QUANTITATIVE ABILITY - 84 (SOLUTION)

1. (C)

Alloy 'A' — Gold : Copper = 5 : 3, Total (5 + 3 = 8) or, (5 × 2) + (3 × 2) = 16

Alloy 'B' — Gold : Copper = 5 : 11, Total (5 + 1 = 16)

To equalise [L.C.M. of 8 & 16 = 16 unit of each alloy]

The ratio of gold and copper in the alloy C = $\frac{(5\times 2)+5}{(3\times 2)+11} = \frac{15}{17}$ = 15 : 17

2. (A) Total % discount on M.P. = $\left(\frac{1}{2}\times 0+\frac{1}{4}\times 20+\frac{1}{4}\times 40\right)\%$ = (0 + 5 + 10)% = 15%

Now,
C.P. = x
Then,
M.P. = 20% above C.P. = $1.2x$
M.P. after discount = 8.5% of $1.2x$
= $0.85 \times 1.2x = 1.02x$
So,

Total gain % = $\frac{1.02x - x}{x}\times 100\%$

= 0.02 × 100 = 2%

3. (D) Let the distance be x km

$T_1 = \frac{x}{2.5}$ and $T_2 = \frac{x}{3.5}$

$T_1 - T_2$ = 12 mins (6 + 6 = 12) i.e. $\frac{12}{60}$ hours

ATQ,

$\frac{12}{60} = \frac{x}{2.5} - \frac{x}{3.5}$

$\frac{1}{5} = \frac{x}{2.5\times 3.5}$

$\frac{1}{5} = \frac{x}{8.75}$

$8.75 = 5x$

$x = 1.75 \text{ km} = 1\frac{3}{4}$ km

4. (B) Money left = 100% – (80% + 6% of 20%)
= 100% – 81.2% = 18.8% of total pocket money
According to question,

18.8% of total pocket money = 47 paise = ₹ $\frac{47}{100}$

So, Total pocket money (i.e. 100%) = ₹ $\frac{47}{100}\times\frac{100}{18.8}$ = ₹ 2.5

5. (C) Money spent on article = 25% of total amount

Money spent on cloths = 10% of remaining 75% amount

= 7.5% of total amount

(25% + 7.5%) of total amount + ₹ 531.25 = Total amount – ₹ 8000

Total (100%) amount – 32.5% of total amount = ₹ 8000 + ₹ 531.25 = ₹ 8531.25

67.5% of the total amount = ₹ 8531.25

So, Money spent on clothes i.e. 7.5% of the total amount = $\frac{8531.25}{67.5} \times 7.5$ = ₹ 948

6. (C) Let r = radius of the circular field

L and portion of the circular field = Total area of the circular field – Area of the rectangular tank

$40000\ m^2 = \pi r^2 - (180 \times 120)\ m^2$

$\pi r^2 = 61600\ m^2$

$r = \sqrt{\frac{61600 \times 7}{22}} = \sqrt{19600} = 140$ m

7. (A) Ratio of diameters of the cylinders = 3 : 2

Ratio of radii of the cylinders = 3 : 2

So, Let the radii of the two cylinders are 3r and 2r

and, Let the heights of the two cylinders are h_1 and h_2.

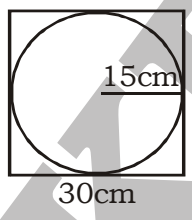
Now, Volume of first cylinder = volume of second cylinder

i.e. $\pi(3r)^2 h_1 = \pi(2r)^2 h_2$

$\frac{h_1}{h_2} = \frac{\pi \times 4r^2}{\pi \times 9r^2}$

$= \frac{4}{9} = 4 : 9$

8. (A)



Perimeter of square = 120 cm

Each side of the square = $\frac{120}{4}$ cm = 30 cm

Radius of the inscribed greatest possible circle = $\frac{30}{2}$ cm = 15 cm

Area of the circle = $\pi \times (15)^2 cm^2 = \frac{22}{7} \times (15)^2\ cm^2$

9. (D) A : B : C
1 : 2 : 3

Average = $\frac{1+2+3}{3} = 2$

Average = 600 $\Rightarrow$ 2 $\cong$ 600

So,

A : B : C

1 : 2 : 3

300 600 900

Now,

A $\xrightarrow{+10\%}$ 300 + 30 = 330 (new value of A)

B $\xrightarrow{-20\%}$ 600 – 120 = 480 (new value of B)

Average $\xrightarrow{+5\%}$ 600 + 30 = 630 (new average)

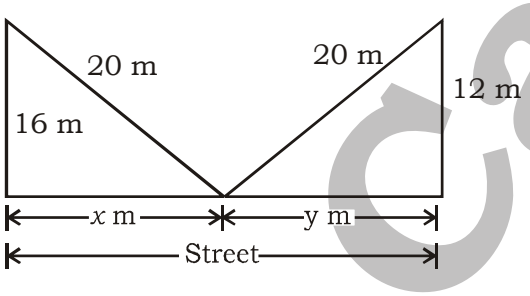
Now,

$\frac{330+480+\text{new value of C}}{3} = 630$

New value of C (630 × 3) – (330 + 480) = 1080

Increase in C = 1080 – 900 = 180

10. (B)



In the given figure, width of the street = (x + y)

= $\sqrt{20^2-16^2}+\sqrt{20^2-12^2}$

= $\sqrt{144}+\sqrt{256}$

= 12 + 16 = 28 m

11. (B) Cost price of each marble at the rate of 20 per rupee = ₹ $\frac{1}{20}$

Cost price of each marble at the rate of 30 per rupee = ₹ $\frac{1}{30}$

Average cost price of each marble = ₹ $\frac{\frac{1}{20}+\frac{1}{30}}{2}$ [$\because$ Number of marbles are equal]

= ₹ $\frac{1}{24}$

According to question,

Selling price of each marble at the rate of 25 per rupee = ₹ $\frac{1}{25}$

$\left[\because \frac{1}{25} < \frac{1}{24} \because \text{S.P.} < \text{C.P.} \Rightarrow \text{loss}\right]$

So, % loss = $\frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$

$= \frac{\frac{1}{25} - \frac{1}{24}}{\frac{1}{24}} \times 100\% = \frac{(24-25)\times 24}{600} \times 100\%$

$= -4\% \Rightarrow 4\%$ loss

12. (B) Loss of 20% on one and gain of 20% on other. There will be a loss (always)

and loss % = $\frac{(20)^2}{100}\%$ = 4% loss (on total C.P.)

C.P. $\xrightarrow{-4\%}$ S.P.
(100%) (96%)
=12,000 ×2 = 24000

S.P. (i.e. 96%) = 24000

So, loss in transaction (i.e. 4%) = $\frac{24000}{96} \times 4$ = ₹ 1000

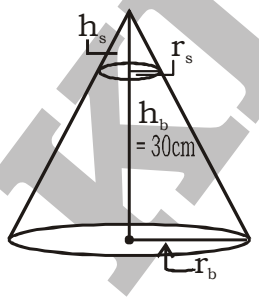
13. (A) Let C.P. = x

So, M.P. = 25% of $x = \frac{125}{100}x$ and S.P. = Price after discount of 12.5% on M.P. = $\frac{87.5}{100} \times \frac{125}{100}x$

$= \frac{7}{8} \times \frac{5}{4}x = \frac{35}{32}x$

So, % profit = $\frac{\frac{35}{32}x - x}{x} \times 100\% = 9\frac{3}{8}\%$

14. (D)



here, $\left[\because \frac{r_b}{r_s} = \frac{h_b}{h_s}\right]$

Volume of small cone = $\frac{\text{Volue of bigger cone}}{27}$

$$\frac{1}{3}\pi(r_s)^2(h_s) = \frac{\frac{1}{3}\pi(r_b)^2(h_b)}{27}$$

$$(r_s)^2(h_s) = \frac{(r_b)^2(h_b)}{27}$$

$$\frac{(r_b)^2(h_b)}{(r_s)^2(h_s)} = 27$$

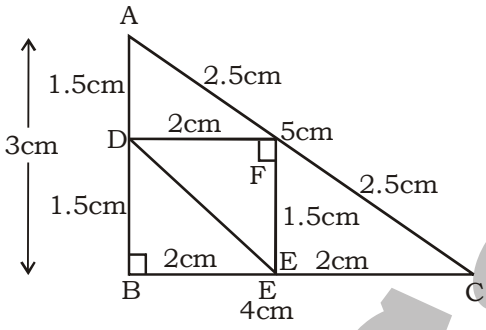
$$\left(\frac{r_b \times r_b \times h_b}{r_s \times r_s \times h_s}\right) = \frac{3\times3\times3}{1\times1\times1}$$

$$\frac{h_b}{h_s} = \frac{3}{1}$$

$$h_s = \frac{h_b}{3} = \frac{30}{3} = 10 \text{ cm}$$

The required height above the base = (30 – 10) = 20 cm

15. (C)



Sides are 3, 4 and 5 cm

Triangle ABC is a right angled triangle where $\angle B = 90°$.

Now, D, E and F are mid points of the sides AB, BC and CA respectively.

Here, FE || AB and DF ||BC

Also, In $\Delta DEF, \angle F = 90°$

ΔDEF is a right angled triangle.

So, also, from mid point theorem,

$$FE = \frac{1}{2}AB = 1.5 \text{ cm} \;\&\; DF = \frac{1}{2}BC = 2 \text{ cm}$$

$$\text{So, Area of } \Delta DEF = \frac{1}{2}\times2\times1.5 = \frac{3}{2}\text{cm}^2$$

16. (C)

	l	***b***	***h***	**Volume**
Externally	3.3 m	2.6 m	1.1 m	
	330 m	260 cm	110 cm	9438000 cm^3
Internally	320 m	250 cm		8000000 cm^3

$$\text{Internal height} = \frac{8000000 \text{ cm}^3}{(320\times250)\text{ cm}^2} = \frac{8000000 \text{ cm}^2}{80000 \text{ cm}^2} = 100 \text{ cm}$$

Thickeness of the bottom = (110 – 100) = 10 cm = 1 dm

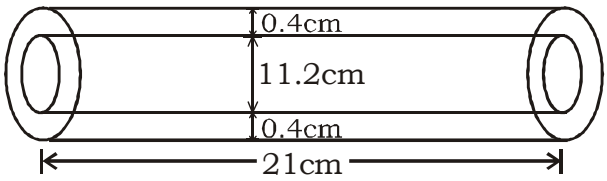
17. (A) $\sqrt{8}+2\sqrt{32}-3\sqrt{128}+4\sqrt{50}$

$= \sqrt{2\times4}+2\sqrt{2\times16}-3\sqrt{2\times64}+4\sqrt{2\times25}$

$= 2\sqrt{2}+8\sqrt{2}-24\sqrt{2}+20\sqrt{2}$

$= 6\sqrt{2} = 6 \times 1.414 = 8.484$

18. (C)



Volume of metal = External vol. of cylindrical tube –Internal volume of cylindrical tube

$= \pi(r_{ex})^2h-\pi(r_{in})^2h = \pi h\{(r_{ex})^2-(r_{in})^2\} = \pi h\left\{\left(\frac{12}{2}\right)^2-\left(\frac{11.2}{2}\right)^2\right\}$

$= \frac{22}{7}\times21\times(36-31.36) = 22 \times 3 \times 4.64 = 306.24\ cm^3$

19. (B) $T_1 = \frac{24}{6} = 4$ hrs, $T_2 = \frac{24}{8} = 3$ hrs, $T_3 = \frac{24}{12} = 2$ hrs.

Average speed $= \frac{24+24+24}{4+3+2} = \frac{72}{9} = 8$ km/hr

20. (B) B's present age = 8 + 2 = 10 years

Let father's age be x years

x + 10 = 2(B + 10)

x + 10 = 2(10 + 10) = 40

x = 30

$\therefore$ A's present age $= \frac{1}{6} \times 30 = 5$ years

21. (B) Let the parts be x, y and $[5200-(x+y)]$

$$\frac{x\times4\times1}{100} = \frac{y\times6\times1}{100} = \frac{\left[5200-(x+y)\right]\times8\times1}{100}$$

$$\frac{x}{y} = \frac{6}{4} = \frac{3}{2}$$

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

$$\text{So, } \frac{x\times4\times1}{100} = \frac{5200-x+\frac{2}{3}x\times8}{100}$$

$$x = 2\left[5200 - \frac{5}{3}x\right]$$

$$x = 10400 - \frac{10}{3}x$$

$$\frac{13}{3}x = 10400$$

$x = ₹\,2400$

22. (D) $n \times 2\pi rh$ = 72% of Area

$$150 \times 2 \times \frac{22}{7} \times 1.68 \times 4.5 = \text{Area} \times \frac{72}{100}$$

$$\text{Area} = \frac{150 \times 2 \times 22 \times 1.68 \times 4.5 \times 100}{7 \times 72} = 9900\ m^2$$

23. (B) 50% increase in 5 years = $1 + \frac{50}{100} = \frac{3}{2}$ times

If 10 year = $\left(\frac{3}{2}\right)^2$ times & 15 years = $\left(\frac{3}{2}\right)^3$ times and in 20 years = $\left(\frac{3}{2}\right)^4$ times

$$\therefore\ x\left(\frac{3}{2}\right)^2 = y\left(\frac{3}{2}\right)^3 = z\left(\frac{3}{2}\right)^4 = K$$

$$x = \frac{4}{9}K,\ y = \frac{8}{27}K,\ z = \frac{16}{81}K$$

$$x : y : z = \frac{4}{9}K : \frac{8}{27}K : \frac{16}{81}K = 9 : 6 : 4$$

24. (C) Let the original fraction be $\frac{a}{b}$

$$\frac{a^2 \times \frac{5}{4}}{b^2 \times \frac{4}{5}} = \frac{5}{8} \times \frac{a}{b}$$

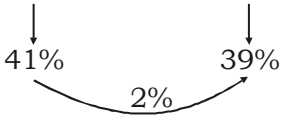
$$\left(\frac{a}{b}\right)^2 \times \frac{25}{16} = \frac{5}{8} \times \left(\frac{a}{b}\right)$$

$$\left(\frac{a}{b}\right) = \frac{2}{5}$$

$a \times b = 2 \times 5 = 10$

25. (D) Let the opponent got x votes then winner got $x + 200$ votes.
ATQ,

$80\% - 120 = x + 200 + x$
$80\% = x + 200 + x + 120$



2% of total votes = 200 – 120 = 80
Total votes = 4,000

Votes, for the losing candidate = $\frac{39}{100} \times 4000 - 120 = 1440$

Total votes cast = $\frac{4}{5} \times 4{,}000 = 3{,}200$

Required % = $\frac{1440}{3200} \times 100 = 45\%$

26. (A) Engineers in Karnataka in 2010 = $\frac{12}{100} \times 7500 = 900$

Average number of engineers from Tamilnadu in 2011, 2013 and 2014

$= \frac{1500 + 900 + 900}{3} = \frac{3300}{3}$

Average number of engineers from all the states in 2012 = $\frac{1200 + 1200 + 1800}{3} = 1400$

Percentage = $\left(\frac{1400 - 1100}{1400} \times 100\right) = 21.4\%$

27. (B) Engineers in Karnataka in 2010 = $\frac{12}{100} \times 7500 = 900$

Similarly, engineers in different states in different years :
Total number of engineers in 3 states in 2015 = 900 + 1200 + 1500 = 3600
In 2015, 67% are male engineers.

So, Female engineers = $\frac{100 - 67}{100} \times 3600 = 1188$

28. (B) Number of engineers in 2010 = 900 + 1800 + 1200 = 3900
Number of engineers in 2011 = 1500 + 1500 + 900 = 3900
Number of engineers in 2012 = 1200 + 1200 + 1800 = 4200
Number of engineers in 2013 = 1500 + 900 + 900 = 3300
Number of engineers in 2014 = 1500 + 900 + 1200 = 3600
Number of engineers in 2015 = 900 + 1200 + 1500 = 3600
Therefore, number of engineers in year 2010 and 2011 are equal and number of engineers in year 2014 and 2015 are equal.

29. (A) Percentage increase in the number of engineers in Maharashtra from 2011 to 2015
= (1500 – 900)/900 × 100 = 66.67%
Percentage decrease in the number of engineers in Karnataka from 2013 to 2015
= (1500 – 900)/1500 × 100 = 40%
Difference = 66.67 – 40 = 26.67%

30. (C) Difference of engineers from Karnataka and Tamilnadu in 2013 = 1500 - 900 = 600
Difference of engineers from Maharashtra and Tamilnadu in 2010 = 1800 - 1200 = 600
Ratio = 600: 600 = 1 : 1

31. (A) Let the number of water taps = x
The number of outlet taps = $(12 - x)$
According to the question

$$\frac{x}{6} - \frac{(12-x)}{12} = \frac{1}{4}$$

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

$3x - 12 = 3$

$3x = 15$

$x = 5$

Number of water taps = 5

32. (D) Difference = (64 + 62 + 84) – (68 + 65 + 73) = 210 – 206 = 4

$\therefore$ Average = $72 + \frac{4}{40} = 72.1$

33. (A) Let the annual rate = R% then,

$$\frac{400\times 2\times R}{100} + \frac{550\times 4\times R}{100} + \frac{1200\times 6\times R}{100} = ₹1020$$

8R + 22R + 72R = ₹ 1020

102R = 1020

$$R = \frac{1020}{102} = 10\%$$

34. (C) Liquid A = $7x$ litres
Liquid B = $5x$ litres
In 9 litres

$$A = \frac{7}{12} \times 9 = \frac{21}{4} \text{ litre}$$

$$B = \frac{5}{12} \times 9 = \frac{15}{4} \text{ litre}$$

$$7x - \frac{21}{4} = 5x - \frac{15}{4} + 9$$

$$2x = \frac{21}{4} - \frac{15}{4} + 9$$

$$2x = \frac{21-15+36}{4} = \frac{42}{4}$$

$$x = \frac{21}{4}$$

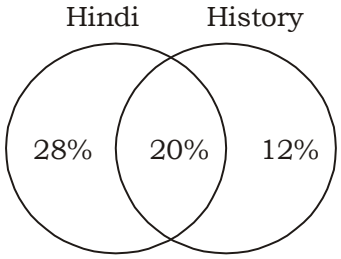
$\therefore$ Liquid A = $7 \times \frac{21}{4} = \frac{147}{4} = 36\frac{3}{4}$ litre

35. (B) Cost price of the watch = ₹ 250
Cost price after 10% custom duty = ₹ 275

CP	**MP**
(100 – 25)	(100 + 20)
75	120
5	8
↓×55	↓×55
275	440

Marked price = ₹ 440

36. (B) Students failed in Hindi = 48%
Students failed in History = 32%



Number of students passed in the exami-nation = (100 – 60) = 40%
According to the question,
40% = 880

$1\% = \frac{880}{40}$

Total students = $\frac{880}{40} \times 100 = 2200$

37. (B) Publisher distributed 300 copies free.
Remaining copies = 900

Total Number of copies	Copies the cost of which were counted
20	18
↓×45	↓×45
900	810

Let the selling price of a book is ₹ x then

$x \times 810 = 60 \times 1200 \times \frac{117}{100}$

$x = \frac{60 \times 12 \times 117}{810}$ = ₹ 104

38. (A) ⟵ d km ⟶

A — C — B

Car 1 ⟶ 10 km/h

Car 2 ⟶ 8km/h + 8.5 km/h + 9 km/h....

I[st] hour IInd hour + ...

$10t = \frac{t}{2}\left[2\times 8 + (t-1)\frac{1}{2}\right]$

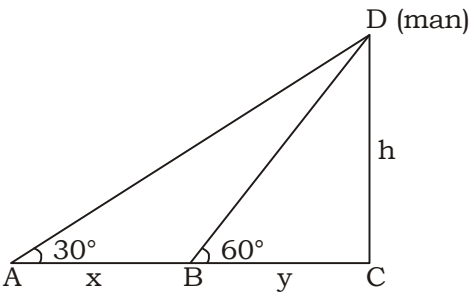
$20 = 16 + \frac{t-1}{2}$

$t - 1 = 8$

$t = 9$ hours

Distance travelled by 1st car in 9 hours = 9 × 10 = 90 km

39. (C)



$\tan 60° = \frac{h}{y}$

$h = y\sqrt{3}$ .....(i)

and $\tan 30° = \frac{h}{x+y}$

$\frac{1}{\sqrt{3}} = \frac{y\sqrt{3}}{x+y}$ [using (i)]

$\therefore$ $3y = x + y$

$2y = x$

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

Time taken to cover a distance from A to B = 20 minutes

Time taken to cover a unit distance = $\frac{20}{x}$ minute

For distance 'y' time taken = $\frac{20}{x}$ × y

$= \frac{20}{x} \times \frac{x}{2} = 10$ minutes

40. (B) Let the length of each of the equal side of the ground be x metre

Base of the play ground = 24 m

Area of ground = $\frac{15}{25} \times 100 = 60$ m^2

But the ground has isosceles shape

Area of ground = $\frac{a}{4}\sqrt{4x^2 - a^2}$

[where a = base, x = each of the equal sides]

$\therefore \quad \frac{24}{4}\sqrt{4x^2 - (24)^2} = 60$

$4x - (24)^2 = (10)^2$

$4x^2 - 576 = 100$

$4x^2 - 676$

$x^2 = \frac{676}{4} = 169$

$x = 13$

$\therefore$ Length of each of the equal side $x = 13$ m

41. (C) $(a^2 - b^2)\sin\theta + 2ab\cos\theta = a^2 + b^2$

$\left(\frac{a^2 - b^2}{a^2 + b^2}\right)\sin\theta + \left(\frac{2ab}{a^2 + b^2}\right).\cos\theta = 1$

On comparing it by

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

we get $\sin\theta = \frac{a^2 - b^2}{a^2 + b^2}$ &

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

$\therefore \quad \tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{a^2 - b^2}{2ab}$

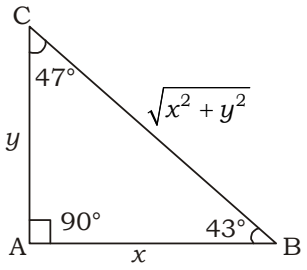
42. (B) Given a = – 5, b = – 6 and c = 10

$\therefore \quad a + b + c = (-5) + (-6) + 10 = -1$

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

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

43. (B) $\cos 43° = \dfrac{x}{\sqrt{x^2+y^2}}$



$\tan 47° = \dfrac{x}{y}$

44. (D) Squaring both the sides : $\left(\sqrt{\dfrac{x}{y}}+\sqrt{\dfrac{y}{x}}\right)^2 = \left(\dfrac{10}{3}\right)^2$

$\left(\dfrac{x+y}{\sqrt{xy}}\right)^2 = \left(\dfrac{10}{3}\right)^2$

$(x+y)^2 = \dfrac{100}{9}xy$

So, $xy = 9$ because $x + y = 10$ given

45. (C) $\sin^2 1° + \sin^2 3° ..... \sin^2 85° + ... + \sin^2 89° = \sin^2 1° + ... + \cos^2 1°$ ($\sin^2 89° = \cos^2 1°$)
[$\because \sin(90° - \theta) = \cos\theta°$]

It is a series of AP
$89 = 1 + (n-1) \times 2 \cong n = 45$

$\sin^2 45°$
22 terms 22 terms

$= 22 + \sin^2 45° = 22\dfrac{1}{2}$

46. (C) Volume of right prism = Area of the base × height
$10380 = 173 \times h$

$h = \dfrac{10380}{173} = 60$ cm

Now, Area of triangle = $\dfrac{\sqrt{3}}{4} \times (\text{Side})^2$

$173 = \dfrac{\sqrt{3}}{4} \times (\text{Side})^2$

Side = $\sqrt{\dfrac{173\times 4}{\sqrt{3}}} = \sqrt{\dfrac{173\times 4}{1.73}} = 20$ cm

Perimeter = $3 \times 20 = 60$ cm
Area of the lateral surface = Perimeter base × height
$= 60 \times 60 = 3600$ sq. cm

47. (B) Let outer radii = R_1 and inner radii = R_2

$\therefore$ $2\pi R_1 h - 2\pi R_2 h = 44$ [Where, h = height of pipe]

$$2 \times \frac{22}{7} \times 14[R_1 - R_2] = 44$$

$$R_1 - R_2 = \frac{1}{2} = 0.5 \quad \text{.....(i)}$$

And $\pi(R_1^2 - R_2^2) \times h = 99$ (Given)

$$\frac{22}{7}(R_1 + R_2)(R_1 - R_2) \times 14 = 99$$

$4 \times 0.5(R_1 + R_2) = 9$

$R_1 + R_2 = 4.5$ .....(ii)

On adding (i) and (ii),

$2R_1 = 5$

$R_1 = 2.5$ cm

48. (B) Distance covered in one revolution = $2\pi R$

$$= \left(2 \times \frac{22}{7} \times 50\right) m = \frac{2200}{7} m$$

$\therefore$ Distance covered in 21 revolution = $\left(\frac{2200}{7} \times 21\right) m = 6600$ m

Speed of the man= $\left(12 \times \frac{5}{18}\right) m/sec = \frac{10}{3} m/sec$

Time = $\left(6600 \times \frac{3}{10}\right)$ second = $\left(\frac{1980}{60}\right)$ = 33 minutes

49. (A)

	Sita	:	**Neeta**	:	**Ramesh**
For 1st 6 months	45000 × 6				
For next 6 months	45000 × 6		80000 × 6		
For next 12 months	45000 × 12		80000 × 12		120000 × 12
	270				
	270		480		
	540		960		1440
	1080	:	1440	:	1440
	3	:	4	:	4

50. (B)

A	**B**	**C**	**D**
15 × 4	12 × 2	18 × 6	16 × 5
60	24	108	80

A's share of rent = ₹ 1020 = 60 unit

$\therefore$ 108 units = $\frac{1020}{60} \times 108$

C's rent = ₹ 1836

51. (B) $\frac{\text{Difference between C.I. and S.I. for 3ys}}{\text{Difference between C.I. \& S.I. for 2 yrs}} = \frac{P\left[\frac{r^3}{100^3}+\frac{3r^3}{100^2}\right]}{\frac{Pr^2}{100^2}}$

$$= \frac{\frac{Pr^2}{100^2}\left[\frac{r}{100}+3\right]}{\frac{Pr^2}{100^2}}$$

$$\frac{25}{8} = \frac{r}{100} + 3$$

$$\therefore \quad \frac{1}{8} = \frac{r}{100}$$

$$r = 12.5\% = 12\frac{1}{2}\%$$

52. (C) $\frac{PR_1T_1}{100} = \frac{PR_2T_2}{100}$

$$8n = 7\left(n-\frac{1}{2}\right)$$

$$n = 3.5$$

ATQ,

$$\frac{P\times 8\times 3.5}{100} + P = 2560$$

$$P = ₹\ 2000$$

53. (A)

Milk	**Water**	
1	2	→ 3 × 4
1	3	→ 4 × 3

$$\begin{array}{ccc} 4 & : & 8 \\ 3 & : & 9 \\ \hline 7 & : & 17 \end{array}$$

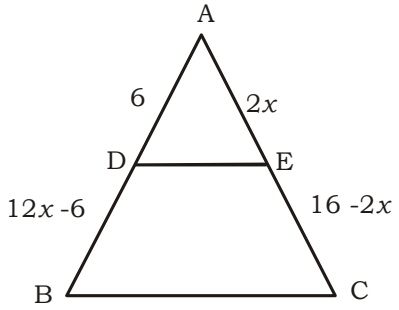
54. (A) By C and D

$$\frac{\sin(x+y)+\sin(x-y)}{\sin(x+y)-\sin(x-y)} = \frac{a+b+a-b}{a+b-a+b}$$

$$\frac{\sin x\cos y}{\cos x\sin y} = \frac{a}{b}$$

$$\frac{\tan x}{\tan y} = \frac{a}{b}$$

55. (C) Given, DE || BC



$\therefore \quad \Delta ADE \sim \Delta ABC$

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

$\frac{12x}{6} = \frac{16}{2x}$

$x^2 = \frac{16 \times 6}{12 \times 2} = 4$

$x = 2$ cm

56. (C) Interior angle of the Ist polygon = 120°

Let, n_1 = number of sides in Ist polygon

Then, $\frac{n_1 - 2}{n_1} \times 180° = 120°$

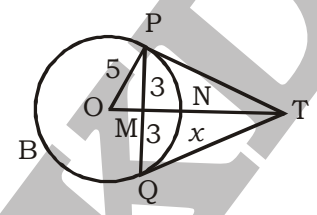
$3n_1 - 6 = 2n_1$

$n_1 = 6$

$\therefore$ Sides of the IInd polygon = 6 × 2 = 12

Interior angle of the IInd polygon = $\frac{12-2}{12} \times 180° = 150°$

57. (C)



In ΔOPM,

$OM = \sqrt{5^2 - 3^2} = 4$cm

$\therefore \quad MN = ON - OM = 1$cm

In ΔPOT,

$PT^2 = OT^2 - OP^2 = (5 + x)^2 - 5^2$

$= x^2 + 10x$ .....(i)

In Δ PMT,

$PT^2 = PM^2 + TM^2$

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

$= x^2 + 2x + 10$ .....(ii)

From Eqs. (i) and (ii), we get

$x^2 + 2x + 10 = x^2 + 10x$

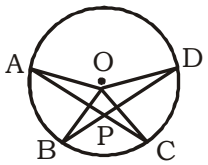
$x = \frac{10}{8} = \frac{5}{4}$

From Eq. (i),

$PT = \sqrt{x^2 + 10x}$

$= \sqrt{\left(\frac{5}{4}\right)^2 + 10\left(\frac{5}{4}\right)} = 3.75$ cm

58. (C) From figure,



$\angle AOB + \angle COD = 2\ \angle ACB + 2\ \angle DBC$

$15° + \angle COD = 2\ (\angle ACB + \angle DBC)$

$15° + \angle COD = 2\ \angle APB$

$\angle COD = 2 \times 30° - 15°$

$\angle COD = 60° - 15° = 45°$

$\therefore \tan^2 \angle APB + \cot^2 \angle COD$

$= \tan^2 30° + \cot^2 45° = \frac{1}{3} + 1 = \frac{4}{3}$

59. (D) $\tan\frac{\pi}{8}.\tan\frac{\pi}{12}.\tan\frac{3\pi}{8}.\tan\frac{5\pi}{12} - \sin^2\frac{\pi}{6}$

$= \tan\frac{\pi}{8}.\tan\frac{\pi}{12}.\cot\left(\frac{\pi}{2} - \frac{3\pi}{8}\right).\cot\left(\frac{\pi}{2} - \frac{5\pi}{12}\right) - \frac{1}{4}$

$= \tan\frac{\pi}{8}.\tan\frac{\pi}{12}.\cot\frac{\pi}{8}\cot\frac{\pi}{12} - \frac{1}{4} = 1 - \frac{1}{4} = \frac{3}{4}$

60. (A) $x \sin^3 \alpha + y \cos^3 \alpha = \sin\alpha \cos\alpha$

$x \sin\alpha . \sin^2\alpha + y \cos\alpha . \cos^2\alpha = \sin\alpha \cos\alpha$

$x \sin\alpha . \sin^2 \alpha + x \sin\alpha . \cos^2\alpha$

$\sin\alpha \cos\alpha$ $[\therefore y \cos\alpha = x \sin \alpha]$

$x \sin \alpha (\sin^2\alpha + \cos^2\alpha) = \sin\alpha \cos\alpha$

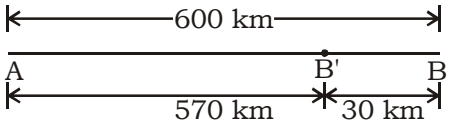
$x = \cos\alpha$

also, $y \cos\alpha = \cos\alpha \sin\alpha$

$y = \sin\alpha$

$x^2 + y = \sin^2\alpha + \cos^2\alpha = 1$

61. (A)



Distance covered by B before movement of A. i.e. Distance covered by B in 20 minutes

$= \left(90 \times \frac{20}{60}\right)$ = 30 km

When train from station A starts to move; the another train will be B' and distance between A & B' = (600 – 30) km = 570 km

Now, Relative speeds of trains = (100 + 90) = 190 km /hr

So, Time taken by each train to reach each other = $\left(\frac{570}{190}\right)$hr. = 3 hrs.

And in 3 hours, distance travelled by A = (100 × 3) km = 300 km

Both train will cross each other at a distance 300 km and from A i.e. at the exact middle point of A and B.

62. (B) Let x = the required speed

$\longrightarrow$ 54 km/hr $\times \left(\frac{12}{60}\right)$hr.

Home ——————————— Office

x km/hr $\times \left(\frac{12+6}{60}\right)$hr. $\longleftarrow$

$54 \times \frac{12}{60} = x \times \frac{18}{60}$

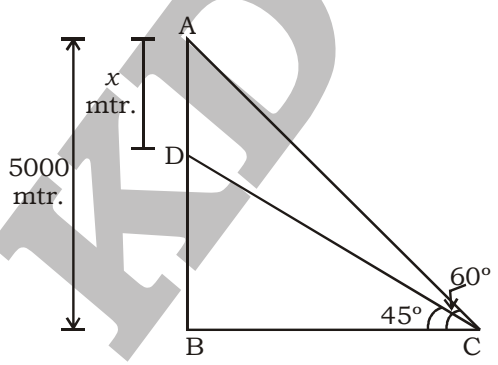
x = 36 km/hr

63. (B) Total number of illiterate persons in the town = number of literate men + number of illiterate women = $\left\{(100\% - 24\%) \text{ of } \frac{40}{83} \times 311250\right\} + \left\{(100\% - 8\%) \text{ of } \frac{43}{83} \times 311250\right\}$

$= \frac{76}{100} \times \frac{40}{83} \times 311250 + \frac{92}{100} \times \frac{43}{83} \times 311250$

= 114000 + 148350 = 262350

64. (C)



$\angle ACB = 60^\circ$

$\angle DCB = 45^\circ$

AB = 5000 mtr.

Let, AD= x mtr.

$\therefore$ From ΔABC,

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

$$\sqrt{3} = \frac{5000}{BC} \text{ mtr.}$$

$$BC = \frac{5000}{\sqrt{3}} \text{ mtr.}$$

From ΔDBC,

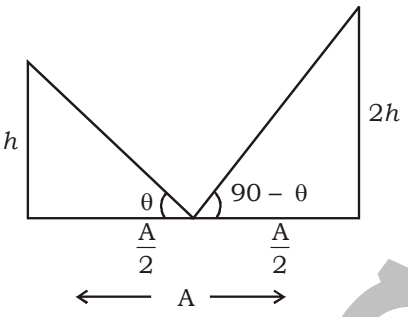
$$\tan 45^\circ = \frac{DB}{BC} = DB = BC = \frac{5000}{\sqrt{3}}$$

Now,

$$AD = AB - BD = 5000 - \frac{5000}{\sqrt{3}}$$

$$= 5000\left(1 - \frac{1}{\sqrt{3}}\right) \text{mtr.}$$

65. (D)



$$\tan\theta = \frac{h}{\frac{A}{2}} = \frac{2h}{A} \quad \text{...(i)}$$

$$\tan(90-\theta) = \frac{2h}{\frac{A}{2}}$$

$$\cos\theta = \frac{4-h}{A}$$

$$\tan\theta = \frac{A}{4h} \quad \text{...(ii)}$$

From (i) & (ii)

$$\frac{2h}{A} = \frac{A}{4h}$$

$8h^2 = A^2$

$h^2 = A^2$

$$h^2 = \frac{A^2}{8}$$

$$h = \frac{A}{2\sqrt{2}}$$

66. (A) Required difference = (15% – 5%) of 500 lakhs = ₹ 50 lakhs

67. (A) Fund left from government agencies

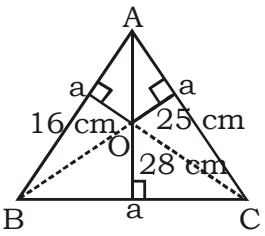
= 45% of 500 lakhs – 20% of 45% of 500 lakhs = ₹ 180 lakhs

68. (B) Required percentage = $\frac{15}{35} \times 100$ = 43%

69. (C) Total amount used by school for payment = $\frac{30}{100} \times 500$ lakhs = ₹ 150 lakhs

70. (D) Amount acquired by school from government agencies = 45 × 5 = ₹ 225 lakhs

71. (A)



Area of ΔABC = Area of $(\Delta AOB + \Delta AOC + \Delta BOC)$

$\frac{\sqrt{3}}{4}a^2 = \frac{1}{2} \times a(16 + 25 + 28)$

$a = \frac{4}{\sqrt{3} \times 2} \times 69$ cm

$a = 46\sqrt{3}$ cm

So, Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times (46\sqrt{3})^2$

$= \frac{\sqrt{3}}{4} \times 2116 \times 3 = 1587\sqrt{3}$ cm^3

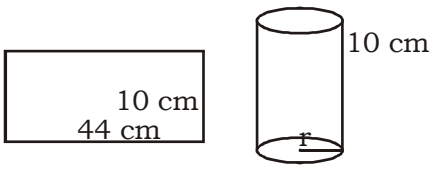
72. (C)

Volume of water needed to fill the empty space = Volume of cylinder – Volume of cone

$= \pi r^2 h - \frac{1}{3}\pi r^2 h = \frac{2}{3}\pi r^2 h = 2 \times \left(\frac{1}{3}\pi r^2 h\right)$

$= 2 \times 27\pi$ cm^3 = 54π cm^3

73. (B)



Perimeter of base

$2\pi r$ = 44 cm

$r = \frac{44 \times 7}{22 \times 2}$ cm

r = 7 cm

Volume of the cylinder = $\pi r^2 h$

= $\pi \times 7^2 \times 10$

= $\frac{22}{7} \times 49 \times 10$ = 1540 m^3

74. (D) $P = \sqrt{\frac{1-\sin x}{1+\sin x}} \Rightarrow P = \frac{1-\sin x}{\cos x}$

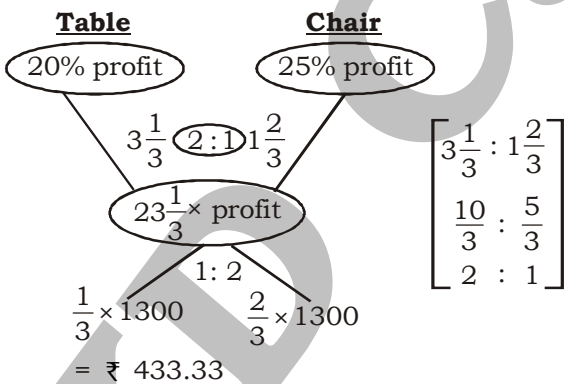
and $Q = \frac{1-\sin x}{\cos x}$

$R = \frac{\cos x}{1+\sin x} \times \frac{1-\sin x}{1-\sin x} = \frac{\cos x(1-\sin x)}{\cos^2 x}$

R = 1 – sin$x$

$P = Q = R$

75. (D)



Cost price of table = ₹ 433.33

Alternative method:-

Let,

x = C.P. of table

(1300 – x) = C.P. of chair

Now, ATQ,

Profit on table + profit on chair = Total profit

20% of x + 25% of (1300 – x) = $23\frac{1}{3}$% of 1300

$$\frac{20}{100}x+\frac{25}{100}(1300-x) = \frac{70}{3\times100}\times1300$$

$$\frac{x}{5}+\frac{1300}{4}-\frac{x}{4}=\frac{910}{3}$$

$$\frac{x}{5}-\frac{x}{4}=\frac{910}{3}-325$$

$$\frac{4x-5x}{20} = \frac{910-975}{3}$$

$$-\frac{x}{20} = -\frac{65}{3}$$

$$x = \frac{65\times20}{3} = ₹\ 433.33$$

76. (A) Prem $\xrightarrow{\text{does the whole work in}}$ 10 days

Prem $\xrightarrow{\text{in 1 day}}$ $\frac{1}{10}$ part of work

Also,

Raj $\xrightarrow{\text{does the whole work in}}$ 12 days

Raj $\xrightarrow{\text{in 1 day}}$ $\frac{1}{12}$ part of work

Now,

Work done by Prem in initial 6 days = $\left(\frac{1}{10}\times6\right) = \frac{3}{5}$ part of work

Remaining part of the work = $1-\frac{3}{5} = \frac{2}{5}$ part of the work

Now,

Amount of work done by Prem & Raj together in 1 day = $\left(\frac{1}{10}+\frac{1}{12}\right) = \frac{11}{60}$ part of the work

So, Number of days taken by Prem & Raj together to do the remaining part of the work

$$= \frac{\frac{2}{5}}{\frac{11}{60}} = \frac{2\times60}{5\times11} = 2\frac{2}{11} \text{ days}$$

Raj actually did the work for $2\frac{2}{11}$ days

77. (B) **A** **B**

6 hours 2 hours

Let the capacity of tank = 12 litres

Rate of filling of tank by pipe A = $\left(\frac{12}{6}\right)$ litre per hour = 2 litre per hour

and rate of filling of tank by pipe B = $\left(\frac{12}{2}\right)$ litre per hour = 6 litre per hour

Rate of filling of tank by pipe A & B together = 8 litre per hour

Now, Pipe B was opened $\frac{1}{2}$ hour earlier than pipe A

Volume of tank filled by pipe B in $\frac{1}{2}$ hour = 3 litre

Remaining part of the tank which is still empty = (12 – 3) = 9 litre

Time required to fill 9 litre of tank by pipe A & B together = $\frac{9}{8}$ hours

= $1\frac{1}{8}$ hours = 1 hours 7.5 minutes

Required point of time = 2 : 30 pm + 1 hour 7.5 mins

= 3 : 37.5 pm or 3 : $37\frac{1}{2}$ pm

Alternative method

Part of tank filled by pipe B alone in $\frac{1}{2}$ hour

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

Time taken by pipe A & B together to fill the remaining part = $\frac{1-\frac{1}{4}}{\frac{1}{6}+\frac{1}{2}} = \frac{\frac{3}{4}}{\frac{4}{6}} = \frac{9}{8}$ hours

Required point of time = 2 : 30 pm + 1 hour 7.5 min = 3 : 37 : 30 pm

78. (A) Let $x = (27+\sqrt{756})^{1/3} + (27-\sqrt{756})^{1/3}$

$x^3 = 27+\sqrt{756}+27-\sqrt{756} + 3(27+\sqrt{756})^{1/3}(27-\sqrt{756})^{1/3}\{(27+\sqrt{756})+(27-\sqrt{756})\}$

$x^3 = 54 + 3(729 - 756)^{1/3}\, x = 54 + 3 \times (-27)\, x$

$x^3 = 54 - 9x$

$x^3 + 9x - 54 = 0$

$(x - 3)(x^2 + 3x + 18)$

$x = 3$

79. (A) $\frac{(K-1)}{(2-K)} = \frac{1}{-3} = \frac{-2}{1}$

–3(K – 1) = 2 – K

–3K + 3 = 2 – K

–3K + K = 2 – 3

–2K = –1

K = $\frac{1}{2}$

80. (B) $a + b + c = 6$

On squaring both sides, we get

$(a + b + c)^2 = 6^2$

$a^2 + b^2 + c^2 + 2(ab + bc + ca) = 36$

$14 + 2(ab + bc + ca) = 36$

$ab + bc + ca = \frac{36-14}{2}$

i.e. $ab + bc + ca = 11$

Now,

$a^3 + b^3 + c^2 - 3abc = (a + b + c)\{a^2 + b^2 + c^2 - (ab + bc + ca)\}$

i.e. $36 - 3abc = 6(14 - 11)$

$3abc = 36 - 18$

$abc = 6$

81. (A) H.C.F. of 435, 493 & 551 = 29

Each container will contain 29 litres of milk

Minimum no. containers required = $\frac{435+493+551}{29} = \frac{1479}{29} = 51$

82. (A) Profit got by C out of ₹ 1000 = ₹ 1000 – ₹ (500 +300) = ₹ 200

Now, profit got by A & C respectively = ₹ 500 & ₹ 200

Ratio of profit got by A & C = 5 : 2

Ratio of contribution of A & C = 5 : 2

Contribution made by A = ₹10,000

Contribution made by C = $\frac{2}{5} \times 10,000 = ₹ 4,000$

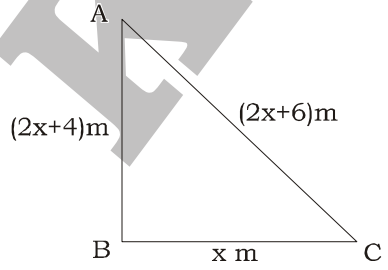
83. (C) Area of Trap. = $\frac{1}{2}$ (sum of || sides) × (distance between them)

$250 = \frac{1}{2}(15+10)(d)$

d = distance b/w || sides = $\frac{250 \times 2}{25} = d$

d = 20 m

84. (B)



In right Δ ABC

$(2x + 6)^2 = (2x + 4)^2 + x^2$

$4x^2 + 24x + 36 = 4x^2+16x +16+x^2$

$x^2 + 16x + 16 - 24x - 36 = 0$

$x^2 - 8x - 20 = 0$

$x^2 - 10x + 2x - 20 = 0$

$(x-10)(x+2) = 0$

$x = 10\text{m}, -2\text{m}$

shortest side = 10 m

85. (C) $\dfrac{\tan\frac{\pi}{4}.\cot^2\frac{\pi}{3}+\tan^2\frac{\pi}{6}.\cot\frac{\pi}{4}}{\sin\frac{\pi}{6}+\cos\frac{\pi}{3}} = \dfrac{\tan 45^\circ.\cot^2 60^\circ+\tan^2 30^\circ.\cot 45^\circ}{\sin 30^\circ+\cos 60^\circ}$

$$= \frac{1\times\left(\frac{1}{\sqrt{3}}\right)^2+\left(\frac{1}{\sqrt{3}}\right)^2.1}{\frac{1}{2}+\frac{1}{2}} = \frac{\frac{1}{3}+\frac{1}{3}}{1} = \frac{2}{3}$$

86. (D) Ratio of water and milk in first glass = 2:1

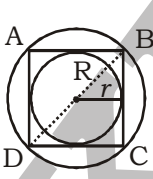
Ratio of water and milk in second glass = 2:3

Quantity of water in the third glass = $\frac{2}{3}+\frac{2}{5}=\frac{16}{15}$

Quantity of milk in the third glass = $\frac{1}{3}+\frac{3}{5}=\frac{14}{15}$

$\therefore$ Ratio of water and milk in the third glass = $\frac{16}{15}:\frac{14}{15}$ = 8 : 7

87. (D) Let ABCD is square with side 'a' cm



Radius of incircle = $\frac{a}{2}$ cm

Area of incircle = $\pi\left(\frac{a}{2}\right)^2 \Rightarrow \frac{\pi a^2}{4}$ cm²

Radius of circumcircle = $\frac{\sqrt{2}\,a}{2} = \left(\frac{a}{\sqrt{2}}\right)$ cm

Area of circumcircle = $\pi\left(\frac{a}{\sqrt{2}}\right)^2 = \frac{\pi a^2}{2}$ cm²

$\therefore$ Required ratio = $\frac{\pi a^2}{4} : \frac{\pi a^2}{2} = 1 : 2$

88. (B) $x + y + z = 2s$

$(s - x) + (s - y) + (-z) = 0$ .....(i)

$(s - x)^3 + (s - y)^3 + (-z)^3 - 3(s - x)(s - y)(-z) = 0$ [cube both side]

$(s - x)^3 + (s - y)^3 + 3(s - x)(s - y)(z) = z^3$

89. (C) $6 - \sqrt{35} = \frac{1}{2}[12 - 2\sqrt{7} \times \sqrt{5}]$

$= \frac{1}{2}[5 + 7 - 2 \times \sqrt{7} \times \sqrt{5}] = \frac{1}{2}[\sqrt{7} - \sqrt{5}]^2$

square root of $(6 - \sqrt{35}) = \sqrt{\frac{1}{2}[\sqrt{7} - \sqrt{5}]^2}$

$= \pm\left[\frac{1}{\sqrt{2}}\left(\sqrt{7} - \sqrt{5}\right)\right]$

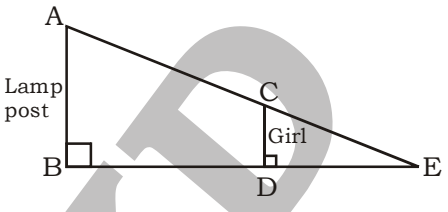
90. (A) Outer curved surface area = $2\pi r^2 = 2 \times \frac{22}{7} \times (5 + 0.25)^2$

$= 2 \times \frac{22}{7} \times 5.25 \times 5.25 = \frac{1212.75}{7}$

= 173.25 sq. cm

91. (C) Required distance = 0

92. (A)



Let length of the shadow = DE = x

BD = 1.2 × 4 = 4.8 cm

$\Delta ABE \sim \Delta CDE$

$\frac{BE}{DE} = \frac{AB}{CD}$

$\frac{4.8 + x}{x} = \frac{3.6}{0.9}$

x = 1.6 meters

93. (D) If points are collinear then area will be zero

Area= $\frac{1}{2}\left|(x_A - x_C)(y_B - y_A) - (x_A - x_B)(y_C - y_A)\right|$

$(x_A - x_C)(y_B - y_A) = (x_A - x_B)(y_C - y_A)$

(2 – 6) (K – 3) = (2 – 4) (–3 –3)

–4(K – 3) = (–2) × (–6)

K – 3 = $\frac{12}{-4}$

K – 3 = – 3

K = 0

94. (C) Let the side of square be D

Average speed = $\frac{D+D+D+D}{\frac{D}{100}+\frac{D}{200}+\frac{D}{300}+\frac{D}{400}}$

= $\frac{D+D+D+D}{\frac{D}{100}+\frac{D}{200}+\frac{D}{300}+\frac{D}{400}}$

= $\frac{4D\times 1200}{25D}$ = 192 km/h

95. (A) One day work of Priya and Supriya = $\frac{1}{2}$ ...(i)

One day work of Supriya and Anita = $\frac{1}{4}$ ...(ii)

One day work of Priya and Anita = $\frac{5}{12}$ ...(iii)

2(Priya + Supriya + Anita) = $\frac{1}{2}+\frac{1}{4}+\frac{5}{12} = \frac{14}{12}$

(Priya + Supriya + Anita) = $\frac{7}{12}$

Priya = $\frac{7}{12}-\frac{1}{4} = \frac{7-3}{12} = \frac{1}{3}$

So, Priya will take 3 days to complete that work.

96. (C) Required no. of students passed the examination = $360 \times \frac{90}{100} \times \frac{75}{100} = 243$

97. (D) Total no. of students from all the colleges in the year 2012

= 480 + 350 + 380 + 500 + 540 = 2250

$\therefore$ Required no. of student who enrolled for computer course = $2250 \times \frac{40}{100} = 900$

98. (C) Average no. of students enrolled with colleges in the year 2014 = $\frac{460+360+430+470+480}{5}$

$= \frac{2200}{5} = 440$

and average no. of students enrolled with colleges in the year 2015

$= \frac{470+340+390+530+530}{5} = \frac{2260}{5} = 452$

$\therefore$ Required ratio = 440 : 452 = 110 : 113

99. (A) Average no. of student enrolled from college M for all the years together

$= \frac{320+350+300+360+340}{5} = \frac{1670}{5} = 334$

and average no. of students enrolled from colloage N for all the years together

$= \frac{400+380+410+430+390}{5} = \frac{2010}{5} = 402$

$\therefore$ Required % = $\left(\frac{334}{402} \times 100\right)\% = 83.08\% \approx 83\%$

100. (B) Total no. of students who enrolled in 2013 = 420 + 300 + 410 + 520 + 460 = 2110

$\therefore$ No of student went abroad = $2110 \times \frac{10}{100} = 211$

QUANTITATIVE ABILITY - 84 (ANSWER KEY)

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