	50

Profit	Number of Pens
5	12
↓×5	↓×5
25	60

Profit percentage = $\frac{50-45}{45} \times 100$

$= \frac{5}{45} \times 100 = \frac{1}{9} \times 100 = 11\frac{1}{9}\%$

26. (A)



From equation (i) and (ii)

$-4S + 6T = 24$

$4S - 4T = 16$

On adding, $2T = 40$

$T = 20$ hours

Put the value of T in equation (ii)

$4S - 80 = 16$

$S = 24$ km/h

Distance = $24 \times 20 = 480$ km

27. (A) A : B

Efficiency → 2 : 1

According to the question,

Both A and B take 4 days to complete the work, then total work = $(2 + 1) \times 4 = 12$ units

Time taken by B = $\frac{12}{1}$ = 12 days

28. (B) Height of pole = 100 m

Work done by spiderman in 2 minutes = 1 m

Time taken by spiderman to climb 96 m

i.e. 96 + 4 = 100 meter

= $96 \times 2 + 1$ min = 3 hrs 13 min

29. (C)

	Water	:	Milk	
same	30	:	170	→ 200
	1×30	:	7×30	→ 240

$87.5\% \rightarrow \frac{7}{8}$

Additional milk required = (210 – 170) = 40 litres

30. (A) Total surface area of tank without top = $30 \times 20 + 2(12 \times 20) + 2(30 \times 12) = 1800$ m^2

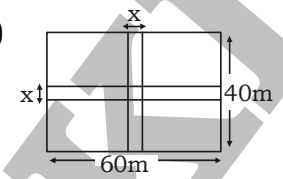
Area of iron sheet = T.S.A without top

Length × width = 1800

Length = $\frac{1800}{3}$ = 600 m

Cost = 600×10 = ₹ 6000

31. (A)



Total area of park = $60 \times 40 = 2400$ m^2

Area of lawn = 2109 m^2 (given)

Area of the cross roads = 2400 – 2109 = 291 m^2

$x(60 + 40 - x) = 291$

$x^2 - 100x + 291 = 0$

$(x - 97)(x - 3) = 0$

$x = 3$ or 97

$x = 3$ [$x = 97$ is not possible]

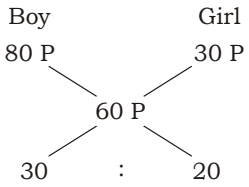
32. (C) Water Poured by the man = $\frac{4}{3}$ litres/min

Water Poured by the woman = $\frac{3}{4}$ litres/min

Required time to fill 200 litres of water = $\frac{200}{\frac{4}{3}+\frac{3}{4}} = \frac{200\times 12}{25}$

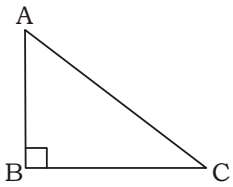
96 min = 1 hour 36 min.

33. (C) Average ₹/student= $\frac{3900P}{65}$ = 60 paise



Then number of girls = $\frac{2}{5}$ × 65 = 26

34. (C)



AB × BC = $\frac{AC^2}{2}$ = AC^2 = 2AB × BC

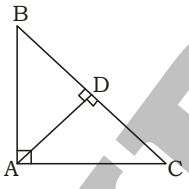
$AB^2 + BC^2 = 2AB \times BC$

$(AB - BC)^2 = 0$

AB = BC

∴ ∠BAC = ∠ACB = 45°

35. (C)



In ΔABC,

AD ⊥ BC

ΔBAC ~ ΔADC

∴ The Ratio of area of two similar triangles = Ratio of square of their corresponding sides

Hence, $\frac{ar(\text{BAC})}{ar(\text{ADC})}$

$= \frac{BC^2}{AC^2} = \frac{64}{36}$

$= \frac{16}{9}$ = 16 : 9

36. (D) $a - b = x + y - x + y = 2y$

$b - c = x - y - x - 2y = -3y$

$c - a = x + 2y - x - y = y$

ATQ,

$$a^2 + b^2 + c^2 - ab - bc - ca = \frac{1}{2}\left[(a-b)^2 + (b-c)^2 + (c-a)^2\right]$$

$$= \frac{1}{2}\left[(2y)^2 + (-3y)^2 + y^2\right] = \frac{1}{2} \times 14y^2 = 7y^2$$

37. (A) $\sec^2\theta + \tan^2\theta = 7$

$1 + \tan^2\theta + \tan^2\theta = 7$

$2\tan^2\theta = 7 - 1 = 6$

$\tan^2\theta = 3$

$\tan\theta = \sqrt{3}$

$\theta = 60°$

38. (C) $5\tan\theta = 4$

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

Now,

$$\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta}$$

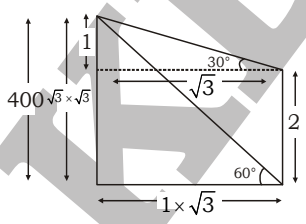
$$= \frac{5 \cdot \frac{\sin\theta}{\cos\theta} - \frac{3\cos\theta}{\cos\theta}}{5 \cdot \frac{\sin\theta}{\cos\theta} + \frac{2\cos\theta}{\cos\theta}}$$

$$= \frac{5\tan - 3}{5\tan\theta + 2} = \frac{5 \times \frac{4}{5} - 3}{5 \times \frac{4}{5} + 2}$$

$$= \frac{4-3}{4+2} = \frac{1}{6}$$

39. (B) In a cyclic quadrilateral opposite angles are supplementary.

40. (C)



3 — 400

$$1 — \frac{400}{3}$$

$\therefore$ The height of the pillar is $= \frac{400}{3} \times 2 = \frac{800}{3}$ m

41. (A) $\sec x + \cos x = 3$

Square both sides,

$\sec^2 x + \cos^2 x + 2 \sec x \cdot \cos x = 9$

$\sec^2 x + \cos^2 x = 9 - 2 = 7$

Now,

$\tan^2 x - \sin^2 x = \sec^2 x - 1 - (1 - \cos^2 x)$ $[\because \sec^2 x - \tan^2 x = 1]$

$= \sec^2 x + \cos^2 x - 2$

$= 7 - 2 = 5$

42. (B) $\frac{x^2}{by+cz} = \frac{y^2}{cz+ax} = \frac{z^2}{ax+by} = 1$

So, $x^2 = by + cz$; $y^2 = cz + ax$, $z^2 = ax + by$

$$\frac{a}{a+x} + \frac{b}{b+y} + \frac{c}{c+z}$$

$$= \frac{ax}{ax+x^2} + \frac{by}{by+y^2} + \frac{cz}{cz+z^2}$$

$$= \frac{ax}{ax+by+cz} + \frac{by}{by+cz+ax} + \frac{cz}{cz+ax+by}$$

$$= \frac{ax+by+cz}{ax+by+cz} = 1$$

Short trick:-

Let a = b = c = 1 and x = y = z = 2

Because these value satisfy $\frac{x^2}{by+cz} = \frac{y^2}{cz+ax} = \frac{z^2}{ax+by} = 1$

$$\frac{a}{a+x} + \frac{b}{b+y} + \frac{c}{c+z} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$$

43. (D) For maximum value,

$a = b = c = d = \frac{1}{4}$

$(1 + a)(1 + b)(1 + c)(1 + d) = \left(\frac{5}{4}\right)^4$

44. (C) Total unsold tyres = [40 × 0.4 + 52 × 0.25 + 60 × 0.5 + 70 × 0.2 + 72 × 0.6 + 90 × 0.4] × 1000
= 152200

45. (B) $B_{sold} = 65 \times 0.8 = 52$

$A_{unsold} = 52 \times 0.25 = 13$

$\therefore$ Required ratio = $\frac{52}{13} = \frac{4}{1} = 4 : 1$

46. (D) Total tyres produced = 45 + 48 + 64 + 62 + 65 + 80 = 364 thousand

Total tyres sold = 45 × 0.5 + 48 × 0.4 + 64 × 0.75 + 62 × 0.6 + 65 × 0.8 + 80 × 0.5
= 218.9 thousand

Total unsold tyres = 364 – 218.9 = 145.1 thousand

Required difference = 218.9 – 145.1 = 73.8 thousand = 73800

47. (D) $Sold_A = 52 \times 0.75 = 39$ thousand
$Sold_B = 80 \times 0.5 = 40$ thousand

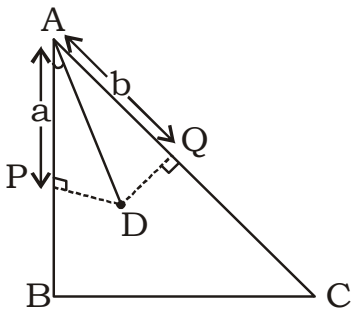
Required% = $\frac{39}{40} \times 100 = 97.5\%$

48. (A) $Sold_A = 70 \times 0.8 = 56$ thousand
$Unsold_B = 64 \times 0.25 = 16$ thousand

Required % = $\left(\frac{56-16}{16} \times 100\right)\% = 250\%$

49. (A) QC || PB

50. (C)



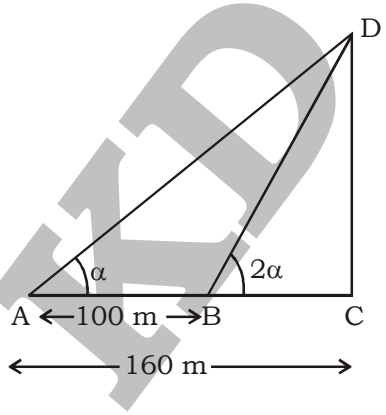
$\angle BAD = 15$ so $\angle ADB = 75°$
$\angle BAC = 45°$ so, $\angle DAQ = 45 - 15 = 30°$ and $\angle ADQ = 60°$

Now $\frac{AD}{AQ} = \frac{H}{P} = \text{cosec } 60$

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

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

51. (A)



$\tan\alpha = \frac{CD}{AC} = \frac{CD}{160}$

$\tan(2\alpha) = \frac{CD}{BC} = \frac{CD}{60}$

$$\frac{CD}{60} = \tan(2\alpha) = \frac{2\tan\alpha}{1-\tan^2\alpha}$$

$$\frac{CD}{60} = \frac{2\times\frac{CD}{160}}{1-\left(\frac{CD}{160}\right)}$$

$$\frac{CD}{60} = \frac{2\times CD}{160}\left[\frac{2\times CD\times 25600}{25600-(CD)^2}\right]$$

$$25600-(CD)^2 = \left[\frac{2\times CD\times 25600\times 60}{160-(CD)^2}\right]$$

$(CD)^2 = 25600 - 19200 = 6400$

$(CD)^2 = (80)^2$

$CD = 80$

Height of two tower = 80 m

52. (D) New ratio of fares (1st, 2nd and 3rd) = $8 \times \frac{5}{6} : 6 \times \frac{11}{12} : 3 \times 1 = 80 : 66 : 36 = 40 : 33 : 18$

Ratio of passengers = 9 : 12 : 26

Ratio of amount collected = 40 × 9 : 12 × 33 : 26 × 18 = 90 : 99 : 117

Amount collected from 1st class fares = $\frac{99}{306} \times 544 = ₹\ 176$

53. (C) Side of the square = $\sqrt{196}$ = 14 cm

Radius of circle = 2 × 14 = 28 cm

Length of rectangle = 2 × 2 × 28 = 112 cm

Breadth = $\frac{112}{2} = 56$ cm

Perimeter = 2 (112 + 56)

= (2 × 168) cm = 336 cm

54. (C) CP of 100 kg of mixture = 1100 – 300 = ₹ 800

CP of 1 kg of mixture = $\frac{800}{200} = ₹\ 4$

∴ Required ratio = 1 : 1

55. (C) Time taken by Q = x minutes.

Time taken by P = $(x + 10)$ minutes.

$$\frac{3}{4} = \frac{x}{x+10}$$

$3x + 30 = 4x$

$x = 30$ minutes

Time taken by P = 40 minutes.

Time taken by P when he doubles his speed = $\frac{40}{2}$ = 20 minutes

56. (B) Let cost of machine for the manufacturer be x.

ATQ,

$$x \times \frac{110}{100} \times \frac{120}{100} \times \frac{95}{100} = 672$$

x = ₹ 535.88

57. (C) Since $\frac{2}{5}$th of the work is completed in the 25 days, remaining $\frac{3}{5}$th of the work is to be completed in 25 days.

Let x men work in for 25 days to complete $\frac{3}{5}$th of the work.

$$\frac{M_1D_1H_1}{W_1} = \frac{M_2D_2H_2}{W_2}$$

$$\frac{25\times105\times8\times5}{2} = \frac{x\times25\times9\times5}{3}$$

$$\frac{105\times8}{2\times3} = 140$$

Additional men employed = 140 – 105 = 35

58. (C) Let he sells A grade cycle at a rate of ₹ n per bicycle

ATQ,

$$8n + \frac{22\times3}{4}n = 3150 \times 1.4$$

$32n + 66n = 17640$

$98n = 1740$

$n = 180$

$\therefore$ He should sell the first grade bicycle at a rate of ₹ 180.

59. (D) Required number of items = $\frac{(3000+1000)}{(60-40)}$

$$= \frac{4000}{20} = 200$$

60. (A) Perimeter of the largest equilateral triangle = 3 × 24 = 72

Now, triangle formed by joining the mid-points will have perimeter half of that original triangle.

Hence, the required sum = 72 + 36 + 18 + ... upon infinite terms.

This is nothing but an infinite GP, with first term (a) = 72 and common (r) = $\frac{1}{2}$

Hence, the required sum = $\frac{a}{1-r} = \left(\frac{75}{1-\frac{1}{2}}\right)$ = 144 cm

61. (C) Given that $l \parallel m \parallel n$ and t_1 and t_2 are the transversal lines, therefore $\frac{AB}{BC} = \frac{PQ}{QR}$

62. (B) $\text{Total}_D = 2400000 \times \frac{20}{100} = 480000$

$\text{Male}_D = \frac{480000}{5} \times 2 = 192000 = 1.92$ lakh

63. (A) $\text{Total}_C = 2400000 \times \frac{16}{100} = 384000$

Non-adults $= 384000 \times \frac{28}{100} = 107520$

64. (D)

65. (D) $\text{Total}_B = 2400000 \times \frac{18}{100} = 432000$

$\text{Male}_B = \frac{432000}{9} \times 5 = 240000$

$\text{Female}_B = 432000 - 240000 = 192000$

Difference $= 240000 - 192000 = 48000$

66. (D) $\text{Adult}_E = \frac{75}{100} \times \left(2400000 \times \frac{10}{100}\right) = 180000$

$\text{Male}_D = \frac{2}{5} \times \left(2400000 \times \frac{20}{100}\right) = 192000$

Required percentage $= \frac{180000}{192000} \times 100 = 93.75\%$

67. (B) Investment and Income in 2000 = ₹ x and ₹ $1.20x$

Investment and Income in 2000 = ₹ $(x - 50000)$ and ₹ $1.20x$

$\therefore$ Profit = 20 + 6 = 26%

Income in 2001 = ₹ $(x - 50000) \times (1.00+0.26)$

Thus, $1.26 (x - 50000) = 1.20x$

$x =$ ₹ 1050000

68. (D) Let each day's salary = ₹ x

Given, $18x + 8 \times \frac{x}{2} - 60 = 1700$

$22x = \frac{1760}{22}$

Monthly Salary $= \frac{1760}{22} \times 30 =$ ₹ 2400

69. (D) Let the person invest amount x and y into two different rates of interest.

ATQ,

$\frac{x \times 12 \times 1}{100} + \frac{y \times 10 \times 1}{100} = 130$

$12x + 10y = 13000$ _____(i)

$\frac{y \times 12 \times 1}{100} + \frac{x \times 10 \times 1}{100} = 134$

$12y + 10x = 13400$ _____(ii)

On solving Eqs. (i) and (ii), we get

$x = ₹\,500$ and $y = ₹\,700$

70. (C) The speeds of the trains be a m/s and b m/s.

Now, when they are moving in the same direction.

Relative speed = (a - b) m/s

$a - b = \frac{100 + 80}{18} = 10$

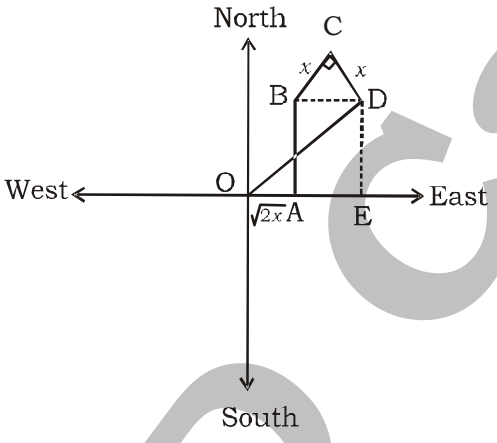
Similarly $a + b = \frac{100 + 80}{9} = 20$

By solving Eq. (i) and Eq. (ii), we get

a = 15m/s and b = 5m/s

Speed of faster train = 15 m/sec.

71. (B) In ΔBCD,



$BD^2 = BC^2 + CD^2 = x^2 + x^2$

$BD = \sqrt{2x}$

$BD = AE = \sqrt{2x}$

$OE = OA + AE = \sqrt{2}.x + \sqrt{2}.x = 2\sqrt{2x}$

$BA = DE = x$

In ΔODE,

$OD^2 = OE^2 + DE^2$

$OD = \sqrt{\left(2\sqrt{2}.x\right)^2 + x^2} = \sqrt{8x^2 + x^2} = 3x$ km

72. (A) Water that leaks in 5.5 min = 2.25 tones

Water that leaks in 60 min = $\frac{2.25}{5.5}\times 60 = \frac{1350}{55}$ tones

After pumping water that is left in boat in 60min = $\frac{1350}{55}$ - 12 = $\frac{690}{55}$ tones

92 tones water that remains in boat in $\frac{55}{690}\times 92 = \frac{22}{3}$ hr

Required speed = $\frac{77}{\frac{22}{3}} = \frac{231}{22}$ = 10.5km/h

73. (D) Let the capacity of the tank = x litres

ATQ,

Quantity of water emptied by the leak in 1 hour = $\frac{x}{20}$ litres

Quantity of water filled by the tap in 1 hour = 120 litres

According to the question,

$\frac{x}{20}-\frac{x}{30} = 120 \Rightarrow \frac{x}{10}-\frac{x}{15} = 240$

$\frac{3x-2x}{30} = 240$

$\frac{x}{30} = 240$

x = 240 × 30 = 7200 liters

74. (B) A's investments for 3 years = (250000 × 3 + 100000 × 2 + 100000 ×1) = ₹ 1005000

B's investment for 3 years = 350000 × 2 = ₹ 700000

C's investment for 3 years = 350000 × 1 = ₹ 350000

Ratio of investment of A : B: C = 1005000 : 700000 : 350000 = 3: 2 :1

B's profit = $\frac{2}{3+2+1}\times 1500000$ = ₹ 500000

75. (A) Work done/hour by a female, a male and a child are x, y and z, unit respectively.

So, $8x = 6y = 12z$

$x = \frac{3}{4}y$ and $z = \frac{Y}{2}$

9 males can complete a work in 6 days working 6 h/ day.

Work done =9 ×6 ×6y = 324y

Work done by 12 males, 12 females and 12 children in 1 day = 8h/day

$= (12y + 12x + 12z)\times 8 = \left[12y+12\times\frac{3}{4}y+12\times\frac{Y}{2}\right]\times 8 = 216y$

Days required to finish work = $\frac{324y}{216y} = 1\frac{1}{2}$ days

76. (D) X : Y : Z = ₹ (16000 × 3 + 11000 × 9 : 12000 × 3 + 17000 × 9 : 21000 × 6) = 7 : 9 : 6

(Y's share - Z's share) = $₹\left[\left(26400\times\frac{9}{22}\right)-\left(26400\times\frac{6}{22}\right)\right]$

= ₹ (10800- 7200) = ₹ 3600

77. (C) Cost price of each table watch = $250+\frac{2500}{150}=\frac{800}{3}$

Labeled price = ₹ 320

SP = 320 - 5% of 320 = 304

Profit percent = $\frac{304-\left[\frac{800}{3}\right]}{\frac{800}{3}}\times100=\frac{112}{3}\times\frac{3}{800}\times100=14\%$

78. (C) $\left(1-\frac{5}{6}\right)$ of time taken by Sneha = 1 hour 15 minutes

Time taken by Sneha = 1 hours 15 minutes × 6

= 7 hours 30 minutes

79. (B) For the Frustum For the cylinder

r_1 = 9 cm, r = 4 cm

r_2 = 4 cm, h = 10 cm

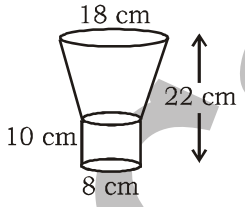
h = 12 cm

$l=\sqrt{h^2+(r_1-r_2)^2}$

$=\sqrt{12^2+(9-4)^2}$

$=\sqrt{144+25}$

$=\sqrt{169}$ = 13 cm



Area of the sheet required = area of frustum + area of cylinder

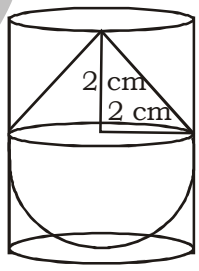
$=\pi(r_1+r_2)l+2\pi rh=\frac{22}{7}[(9+4)\times13+2\times4\times10]$

$=\frac{22}{7}[169+80]=\frac{22}{7}\times249=782.57\ cm^2$

80. (A) Volume of the toy

$=\frac{1}{3}\pi r^2h+\frac{2}{3}\pi r^2$

$=\frac{1}{3}\pi\times2\times2\times2+\frac{2}{3}\pi\times2\times2\times2$



$=\frac{8\pi}{3}+\frac{16\pi}{3}=\frac{24\pi}{3}=8\pi\ cm^3$

Volume of the cylinder = $\pi r^2h = \pi\times2\times2\times4=16\pi\ cm^3$

Required difference = $16\pi-8\pi=8\pi\ cm^3=25.12\ cm^3$

81. (D) Side of the square field = $\sqrt{31684}$ = 178 m

Perimeter of the square field = 4 × 178 = 712 m

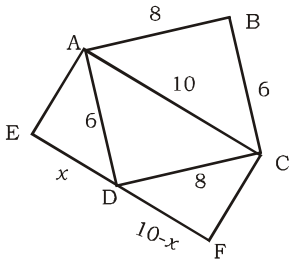
Length of the wire required to cover the field once = 105% of 712 m

= 1.05 × 712 = 747.6 m

Total length of the wire = 4 × 747.6 = 2990.4 m

82. (C) Let ED = x

Now, AC = $\sqrt{8^2+6^2}$ =10



In Δ AED,

$AE^2 = AD^2 - x^2 = 36 - x^2$ _____(i)

And in Δ CFD,

$CF^2 = (8)^2 - (10 - x)^2$ _____(ii)

From Equation (i) and (ii), we get

$36 - x^2 = 64 - (10 - x)^2$ ($\because$ AE = FC)

$36 - x^2 = 64 - (100 + x^2 - 20x)$

$20x = 72$

$x = \frac{18}{5}$

From Equation (i),

$AE^2 = 36 - \left(\frac{18}{5}\right)^2$

$AE^2 = 36 - \frac{324}{25} = \frac{900-324}{25}$

$\frac{\text{Area of rectangle ABCD}}{\text{Area of recetangle AEFC}} = \frac{8\times 6}{10\times\frac{24}{5}} = 1$

83. (C) Marked Price = ₹1500

After two successive discounts,

Selling price = $(100 - x)^2$% of 1500 = $\left(\frac{(100-x)^2}{10000}\right)\times 1500 = \left(\frac{(100-x)^2}{20}\right)\times 3$

Given,

$3\left(\frac{(100-x)^2}{20}\right) = 1500 - 587.40 = 912.60$

$(100 - x)^2 = 6084$

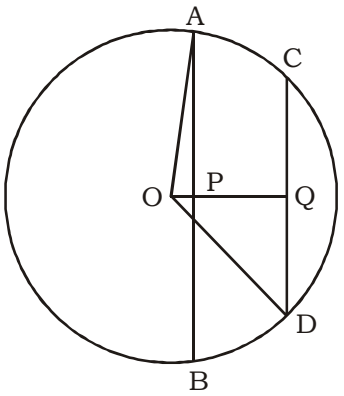
$100 - x = \pm 78$

x = 22, 178 (invalid as discount% can't be greater than 100)

so, x = 22%

And new selling price = $\left[\frac{(100-22)}{100}\right]$ of 1500 = ₹ 1170

84. (A)



CD = 12 cm, AB = 20 cm, OA = OD = $5\sqrt{(13)}$ cm

PQ is the distance between the chords AB and CD, so OQ is perpendicular to CD and OP is perpendicular to AB.

So, AP = PB and CQ = QD and ΔAPO and ΔDQO are right angled triangles.

In ΔAPO, $OA^2 = OP^2 + PA^2$

$$\left(5\sqrt{(13)}\right)^2 = OP^2 + \left(\frac{AB}{2}\right)^2$$

$OP^2 = 325 - 100 = 225$

$OP = 15$

In ΔDQO,

$OD^2 = OQ^2 + QD^2$

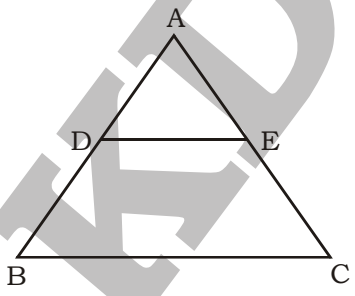
$$\left(5\sqrt{(13)}\right)^2 = (OP + PQ)^2 + \left(\frac{CD}{2}\right)^2$$

$(15 + PQ)^2 = 325 - 36 = 289$

$15 + PQ = 17$

$PQ = 2$ cm

85. (B)



Here, AD × AC = AB × AE

$$\frac{AD}{AB} = \frac{AE}{AC}$$

So, DE is parallel to BC. Then,

$\angle ADE = \angle ABC = \angle ACB + 30°$ and $\angle ABC = 78°$

Then, 78° = $\angle ACB = 30°$

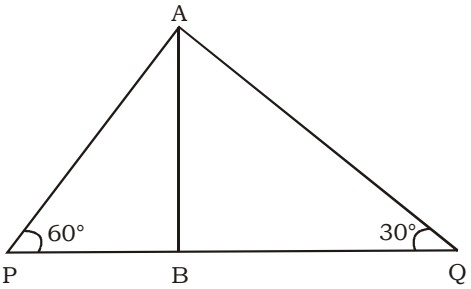
$\angle ACB = 48°$

Now, $\angle A + \angle ACB + \angle ABC = 180°$

$\angle A + 48° + 78° = 180°$

$\angle A = 54°$

86. (A)



ATQ,

Here, PQ = $84\sqrt{3}$ m

$\tan 60° = \frac{AB}{PB} = \sqrt{3}$

$AB = \sqrt{3}\,PB$

and $\tan 30° = \frac{AB}{BQ} = \frac{1}{\sqrt{3}}$

$\frac{AB}{\left(84\sqrt{3} - PB\right)} = \frac{1}{\sqrt{3}}$

$AB = \frac{\left(84\sqrt{3} - PB\right)}{\sqrt{3}}$

Then, $\sqrt{3}PB = \frac{\left(84\sqrt{3} - PB\right)}{\sqrt{3}}$

$PB = 21\sqrt{3}$

Therefore, $AB = \sqrt{3} \times 21\sqrt{3} = 63$ m

87. (D) Radius of sector = 10.5 cm
Central angle = 120°

Then, circumference of the base of cone = $\left(\frac{120}{360}\right) \times 2 \times \pi \times 10.5 = 7\pi$ cm

Now, circumference of base of cone = 2 × π × radius of cone = 7π
Radius of cone = 3.5 cm
And, slant height of cone = length of sector = 10.5 cm

Then, height of cone = $\sqrt{\left(10.5^2 - 3.5^2\right)} = 7\sqrt{2}$ cm

Therefore, volume of cone = $\left(\frac{1}{3}\right) \times \pi \times 3.5^2 \times 7\sqrt{2} = \frac{343\sqrt{2}}{12}\pi \text{ cm}^3$

88. (D) Let the original number of boys and girls be $5x$ and $3x$ respectively and that of new boys and girls be $5y$ and $7y$ respectively.

$5x + 3x + 5y + 7y = 1200$

$2x + 3y = 300$ ..... (i)

and $\frac{5x+5y}{3x+7y} = \frac{7}{5}$

$25x + 25y = 21x + 49y$

$4x = 24y$

$x = 6y$ ..... (i)

From equation (i),

$4x + 6y = 600$

$5x = 600$

$x = 120$

Original no. of students = $8x = 960$

89. (A) Ratio of first and second class fares = 3 : 1

and Ratio of no. of passengers = 1 : 50

Ratio of total amount from 1st & 2nd class passengers = 3 × 1 : 1 × 50 = 3 : 50

So, Amount collected from 2nd class passengers = $\left(\frac{50}{52}\times 1325\right)$ = ₹ 1250

90. (A) Let x= number of months (from starting) after which C joined the business.

So, Ratio of shares of Profit = 30,000 × 12 : 40,000 × 8 : 50,000 × x = 32 : 36 : $5x$

C's share $= \frac{5x}{36+32+5x} = \frac{5x}{68+5x}$

Given, $\frac{5x}{68+5x} = \frac{15000}{49000} \Rightarrow x = 6$

C joined the business (i.e. 6-4) =2 months after joining of B

91. (D) Part of tank filled in one hour by inlet pipe $= \frac{1}{12} - \frac{1}{15} = \frac{1}{60}$ part

So, the inlet pipe can fill the tank in 60 hrs.

Inlet pipe fills water at the rate of 5 litres per minute

Capacity of tank = (60 × 60 × 5) litres = 18000 litres

92. (C) Let $p(x) = ax^3 + 3x^2 - 8x + b$

$(x + 2)$ is a factor of $p(x)$

$P(-2) = 0$

$a(-2)^3 + 3(-2)^2 - 8(-2) + b = 0$

$-8a + 12 + 16 + b = 0$

$-8a + b + 28 = 0$ ..... (i)

Again,

$(x-2)$ is factor of $p(x)$

$P(2) = 0$

$a(2)^3 + 3(2)^2 - 8.2 + b = 0$

$8a + b - 4 = 0$ ..... (ii)

On adding (1) & (2), we have

$2b + 24 = 0$

$b = -12$

On substituting b = -12 in (2)

$8a - 12 - 4 = 0$

$a = 2$

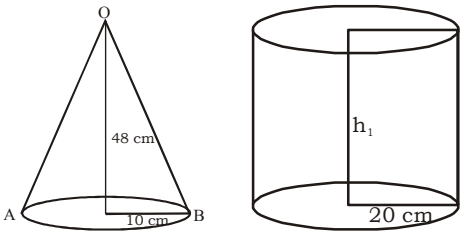
93. (C) $CF \parallel AB$

$\angle BCF = \angle ABC$ (alternate interior angles) = 85^0

(Given) $\angle$ BCE = $\angle$ BCF + $\angle$ ECF
= 85^0 + 20^0 = 105^0
$\angle BAD = \angle BCF$

(Angles in the alternate segment) = 105^0

94. (D) r = 10 cm
h = 48 cm



Volume of the water in the conical vessel = Volume of the water in the cylindrical vessel.

$\frac{1}{3}\pi r^2 h = \pi r_1^2 h_1$

$\frac{1}{3} \times (10)^2 \times 48 = (20)^2 \times h_1$

$h_1 = \frac{10 \times 10 \times 48}{20 \times 20 \times 3} = 4$ cm

95. (A) r = $\frac{7}{2}$ cm
h = 12 cm

Volume of the water in pipe in 1 sec. = $\pi r^2 h = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12 = 66 \times 7$ cm^3

Volume of water stored in (3600 seconds)1 hr. = 66× 7 × 3600 cm^3 = 1663200 cm^3

= $\frac{1663200}{1000000}$ m^3 = 1.6632 m^3 = 1663.2 litres

96. (B) Profit of the company A in the year 2005 = ₹ 1.84 lakh
In the year 2006, 25% rise in the profit of the company A.
So, the profit of the company A in the year 2006 = 1.84 × 1.25 = ₹ 2.3 lakh

97. (A) According to graph, it is clear that the profit of the companies A and B increased every year.
Minimum profit in the year 2004 and
Maximum profit in the year 2009 by both companies.
Ratio cannot be determined because numerical value are not given.
So, only statement I is true.

98. (D) Required percentage = $\frac{35-20}{20} \times 100\% = 75\%$

99. (C) Profit of company B in the year 2008 = ₹ 4.63 lakh

Profit of company B in the year 2006 = ₹ 4.63 × $\frac{100}{120} \times \frac{100}{125}$ = ₹ 2.42 lakh

100. (D) Required average = $\frac{20+15+25+30+35+30}{6}$

= $\frac{155}{6} = 25\frac{5}{6}\%$

QUANTITATIVE ABILITY - 74 (ANSWER KEY)

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