QUANTITATIVE ABILITY - 71 (SOLUTION)

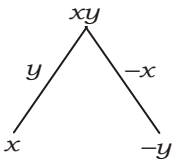
1. (B) $x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]$

$= \frac{1}{2}(332 + 333 + 335)[(332 - 333)^2 + (333 - 335)^2 + (335 - 332)^2]$

$= \frac{1}{2} \times 1000[(-1)^2 + (-2)^2 + (3)^2] = \frac{1}{2} \times 1000[1 + 4 + 9]$

$= 500 \times 14 = 7000$

2. (D)



Required time = $\frac{xy}{y - x}$

3. (D) From option,
Let first number be 6, second be 10, third be 14 and fourth be 18.
ATQ,
6 + 5 = 10 + 1 = 14 – 3 = 18 – 7 =11
So, all are equal

4. (B) Quantity of milk = $729 \times \frac{7}{9}$ = 567 ml

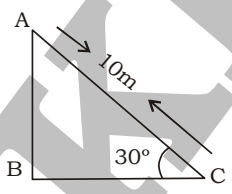
Quantity of Water = 162 ml
Let x ml water be added.
ATQ,

$\frac{567}{162 + x} = \frac{7}{3}$

$162 + x = 243$

$x = 81$ ml

5. (A)



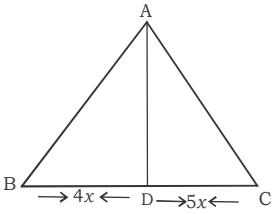
In $\triangle ABC$,

$\cos 30^\circ = \frac{BC}{AC}$

$\frac{\sqrt{3}}{2} = \frac{BC}{10}$

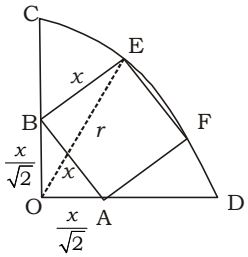
BC = 8.66 m

6. (B)



Area of Δ ADC = $\left(\frac{5}{4}\times 60\right)$ sq. cm = 75 sq. cm

7. (D)



Radius = OE

OB = OA = $\frac{x}{\sqrt{2}}$

$\angle$EBO = 90° + 45°

cos$\angle$EBO = cos (90 + 45)°

$$\cos(90+45^\circ) = \frac{BE^2 + OB^2 - OE^2}{2\times BE\times OB}$$

$$-\sin 45^\circ = \frac{x^2 + \left(\frac{x}{\sqrt{2}}\right)^2 - OE^2}{2\times x\times \frac{x}{\sqrt{2}}}$$

$$-\frac{1}{\sqrt{2}} = \frac{x^2 + \frac{x^2}{2} - OE^2}{\sqrt{2}\times x^2}$$

$OE^2 = \frac{5x}{2}$

OE = $\sqrt{\frac{5}{2}}\,x$

8. (B) Total C.P of the rice = 30 × 70 + 20 × 70.75 = 2100 + 1415 = ₹ 3515

Total S.P of rice = 50 × 80.50 = ₹ 4025

So, profit = 4025 – 3515 = ₹ 510

9. (C) tan4°.tan43°.tan47°.tan86°

= tan(90°–86°). tan(90°–47°).tan47°. tan86°

= cot86°. cot47°. tan47° . tan86° = 1

10. (A) $x\cos\theta - \sin\theta = 1$

Let $\theta = 0°$

$x\cos0° - \sin0° = 1$

$x \times 1 - 0 = 1$

$x = 1$ .....(i)

$x^2 + (1 + x^2)\sin\theta°$

$= x^2 + (1 + x^2)\sin0°$

$= x^2 + (1 + x^2) \times 0$

$= x^2$ *or* $(1)^2 = 1$

11. (A) Area A = πr^2 .....(i)

C = $2\pi r$ .....(ii)

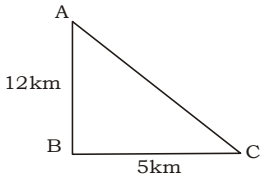
Dividing equation (i) by (ii),

$$\frac{A}{C} = \frac{\pi r^2}{2\pi r}$$

$$\frac{A}{C} = \frac{r}{2}$$

$2A = Cr$

12. (D)

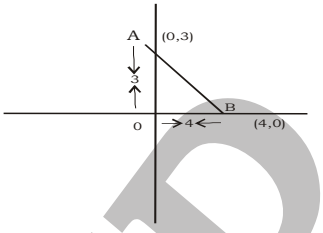


In $\triangle$ ABC,

$AC = \sqrt{12^2 + 5^2} = \sqrt{144 + 25}$

$= \sqrt{169} = 13$ km

13. (B)



$AB = \sqrt{3^2 + 4^2} = \sqrt{9+16}$

$= \sqrt{25} = 5$ units

14. (C) $\frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{3-\sqrt{8}}$

$$= \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} \times \frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}+\sqrt{5}} + \frac{1}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{\sqrt{8}+\sqrt{7}}{\sqrt{8}+\sqrt{7}} + \frac{1}{3-\sqrt{8}} \times \frac{3+\sqrt{8}}{3+\sqrt{8}}$$

$$= \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2-(\sqrt{6})^2} - \frac{\sqrt{6}+\sqrt{5}}{(\sqrt{6})^2-(\sqrt{5})^2} + \frac{\sqrt{5}+2}{(\sqrt{5})^2-2^2} - \frac{\sqrt{8}+\sqrt{7}}{(\sqrt{8})^2-(\sqrt{7})^2} + \frac{3+\sqrt{8}}{3^2-(\sqrt{8})^2}$$

$= \sqrt{7} + \sqrt{6} - \sqrt{6} - \sqrt{5} + \sqrt{5} + 2 - \sqrt{8} - \sqrt{7} + 3 + \sqrt{8} = 5$

15. (A) Required percentage = $\frac{10 + 5 + 4 + 3}{9 + 15 + 18 + 22 + 14 + 10 + 5 + 4 + 3} \times 100$

$= \frac{22}{100} \times 100 = 22\%$

16. (C) Required percentage = $\frac{4 + 3}{9 + 15 + 18 + 22 + 14 + 10 + 5 + 4 + 3} \times 100$

$= \frac{7}{100} \times 100 = 7\%$

17. (B) Required percentage = $\frac{18 + 22}{9 + 15 + 18 + 22 + 14 + 10 + 5 + 4 + 3} \times 100$

$= \frac{40}{100} \times 100 = 40\%$

18. (A) $x + y = 2z$

$x = 2z - y$

$x - z = 2z - y - z$

$x - z = z - y$

$\therefore \quad \frac{x}{x-z} + \frac{z}{y-z}$

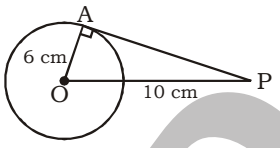
$= \frac{x}{x-z} - \frac{z}{z-y}$

$= \frac{x}{x-z} - \frac{z}{x-z}$

$= \frac{x-z}{x-z} = 1$

19. (B) Length of train = $\frac{350}{27-9} \times 9 = \frac{350 \times 9}{18} = 175$ m

20. (D)



So, length of PA = $\sqrt{(PO)^2 - (OA)^2}$

$= \sqrt{(10)^2 - (6)^2} = 8$ cm

21. (C) $\tan\theta = \frac{p}{q}$ [Given]

$\therefore \quad \frac{p\sin\theta - q\cos\theta}{p\sin\theta + q\cos\theta} = \frac{\frac{p}{q}\tan\theta - 1}{\frac{p}{q}\tan\theta + 1}$

$= \frac{\frac{p}{q} \times \frac{p}{q} - 1}{\frac{p}{q} \times \frac{p}{q} + 1} = \frac{p^2 - q^2}{p^2 + q^2}$

22. (A) Weight of the new man = 42 + 15 × 1.6
= 42 + 24.0 = 66.0 kg

23. (C) Let the number of students appeared in school X = 100
Number of students qualified in school X = 70
According to question,
Number of students appeared in School Y = 120
Number of students qualified in School Y = 70 + 50% of 70 = 70 + 35 = 105

$\therefore$ Required percentage = $\frac{105\times100}{120}$ = 87.5%

24. (C) $\frac{\cos^2 45^\circ}{\sin^2 60^\circ} + \frac{\cos^2 60^\circ}{\sin^2 45^\circ} - \frac{\tan^2 30^\circ}{\cot^2 45^\circ} - \frac{\sin^2 30^\circ}{\cot^2 30^\circ}$

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

$= \frac{\frac{1}{2}}{\frac{3}{4}} + \frac{\frac{1}{4}}{\frac{1}{2}} - \frac{\frac{1}{3}}{1} - \frac{\frac{1}{4}}{3} = \frac{2}{3} + \frac{1}{2} - \frac{1}{3} - \frac{1}{12}$

$= \frac{8+6-4-1}{12} = \frac{14-5}{12}$

$= \frac{9}{12} = \frac{3}{4}$

25. (D) If equations have no solution,
then,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\frac{2}{6} = \frac{-k}{-12} \neq \frac{15}{15}$

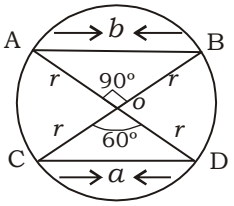
$6k = 24$

$k = 4$

26. (C) Required time = $\frac{4\times\frac{165}{60}}{16.5}$ hour

$= \frac{4\times165}{16.5\times60} \times 60$ = 40 minutes

27. (B)



$\because$ Δ COD is a equilateral triangle.

$\therefore$ $a = r$

$\because$ Δ AOB is an isosceles triangle.

So, $\angle OBA = 45°$

$\sin 45° = \frac{r}{b}$

$\frac{1}{\sqrt{2}} = \frac{r}{b}$

$b = \sqrt{2}\, r \text{ or } \sqrt{2}\, a$

28. (B) Arithmetic mean of first n natural number = $\frac{n+1}{2}$

29. (A) One side of cube = $\frac{20}{4}$ = 5 cm

Area of cube = $5^3 = 125$ cm^3

30. (D) $\left[\sqrt{6}+\sqrt{2}\right]^2 < \left[\sqrt{5}+\sqrt{3}\right]^2$

$\left(\sqrt{6}\right)^2 + \left(\sqrt{2}\right)^2 + 2\sqrt{6} \times \sqrt{2} < \left(\sqrt{5}\right)^2 + \left(\sqrt{3}\right)^2 + 2 \times \sqrt{5} \times \sqrt{3}$

$6+2+2\sqrt{12} < 5+3+2\sqrt{15}$

$8 + 2\sqrt{12} < 8 + 2 + 2\sqrt{15}$

So, Statement (i) and (iii) are incorrect.

31. (C) Rate = $12\frac{1}{2}\% = \frac{1}{8}$

Amount		Instalment	
8×9		9	×9
64		81	
136		81	
	×50		×50
₹6800		₹4050	

32. (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

33. (C) S.I = 956 – 800 = ₹ 156

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

New rate = 10.5%

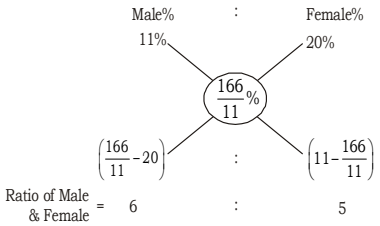
∴ S.I = $\frac{800 \times 3 \times 10.5}{100}$ = ₹ 252

Amount = 800 + 252 = ₹ 1052

34. (A) Population of the village = 5500

After increment new population of the village = 6330

Percentage increment = $\frac{(6330 - 5500)}{5500} \times 100 = \frac{166}{11}\%$



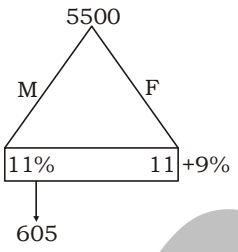
According to the question,

11 units = 5500

1 unit = 500

Number of females = 500 × 5 = 2500

Short trick:-



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

35. (C) Let the total valid votes be 100%.

Then second candidate got = (100 – 52 – 12)% = 36%

According to the question,

36% = 28800

100% = 28800 × $\frac{100}{36}$ = 800,00

Hence total valid votes = 80,000

Total votes polled = 80,000 + 10,000 = 90,000

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

36. (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

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

37. (C) According to the question,

$$n \times \frac{90}{100} \times \frac{80}{100} \times \frac{75}{100} = 270$$

$$n = \frac{270 \times 10 \times 10 \times 100}{9 \times 8 \times 75}$$

n = 500 chocolates

Short trick:-

$10\% = \frac{1}{10}$, $20\% = \frac{1}{5}$, $25\% = \frac{1}{4}$

ATQ,

Quantity	Remaining
10	9
5	4
4	3
200	108
×2.5 ↓	×2.5 ↓
500	270

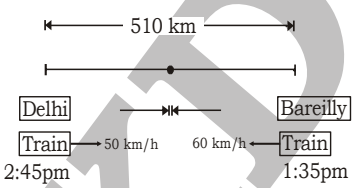
38. (C) According to the question,

Man : Woman : Girl

Efficiency→ 6 : 3 : 1

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

39. (C)



Let R is a point where both the trains meet.

Till 2 : 45 pm the distance covered by the second train= $\frac{70}{60}$ × 60 = 70 km

Remaining distance = 510 – 70 = 440 km

Now relative speed of both trains = 50 + 60 =110 km/h

Required time of meeting = $\frac{440}{110}$ = 4 hours

Distance from Delhi to meeting point R = 4 × 50 = 200 km

40. (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

41. (A)

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

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

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

Sonam : Mona
12% 20%
15%
5 : 3

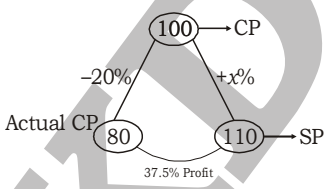
Amount of Sonam = $\frac{1200}{8} \times 5$ = ₹ 750

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

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

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

44. (A)



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

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

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

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

45. (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 = $\frac{50-45}{45} \times 100 = 11\frac{1}{9}\%$

46. (A)

S — T
+6 — –4 } –4S + 6T = 24 ....(i)

S — T
–4 — +4 } 4S – 4T = 16 ....(ii)

From equation (i) and (ii)

$-4S + 6T = 24$

$4S - 4T = 16$

$2T = 40$

$T = 20$ hours

Put the value of T in equation (ii),

$4S - 80 = 16$

$S = 24$ km/h

Distance = 24 × 20 = 480 km

47. (A)

	A	:	B
Efficiency →	2	:	1

According to the question,

Both A and B take 4 days to complete the work

Total work = (2 + 1) × 4 = 12 units

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

48. (D) Total Distance = 240 × 5 = 1200 km

Then required speed to cover the same distance in $1\frac{2}{3}$ hours, i.e. is in $\frac{5}{3}$ hrs = $\frac{1200}{\frac{5}{3}}$

= $\frac{1200 \times 3}{5}$ = 720 km/hr.

49. (B) Discount offered by Sonu = $25 + 5 - \frac{25 \times 5}{100}$ = 28.75%

Discount offered by Monu = $16 + 12 - \frac{16 \times 12}{100}$ = 26.08%

Buying from Sonu is more preferable.

50. (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 × 2 + 1 min = 3 hrs 13 min

51. (C)

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

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

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

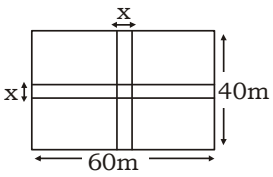
52. (A) Total surface area of tank without top = 30 × 20 + 2(12 × 20) + 2(30 × 12) = 1800 m^2
Area of iron sheet = T.S.A without top
Length × width = 1800

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

$\therefore$ Cost = 600 × 10 = ₹ 6000

53. (B) $4x - 3y = 13$
Cubing both sides,
$(4x - 3y)^3 = (13)^3$
$64x^3 - 27y^3 - 3 \times 4x \times 3y\,(4x - 3y) = 2197$
$64x^3 - 27y^3 - 36\,(14)(13) = 2197$
$64x^3 - 27y^3 = 2197 + 6552$
$64x^3 - 27y^3 = 8749$

54. (A)



Total area of park = 60 × 40 = 2400 m^2
Area of lawn = 2109 m^2 (given)
Area of the cross roads = 2400 – 2109 = 291 m^2
ATQ,
$x(60 + 40 - x) = 291$
$x^2 - 100x + 291 = 0$
$(x - 97)(x - 3) = 0$
$x = 3$ or 97
$x = 3$ [$x = 97$ is not possible]

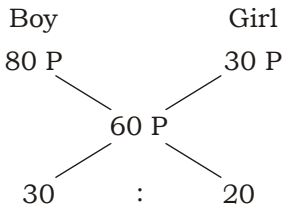
55. (C) Water Poured by the man = $\frac{4}{3}$ litres/min

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

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

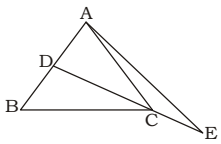
= 96 min = 1 hour 36 min.

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



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

57. (D)



ΔABC is equilateral,
∠BCD = ∠DCA = 30° (CD bisects ∠ACB)
ACE = 180° – 30° = 150°
AC = CE

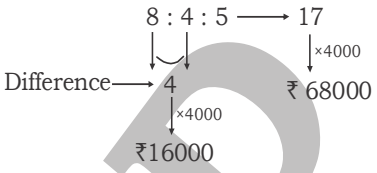
∠CAE = ∠CEA = $\frac{30}{2}$ = 15°

58. (A) Larger Radius (R) = 14 + 7 = 21 cm
Smaller Radius (r) = 7 cm

∴ Area of shaded portion = $\pi\frac{30°}{360°}(21 \times 21 - 7 \times 7)$

= $\frac{22}{7} \times \frac{1}{12} \times 392 = 102.67$ cm²

59. (D) Ratio of A, B and C = $\frac{1}{2}:\frac{1}{4}:\frac{5}{16}$



60. (A) $\left(x+\frac{1}{x}\right)^2 = 3$

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

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

= $3\sqrt{3} - 3\sqrt{3} = 0$

$x^6 + 1 = 0$

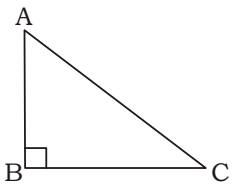
∴ $x^{206} + x^{200} + x^{90} + x^{84} + x^{18} + x^{12} + x^6 + 1$

= $x^{200}(x^6 + 1) + x^{84}(x^6 + 1) + x^{12}(x^6 + 1) + (x^6 + 1) = 0$ $[\because x^6 + 1 = 0]$

61. (B) Maximum value of $(2\sin\theta + 3\cos\theta) = \sqrt{a^2 + b^2}$

$= \sqrt{4+9} = \sqrt{13}$

62. (C)



In $\triangle$ ABC,

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

$AC^2 = 2AB \times BC$

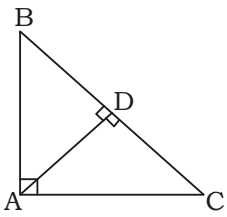
$AB^2 + BC^2 = 2AB \times BC$

$(AB - BC)^2 = 0$

$AB = BC$

$\therefore$ $\angle BAC = \angle ACB = 45°$

63. (C)



In ΔABC,

$AD \perp BC$

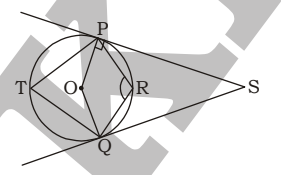
$\Delta BAC \sim \Delta ADC$

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

Hence, $\frac{ar(BAC)}{ar(ADC)} = \frac{BC^2}{AC^2} = \frac{64}{36}$

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

64. (D)



$\angle OPS = \angle OQS = 90°$

$\angle PSQ = 20°$ (Given)

$\angle POQ = 160°$ [$\angle PSQ + \angle POQ = 180°$]

$PTQ = 80°$

PRQT is a cyclic quadrilateral

$\therefore$ $\angle PRQ = 180° - 80° = 100°$

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

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

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

ATQ,

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

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

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

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

$2\tan^2\theta = 6$

$\tan^2\theta = 3$

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

$\theta = 60°$

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

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

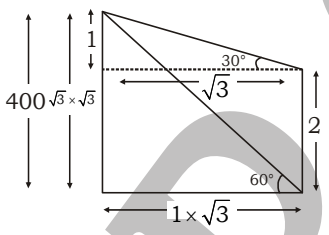
$$\therefore \quad \frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta} = \frac{5 \cdot \frac{\sin\theta}{\cos\theta} - \frac{3\cos\theta}{\cos\theta}}{5 \cdot \frac{\sin\theta}{\cos\theta} + \frac{2\cos\theta}{\cos\theta}}$$

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

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

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

69. (C)



3 unit — 400

1 unit — $\frac{400}{3}$

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

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

$$\therefore \quad x + \frac{1}{x} = 7$$

$$x^2 + \frac{1}{x^2} = 47$$

71. (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, $\tan^2 x - \sin^2 x$

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

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

$= 7 - 2 = 5$

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

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

$\therefore \quad \dfrac{a}{a+x} + \dfrac{b}{b+y} + \dfrac{c}{c+z} = \dfrac{ax}{ax+x^2} + \dfrac{by}{by+y^2} + \dfrac{cz}{cz+z^2}$

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

Short trick:-

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

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

$\therefore \quad \dfrac{a}{a+x} + \dfrac{b}{b+y} + \dfrac{c}{c+z} = \dfrac{1}{3} + \dfrac{1}{3} + \dfrac{1}{3} = 1$

73. (B) $\cos\theta = \dfrac{15}{17}$

$\sec\theta = \dfrac{1}{\cos\theta} = \dfrac{17}{15}$

$\therefore \quad \cot(90 - \theta) = \tan\theta$

$= \sqrt{\sec^2\theta - 1} = \sqrt{\left(\dfrac{17}{15}\right)^2 - 1}$

$= \sqrt{\dfrac{289}{225} - 1} = \sqrt{\dfrac{289-225}{225}}$

$= \sqrt{\dfrac{64}{225}} = \dfrac{8}{15}$

74. (D) For maximum value,

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

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

75. (B) $12 \times 12 \times 12 = 1728 = 1728 - 1720 = 8$
∴ Required number = 8

76. (B) Total grain production of state:
P = 45 + 103 + 27 + 29 = 204 lakh tonnes
Q = 48 + 86 + 73 + 19 + 15 = 241 lakh tonnes
R = 59 + 32 + 67 + 14 + 31 = 203 lakh tonnes
S = 41 + 37 + 59 + 21 + 15 = 173 lakh tonnes
Obviously, State Q had the highest grain production.

77. (C) Total rice Production = 393 lakh tonnes
Total wheat Production = 331 lakh tonnes
∴ Required Ratio = 393 : 331 = 1.2 : 1

78. (A) In the states Q, R and S, Jowar recorded highest production.

79. (D) Required percentage = $\frac{103}{331} \times 100 \approx 30\%$

80. (C) Average per hectare yield of rice = 30 tonnes
Total rice production = 393 lakh tonnes
∴ Required area = $\frac{393}{30}$ = 13.1 = 13 lakh hectare

81. (A) $100 \times 35 = 3500$
$200 \times 5 = 1000$
Total work = 4500
$200 \times 5 = 100 \times x$
10 days = x
Total days = 35 + 10 = 45 days
Extra days = 45 – 40 = 5 days

82. (C) Let the income of Ram = ₹ 100

Expenditure on food = $100 \times \frac{25}{100}$ = ₹ 25

After increase of 20%, income = $100 \times \frac{120}{100}$ = ₹ 120

ATQ,
Expenditure is same in both cases.

∴ Expenditure = $\frac{25}{120} \times 100 = ₹\frac{250}{12}$

Percentage expenditure = 20.833%
Percentage decrease in expenditure = 25 – 20.833 = 4.16%

83. (D) Interest after 10 years at the rate of 5% = ₹ 500

Time = $\frac{500 \times 100}{1500 \times 5} = 6\frac{2}{3}$ years

∴ Required time = $\left(10 + 6\frac{2}{3}\right)$ years = $16\frac{2}{3}$ years

84. (B) Let the required number be x.

ATQ,

$x^2 + 5^2 = 386$

$x^2 = 386 - 25$

$x^2 = 361$

$x = \sqrt{361} = 19$

85. (B) Let the minimum score be x.

Maximum score = $x + 100$

ATQ,

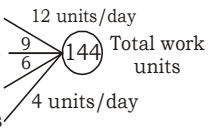
$28 \times 38 + x + x + 100 = 30 \times 40$

$1064 + 2x + 100 = 1200$

$2x = 1200 - 1164 = 36$

$x = 18$

86. (D) A → 12 days, B → 16 days, C → 24 days, D → 36 days



Work done on first day = 12 units

On second day = 12 + 9 = 21 units

On third day = 21 + 6 = 27 units

On fourth day = 27 + 4 = 31 units

On fifth day = 31 units and so on.

Work done in five days = 91 + 31 = 122 units

Remaining work = 144 – 122 = 22 units

∴ Total time = $5\frac{22}{31}$ days

87. (D) Required number of students = L.C.M of 6, 8, 12 and 16 = 96

88. (A) 1 cow : 1 calf

Old cost → 4000 : 2800

↓+20% ↓+30%

New Cost → 4800 3640

ATQ,

Price of 1 dozen cows = 4800 × 12 = 57600

Price of 2 dozen calves = 3640 × 24 = 87360

Total cost = 57600 + 87360 = ₹ 144960

89. (D) Simple interest of 2 years = 20%

Compound interest of 2 years = 21%

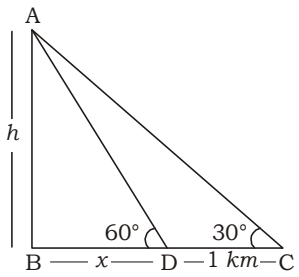
Difference between simple and compound interest = 1%

↓×130

130

∴ Principal = 130 × 100 = ₹ 13000

90. (A)



Height of balloon = AB = h km

BD = x km, CD = 1 km

In ΔABD,

$$\tan 60° = \frac{AB}{BD}$$

$$\sqrt{3} = \frac{h}{x}$$

$$x = \frac{h}{\sqrt{3}} \text{ km} \qquad \text{.....(i)}$$

In ΔABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{\frac{h}{\sqrt{3}} + 1}$$

$$\sqrt{3}h = \frac{h}{\sqrt{3}} + 1$$

$$\sqrt{3}h - \frac{h}{\sqrt{3}} = 1$$

$$\frac{3h - h}{\sqrt{3}} = 1$$

$$2h = \sqrt{3}$$

$$h = \frac{\sqrt{3}}{2} \text{km}$$

91. (C) S.I. $= \frac{6000 \times 5 \times 2}{100} =$ ₹ 600

$$\text{C.I.} = 5000\left[\left(1 + \frac{8}{100}\right)^2 - 1\right] = 5000\left[\left(\frac{27}{25}\right)^2 - 1\right]$$

$$= 5000\left[\left(\frac{729 - 625}{625}\right)\right] = 5000 \times \frac{104}{625} = ₹\ 832$$

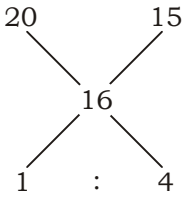
Difference = (₹ 832 – 600) = ₹ 232

92. (D) $\sqrt{24010000} = 4900$

Again $\sqrt{4900} = 70$

$\therefore \quad \sqrt[4]{24010000} = 70$

93. (D) From alligation,

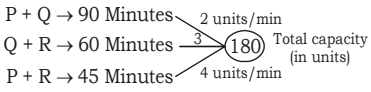


$\therefore$ Required ratio = 1 : 4

94. (A) Average height $= \frac{6\times1.15+8\times1.10+6\times1.12}{20} = \frac{6.9+8.8+6.72}{20}$

$= \frac{22.42}{20} = 1$ m 12.1 cm

95. (A)



Efficiency of (P + Q + R) = $\frac{2+3+4}{2} = 4.5$ units/min

Efficiency of P = (4.5 – 3) = 1.5 units/min

Efficiency of Q = (4.5 – 4) = 0.5 units/min

Efficiency of R = (4.5 – 2) = 2.5 units/min

Required time for P = $\frac{180}{1.5}$ = 120 min

Required time for Q = $\frac{180}{0.5}$ = 360 min

Required time for R = $\frac{180}{2.5}$ = 72 min

96. (B)

Initial	Present
100	103
40	41
20	21
80,000	88683
↓×2	↓×2
1,60,000	1,77,366

Hence, Present population = 1,77,366

97. (D)

A	:	B	:	C	:	D
2	:	3	:	3	:	3
4	:	4	:	3	:	3
2	:	2	:	2	:	3
16	:	24	:	18	:	27 → 85
		↓×60		↓×60		↓×60
		1440		1620		5100

Required total of B and D = ₹ 3060

98. (A) Work done by A in 1 day = Work done by B in 3 days

	A	**:**	**B**
Time	1	:	3
Efficiency	3	:	1

Now total work = 3 × 2 + 9 × 1 = 15 units

Required time for A to complete the work = $\frac{15}{3}$ = 5 days

Required time for B to complete the work = $\frac{15}{1}$ = 15 days

99. (A) A + B + C earns in one day = $\frac{2700}{18}$ = ₹ 150

A + C earns in one day = ₹ 94

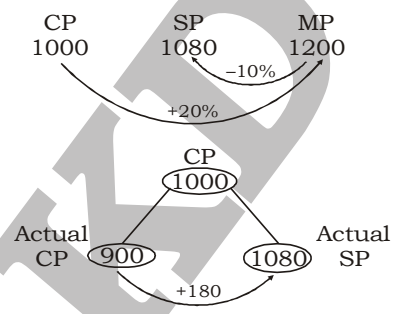
B + C earns in one day = ₹ 76

Earning of A = 150 – 76 = ₹ 74

∴ Earning of C = 94 – 74 = ₹ 20

100. (C) Let the initial price = ₹ 1000 the price of 1 gm weight is ₹ 1.

ATQ,



Percentage profit = $\frac{180}{900}$ × 100 = 20%

QUANTITATIVE ABILITY - 71 (ANSWER KEY)

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