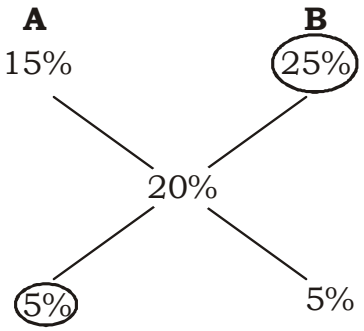
QUANTITATIVE ABILITY - 70 (SOLUTION)

1. (A)



So,

	CP	SP
A	100	115
B	100	125

10 units = 4800

100 units = 48000

CP of each cycle = ₹ 48,000

2. (C) From question:

$\Delta s \propto \sqrt{n}$

$\Delta s = k\sqrt{n}$ ...(i)

where $\Delta s \rightarrow$ reduction in speed, $n \rightarrow$ no. of wagons

$\Delta s = (36 - 30) = 6$ km/h, $n = 9$

Put values in equation (i),

$6 = k\sqrt{9}$

$k = 2$

For maximum wagons $\Rightarrow \Delta s = 36$ km/h

$36 = 2\sqrt{n}$

$n = 324$

Maximum wagons (n) = 324 – 1 = 323

3. (D) Let the rate of interest allowed by the bank is R.

Interest after 3 years = $\frac{12000 \times R \times 3}{100}$ = ₹ 360R

Interest after 5 years = $\frac{12000 \times 10 \times 5}{100}$ = ₹ 6000

ATQ,

6000 – 360 R = 3320

$R = \frac{2680}{360} = 7\frac{4}{9}\%$

4. (A) Total quantity of petrol consumed in 3 years = $\left(\frac{4000}{7.50}+\frac{4000}{8}+\frac{4000}{8.50}\right)$ litres

= $4000\left(\frac{2}{15}+\frac{1}{8}+\frac{2}{17}\right)$ litres = $\left(\frac{76700}{51}\right)$ litres

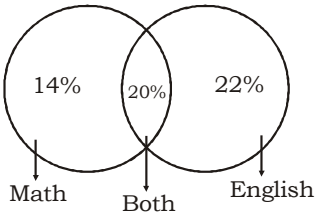
Total amount spent = ₹ (3 × 4000) = ₹ 12000

∴ Average cost = ₹ $\left(\frac{12000\times 51}{76700}\right)$ = ₹ $\frac{6120}{767}$ = ₹ 7.98

5. (A) If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

∴ $\frac{a^2}{bc}+\frac{b^2}{ca}+\frac{c^2}{ab}=\frac{a^3+b^3+c^3}{abc}=\frac{3abc}{abc}=3$

6. (A)



100% – 56% = 44%

7. (C) $\frac{1}{\text{cosec}^2 51°}+\sin^2 39°+\tan^2 51°-\frac{1}{\sin^2 51°\cdot\sec^2 39°}$

= $\sin^2 51° + \sin^2 39° + \tan^2 51° - \frac{\cos^2 39°}{\sin^2 51°}$

= $\sin^2 51° + \cos^2 51° + \tan^2 51° - \frac{\sin^2 51°}{\sin^2 51°}$

= $1 + \tan^2 51° - 1 = \tan^2 51°$

= $\cot^2 39°$

= $\text{cosec}^2 35° - 1 = x^2 - 1$

8. (B) $(x^4 + x^{-4}) = 322$

$x^4+\frac{1}{x^4}=322$

∴ $x^2+\frac{1}{x^2}=18$

$x^2+\frac{1}{x^2}-2=16$

$\left(x-\frac{1}{x}\right)^2=4$

$x - x^{-1} = 4$

9. (C) $2(\cos^2\theta - \sin^2\theta) = 1$

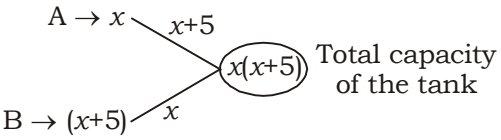
$\cos^2\theta - \sin^2\theta = \frac{1}{2}$

$\therefore$ $\cos 2\theta = \cos 60°$

$2\theta = 60°$

$\theta = \frac{60°}{2} = 30°$

10. (B) Let the time taken by the faster pipe (A) = x hours



Then time taken by the slower pipe B = $(x + 5)$ hours

ATQ,

$\frac{x(x+5)}{x+(x+5)} = 6$

$x^2 + 5x = 12x + 30$

$x^2 - 7x - 30 = 0$

$x^2 - 10x + 3x - 30 = 0$

$x(x - 10) + 3(x - 10) = 0$

$(x - 10)(x + 3) = 0$

$x = 10$ hours

11. (A) TSA of the remaining solid = $2\pi rh + \pi r^2 + \pi rl$ $\quad (\because\ l = \sqrt{h^2 + r^2})$

$= 2 \times \pi \times 3 \times 4 + \pi \times 9 + \pi \times 3 \times 5$

$= \pi [24 + 9 + 15] = \pi [48]\ cm^2$

12. (A) S.I for 1 year = 10%

C.I for 1 year half yearly = 10.25%

$\therefore$ 0.25% = 180

100% = ₹ 72,000

13. (A) $a = \frac{4}{3}$ (Given)

$27a^3 - 108\ a^2 + 144a - 317$

$= 27 \times \frac{64}{27} - 108 \times \frac{16}{9} + 144 \times \frac{4}{3} - 317$

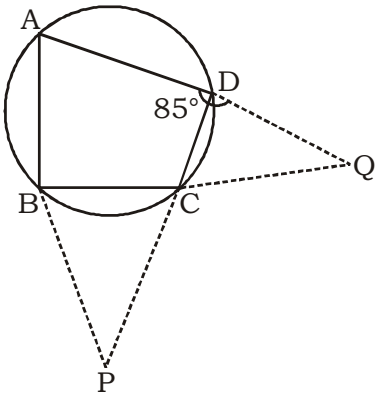
$= 64 - 192 + 192 - 317 = -253$

14. (B) $\cot 18° \left[\cot 72 \cdot \cos^2 22° + \frac{1}{\tan 72° \sec^2 68°}\right]$

$= \tan 72° \left[\frac{\cos^2 22°}{\tan 72°} + \frac{\cos^2 68°}{\tan 72°}\right]$

$= \tan 72° \times \frac{1}{\tan 72°} [\cos^2 22° + \cos^2 68°] = 1 \times 1 = 1$

15. (B)



$\angle ADC = 85°$

$\therefore$ $CDQ = 180° - 85 = 95°$

$\angle PBC = \angle ADC = 85°$

In ΔBCD,

$\angle PBC + \angle CPB + \angle BCP = 180°$

$85° + 40° + \angle BCP = 180°$

$\angle BCP = 180° - 125° = 55°$

$\therefore$ $\angle DCQ = \angle BCP = 55°$

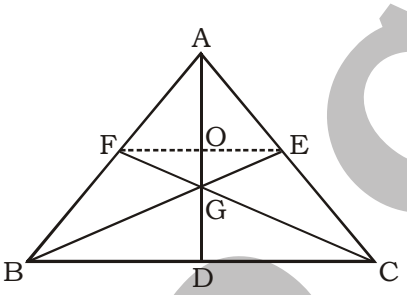
In ΔCDQ,

$\angle C + \angle D + \angle Q = 180°$

$55° + 95° + Q = 180$

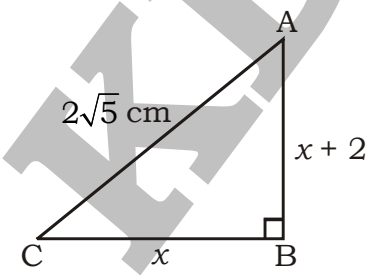
$\angle Q = 180° - 150° = 30°$

16. (C)



$\therefore$ AO : OG = 3 : 1

17. (D)



$(x + 2)^2 + x^2 = \left(2\sqrt{5}\right)^2$

$x^2 + 4 + 4x + x^2 = 20$

$x^2 + 2x = 8$

$x^2 + 2x - 8 = 0$

$x^2 + 4x - 2x - 8 = 0$

$(x + 4)(x - 2) = 0$

$x = 2$

Now, $\cos^2 A - \cos^2 C$

$$\left(\frac{4}{2\sqrt{5}}\right)^2 - \left(\frac{2}{2\sqrt{5}}\right)^2$$

$$\frac{16}{20} - \frac{4}{20} = \frac{12}{20} = \frac{3}{5}$$

18. (A) Let radius = $5x$ cm and height = $12x$ cm

$$V = \frac{1}{3}\pi \times (5x)^2 \times 12x$$

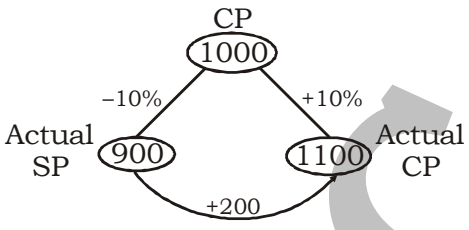
$$314 = \frac{1}{3} \times 3.14 \times 25 \times 12 \times x^3$$

$$\frac{300}{25 \times 12} = x^3$$

$x = 1$

$$l = \sqrt{h^2 + r^2} = \sqrt{5^2 + 12^2} = 13 \text{ cm}$$

19. (B) Let the cost price of 1 gm weight is ₹ 1.



$$\text{Profit\%} = \frac{200}{900} \times 100 = 22\frac{2}{9}\%$$

20. (A) Area of equilateral $\Delta = \frac{\sqrt{3}}{4}\text{side}^2$

$$\therefore \quad 121\sqrt{3} = \frac{\sqrt{3}}{4}\text{side}^2 = 121 \times 4$$

$\text{Side}^2 = 11^2 \times 2^2$

Side = 22 cm

$\because$ Perimeter of equilateral Δ = Circumference of circle

$$\therefore \quad 3 \times 22 = 2 \times \frac{22}{7} r$$

$$r = \frac{21}{2} \text{ cm} = 10.5 \text{ cm}$$

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 10.5 \times 10.5 = 346.5 \text{ cm}^2$$

21. (B) Right cylinder's volume = It's curved surface area

$\therefore$ $\pi r^2 h = 2\pi rh$

$r = 2$ units

22. (B) Let the age of father and son 10 years ago be $3x$ and x years respectively.

ATQ,

$(3x + 10) + 10 = 2[(x + 10) + 10]$

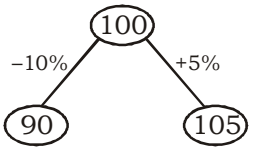
$3x + 20 = 2x + 40$

$x = 20$

$\therefore$ Required ratio = $(3x + 10) : (x + 10) = 70 : 30 = 7 : 3$

23. (C) Let the cost price of the watch = ₹ 100

ATQ,

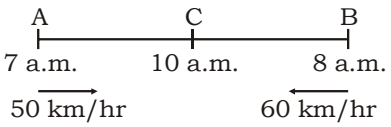


Loss = ₹ 10

Profit = ₹ 5

Required % = $\frac{10}{5} \times 100 = 200\%$

24. (B)

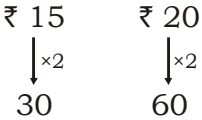


AC = Distance covered by train starting from A in 3 hours = 50 × 3 = 150 km

BC = Distance covered by train starting from B in 2 hours = 60 × 2 = 120 km

$\therefore$ AC : BC = 150 : 120 = 5 : 4

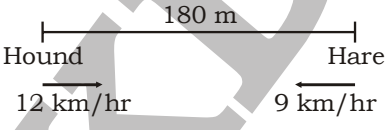
25. (A)



$\frac{15 \times 2 + 20 \times 3}{2 + 3} = \frac{90}{5} = 18$

Required rate = ₹ 18/kg

26. (A)



ATQ,

Hound chases Hare after 1 min then distance covered by Hare in 1 min = $\frac{9 \times 5 \times 60}{18}$ = 150 m

Total distance travelled by hound to catch rabbit = (180 + 150) = 330 m

Now both are moving in same direction then relative speed = (12 – 9) km/h = 3 km/h

Time taken by hound to catch the Hare = $\frac{330 \times 18}{3 \times 5}$ = 396 sec

Distance travelled by hound = $396 \times 12 \times \frac{5}{18}$ = 1320 m

27. (C) Difference in percentage of votes = (54 – 46)% = 8%
8% of total votes = 14400

54% of total votes = $\frac{14400 \times 54}{8}$ = 97200

28. (B) Let his expenditure be ₹ $39x$ and savings be $24x$.
ATQ,
$39x + 24x = 14490$
$63x = 14490$

$x = \frac{14490}{63} = 230$

His monthly expenditure = $39x$ = 39 × 230 = ₹ 8970

29. (B) Total increased weight = $\frac{1}{4} \times 44 = 11$ kg

$\therefore$ Weight of the new man = 44 + 11 = 55 kg

30. (A) (A + B)'s 1 day's work = $\frac{1}{16}$ _____(i)

(B + C)'s 1 day's work = $\frac{1}{12}$ _____(ii)

(C + A)'s 1 day's work = $\frac{1}{24}$ _____(iii)

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

2(A + B + C)'s 1 day's work = $\frac{1}{16} + \frac{1}{12} + \frac{1}{24} = \frac{3+4+2}{48} = \frac{9}{48}$

(A + B + C)'s 1 day's work = $\frac{9}{96}$

$\therefore$ All three together will complete the work = $\frac{96}{9} = 10\frac{2}{3}$ days

Shortcut:-

A + B	16	3
B + C	12 — 48	4
C + A	24	2
2(A + B + C)		9

All three together will complete the work in = $\frac{48}{9} \times 2 = 10\frac{2}{3}$ days

31. (B) Pipe A fills the tank in 45 minutes.

$\therefore$ Tank filled by A in 30 min = $\frac{30}{45} = \frac{2}{3}$

Remaining part = $1 - \frac{2}{3} = \frac{1}{3}$

1 part is filled by pipe B in 51 min.

$\frac{1}{3}$ part is filled in = $\frac{1}{3} \times 51 = 17$ min

Shortcut:

A 45 ——— 17
765
B 51 ——— $\frac{15}{32}$

Work done by A and B in 30 minutes = 32 × 30 = 960
Work not done by B = 960 – 765 = 195

Tab B was turned off = $30 - \frac{195}{15}$ = 17 min

32. (C) Let ₹ x and ₹ y be the cost price of two goats.
64% of x = 144% of y

$$\frac{x}{y} = \frac{144}{64} = \frac{9}{4}$$

$x : y = 9 : 4$

∴ Cost price of first goat = ₹ $\left(\frac{9}{13} \times 728\right)$ = ₹ 504

33. (B) Let the sum lent in each case be ₹ x.

$$\frac{x \times 11 \times 2}{100} + \frac{x \times 12 \times 2}{100} = ₹\ 828$$

$$\frac{22x + 24x}{100} = ₹\ 828$$

$46x$ = ₹ 82800

x = ₹ 1800

34. (B) Let the total number of students = 100
∴ 18 students speak none of the two languages.
∴ 82 students speak either Hindi or German.
Let x students speak both languages.
$100 - 65 - x + x + 35 + x = 100 - 82$
$x = 18$

35. (B) $S = 1 - \frac{1}{10} + \frac{1}{10^2} - \frac{1}{10^3} + \ldots\ldots\ldots \infty$

It is Geometric series to infinity

$a = 1$ and common ratio $(r) = \frac{-1}{10}$

∴ $S_\infty = \frac{a}{1-r} = \frac{1}{1-\left(\frac{-1}{10}\right)} = \frac{10}{11} = 0.\overline{90}$

∴ The value correct up to 6 places of decimal = 0.909090

36. (C) Distance = $\frac{7\times8}{8-7} \times \frac{6}{60} = \frac{56}{10}$ = 5.6 km

Shortcut:-

Speed		Time	Actual Time
7		8	+6 min late
	56		
8		7	0 min
		1 hour or 60 min	6 min

Actual distance = $\frac{6}{60}$ × 56 = 5.6 km

37. (B) t = 4, u = 12, v = 8

Distance between A and B = $\frac{t(u^2-v^2)}{2u}$

$= \frac{4(144-64)}{2\times12}$ = 13.33 km

38. (A) Number of teachers in Physics = 1800 × $\frac{17}{100}$ = 306

Number of female teachers in Physics = $\frac{2}{9}$ × 306 = 2 × 34 = 68

Number of male teachers = 306 – 68 = 238

Required percentage = $\frac{238}{23\times18} \times 100 \approx 57\%$

39. (B) Required number of teachers = 62% of 1800 = 1116

40. (B) Teachers who teach English + Physics = 44% of 1800
Teachers who teach Mathematics + Biology together = 25% of 1800
Required difference = 19% of 1800 = 342

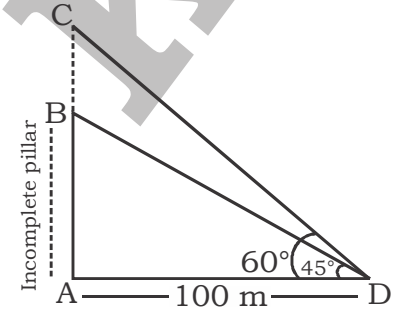
41. (D) Required ratio = 13 : 8

42. (C) New strength of Mathematics teachers = 234 + ($\frac{1}{2}$ × 13% of 1800 = 117) = 351

New strength of Hindi teachers = $\frac{3}{4}$ × 8% of 1800 = 108

Collective strength of both subject teachers = 357 + 108 = 459

43. (B)



AB is a incomplete pillar and BC is a extended height.
$\angle ADB = 45°$ and $\angle ADC = 60°$

$$\tan 45° = \frac{AB}{AD}$$

$$1 = \frac{AB}{100}$$

$AB = 100$ m

In ΔACD,

$$\tan 60° = \frac{AC}{AD}$$

$$\therefore \quad \frac{\sqrt{3}}{1} = \frac{BC+100}{100} = BC + 100 = 100\sqrt{3}$$

$$\therefore \quad BC = 100\sqrt{3} - 100 = 100\left(\sqrt{3}-1\right) \text{ m}$$

44. (A) Let the larger number be x and smaller number be y.
ATQ,

$$x - \frac{y}{2} = \left(y - \frac{y}{2}\right) \times 5$$

$$\frac{2x-y}{2} = \frac{y}{2} \times 5$$

$$2x - y = 5y$$

$$2x = 6y \Rightarrow \frac{x}{y} = \frac{6}{2}$$

$x : y = 3 : 1$

45. (A) From the question we have,

$$\frac{\pi(r-n)^2}{\pi r^2} = \frac{1}{2}$$

$r^2 = 2(r - n)^2$

$$r^2 - \left\{\sqrt{2}(r-n)\right\}^2 = 0$$

$$\left\{r - \sqrt{2}(r-n)\right\}\left\{r + \sqrt{2}(r-n)\right\} = 0$$

Since $r + \sqrt{2}\ (r-n) \neq 0$, we have

$r - \sqrt{2}\ (r-n) = 0$

$r - \sqrt{2}\ r + r - \sqrt{2}\ n = 0$

$r - \sqrt{2}\ r + \sqrt{2}\ n = 0$

$\sqrt{2}\ n = \sqrt{2}\ r - 1$

$\sqrt{2}\ n = r\left(\sqrt{2}-1\right)$

$$n = \frac{\sqrt{2}n}{\sqrt{2}-1}$$

46. (C) Area of square = 22 cm^2

Perimeter of the square = $4\sqrt{22}$ cm

Now, this perimeter is the circumference of the circle.

Circumference of the circle = $2\pi r = 4\sqrt{22}$

$\therefore \quad r = \dfrac{2\sqrt{22}}{\pi}$

Area of the circle = $\pi r^2 = \pi\left(\dfrac{2\sqrt{22}}{\pi}\right)^2$

$= \dfrac{\pi \times 4 \times 22}{\pi^2} = \dfrac{4 \times 22}{\pi} = \dfrac{4 \times 22 \times 7}{22} = 28 \text{ cm}^2$

47. (D) Area of the quadrilateral = $\dfrac{1}{2}$ × any diagonal × (sum of perpendiculars drawn on diagonal from two vertices) = $\dfrac{1}{2}$ × D × (P_1 + P_2)

$= \dfrac{1}{2} \times 23 \times (17 + 7) = 2 \times 23 = 276$ sq cm

48. (B) $\cos\theta = \dfrac{15}{17}$; $\sec\theta = \dfrac{17}{15}$

$\therefore \quad \cot(90° - \theta) = \tan\theta = \sqrt{\sec^2\theta - 1}$

$= \sqrt{\left(\dfrac{17}{15}\right)^2 - 1} = \sqrt{\dfrac{289 - 225}{225}} = \dfrac{8}{15}$

49. (A) $\dfrac{2\sin\theta - \cos\theta}{\cos\theta + \sin\theta} = 1$

Dividing numerator and denominator by $\sin\theta$,

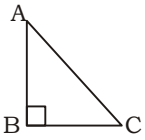
$\dfrac{2 - \cot\theta}{\cot\theta + 1} = 1$

$2 - \cot\theta = \cot\theta + 1$

$2\cot\theta = 1$

$\cot\theta = \dfrac{1}{2}$

50. (B)



$\frac{AB}{BC} = \frac{2}{1}$

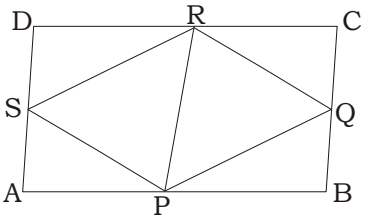
AB = 2k, BC = k

$\therefore$ AC = $\sqrt{(2k)^2 + k^2}$ = $\sqrt{5k^2}$ = $\sqrt{5}k$

sinA + cot C = $\frac{BC}{AC} + \frac{BC}{AB} = \frac{k}{\sqrt{5}k} + \frac{k}{2k}$

= $\frac{1}{\sqrt{5}} + \frac{1}{2} = \frac{2+\sqrt{5}}{2\sqrt{5}}$

51. (B)

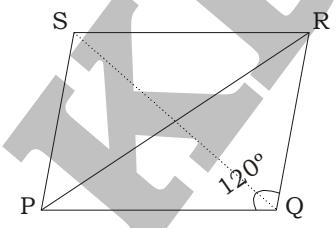


Area of ($\Delta PRS + \Delta PQR$) = $\frac{1}{2}$ (area of ||gm APRD) + $\frac{1}{2}$ (area of ||gm BPRC)

If a triangle and a ||gm are on the same base & between the same parallel, the area of triangle is half the area of ||gm = $\frac{1}{2}$ (area are ||gm ABCD)

= $\frac{1}{2}$ × 40 = 20 cm²

52. (D)



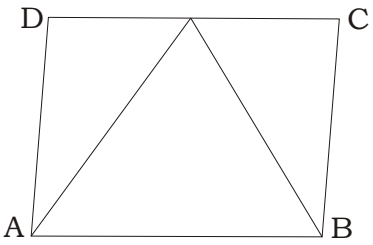
$\angle SPQ$ = 180° – 120° = 60°

And $\angle PSQ$ = 180° – 60° – 60° = 60°

$\therefore$ ΔPSQ is an equilateral triangle.

Hence, SQ = PQ = QS = 36 cm

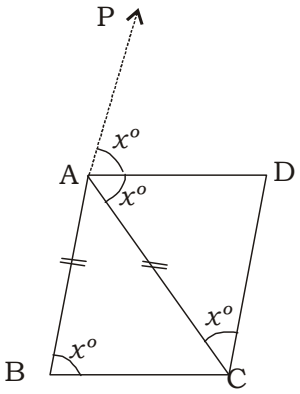
53. (D)



So, Area of parallelogram (P) and area of rhombus (R) are same because their base is same and are between same parallel lines. Also area of triangle is half of area of parallelogram (P) or area of rhombus (R).

Hence, R = P = 2T

54. (A)



$\because$ AB = AC $\Rightarrow \angle B = \angle C = x^o$ (Say)

Now, $\angle PAC = \angle B + \angle C$ (Exterior angle sum property)

$2\angle CAD = x^o + x^o$ ($\because$ AD bisects $\angle PAC$)

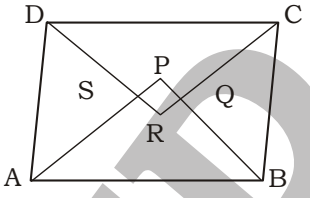
$\angle CAD = x^o = \angle ACB$ (Which are alternate interior angles)

Hence AD $\parallel$ BC

Also AD $\parallel$ CD (given)

$\square$ ABCD is a $\parallel$gm.

55. (A)



$\angle A + \angle B = 180^o$ (Adjacent angles of a $\parallel$gm are supplementary)

$\frac{1}{2}\angle A + \frac{1}{2}\angle B = 90^o$ ($\because$ AP & BP are bisector of $\angle A$ & $\angle B$ respectively)

$\angle APB = 90^o$ or $\Rightarrow \angle QPS = 90^o$.....(i)

Again $\angle B + \angle C = 180^o$

$\frac{1}{2}\angle B + \frac{1}{2}\angle C = 90^o$

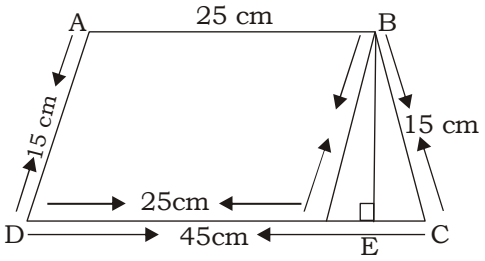
$\angle BQC = 90^o$

$\therefore$ $\angle PQR = \angle BQC = 90^o$.....(ii)

Similarly we can show that $\angle PSR = \angle SRQ = 90^o$

Hence $\square$ PQRS is a rectangle.

56. (B)

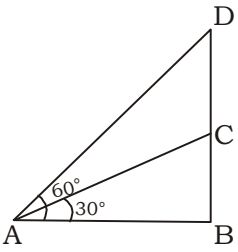


$BE = \sqrt{15^2 - 10^2} = \sqrt{125} = 5\sqrt{5}$ cm

Area $= \frac{1}{2}(25 + 45)\ 5\sqrt{5}$

$= \frac{1}{2} \times 70 \times 5\sqrt{5} = 175\sqrt{5}$ cm²

57. (D)



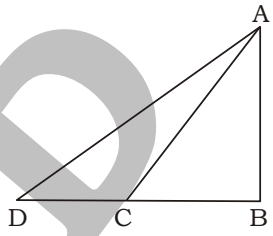
Height of the aeroplane at C (BC) = 3125 m
ATQ,

$AB = BC \cot 30° = 3125 \times \sqrt{3}$

Distance of aeroplane at C from the ground = $3125\sqrt{3}$
BD = AB tan 60°

$= 3125\sqrt{3} \times \sqrt{3} = 9375$ m
Height of aeroplane at D from the ground = 9375 m
Distance between both aeroplanes = 9375 – 3125 = 6250 m

58. (C)



Let height of the monument = x m
ATQ,

$\frac{AB}{BD} = \tan(\angle ADB) = \frac{1}{5}$

$5AB = BD$ …(i)

$\frac{AB}{BC} = \tan(\angle ACB) = \sqrt{\sec^2(\angle ACB) - 1}$

$AB = (BD - 138)\sqrt{\frac{193}{144} - 1}$

$AB = (BD - 138)\left(\frac{7}{12}\right)$ ...(ii)

Putting the value of BD in equation (ii),

$12\ AB = (5AB - 138) \times 7$

$12\ AB = 35\ AB - 138 \times 7$

$23\ AB = 138 \times 7$

$AB = 42$ m

59. (C) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$a^2 + b^2 + c^2 = (27\sqrt{29})^2 - 2\ (ab + bc + ca)$

Also, $3a = 4b = 6c$

$\frac{a}{12} = \frac{b}{9} = \frac{c}{6} = k$

$a = 12k,\ b = 9k,\ c = 6k$

$a + b + c = 27k = 27\sqrt{29}$

$k = \sqrt{29}$

So, $a = 12\sqrt{29}$, $b = 9\sqrt{29}$ and $c = 6\sqrt{29}$

$ab + bc + ca = (108 + 54 + 72)\ 29$

$ab + bc + ca = 234 \times 29$

Now, we have

$a^2 + b^2 + c^2 = 27^2 \times 29 - 2\ (ab + bc + ca)$

$= 27^2 \times 29 - 2 \times 234 \times 29 = 29\ (27^2 - 468)$

$= 29\ (729 - 468) = 29 \times 261 = 7569$

60. (D) $x^4 + \frac{1}{x^4} = 322$

$\left(x^2 + \frac{1}{x^2}\right)^2 = 322 + 2 = 324$

$x^2 + \frac{1}{x^2} = 18$

$\left(x - \frac{1}{x}\right)^2 = 18 - 2 = 16$

$x - \frac{1}{x} = 4$

61. (B) We have the given expression as

$x^2 + 4y^2 + 4y - 4xy - 2x - 8$

$= x^2 - 2xy - 4x - 2xy + 4y^2 + 8y + 2x - 4y - 8$

$= x\ (x - 2y - 4) - 2y\ \ (x - 2x - y) + 2\ (x - 2y - 4)$

$= (x - 2y - 4)\ (x - 2y + 2)$

So, we have $(x - 2y - 4)\ (x - 2y + 2)$ as two factors of the given polynomial.

62. (C) Given:

$x = (b - c)\ (a - d)$

$y = (c - a)\ (b - d)$

$z = (a - b)\ (c - d)$

$\therefore\ \ x + y + z = (b - c)\ \ (a - d) + (c - a)\ \ (b - d) + (a - b)\ (c - d) = 0$

So, $x^3 + y^3 + z^3 = 3xyz$

63. (C) We have,
$\because$ $(x-k)$, is a factor of $x^2-3x-10$
$\therefore$ $k^2-3x-10=0$
$(k+2)(k-5)$
$k=-5,-2$

64. (C) We have $m=n^2-n$
$m^2-2m=(n^2-n)^2-2(n^2-n)=n(n-1)(n^2-n-2)=(n+1)(n)(n-1)(n-2)$
As, we can observe that it is the product of 4 consecutive number.
Hence, it is divisible by 24.

65. (D) (1) $\frac{1.}{4}M^2+\frac{4}{9}N^2+\frac{2}{3}MN$

(2) $\frac{4}{9}N^2+\frac{1}{4}M^2+\frac{2}{3}MN$

(3) $\frac{M^2}{4}-\frac{4}{9}M^2-\frac{2MN}{6}+\frac{2MN}{6}$

(4) $\frac{1}{4}\left[M^2+\frac{16}{9}N^2+\frac{8MN}{3}\right]=\frac{M^2}{4}+\frac{4}{9}M^2+\frac{2MN}{3}$

Therefore;
Only (1) ,(2) and (4) are equivalent.

66. (B) $\frac{n-1}{n^{\frac{3}{4}}+n^{\frac{1}{2}}}\cdot\frac{n^{\frac{1}{2}}+n^{\frac{1}{4}}}{n^{\frac{1}{2}}+1}\cdot n^{\frac{1}{4}}$

$n=16$
$n^{1/2}=4$
$n^{1/4}=2$
$n^{3/4}=8$

$\therefore$ $\frac{15}{8+4}\cdot\frac{4+2}{4+1}\cdot 2$

$\frac{15}{12}\times\frac{6}{5}\times 2=3$

67. (D) $\sqrt{b\sqrt[3]{b}}-\sqrt[3]{b\sqrt{b}}=\sqrt{b}$

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

$b^{\frac{4}{3}\times\frac{1}{2}}-b^{\frac{3}{2}\times\frac{1}{3}}=b^{\frac{1}{2}}$

$b^{\frac{2}{3}}-b^{\frac{1}{2}}=b^{\frac{1}{2}}$

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

$b^{\frac{1}{6}}=2$

$b=2^6=64$

68. (B) $\left(\frac{p^2}{q^2}\right)^{5x+7} = \left(\frac{q^3}{p^3}\right)^{x-8}$

$\left(\frac{p^2}{q^2}\right)^{5x+7} = \left(\frac{p^3}{q^3}\right)^{8-x}$

$\left[\left(\frac{p}{q}\right)^2\right]^{5x+7} = \left[\left(\frac{p}{q}\right)^3\right]^{8-x}$

$10x + 14 = 24 - 3x$

$13x = 10$

$x = \frac{10}{13}$

$5x + 7 = 5 \times \frac{10}{13} + 7 = \frac{141}{13} = 10\frac{11}{13}$

69. (D) $\frac{a^2+b^2}{c^2+d^2} = \frac{ab}{cd} = \frac{2ab}{2cd}$ [If $\frac{a}{c} = \frac{b}{d}$, then $\frac{a}{b} = \frac{c}{d}$]

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

On applying componendo and dividendo,

$\frac{a^2+b^2+2ab}{a^2+b^2-2ab} = \frac{c^2+d^2+2cd}{c^2+d^2-2cd}$

$\frac{(a+b)^2}{(a-b)^2} = \frac{(c+d)^2}{(c-d)^2}$

$\therefore \quad \frac{a+b}{a-b} = \pm\frac{c+d}{c-d}$

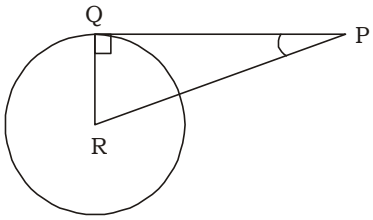
70. (A) $\frac{a^{\frac{1}{2}}+a^{-\frac{1}{2}}}{1-a} + \frac{1-a^{-\frac{1}{2}}}{1+\sqrt{a}}$

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

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

$= \frac{1+a^\circ}{1-a^\circ} = \frac{1+1}{1-a} = \frac{2}{1-a}$ ($a^\circ = 1$ because any number raised to the power 0 is equal to 1)

71. (D) ATQ,



$PQ = \sqrt{3}\, QR$

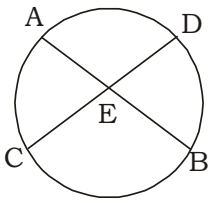
and, $\angle RQP = 90°$

Then,

$$\tan \angle QPR = \frac{QR}{QP} = \tan 30°$$

$\angle QPR = 30°$

72. (A) ATQ,

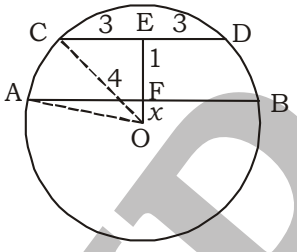


$AE \times BE = CE \times ED$

$5 \times 4 = 8 \times ED$

$ED = 2.5$ cm

73. (C) ATQ,



Let the OF = x cm

ATQ,

$OA^2 = x^2 + 4^2$

and, $OC^2 = (x+1)^2 + 3^2$

Now, OA = OC

$x^2 + 4^2 = (x + 1)^2 + 3^2$

$x = 3$

Now, $OA^2 = 3^2 + 4^2$

$OA = \sqrt{25} = 5$ cm

$\therefore$ Radius of circle = 5 cm

74. (A) Total speed = 60 + 45 = 105 km/hr

$= 105 \times \frac{5}{18} = \frac{175}{6}$ m/s

Total length of both trains = $\frac{175}{6} \times 18 = 525$ m

Ratio of length of trains = 2 : 1

Length of first train = $\frac{525}{3} \times 2 = 350$ m

and length of second train = 525 – 350 = 175 m
Distance covered in 45 sec. by

First train = $60 \times \frac{5}{18} \times 45 = 750$ m

∴ Length of platform = 750 – 350 = 400 m

75. (B) Let the speed of train = x km/hr
ATQ,

$x \times \frac{40}{60} = (x - 10) \times \frac{45}{60}$

$\frac{2x}{3} = \frac{3x}{4} - \frac{15}{2}$

$\frac{3x}{4} - \frac{2x}{3} = \frac{15}{2}$

$\frac{9x - 8x}{12} = \frac{15}{2}$

$x = 90$ km/hr

Distance between A and B = $90 \times \frac{40}{60} = 60$ km

76. (C) The goods train leaves Delhi at 8 am and mail train 12 pm, hence after 6 hours
The distance covered by goods train in 6 hours at 40 kmph = 40 × 6 = 240 km
The relative speed of mail train with respect to goods train = 60 – 40 = 20 kmph
To completely cross the goods train, the mail train will have to cover a distance
= 240 km + 160 m + 140 m = 240.300 km more.
Since, the mail train goes 20 km more in 1 hour.

∴ Mail train goes 240.300 km more in $\frac{2403}{10} \times \frac{1}{20} = 12.015$ hours.

77. (C) Let the speed of boat in still water is x kmph and that of the current be y kmph, then

$\frac{12}{x - y} + \frac{18}{x + y} = 3$ …(i)

$\frac{36}{x - y} + \frac{24}{x + y} = \frac{13}{2}$ …(ii)

By equation (i) × 3 – equation (ii),

$\frac{54}{x + y} - \frac{24}{x + y} = 9 - \frac{13}{2}$

$\frac{30}{x + y} = \frac{5}{2}$

$x + y = 12$ …(iii)

From equation (i),

$$\frac{12}{x-y} + \frac{18}{12} = 3$$

$$\frac{12}{x-y} = 3 - \frac{3}{2} = \frac{3}{2}$$

$$x - y = \frac{12 \times 2}{3} = 8 \qquad \ldots(iv)$$

$\therefore$ Speed of current = $\frac{1}{2}(12 - 8) = 2$ kmph

78. (C) Let the number be = x
ATQ,

$$\frac{3}{4}x - \frac{3}{14}x = 150$$

$$\frac{21x - 6x}{28} = 150$$

$$\frac{15x}{20} = 150$$

$$x = 150 \times \frac{28}{15} = 280$$

79. (C) The highest marks = 47
The lowest marks = 14
Difference in marks = 33

After assessment if 50 becomes 10 then 33 becomes = $33 \times \frac{10}{50} = 6.6$

80. (B) $7\frac{1}{2} - \left[2\frac{1}{4} \div \left\{1\frac{1}{4} - \frac{1}{2}\left(1\frac{1}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$

$$= \frac{15}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{3}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right] = \frac{15}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{9-2-1}{6}\right)\right\}\right]$$

$$= \frac{15}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2} \times 1\right\}\right] = \frac{15}{2} - \left[\frac{9}{4} \div \left\{\frac{5-2}{4}\right\}\right]$$

$$= \frac{15}{2} - \left[\frac{9}{4} \div \frac{3}{4}\right] = \frac{15}{2} - \left[\frac{9}{4} \times \frac{4}{3}\right] = \frac{15}{2} - 3 = \frac{15-6}{2}$$

$$= \frac{9}{2} = 4\frac{1}{2}$$

81. (C) $2 \div \left[\frac{1}{2} + 2 \div \left\{2 + 2 \div (2 + 2 \div 3)\right\}\right]$

$$= 2 \div \left[\frac{1}{2} + 2 \div \left\{2 + 2 \div \left(2 + \frac{2}{3}\right)\right\}\right] = 2 \div \left[\frac{1}{2} + 2 \div \left\{2 + 2 \div \frac{8}{3}\right\}\right]$$

$$= 2 \div \left[\frac{1}{2} + 2 \div \left\{2 + 2 \times \frac{3}{8}\right\}\right] = 2 \div \left[\frac{1}{2} + 2 \div \left\{2 + \frac{3}{4}\right\}\right]$$

$$= 2 \div \left[\frac{1}{2} + 2 \div \frac{11}{4}\right] = 2 \div \left[\frac{1}{2} + 2 \times \frac{4}{11}\right] = 2 \div \left[\frac{1}{2} + \frac{8}{11}\right]$$

$$= 2 \div \left[\frac{27}{22}\right] = \frac{44}{27}$$

82. (B) $\left[\frac{1}{2}+\frac{1}{2}\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{7}{8}-\frac{3}{4}\right)\right\}\right]$

$= \left[\frac{1}{2}+\frac{1}{2}\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{7-6}{8}\right)\right\}\right] = \left[\frac{1}{2}+\frac{1}{2}\left\{\frac{3}{4}-\frac{1}{16}\right\}\right]$

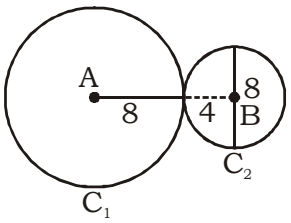
$= \left[\frac{1}{2}+\frac{1}{2}\left\{\frac{12-1}{16}\right\}\right] = \left[\frac{1}{2}+\frac{1}{2}\times\frac{11}{16}\right]$

$= \left[\frac{1}{2}+\frac{11}{32}\right] = \left[\frac{16+11}{32}\right] = \frac{27}{32}$

83. (B) $\frac{(0.55)^2+(0.07)^2+(0.027)^2}{(0.055)^2+(0.007)^2+(0.0027)^2}$

$= \frac{100\left[(0.055)^2+(0.007)^2+(0.0027)^2\right]}{\left[(0.055)^2+(0.007)^2+(0.0027)^2\right]} = 100$

84. (A)



Radius of first circle = 8 cm

Radius of second circle = 4 cm

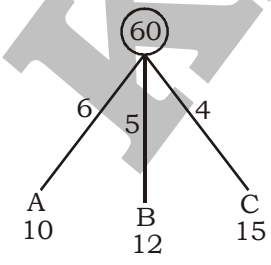
Diameter of new circle = (8 + 4) = 12 cm

Area of new circle = $\pi r^2 = 36\ \pi\ cm^2$

85. (C) $\angle CBA = \frac{1}{2}\ \angle COA = 60°$

$\therefore$ $\angle CBE = 180° - \angle CBA = 180° - 60 = 120°$

86. (A)



$\therefore$ Required number of days = $\frac{64}{5+4} = \frac{64}{9}$ days

87. (D) $\frac{1}{\sqrt{2}+\sqrt{1}} = \frac{1}{\sqrt{2}+\sqrt{1}} \times \frac{\sqrt{2}-\sqrt{1}}{\sqrt{2}-\sqrt{1}} = \sqrt{2}-\sqrt{1}$

$\frac{1}{\sqrt{1}+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} \cdots \frac{1}{\sqrt{99}+\sqrt{100}}$

$= \sqrt{2} - \sqrt{1} + \sqrt{3} - \sqrt{2} + ... + \sqrt{100} - \sqrt{99}$

$= \sqrt{100} - \sqrt{1} = 10 - 1 = 9$

88. (B) 5 years ago avg. age of husband and wife = 23 years
Present age of husband or wife = 23 + 5 = 28 years
Sum of present age of husband and wife = 28 × 2 = 56 years
Sum of present age of husband, wife and child = 20 × 3 = 60 years
∴ Age of child = 60 – 56 = 4 years

89. (B) A : B = 3 : 2 = 6 : 4
B : C = 4 : 3
∴ A : B : C = 6 : 4 : 3 ⇒ total number of books should be multiple of 13.
So, 689 is the required number of books.

90. (C) Interest for 2 years = $10 + 10 + \frac{10\times10}{100} = 21\%$

Interest for 3 years = $21 + 10 + \frac{21\times10}{100} = 33.1\%$

Now, (33.1 – 21)% of P = 12100
12. 1% of P = 12100

P = $\frac{12100\times100}{12.1}$ = ₹ 100000

91. (A) Amount remaining after

1 year = $4000\left(1+\frac{7.5}{100}\right) - 1500$ = ₹ 2800

2 years = $2800\left(1+\frac{7.5}{100}\right) - 1500$ = ₹ 1510

3 years = $1510\left(1+\frac{7.5}{100}\right) - 1500$ = ₹ 123.25

92. (C) Let the number of students appeared in school X = 100
∴ Number of students qualified in school X = 70
∴ ATQ,
Number of students appeared in School Y = 120
Number of students qualified in School Y = 70 + 50% of 70 = 70 + 35 = 105

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

93. (D) Required number of items = $\frac{(3000+1000)}{(60-40)} = \frac{4000}{20} = 200$

94. (A) According to question,

SI for 10 years = $\frac{1000\times5\times10}{100}$ = ₹ 500

Now, P = ₹ 1500, A = ₹ 2000

∴ SI = ₹ 500

Now, $T = \frac{500\times100}{1500\times5} = 6\frac{2}{3}$ years

∴ Total time = $16\frac{2}{3}$ years

95. (B) SI = $\frac{15000\times9\times2}{100}$ = ₹ 2700

CI = $12000\left[\left(1+\frac{8}{100}\right)^2-1\right] = 12000\left[\left(\frac{27}{25}\right)^2-1\right]$

$= 12000\left[\frac{729-625}{625}\right] = 12000\times\frac{104}{625}$ = ₹ 1996.8

∴ Total interest earned = ₹ (2700 + 1996.8) = ₹ 4696.8

96. (C) Required percentage = $\left(\frac{5}{12.5}\times100\right)\%$ = 40%

97. (B) 17.5% → 2.45

30% → $\frac{2.45}{17.5}\times30$ = ₹ 4.2 crore

∴ Required Amount = ₹ 4.2 cr.

98. (D) Required ratio = (20 + 12.5) : (10+17.5) = 32.5 : 27.5 = 13 : 11

99. (C) Required ratio = 12.5 : 20 = 5 : 8

100. (D) Ratio of expenditure to saving = 61 : 6

ATQ,

67 units = 8710

6 units = $\frac{8710}{67}\times6$ = 780

∴ His saving = ₹ 780

QUANTITATIVE ABILITY - 70 (ANSWER KEY)

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