Hints and Solutions

1. Let the number of persons be x. Then,

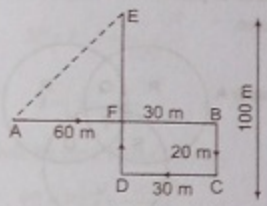
$$\frac{96}{x-4}-\frac{96}{x}=4 \Rightarrow \frac{1}{x-4}-\frac{1}{x}=\frac{4}{96}$$

$$\Rightarrow \frac{x-(x-4)}{x(x-4)}=\frac{1}{24}$$

$$\Rightarrow x^2-4x-96=0 \Rightarrow (x-12)(x+8)=0 \Rightarrow x=12$$

So, required number $= x-4=8$

2. Clearly, the child moves form A, 90 m eastwards upto B, then turns right and moves 20 m upto C, then turns right and moves 30 m upto D. Finally, he turns right and moves 100 m upto E.



Clearly,

$AB = 90$ m, $BF = CD = 30$ m

So, $AF = AB - BF = 60$ m

Also, $DE = 100$ m, $DF = BC = 20$ m

So, $EF = DE - DF = 80$ m

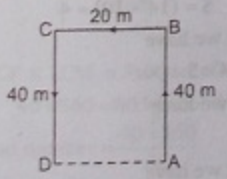
$\therefore$ His distance from starting point A

$$= AE = \sqrt{AF^2 + EF^2}$$

$$= \sqrt{(60)^2 + (80)^2} = \sqrt{3600 + 6400}$$

$$= \sqrt{10000} = 100 \text{ m}$$

3. The movements of Manick are as shown in Figure given below. (A to B, B to C and C to D). Clearly, ABCD is a rectangle and so AD = BC = 20 m



Thus, D is 20 m to the West of A.

4. The word 'LUMEN' cannot be formed using the letters of original word because of the letter 'U'.

6. Clearly, the letters of the given word are written in a reverse order and then each letter is moved one step backward to obtain the code.

Reversing the order of letters in NORTH, we get HTRON.

Thus, we have

H	T	R	O	N
-1 ↓	-1 ↓	-1 ↓	-1 ↓	-1 ↓
G	S	Q	N	M

So, the required code is GSQNM.

7. We have A = 1, B = 2, C = 3, ..., Y = 25, Z = 26

Clearly, the code for a word is obtained by dividing the sum of the individual values of its letters by the number of letters in the word.

Thus, HOTEL $= \frac{H+O+T+E+L}{5}$

$$= \frac{8+15+20+5+12}{5} = \frac{60}{5} = 12$$

So, LAMB $= \frac{L+A+M+B}{4}$

$$= \frac{12+1+13+2}{4} = \frac{28}{4} = 7$$

9. All three are names of countries, the middle one being sandwiched between the other two.

10. Second follows the first and third follows the second.

11. Second and third are of higher intensity than the first and second respectively.

12. A performer plays music on a guitar. Similarly, an acrobat performs tricks on a rope.

13. Each letter of the first group is moved three steps forward to obtain the corresponding letter of the second group.

14. The first three letters and the last three letters of the first group are separately reversed in order to obtain the second group.

15. The letters at odd-numbered positions in the first group are each moved three steps forward while those at even numbered positions are each moved two steps forward to obtain the corresponding letters of the second group.

16. Here, the relationship is

$$x^2 : (x+1)^2 + 1 \text{ or } 5^2 : (5+1)^2 + 1$$

Just in the same way $35 : 36 + 1 = 37$

$$7^2 : (7+1)^2 + 1$$

$$49 : 64 + 1 = 65$$

17. Clearly, A + B = 1 + 2 (According to alphabetical order)

$$= 3 \times 10 = 30$$

In the same way = G + H = 7 + 8

$$= 15 \times 10 = 150$$

18. All except, flute are string instruments.

19. All the others are branches of Mathematics.

20. All except, arrow are used while holding in hand.

21. In all other groups, the second, third and first letters are alternate letters of the alphabet in order.

22. Each of the number except 63, is a prime number.

23. In all other numbers, the seem of second and last digits is twice the sum of first and third digits.

24. In each set, 2nd number = (1st number × 7)

and 3rd number = (1st number × 8)

25. Only 'MNOP' are arranged in correct alphabetical order.

26. From left to right, the terms are

$1^3-1; 2^3-1; 3^3-1, 4^3-1\ldots.$

So, the missing number $=5^3-1$

$=125-1=124$

27. The given words can be arranged in the alphabetical order as Faithfully, False, Follow, Fool

28. The group of order 'cbda' completes the given series.

29. The sequence is -2 series.

30. The sequence is $4^1, 4^2, 4^3, 4^4, \ldots$ and so on.

31. The sequence is $+2, +4, +6, +8$ ... and so on.

32. In the first row, $(4\times7)-1=27$

In the second row, $(5\times8)-2=38$

So, the missing number, $(6\times9)-3=(54-3)=51$

33. The sequence is $(14)^2, (13)^2, (12^2), (11)^2, (10)^2$

So, 101 is wrong and it must be replaced by $(10)^2$ *i.e.*, 100.

34. Let x and y be the number of deer and peacocks in the zoo respectively. Then,

$x+y=80$ ...(i)

and $4x+2y=200$ or $2x+y=100$ ...(ii)

Solving Eqs. (i) and (ii), We get

$x=20, y=60$

35. We have $A=C-3, A=D+1, D=B+1, D=C-4, C=15$

Thus, $D=C-4=15-4=11$

$B=D-1=11-1=10$

36. A and B are husband and wife. Since, X and Y are brothers and X is the brother of A. Y is also the brother of A. Thus, Y is the brother-in-law of B.

37. Let the number of adults and children be $2x$ and $3x$ respectively.

Then, literate population $=(100-40)\%$ of $2x+85\%$ of $3x$

$=\left(\frac{60}{100}\times2x\right)+\left(\frac{85}{100}\times3x\right)$

$=\frac{6x}{5}+\frac{51x}{20}=\frac{75x}{20}$

$\therefore$ Required percentage

$=\left[\frac{75x}{20}\times\frac{1}{5x}\times100\right]\%=75\%$

38. 30th January, 2003 was Thursday. So, 6th, 13th, 20th and 27th February were all Thursday. Thus, 2nd March, 2003 was 3 days after Thursday *i.e.*, Sunday.

39. Let the number of cows be x and the number of hens by y.

Then,

$4x+2y=2(x+y)+14$

$\Rightarrow \quad 4x+2y=2x+2y+14$

$\Rightarrow \quad 2x=14\Rightarrow x=7$

40. Aayush leaves his house at 6 : 40 am. He reaches Tushar's house in 25 min *i.e.*, at 7 : 05 am.

Both leave for office 15 min after 7 : 05 am *i.e.*, at 7 : am.

41. The given figure contains numbers 1 to 6 in three alte segments, the smaller number being towards the c and the numbers 14 to 19 in the remaining three alte segments with the smaller number towards the inside

42. Let

$A=1, B=2, C=3,\ldots, W=23, X=24, Y=25, Z=26$

Then,

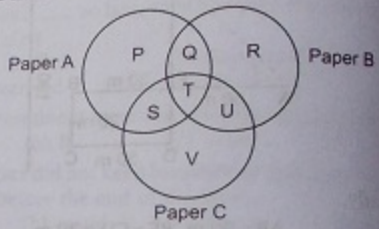
$W-T=23-20=3; T-J=20-10=10,$

$S-D=19-4=15$

So, missing number $=P-G=16-7=9$

43. Let the number of persons be 100.

Then, we have



$P+Q+S+T=26$

$Q+R+T+U=25$

$S+T+U+V=14$

$Q+T=11$

$T+U=10$

$S+T=9$

$V=0$

Putting $V=0$ in Eq. (iii), we get

$S+T+U=14$

But $T+U=10$

So, $S=(14-10)=4$

From Eq. (vi), we have

$T=9-S=9-4=5$

From Eq. (v), we have

$U=10-T=5$

From Eq. (iv), we have

$Q=11-T=6$

From Eq. (i), we have

$P=26-(Q+S+T)=26-(6+4+5)=11$

From Eq. (ii), we have

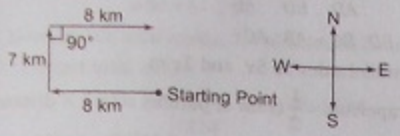
$R=25-(Q+T+U)=25-(6+5+5)=9$

So, percentage of readers who read all the newspaper $=T=5$

44. On interchanging $-$ and $\div$ and 4 and 8 in (c), we g equation as

$8-4\div2=6$ or $8-2=6$ or $6=6$

45. Clockwise direction



So, the answer is East.

46. Physics and Chemistry are entirely different subjects, but both are branches of Science.

48. 

101. Let ₹ P be the principal.

$$\therefore \quad 3P = P\left(1+\frac{r}{100}\right)^5$$

$$3=\left(1+\frac{r}{100}\right)^5 \qquad ...(i)$$

Let the sum will be nine times in n yr.

$$\therefore \quad 9P = P\left(1+\frac{r}{100}\right)^n$$

$$(3)^2=\left(1+\frac{r}{100}\right)^n \qquad ...(ii)$$

$$n = 10 \text{ yr}$$

102. Let the HCF of two numbers $= x$

$\therefore$ LCM of two numbers $= 14x$

Now,

$$\text{HCF} + \text{LCM} = 600$$

$$x + 14x = 600 \text{ or } x = \frac{600}{15} = 40$$

$\therefore$ HCF of two numbers $= 40$

and LCM of two numbers $= 14 \times 40$

$$= 560$$

We know that

$$\text{HCF} \times \text{LCM} = \text{Product of two numbers}$$

$$40 \times 560 = 80 \times \text{Second number}$$

$$\therefore \quad \text{Second number} = \frac{40 \times 560}{80}$$

$$= 280$$

103. $\sqrt{7.84} + \sqrt{0.0784} + \sqrt{0.000784} + \sqrt{0.00000784}$

$$= \sqrt{\frac{784}{100}} + \sqrt{\frac{784}{10000}} + \sqrt{\frac{784}{1000000}} + \sqrt{\frac{784}{100000000}}$$

$$= \frac{28}{10} + \frac{28}{100} + \frac{28}{1000} + \frac{28}{10000}$$

$$= 2.8 + 0.28 + 0.028 + 0.0028$$

$$= 3.1108$$

104. Let B completes his work in $2x$ days.

$\therefore A$ can complete his work in x days.

$$\therefore \quad \frac{1}{x} + \frac{1}{2x} = \frac{1}{14}$$

$$\frac{3}{2x} = \frac{1}{14}$$

$$x = \frac{3 \times 14}{2} = 21$$

$\therefore A$ can complete his work in 21 days.

105. Let the amount of sugar sold at 7% profit be x kg and let CP per kg be ₹ 1.

Total CP = ₹ 100

Total SP = 107% of x + 117% of $(100 - x)$

$$= 1.07x + 1.17(100 - x)$$

$$= 1.07x + 117 - 1.17x$$

$$= 117 - 0.1x$$

$\therefore \quad 117 - 0.1x$

$$= 110\% \text{ of } 100$$

$\Rightarrow \quad 0.1x = 117 - 110 = 7$

$\Rightarrow \quad x = \frac{7}{0.1} = 7 \times 10 = 70$ kg

106. Let the original price per kg be ₹ 100.

$\therefore$ Reduced price = ₹ 98

$\therefore$ Amount to be bought $= \frac{4900}{98}$

$$= 50 \text{ kg}$$

107. The batsman scored $3 \times 4 + 8 \times 6 = 60$ runs by boundaries and sixes respectively. Then, runs scored by running

$$= 110 - 60 = 50$$

$\therefore$ Required percentage

$$= \frac{50}{110} \times 100 = \frac{500}{11} = 45\frac{5}{11}\%$$

108. **Short-cut method**

If height and radius both of a cylinder change by x%, then volume changes by

$$\left[3x + \frac{3x^2}{100} + \frac{x^3}{100^2}\right]\%$$

$$= \left[3 \times 20 + \frac{3 \times 20 \times 20}{100} + \frac{20 \times 20 \times 20}{10000}\right]\%$$

$$= (60 + 12 + 0.8)\% = 72.8\%$$

109. Let the total number of students $= 100$

$\therefore$ Number of students who failed in Hindi or English or both $= 52 + 42 - 17 = 77$

$\therefore$ Number of students who passed in both subjects $= 100 - 77 = +23$

$\therefore$ Required percentage = 23%

110. A number is divisible by 9 if the sum of its digits is divisible by 9.

Here, $6 + 7 + 0 + 9 = 22$

Now, $22 + 5 = 27$, which is divisible by 9. Hence, 5 must be added to 6709.

111. Expression

$$= \frac{10.3 \times 10.3 \times 10.3 + 1 \times 1 \times 1}{10.3 \times 10.3 - 10.3 \times 1 + 1 \times 1}$$

Let $10.3 = a$ and $1 = b$

Then,

$$\text{Expression} = \frac{a^3 + b^3}{a^2 - ab + b^2}$$

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

$$= a + b = 10.3 + 1 = 11.3$$

112. Clearly $122 - 2 = 120$ and $243 - 3 = 240$ are exactly divisible by the required number.

$\therefore$ Required number

= HCF of 120 and 240 = 120

113. By Pythagoras theorem,

$$PR = \sqrt{PQ^2 + QR^2} = \sqrt{5^2 + 12^2}$$

$$= 13 \text{ cm}$$

$\because O$ is centroid $\Rightarrow QM$ is median and M is mid-point of PR.

$$QM = PM = \frac{13}{2}$$

$\because$ Centroid divides median in ratio 2 : 1.

$$\therefore \quad OQ = \frac{2}{3}QM = \frac{2}{3} \times \frac{13}{2} = \frac{13}{3}$$

$$\therefore \quad OQ = 4\frac{1}{3} \text{ cm}$$

114. It is obvious from the graph.

115. Percentage expenditure on clothing = 15

Percentage savings = 12. 5

$\therefore$ Required difference = 15 – 12.5 = 2.5%

116. Savings

$$= 12.5\% \text{ of } ₹\ 100000$$

$$= ₹\ \frac{12.5 \times 100000}{100} = ₹\ 12500$$

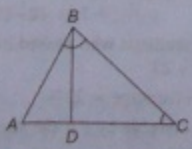
117. Both expenditures are equal to 20% each.

118. The expenditure on housing is 10% which is less than 12.5% the savings.

119. As $\angle B = 2\angle C$

$$\Rightarrow \quad \angle ABD = \angle BCA$$

In ΔABC and ΔABD,



$\angle A = \angle A$ (common)

$\angle ABD = \angle BCA$ (proved)

$\therefore \quad \Delta ABC \sim \Delta ABD$

$$\Rightarrow \quad \frac{AB}{AD} = \frac{BC}{BD} = \frac{AC}{AB}$$

$$\Rightarrow \quad BD : BC = AB : AC$$

120. Let the parallel sides be $5x$ and $3x$ m.

Area of trapezium $= \frac{1}{2}$ (sum of parallel sides) $\times$ distance between them

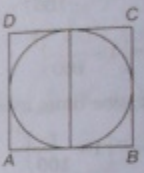
$$\Rightarrow \quad 1440 = \frac{1}{2}(5x + 3x) \times 24$$

$$\Rightarrow \quad 12 \times 8x = 1440$$

$$\Rightarrow \quad x = \frac{1440}{12 \times 8} = 15$$

$\therefore$ The longer parallel side $= 5x \times 5 \times 15 = 75$ m

121. Side of the square $= \frac{120}{4} = 30$ cm



Clearly, diameter of the greatest circle = Side of the square = 30 cm

$$\therefore \quad \text{Radius} = \frac{30}{2} = 15 \text{ cm}$$

Required area $= \pi \times (\text{radius})^2$

$$= \frac{22}{7} \times (15)^2 \text{ cm}^2$$

122. Surface area of a small cube $= 6 \times (\text{edge})^2 = 6 \times 1 = 6 \text{ cm}^2$

Surface area of the large cube $= 6 \times (5)^2 = 6 \times 25 \text{ cm}^2$

$\therefore$ Required ratio $= \frac{6}{6 \times 25} = \frac{1}{25}$

i.e., $\quad 1 : 25$

123. Let the required distance be x km.

Difference of time

$$= 6 + 6 = 12 \text{ min}$$

$$= \frac{12}{60} = \frac{1}{5} \text{ h}$$

According to the question,

$$\frac{x}{5} - \frac{x}{7} = \frac{1}{5}$$

$$\Rightarrow \quad \frac{2x}{5} - \frac{2x}{7} = \frac{1}{5}$$

$$\Rightarrow \quad \frac{14x - 10x}{35} = \frac{1}{5}$$

$$\Rightarrow \quad \frac{4x}{35} = \frac{1}{5}$$

$$\Rightarrow \quad x = \frac{35}{4 \times 5} = \frac{7}{4} = 1\frac{3}{4} \text{ km}$$

124. Total marks obtained by 5 students
$= 50 \times 5 = 250$

Now, in this total marks, 84 is included instead of 48.

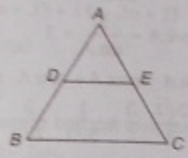
$\therefore$ Correct total marks

$= 250 - 84 + 48 = 214$

$\therefore$ Correct average $= \frac{214}{5}$

$= 42.8$

125. As in ΔADE and ΔABC



$$\frac{AD}{AB} = \frac{8}{20} = \frac{2}{5}, \frac{AE}{EC} = \frac{6}{15} = \frac{2}{5}$$

So, $\frac{AD}{AB} = \frac{AE}{EC}$

and $\angle A = \angle A$ (common)

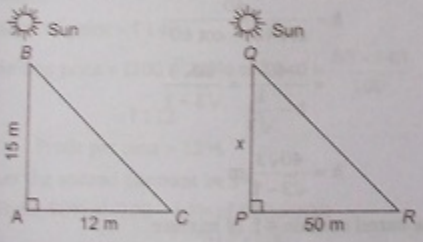
$\Delta ADE \sim \Delta ABC$

$\therefore \frac{DE}{BC} = \frac{AD}{AB} \Rightarrow \frac{DE}{BC} = \frac{2}{5}$

$\Rightarrow BC = \frac{5}{2} DE$

126. Let AB be a vertical stick and AC be its shadow.

Also, let PQ be a tower having shadow PR.



As $\Delta ABC \sim \Delta PQR$

$\therefore \frac{AB}{PQ} = \frac{AC}{PR}$

$\Rightarrow \frac{15}{x} = \frac{12}{50}$

$\Rightarrow x = \frac{15 \times 50}{12} = 62.5 \text{ m}$

Hence, height of the tower is 62.5 m.

127. Let the CP of article be ₹ x.

According to the question,

$$\left(100 + \frac{25}{2}\right)\% \text{ of } x - \left(100 - \frac{25}{2}\right)\% \text{ of } x = 13$$

$\Rightarrow \frac{x}{100}\left(100 + \frac{25}{2} - 100 + \frac{25}{2}\right) = 13$

$\Rightarrow \frac{x}{100} \times 25 = 13$

$\Rightarrow x = 13 \times 4 = 52$

128. Distance covered by A in 4 h $= 4 \times 4 = 16$ km

Relative speed of B with respect to $A = 10 - 4 = 6$ km/h

$\therefore$ Time taken to catch $A = \frac{16}{6} = \frac{8}{3}$ h

$\therefore$ Required distance $= \frac{8}{3} \times 10 = \frac{80}{3} = 26.7$ km

129. Let train A start from station A and B from station B.

Let the trains A and B meet after t h.

$\therefore$ Distance covered by train A in t h $= 50t$

Distance covered by train B in t h $= 60t$ km

According to the question,

$60t - 50t = 120$

$\Rightarrow t = \frac{120}{10} = 12$ h

$\therefore$ Distance $AB = 50 \times 12 + 60 \times 12$

$= 600 + 720$

$\Rightarrow = 1320$ km

130. Each interior angle

$$= \frac{(n-2) \times 180^\circ}{n}$$

$\therefore \frac{(n-2) \times 180^\circ}{n} = 150^\circ$

$(n-2) \times 180^\circ = n \times 150^\circ$

$30n = 360^\circ$

$n = \frac{360^\circ}{30}$

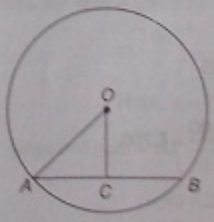
$n = 12$

131. Let number of side be n. Each equal side subtends equal angle at the centre. So,

$n \times 72 = 360$

$\Rightarrow n = \frac{360}{72} = 5$

132.



$AC = BC = 4$ cm

$OA = 6$ cm

$\therefore OC = \sqrt{6^2 - 4^2}$

$= \sqrt{(6+4)(6-4)}$

$= \sqrt{10 \times 2} = 2\sqrt{5}$ cm