

3

ALLIGATIONS

As we have studied the normal average in the previous chapter, so here we study particularly weighted average. In this chapter we will learn to find the average of two different groups with different number of elements which is known as weighted average. So alligation method is the simplified technique to solve the complex average problems. In this chapter, various kinds of problems will be discussed, since this chapter works as a means not as an end for.

Basically in the entrance tests or competitive exams like

EXAMPLE 1 The average weight of a class of 40 students is 30 and the average weight of a class of 20 students is 15. Find the average weight of both the combined classes :

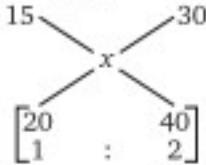
- (a) 20 (b) 25 (c) 17.5 (d) 15

SOLUTION To find the solution of this problem, we can use two widely used techniques :

1. Weighted average method

$$\text{The required average} = \frac{40 \times 30 + 20 \times 15}{(40 + 20)} = 25$$

2. Alligation method :



In this graphical representation of the solution, x is the weighted average where 15 and 30 are the averages of different class. So remember that the weighted average is always written in middle and the individual averages are written at the top, the smaller one in the left and the greater one in the right just for convenience and the number of elements (or the fixed quantities) are written below correspondingly.

Now, the difference between the two averages is divided in the inverse ratio of the quantities written below. As in the above problem, the difference 15 ($= 30 - 15$) will be divided in the ratio of 2:1 (as 40:20) but not in the ratio of 1:2, which must be clear from the arrows indicating cross proportion.

$$\text{So, the value of } x = 15 + \frac{2}{3} \times (30 - 15) = 25$$

CAT, the problems are not directly asked from this chapter, rather the techniques used in this chapter are applied for the higher level problems of CAT. As the alligation plays a vital role as a time saving method in solving the problems of Ratio Proportion, S.I., C.I. Profit Loss and some other topics, so we need to emphasize on the concept of Alligation and its applications extensively applied.

Remember, in some exams like MAT, IRMA, CET etc., the problems of this chapter are directly asked which you need to solve within seconds, even orally.

$$\text{or } x = 30 - \frac{1}{3} \times (30 - 15) = 25$$

Therefore, the average weight of both the classes is 25.

EXAMPLE 2 If the average weight of a class of students is 15 and the average weight of another class of students is 30, then find the ratio of the students of the first class to the another class of 30 students when the average weight of both the classes is 25 :

- (a) 1 : 2 (b) 2 : 1 (c) 1 : 3 (d) 3 : 4

SOLUTION Let the ratio of the students with 15 students to 30 students be $x : y$, then



Here we know that the averages of individual classes is 15 and 30. Again we know that the averages of both the combined classes is 25. So the difference between 25 and 15 i.e., 10 and 30 & 25, i.e., 5 is written diagonally opposite.

$$\text{Thus the required ratio} = \frac{5}{10} = \frac{1}{2}$$

EXAMPLE 3 The average weight of girls is 15 and the average weight of boys is 30 and the average weight of boys and girls both is 25. If the number of boys are 12, then the number of girls is :

- (a) 4 (b) 6 (c) 10 (d) 18

SOLUTION



$$\text{Since the ratio of girls to boys is } \frac{5}{10} = \frac{1}{2}$$

Hence if there are 12 boys, so there will be 6 girls.

EXAMPLE 4 The ratio of number of girls to number of boys is 1 : 2. If the average weight of the boys is 30 kg and the average weight of both the boys and girls be 25 kg, then the average weight of the girls is :

- (a) 15 kg (b) 20 kg (c) 35 kg (d) 40 kg

SOLUTION

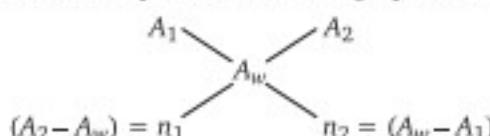
$$\begin{aligned} & G \quad \quad \quad 30 \\ & \diagup \quad \quad \quad \diagdown \\ & 25 \quad \quad \quad 25 \\ & \diagdown \quad \quad \quad \diagup \\ & (30 - 25) = x \quad \quad \quad 2x = (25 - G) \\ \Rightarrow & \quad \quad \quad \left(\frac{30 - 25}{25 - G} = \frac{x}{2x} \right) \\ \text{So} & \quad \quad \quad \frac{(30 - 25)}{(25 - G)} = \frac{1}{2} \Rightarrow G = 15 \end{aligned}$$

Therefore, the average weight of the girls is 15 kg. In general, if the average of group 1 be A_1 and the number of the elements be n_1 and the average of the group 2 be A_2 & the number of element be n_2 then the weighted average

$$\begin{aligned} A_w &= \frac{n_1 A_1 + n_2 A_2}{n_1 + n_2} \\ \Rightarrow n_1 A_w + n_2 A_w &= n_1 A_1 + n_2 A_2 \\ \Rightarrow n_1 (A_w - A_1) &= n_2 (A_2 - A_w) \\ \Rightarrow \frac{n_1}{n_2} &= \frac{(A_2 - A_w)}{(A_w - A_1)} \end{aligned}$$

(known as Alligation Equation)

So this can be represented in the graphical form as given below



So all these problems concerned to the topic can be solved either by the formula of weighted average or Alligation equation or graphical representation method, as discussed above.

EXAMPLE 5 Two varieties of soda water with different prices is mixed in the ratio of 2 : 3. The price of first soda water is Rs. 10 per litre while the price of second soda water is Rs. 15 per litre, respectively. The average price of the mixture (per litre) is :

- (a) Rs. 12 (b) Rs. 13 (c) Rs. 14 (d) Rs. 15

SOLUTION

$$\begin{aligned} & 10 \quad \quad \quad 15 \\ & \diagup \quad \quad \quad \diagdown \\ & 2 \quad \quad \quad 3 \\ \Rightarrow & \quad \quad \quad \frac{(x - 10)}{(15 - x)} = \frac{2}{3} \\ \Rightarrow & \quad \quad \quad 2(x - 10) = 3(15 - x) \\ \Rightarrow & \quad \quad \quad x = 13 \end{aligned}$$

EXAMPLE 6 5 kg of superior quality of sugar is mixed with 25 kg of inferior quality sugar. The price of superior quality and inferior quality sugar is Rs. 18 and Rs. 12 respectively. The average price per kg of the mixture is :

- (a) Rs. 13 (b) Rs. 15 (c) Rs. 18 (d) Rs. 21

SOLUTION

$$\begin{aligned} & 12 \quad \quad \quad 18 \\ & \diagup \quad \quad \quad \diagdown \\ & 25 \quad \quad \quad 5 \\ \Rightarrow & \quad \quad \quad \frac{(x - 12)}{(18 - x)} = \frac{5}{25} \\ \Rightarrow & \quad \quad \quad x = 13 \end{aligned}$$

SHORTCUT The corresponding ratio is 25 : 5 = 5 : 1

Now reverse the ratio, which is 1 : 5

Now divide the differences of 12 and 18 in the ratio of 1 : 5 i.e., divide 6 into two parts in the ratio of 1 : 5. then the average price of mixture is $12 + 1 = 13$

or $18 - 5 = 13$

EXAMPLE 7 16 litres of kerosene is mixed with 5 litres of petrol. The price of kerosene is Rs. 12 per litre and the price of petrol is Rs. 33 per litre. The average price of the mixture per litre is :

- (a) Rs. 15 (b) Rs. 17 (c) Rs. 23 (d) Rs. 27

SOLUTION

$$\begin{aligned} & 12 \quad \quad \quad 33 \\ & \diagup \quad \quad \quad \diagdown \\ & 16 \quad \quad \quad 5 \end{aligned}$$

Now divide the difference of 12 and 33 in the ratio of 5 : 16 (not in the ratio of 16 : 5)

Here, the difference of 33 and 12 = 21

Again on dividing 21 in the ratio of 5 : 16, we get the first part = 5 and second part = 16

So, the average price = $12 + 5 = 17$
or $= 33 - 16 = 17$

NOTE This cross among the numbers written above shows that the difference between x and 12 is 5 and the difference between 33 and x is 16.

EXAMPLE 8 Amit travels 30 minutes at the speed of 25 km/hr. Further he travels 20 minutes at the speed of 40 km/hr. Find his average speed.

- (a) 25 km/hr (b) 30 km/hr
(c) 31 km/hr (d) none of these

SOLUTION

$$\begin{aligned} & 25 \quad \quad \quad 40 \\ & \diagup \quad \quad \quad \diagdown \\ & 30 \quad \quad \quad 20 \end{aligned}$$

Since the actual ratio is 3 : 2, so reverse it, i.e., the required ratio is 2 : 3.

Now divide the difference of both the speeds i.e., 25 and 40 in the ratio of 2 : 3.

$$\text{i.e., } (40 - 25) \times \frac{2}{5} = 6 \text{ and } (40 - 25) \times \frac{3}{5} = 9$$

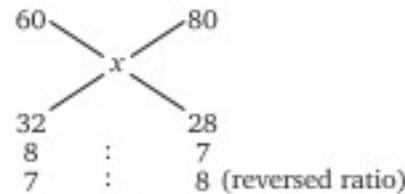
So the average speed is $25 + 6 = 31$

or $40 - 9 = 31$

EXAMPLE 9 A milkman has two types of milk. In the first container the percentage of milk is 80% and in the second container the percentage of milk is 60%. If he mixes 28 litres of milk of the first container to the 32 litres of milk of the second container, then the percentage of milk in the mixture is :

- (a) 63.99 (b) 69.33 (c) 72.5 (d) 75.2

SOLUTION



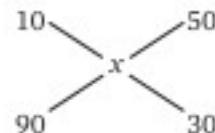
$$\text{So } (80 - 60) \times \frac{7}{7+8} = 20 \times \frac{7}{15} = 9.33$$

Thus the required percentage = $60 + 9.33 = 69.33$

EXAMPLE 10 Modern electronic shop sold the 30% hardware at the profit of 50% and 90% software at the profit of 10%. The average profit percent of the Modern electronic shop is, if it sells only these two kinds of things :

- (a) 15 (b) 20 (c) 25 (d) 45

SOLUTION



The actual ratio is 3:1.

So the reversed ratio is 1:3.

Now divide the difference of 10 and 50 in the ratio of 1:3 then add the first part to the 10 or subtract the second part from the 50.

$$\text{i.e., Required average} = 10 + (50 - 10) \times \frac{1}{4} = 10 + 10 = 20$$

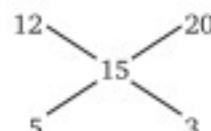
$$\text{or } 50 - (50 - 10) \times \frac{3}{4} = 20$$

NOTE All the problems discussed above can be solved in any way, i.e., either by using the formula of weighted average or Alligation Equation. But we have emphasised on the graphical (cross proportion) method. Since this technique is quite handy, i.e., sometimes you need not to calculate on paper.

EXAMPLE 11 Avinash covered 150 km distance in 10 hours. The first part of his journey he covered by car, then he hired a rickshaw. The speed of car and rickshaw is 20 km/hr and 12 km/hr respectively. The ratio of distances covered by car and the rickshaw respectively are :

- (a) 2:3 (b) 4:5 (c) 1:1 (d) none of these

SOLUTION The average speed of Avinash = $\frac{150}{10} = 15 \text{ km/hr}$



It means the rickshaw took $\frac{5}{8}$ and car took $\frac{3}{8}$ of the total time i.e., the ratio of time taken by rickshaw to car is 5:3

So the ratio of distances covered by rickshaw to car is

$$5 \times 12 : 3 \times 20 \Rightarrow 1:1$$

NOTE

1. In this calculation (i.e., in alligation method) distance never involves directly. Only time and speeds are involved.
2. Since we have to find generally the average speed (not the average time) so speeds are written on the top and corresponding time taken is written below.

EXAMPLE 12 A mixture of rice is sold at Rs. 3.00 per kg. This mixture is formed by mixing the rice of Rs. 2.10 and Rs. 2.52 per kg. What is the ratio of price of cheaper to the costlier quality in the mixture if the profit of 25% is being earned.

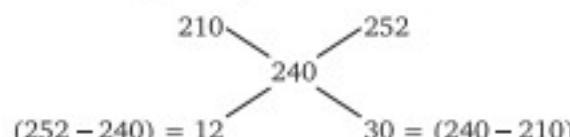
- (a) 5:2 (b) 2:7 (c) 2:5 (d) 15:8

SOLUTION Let the cost price of the mixture be Rs. x per kg, then selling price = $x + \frac{25 \times x}{100} = 3$

$$\Rightarrow 1.25x = 3$$

$$\Rightarrow x = 2.4$$

Now the average cost price of mixture = Rs. 2.4



Therefore, the ratio of cheaper to costlier rice is 12:30, i.e., 2:5.

NOTE Re 1 = 100 paise. There is no change in the ratio when we change the rupees into paise, just for our convenience in calculation.

EXAMPLE 13 A milkman has 20 litres of milk. If he mixes 5 litres of water, which is freely available, in 20 litres of pure milk. If the cost of pure milk is Rs. 18 per litre, then the profit of the milkman, when he sells all the mixture at cost price, is :

- (a) 20% (b) 25% (c) 33.33% (d) 18%

SOLUTION When the water is freely available and all the water is sold at the price of the milk, then the water gives the profit on the cost of 20 litres of milk.

$$\text{Therefore, profit percentage} = \frac{5}{20} \times 100 = 25\%$$

$$\text{Since, } \text{the profit \%} = \frac{\text{profit}}{\text{cost price}} \times 100$$

NOTE Here the milkman cheats his customer by false practise of creating illusion that instead of 20 litres milk, there is 25 litres of milk. So this extra 5 litres of milk (actually water) is the part of profit.

EXAMPLE 14 In what ratio should water and wine be mixed so that after selling the mixture at the cost price a profit of 33.33% is made?

- (a) 1:4 (b) 1:3 (c) 2:3 (d) 3:4

SOLUTION 33.33% profit means there is one part water and 3 part is pure wine. So the required ratio of water and wine in the mixture is 1:3.

NOTE The above problem (No. 14) and the previous problem are basically related to the topics of ratio and profit-loss.

EXAMPLE 15 In what ratio should freely available water be mixed with the wine worth Rs. 60 per litre so that after selling the mixture at Rs. 50 per litre, the profit will be 25%?

- (a) 1:2 (b) 2:3 (c) 3:4 (d) 4:5

EXERCISE



1. How much Pepsi at Rs. 6 a litre is added to 15 litre of 'dew' at Rs. 10 a litre so that the price of the mixture be Rs. 9 a litre?
 (a) 5 (b) 8
 (c) 10 (d) none of these

2. In a municipal parking there are some two wheelers and rest are 4 wheelers. If wheels are counted, there are total 520 wheels but the incharge of the parking told me that there are only 175 vehicles. If no vehicle has a stepney, then the no. of two wheelers is :
 (a) 75 (b) 100
 (c) 90 (d) 85

3. In my pocket there are Rs. 25 consisting of only the denominations of 20 paise and 50 paise. Thus there are total 80 coins in my pocket. The no. of coins of the denomination of 50 paise is :
 (a) 30 (b) 70
 (c) 50 (d) 25

4. There are some shepherds and their sheep in a grazing field. The no. of total heads are 60 and total legs are 168 including both men and sheep. The no. of sheep is :
 (a) 18 (b) 26
 (c) 24 (d) 36

5. In the 75 litres of mixture of milk and water, the ratio of milk and water is 4 : 1. The quantity of water required to make the ratio of milk and water 3 : 1 is :
 (a) 1 litre (b) 3 litres
 (c) 4 litres (d) 5 litres

6. In my office the average age of all the female employees is 21 years and that of male employees is 32 years, where the average age of all the (male and female) employees is 28 years. The total no. of employees in my office could be :
 (a) 35 (b) 78
 (c) 231 (d) 90

7. A car agency has 108 cars. He sold some cars at 9% profit and rest at 36% profit. Thus he gains 17% on the sale of all his cars. The no. of cars sold at 36% profit is :
 (a) 25 (b) 32
 (c) 35 (d) 75

8. Rs. 69 were divided among 115 students so that each girl gets 50 paise less than a boy. Thus each boy received twice the paise as each girl received. The no. of girls in the class is :
 (a) 92 (b) 42
 (c) 33 (d) 23

9. In what proportion water be mixed with spirit to gain 12.5% by selling it at cost price?
 (a) 3 : 5 (b) 1 : 8
 (c) 2 : 7 (d) 1 : 9

10. A butler stole wine from a butt of sherry containing 50% of spirit, then he replenished it by different wine containing 20% spirit. Thus there was only 30% strength (spirit) in the new mixture. How much of the original wine did he steal?
 (a) 1/3 (b) 2/3
 (c) 1/2 (d) 1/4

11. Mr. Mittal purchased two steel factories, one in India and other one in Malaysia for total Rs. 72 crores. Later on he sold the Indian factory at 16% profit and Malasian factory at 24% profit. Thus he gained a total profit of 19%. The selling price of Indian factory is :
 (a) 45 crore (b) 52.2 crore
 (c) 8.55 crore (d) can not be determined

12. In a 25 litre mixture of milk and water, the water is only 20%. How many litres of water is required to increase the percentage of water to 90%?
 (a) 45 litre (b) 70 litre
 (c) 115 litre (d) 175 litre

13. A milkman sells the milk at the cost price but he mixes the water (freely available) in it and thus he gains 9.09%. The quantity of water in the mixture of 1 litre is :
 (a) 83.33 mL (b) 90.90 mL
 (c) 99.09 mL (d) can't be determined

14. The price of petrol is Rs. 60 per litre and the price of spirit is Rs. 40 per litre. In what ratio the petrol and spirit be mixed such that the profit after selling the mixture at Rs. 75 per litre be 25%?
 (a) 1 : 1 (b) 3 : 2
 (c) 5 : 1 (d) such a mixture is not possible

15. A trader sells total 315 TV sets. He sells black and white TV sets at a loss of 6% and colour TV sets at a profit of 15%. Thus he gains 9% on the whole. The no. of B/W TV sets, which he has sold, is :
 (a) 126 (b) 216
 (c) 135 (d) 90

16. In a class of 30 students, the average weight of boys is 20 kg and the average weight of the girls is 25 kg. The fraction of boys out of the total students of the class is :
 (a) $\frac{4}{5}$ (b) $\frac{5}{6}$
 (c) $\frac{3}{4}$ (d) data insufficient

17. Baniya sells two types of tea viz. Desi Chai and Videshi Chai. He sells Desi Chai at Rs. 18 per kg and incurs a loss of 10% whereas on selling the Videshi Chai at Rs. 30 per kg, he gains

- 20%. In what proportion should the Desi Chai and Videshi Chai be mixed such that he can gain a profit of 25% by selling the mixture at Rs. 27.5 per kg?
- (a) 3 : 2 (b) 2 : 3
(c) 2 : 5 (d) 3 : 5
18. The average age of boys in class is 16.66, while the average age of girls is 18.75. Thus the average age of all the 40 students of the class is 17.5. If the difference between the no. of boys and girls is 8, then the no. of girls in the class is :
- (a) 12 (b) 16
(c) 18 (d) data insufficient
19. The ratio of water and alcohol in two different containers is 2 : 3 and 4 : 5. In what ratio we are required to mix the mixtures of two containers in order to get the new mixture in which the ratio of alcohol and water be 7 : 5?
- (a) 7 : 3 (b) 5 : 3
(c) 8 : 5 (d) 2 : 7
20. The average marks of the students in four sections A, B, C and D together is 60%. The average marks of the students of A, B, C and D individually are 45%, 50%, 72% and 80% respectively. If the average marks of the students of sections A and B together is 48% and that of the students of B and C together is 60%. What is the ratio of number of students in sections A and D?
- (a) 2 : 3 (b) 4 : 3
(c) 5 : 3 (d) 3 : 5
21. The diluted wine contains only 8 litres of wine and the rest is water. A new mixture whose concentration is 30%, is to be formed by replacing wine. How many litres of mixture shall be replaced with pure wine if there was initially 32 litres of water in the mixture?
- (a) 4 (b) 5
(c) 8 (d) none of these
22. The average weight of boys in a class is 30 kg and the average weight of girls in the same class is 20 kg. If the average weight of the whole class is 23.25 kg, what could be the possible strength of boys and girls respectively in the same class?
- (a) 14 and 26 (b) 13 and 27
(c) 17 and 27 (d) none of these
23. The shopkeeper mixed 40 kg refined oil with vegetable oil worth Rs. 60 per kg. Thus he gains Rs. 10 after selling the mixture of the two oils. The price of the first oil is :
- (a) 20 (b) 25
(c) 45 (d) can't be determined
24. In a mixture of milk and water, there is only 26% water. After replacing the mixture with 7 litres of pure milk, the percentage of milk in the mixture become 76%. The quantity of mixture is :
- (a) 65 litre (b) 91 litre
(c) 38 litre (d) none of these
25. The ratio of expenditure and savings is 3 : 2. If the income increases by 15% and the savings increases by 6%, then by how much per cent should his expenditure increases?
- (a) 25 (b) 21
(c) 12 (d) 24
26. 4 kg of a metal contains $\frac{1}{5}$ copper and rest is zinc. Another 5 kg of metal contains $\frac{1}{6}$ copper and rest is zinc. The ratio of copper and zinc into the mixture of these two metals :
- (a) 49 : 221 (b) 39 : 231
(c) 94 : 181 (d) none of these
27. 450 litres of a mixture of milk and water contain the milk and water in the ratio 9 : 1. How much water should be added to get a new mixture containing milk and water in the ratio 3 : 1?
- (a) 54 (b) 90
(c) 45 (d) 63
28. The ratio of petrol and kerosene in the container is 3 : 2 when 10 litres of the mixture is taken out and is replaced by the kerosene, the ratio becomes 2 : 3. The total quantity of the mixture in the container is :
- (a) 25 (b) 30
(c) 45 (d) cannot be determined
29. From a container, 6 litres milk was drawn out and was replaced by water. Again 6 litres of mixture was drawn out & was replaced by the water. Thus the quantity of milk and water in the container after these two operations is 9 : 16. The quantity of mixture is :
- (a) 15 (b) 16
(c) 25 (d) 31



Answers

1. (a)	2. (c)	3. (a)	4. (c)	5. (d)	6. (c)	7. (b)	8. (a)	9. (b)	10. (b)
11. (b)	12. (d)	13. (a)	14. (d)	15. (d)	16. (d)	17. (a)	18. (b)	19. (b)	20. (b)
21. (b)	22. (b)	23. (d)	24. (b)	25. (b)	26. (a)	27. (b)	28. (b)	29. (a)	



Hints & Solutions

1. Let x litre pepsi is required.

$$\begin{array}{ccccc} 6 & & 10 & & \\ & \diagdown & \diagup & & \\ & x & 9 & 15 & \\ (10-9) = 1 & : & 3 = (9-6) & & \end{array}$$

Therefore $\frac{x}{15} = \frac{1}{3}$

$\Rightarrow x = 5$ litre

Alternatively : Go through options.

2. Go through options :

$$90 \times 2 + 85 \times 4 = 520$$

If 2 wheelers be 90 then the four wheelers will be

$$85 = (175 - 90)$$

Alternatively : The average number of wheels per vehicle $= \frac{520}{175}$

$$\begin{array}{ccccc} 2 \times \frac{175}{175} & & 4 \times \frac{175}{175} & & \\ & \diagdown & \diagup & & \\ & 520 & & & \\ \frac{180}{175} & : & \frac{170}{175} & & \\ \Rightarrow 180 & : & 170 & & \\ \Rightarrow 90 & : & 85 & & \\ \Rightarrow 18 & : & 17 & & \end{array}$$

Therefore the ratio of two wheelers to four wheelers is $18 : 17$.
Hence there are 90 "two wheelers".

3. Go through options :

$$30 \times 50 + 50 \times 20 = 2500$$
 paise

Alternatively : Since the average price of a coin

$$= \frac{2500}{80} = 31.25$$
 paise

$$20 \diagdown \quad 50 \diagup$$

$$31.25 \quad \quad$$

$$18.75 \quad \quad 11.25$$

So the ratio of no. of 20 paise coins to the no. of 50 paise coins

$$= 18.75 : 11.25$$

$$= 75 : 45 = 5 : 3$$

Therefore, the no. of coins of the denominations of 50 paise is 30.

4. Go through option :

$$24 \times 4 + 36 \times 2 = 168$$

Alternatively :

$$\begin{array}{ccccc} 2 & & 4 & & \\ & \diagdown & \diagup & & \\ & 2.8 & & & \\ 1.2 & & 0.8 & & \\ \Rightarrow 3 & : & 2 & & \end{array}$$

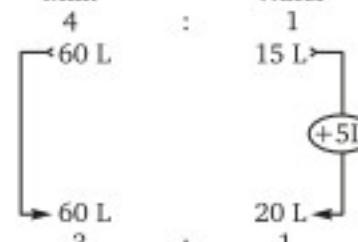
Therefore, the ratio of men and sheep is $3 : 2$.

Alternatively : Suppose there are only men, then the no. of legs $= 60 \times 2 = 120$.

Now since there are $48 = (168 - 120)$ legs extra, it means there are $24 = \left(\frac{48}{2}\right)$ sheep, since a sheep has 2 extra legs than a man has.

5. Total quantity of mixture = 75 litre

Therefore Milk : Water



6. Since the ratio of no. of female and male employees is $4 : 7$, so the total no. of employees must be the multiples of 11. Hence the possible answer is 231.

$$\begin{array}{ccccc} 21 & & 32 & & \\ & \diagdown & \diagup & & \\ & 28 & & & \\ 4 & & 7 & & \end{array}$$

7. Since the ratio of cars sold at profit of 9% to the 36% is $19 : 8$, hence the no. of cars sold at 36% profit is 32.

$$\begin{array}{ccccc} 9 & & 36 & & \\ & \diagdown & \diagup & & \\ & 17 & & & \\ 19 & & 8 & & \end{array}$$

8. Here each girl receives 50 paise and each boy receives 100 paise and the average receiving of each student

$$= \frac{6900}{115} = 60$$
 paise

$$\begin{array}{ccccc} 50 & & 100 & & \\ & \diagdown & \diagup & & \\ & 60 & & & \\ 40 & & 10 & & \\ \Rightarrow (G) 4 & : & (B) 1 & & \end{array}$$

Thus the no. of girls = 92.

[Number of boys = 23]

9. Profit = $12.5\% = \frac{1}{8}$

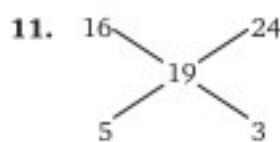
Hence the ratio of water to spirit is $1 : 8$

since profit % = $\frac{\text{profit}}{\text{cost}} \times 100$.

$$\begin{array}{ccccc} 20 & & 50 & & \\ & \diagdown & \diagup & & \\ & 30 & & & \\ 20 & : & 10 & & \\ 2 & : & 1 & & \end{array}$$

Since the ratio of 20% wine to 50% wine is $2 : 1$, it means there is $\frac{2}{3}$ wine which is replaced with wine in which the concentration of spirit is 20%.

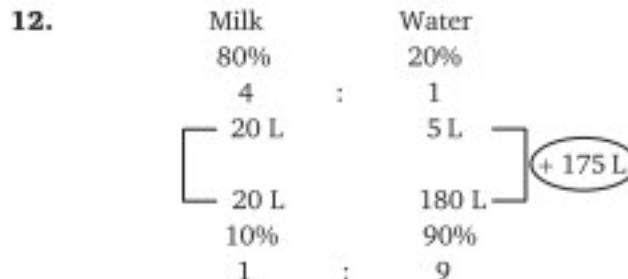
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Thus the cost price of Indian factory is Rs. 45 crore.

Therefore, the selling price of Indian factory is

$$= 45 + \frac{45 \times 16}{100} = 52.2 \text{ crore}$$



$$= 1000 \times \frac{1}{12} = 83.33 \text{ mL}$$

Since the ratio of water and milk is 1 : 11,

Therefore the ratio of water is to mixture = 1 : 12

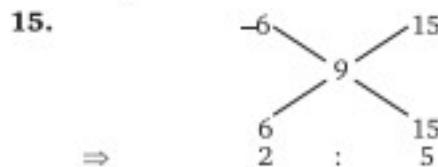
Thus the quantity of water in mixture of 1 litre

$$= 1000 \times \frac{1}{12} = 83.33 \text{ mL}$$

14. The selling price of mixture = Rs. 75

∴ The cost price of mixture = Rs. 60

Now we know that if he mixes the spirit (worth Rs. 40) with petrol (worth Rs. 60), the cost price of mixture must be less than Rs. 60, which is impossible. Hence there is no spirit with the petrol.



Thus the ratio of B/W TV sets to the no. of colour TV sets

$$= 2 : 5$$

Therefore, no. of B/W TV sets = 90

16. Since we do not know either the average weight of the whole class or the ratio of no. of boys to girls.

17. The S.P. of Desi Chai = Rs. 18

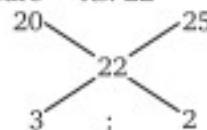
The S.P. of Videshi Chai = Rs. 30

The C.P. of Desi Chai = Rs. 20

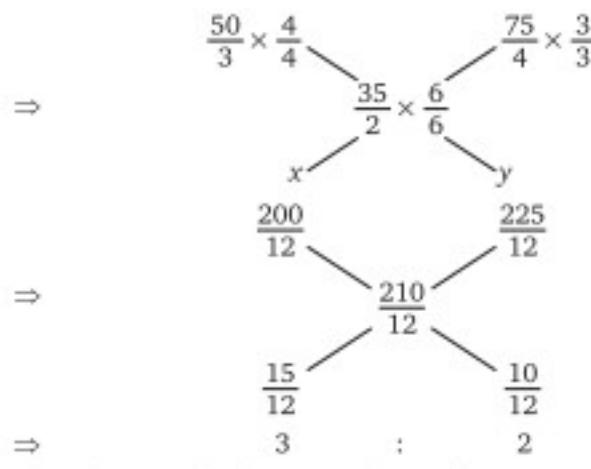
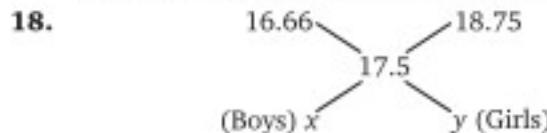
The C.P. of Videshi Chai = Rs. 25

The S.P. of mixture = Rs. 27.5

The C.P. of mixture = Rs. 22



Therefore, the ratio of Desi Chai is to Videshi Chai is 3 : 2



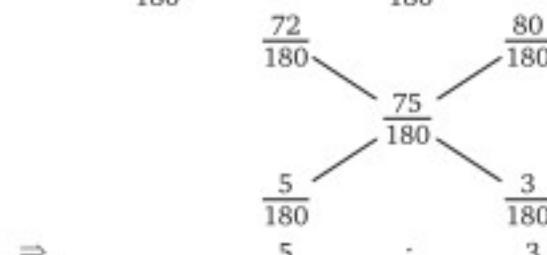
Thus the no. of girls = 16 and no. of boys = 24

$$19. W_1 : A_1 \quad W_2 : A_2 \quad W_N : A_N$$

$$2 : 3 \quad 4 : 5 \quad 5 : 7$$

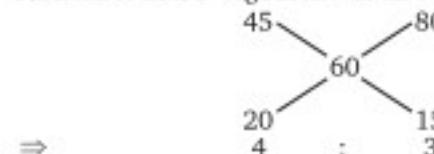
$$\frac{W_1}{W_1 + A_1} = \frac{2}{5} \quad \frac{W_2}{W_2 + A_2} = \frac{4}{9} \quad \frac{W_N}{W_N + A_N} = \frac{5}{12}$$

$$= \frac{72}{180} \quad = \frac{80}{180} \quad = \frac{75}{180}$$



Therefore, the ratio is 5 : 3.

20. Since the average marks of sections B and C together are equal the average marks of all the four sections (i.e., A, B, C and D), therefore the average marks of the remaining two sections A and D together will also be equal i.e., 60%.



Hence, the required ratio is 4 : 3.

$$21. \text{Wine} \quad \text{Water}$$

$$8 \text{ L} \quad 32 \text{ L}$$

$$1 \quad : \quad 4$$

20% (original ratio)

30% (required ratio)

In this case, the percentage of water being reduced when the mixture is being replaced with wine.

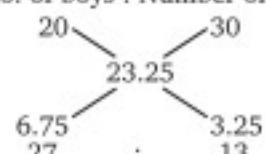
So the ratio of **left quantity** to the initial quantity is 7 : 8.

$$\text{Therefore } \frac{7}{8} = \left[1 - \frac{K}{40} \right] \Rightarrow \frac{7}{8} = \left[\frac{40 - K}{40} \right]$$

$$\Rightarrow K = 5 \text{ litre}$$

Alternatively : Go through options.

22. Therefore no. of boys : Number of girls = 13 : 27



23. Since there is insufficient data.

24. Milk Water

74% 26% (initially)

76% 24% (after replacement)

Left amount = Initial amount $\left(1 - \frac{\text{replaced amount}}{\text{total amount}}\right)$

$$24 = 26 \left(1 - \frac{7}{K}\right)$$

$$\Rightarrow \frac{12}{13} = \left(1 - \frac{7}{K}\right)$$

$$\Rightarrow \frac{1}{13} = \frac{7}{K}$$

$$\Rightarrow K = 91 \text{ litre}$$

NOTE In case of replacement, the initial (pure) amount is equal to the amount of final mixture.

25.

$$\begin{array}{c} 6 \quad \quad \quad x \\ \diagup \quad \diagdown \\ 15 \end{array}$$

$$6 = 2k \quad \quad \quad 3k = 9$$

Therefore $x = 21\%$

26. Copper in $4 \text{ kg} = \frac{4}{5} \text{ kg}$

and Zinc in $4 \text{ kg} = 4 \times \frac{4}{5} = \frac{16}{5} \text{ kg}$

Copper in $5 \text{ kg} = 5 \times \frac{1}{6} = \frac{5}{6} \text{ kg}$

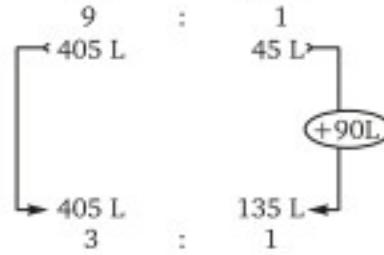
Zinc in $5 \text{ kg} = 5 \times \frac{5}{6} = \frac{25}{6} \text{ kg}$

Therefore, Copper in mixture $= \frac{4}{5} + \frac{5}{6} = \frac{49}{30} \text{ kg}$

and Zinc in the mixture $= \frac{16}{5} + \frac{25}{6} = \frac{221}{30} \text{ kg}$

Therefore, the required ratio $= 49 : 221$.

27. Milk Water



28. Petrol : Kerosene

3 : 2 (initially)

2 : 3 (after replacement)

$\frac{\text{Remaining (or left) quantity}}{\text{Initial quantity}} = \left(1 - \frac{\text{replaced quantity}}{\text{total quantity}}\right)$

$$\text{(for petrol)} \frac{2}{3} = \left(1 - \frac{10}{K}\right)$$

$$\Rightarrow \frac{1}{3} = \frac{10}{K}$$

$$\Rightarrow K = 30 \text{ litre}$$

Therefore, the total quantity of the mixture in the container is 30 litre.

29.

$$\frac{9}{25} = \left(1 - \frac{6}{K}\right)^2$$

$$\Rightarrow \frac{3}{5} = \left(1 - \frac{6}{K}\right)$$

$$\Rightarrow K = 15 \text{ litre}$$



2

AVERAGES

In MAT, CET, FMS and other entrance exams the questions are directly asked from this chapter and they are very moderate, but in CAT this chapter constitutes a very low proportion of questions i.e., they are rarely asked based on direct formula. As in last 10-12 years on an average 1 question per year has appeared in CAT and each question was almost of applied nature and blended with the logical reasoning.

So, when we said that on an average there was 1 question was asked per year in the last decade (i.e., 10 years), it means we can conclude that almost 10 questions were asked by CAT in the last 10 years.

In general average is the central value of the given data. For example if the heights of three persons A , B and C be

PROPERTIES OF AVERAGES

1. The average of any two or more quantities (or data) necessarily lies between the lowest and highest values of the given data. i.e., if x_l and x_h be the lowest and highest (or greatest) values of the given data $(x_1, x_2, \dots, x_l, \dots, x_h, \dots, x_n)$ then $x_l < \text{Average} < x_h$; $x_l \neq x_h$

$$\text{i.e., } x_l < \frac{(x_1 + x_2 + x_3 + x_l + \dots + x_h + \dots + x_n)}{n} < x_h$$

EXAMPLE 1 The average of 8, 9, 12, 13, 15, 9 is :

- (a) 11 (b) 6 (c) 16 (d) 18

SOLUTION From the above mentioned property (1) we can say that options (b), (c) and (d) are invalid since 6, 16, and 18 are out of range i.e., either below 8 (which is the least value) or above 15 (which is the highest value of the data).

So, option (a) can be acceptable only.

Alternatively :

$$\text{Average} = \frac{8 + 9 + 12 + 13 + 15 + 9}{6} = \frac{66}{6} = 11$$

EXAMPLE 2 A has 8 pencils, B has 10 pencils and C has 15 pencils, then the average number of pencils with them :

- (a) 8 (b) 10 (c) 15 (d) lies between 9 and 15

90 cm, 110 cm and 115 cm respectively, then the average height of A , B and C together will be $\frac{90 + 110 + 115}{3} = 105$ cm.

So we can say that the height of each person viz. A , B and C is near about 105 cm. Thus in layman's language it can be said that every one is almost 105 cm tall.

Basically the average is the arithmetic mean of the given data. For example if the $x_1, x_2, x_3, x_4, \dots, x_n$ be any 'n' quantities (i.e., data), then the average (or arithmetic mean) of these 'n' quantities

$$= \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

SOLUTION Average number of pencils = $\frac{8 + 10 + 15}{3} = 11$

So, option (d) is correct.

2. If each quantity is increased by a certain value 'K' then the new average is increased by K .

EXAMPLE 3 A, B, C, D, E are the five electronic shops in the Naza market, which have 20, 30, 60, 80 and 50. T.V. sets with them respectively, then the average number of T.V. sets in each shop is :

- (a) 24 (b) 48 (c) 50 (d) 60

SOLUTION Average number of T.V. sets

$$= \frac{20 + 30 + 60 + 80 + 50}{5} = 48$$

So option (b) is correct.

EXAMPLE 4 In the previous example, if each of A, B, C, D and E have imported 12 new T.V. sets, then the average number of T.V. sets is:

- (a) 50 (b) 56 (c) 60 (d) 144

SOLUTION Average number of T.V. sets

$$= \frac{(20 + 12) + (30 + 12) + (60 + 12) + (80 + 12) + (50 + 12)}{5} = \frac{300}{5} = 60$$

EXAMPLE 11 The average of 6 numbers 13, 17, 25, 11, 26, 10 is :

- (a) 20 (b) 17 (c) 15 (d) 25

SOLUTION Let the average be 20.

then	$20 - 13 = 7$	$20 - 25 = 5$
	$20 - 17 = 3$	and $20 - 26 = 6$
	$20 - 11 = 9$	$\frac{11}{29}$
	$20 - 10 = 10$	(Surplus)
	$\underline{29}$	(deficit)

The net difference (surplus - deficit) = $(11 - 29) = -18$

Therefore average variation = $\frac{-18}{6} = -3$

Hence, the actual average = $20 + (-3) = 17$

NOTE This method is very helpful in Data Interpretation section where there are very large values are to be calculated and most of the time we need just the lumpsum value.

7. Weighted average : When the average of groups or sets, instead of individuals, having different number of elements is being calculated, then it is called the weighted average. Since in this case the number of elements is different for the different sets thus they carry different weightage. If the number of elements in n different groups be $K_1, K_2, K_3, K_4, \dots, K_n$ and the averages of the respective groups be $A_1, A_2, A_3, A_4, \dots, A_n$ then the

$$\text{weighted average} = \frac{K_1 A_1 + K_2 A_2 + K_3 A_3 + \dots + K_n A_n}{K_1 + K_2 + K_3 + \dots + K_n}$$

EXAMPLE 12 The average salary of 12 employees of STAR plus is Rs. 18,000 per month and 15 employees of NDTV is Rs. 16,000 per month. The average salary of all the 27 employees is :

- (a) Rs. 17,000 (b) Rs. 16,500
(c) Rs. 16,888.88 (d) none of these

SOLUTION Required average salary =

$$\frac{12 \times 18,000 + 15 \times 16,000}{12 + 15} = \frac{4,56,000}{27} = \text{Rs. } 16,888.88$$

EXAMPLE 13 The number of students at IIM in morning batch, evening batch and weekends batch is 30, 40 and 60 respectively and their respective averages ages (in years) are 22, 21 and 25, then the average age of all the students (combined) is :

- (a) $22\frac{1}{13}$ years (b) $23\frac{1}{13}$ years
(c) 24.5 years (d) none of these

SOLUTION $\frac{30 \times 22 + 40 \times 21 + 60 \times 25}{130} = \frac{3000}{130} = 23\frac{1}{13}$ years

8. Problems based on ages :

- If the average age of ' n ' members of a family is x years then K years back, the average age of the family is $(x - K)$ years, provided that no any person is expired or born in K years period.
- If the present age of ' n ' members of a family is x years then K years later the average age of the same family will be $(x + K)$ years.

EXAMPLE 14 The average age of 7 members of Patel's family is 25 years. The average age of the same family 3 years ago was :

- (a) 21 years (b) 22 years
(c) 25 years (d) none of these

SOLUTION Present average age of family = 25 years

3 years ago average age of family = $25 - 3 = 22$ years

EXAMPLE 15 The average age of all the 16 professors of Lucknow University is 52 years. Four years later the average age of all the 16 professors will be, if there is no any retirement or recruitment :

- (a) 68 (b) 64
(c) 56 (d) none of these

SOLUTION Present average age = 52 years

4 years later the average age = $52 + 4 = 56$ years

EXAMPLE 16 6 months ago the present age of the student of class 10th was 14 years. 6 months hence, the age of the same students will be :

- (a) 15 years (b) $15\frac{1}{2}$ years
(c) 20 years (d) none of these

SOLUTION Since the time difference between two dates is 1 year, hence the average age will be increased by 1 year.

Thus the average age of the class 6 months hence will be 15 years.

EXAMPLE 17 The average age of Priyambada's family consisting of 5 members 3 years ago was 35 years. One year ago a new baby was born in this family. Three years hence the average age of the family will be :

- (a) 36 years (b) $34\frac{5}{6}$ years
(c) $35\frac{4}{5}$ years (d) none of these

SOLUTION 3 years ago total age of 5 members

$$= 5 \times 35 = 175 \text{ years}$$

At the time of birth of new baby the total age of family

$$= 175 + (2 \times 5)$$

$$= 185 \text{ years}$$

The present age of family = $185 + (1 \times 6) = 191$ years

3 years hence, the average age of family

$$= \frac{191 + (3 \times 6)}{6} = 34\frac{5}{6} \text{ years}$$

EXAMPLE 18 10 years ago the average age of all the 25 teachers of the Girls college was 45 years. 4 years ago, the principal has retired from her post at the age of 60 year. So after one year a new principal whose age was 54 years recruited from outside. The present average age of all the teachers is, if principal is also considered as a teacher :

- (a) $54\frac{18}{25}$ years (b) $55\frac{17}{25}$ years
(c) $49\frac{1}{2}$ years (d) none of these

SOLUTION 10 years ago average age of 25 teachers = 45 years

4 years ago (just before the retirement of principal) average age of 25 teachers = $45 + 6 = 51$ years

and the same time total age of 25 teachers = 51×25

$$= 1275 \text{ years}$$

and the total age of remaining 24 teachers when just the principal has retired

$$= 1275 - 60 = 1215 \text{ years}$$

1 year later (i.e., 3 years ago from present) total age of 24 teachers (just before the recruitment of new principal)

$$= 1215 + (1 \times 24) = 1239 \text{ years}$$

and the total age of 25 teachers including new principal just after the recruitment

$$= 1239 + 54 = 1293 \text{ years}$$

Thus the present age of all the 25 teachers

$$= 1293 + (3 \times 25) = 1368 \text{ years}$$

Hence, the present average age of the 25 teachers

$$= \frac{1368}{25} = 54 \frac{18}{25} \text{ years}$$

Alternatively : 10 years ago, the average age of 25 teachers = 45 years

Let us assume that the principal has not retired from her post then the present average age of all the 25 teachers,

$$= 45 + 10 = 55 \text{ years}$$

Thus the total age of all the 25 teachers

$$= 55 \times 25 = 1375 \text{ years}$$

Now assume that the new principal has replaced the old principal 4 years ago instead of 3 years ago, when the age of new principal would have been 53 years. Thus the age of new principal was 7 years less than the age of old principal, which results in the reduction of total age of the group of 25 teachers by 7 years.

Thus the actual total age of the 25 teachers (presently)

$$= 1375 - 7 = 1368 \text{ years}$$

Hence, the present average age of the 25 teachers

$$= \frac{1368}{25} = 54 \frac{18}{25} \text{ years}$$

EXAMPLE 19 The ratio of the ages of the father and the daughter at present is 3 : 1. Four years ago the ratio was 4 : 1. The average age of the father and daughter 2 years hence will be :

- (a) 24 (b) 26 (c) 25 (d) 36

SOLUTION Let the present ages of father be $3x$ and daughter be x .

So the 4 years ago father's age and daughter's age was $(3x - 4)$ and $(x - 4)$

$$\text{Therefore } \left(\frac{3x - 4}{x - 4} \right) = \frac{4}{1}$$

$$\Rightarrow x = 12 \text{ years and } 3x = 36 \text{ years}$$

Hence, the present average age of father and daughter = 24 years and the average age 2 years hence will be 26 years.

9. Problems based on income/salary

$$\text{Income} = \text{Expenditure} + \text{Savings}$$

EXAMPLE 20 The average salary of Rajesh, Bahadur and Amir is Rs. 8000 per month. The average expenditure of the Rajesh, Bahadur and Amir per month is Rs. 5000. The average savings of all the 3 persons per month is :

- (a) Rs. 3000 (b) Rs. 5000
(c) Rs. 2500 (d) Rs. 9000

SOLUTION Average saving

$$\begin{aligned} &= \text{Average Income} - \text{Average Expenditure} \\ &= 8000 - 5000 = 3000 \end{aligned}$$

EXAMPLE 21 The average salary of A, B and C is Rs. 10,000 and average expenditure of A is Rs. 6000 then the average savings of B and C is :

- (a) Rs. 5500 (b) Rs. 4500
(c) Rs. 4000 (d) can't be determined

SOLUTION Total income = Total Expenditure + Total savings

We can not find the average savings of B and C, since data is insufficient.

EXAMPLE 22 The average salary of A, B is Rs. 6000 and that of C, D and E is Rs. 8000. The average salary of all the 5 people is :

- (a) Rs. 7200 (b) Rs. 7000
(c) Rs. 7500 (d) can't be determined

SOLUTION Required average salary =

$$\frac{6000 \times 2 + 8000 \times 3}{(2 + 3)} = \frac{36000}{5} = \text{Rs. 7200}$$

EXAMPLE 23 The average salary of all the 60 employees in an office is Rs. 12,000 per month. If the number of executives is twice the number of non executive employees, then the average salary of all the non executive employees is :

- (a) Rs. 9000 (b) Rs. 8000
(c) Rs. 6000 (d) can't be determined

SOLUTION $\frac{\text{No. of executives}}{\text{No. of non-executives}} = \frac{2}{1}$

Therefore number of executives = 40

and number of non-executive employees = 20

Now, go through the options

$$\text{Total salary} = 40 \times \text{salary of executive} + 20$$

$$\times \text{salary of non-executive}$$

$$60 \times 12000 = 40 \times k + 20 \times l, \text{ here } k, l \text{ are unknowns}$$

So we can't determine the required average salary.

EXAMPLE 24 In the above problem, if the average salary of non-executives be $\frac{2}{5}$ th of the average salary of executives, then the average salary of non-executive employees is :

- (a) Rs. 9000 (b) Rs. 8000
(c) Rs. 6000 (d) data insufficient

SOLUTION By options : $60 \times 12000 = 20 \times 6000 + 40 \times 15000$

Hence option (c) is correct.

$$\text{Alternatively : } 60 \times 12000 = 20 \times x + 40 \times \frac{5}{2} x$$

$$\Rightarrow x = 6000$$

10. Problems based on speed, time and distance :

Case 1: When the distance travelled in different time slots or parts is same i.e., if a person or vehicle moves x km at a speed of u km/hr and further he goes or comes back the same distance x km at a speed of v km/hr. Then the average speed = $\frac{2uv}{(u+v)}$

If there are 3 parts of distance x km travelled with 3 different speeds i.e., if a person goes first x km @ speed of u km/hr and next x km @ v km/hr and the last x km @ w km/hr.

$$\text{Then the average speed} = \frac{3uvw}{(uv + vw + wu)}$$

SOLUTION Let $A, B, C, D, E, F, G, H, I, J, K$ be the 11 players in the order of increasing weight then,

$$A + B + C + D + E + F = 49 \times 6 = 294$$

$$F + G + H + I + J + K = 52 \times 6 = 312$$

$$\begin{aligned} \text{and } A + B + C + D + E + F + G + H + I + J + K \\ = 50 \times 11 = 550 \end{aligned}$$

$$\begin{aligned} \text{Therefore } F = (A + B + C + D + E + F) \\ + (F + G + H + I + J + K) - (A + B + C + D + \dots + J + K) \\ = 294 + 312 - 550 = 56 \end{aligned}$$

Hence the average weight of $F = 56$ kg.

EXAMPLE 30 The average presence of students in a class on Monday, Tuesday and Wednesday is 30 and on the Wednesday, Thursday, Friday and Saturday is 28 then number of students who attended the class on Wednesday is, if the average number of students on all the six days is 27 :

- (a) 24 (b) 25 (c) 20 (d) 40

SOLUTION Since $W = (M + T + W) + (W + Th + F + S)$

$$\quad \quad \quad - (M + T + W + Th + F + S)$$

$$\quad \quad \quad = (30 \times 3) + (28 \times 4) - (27 \times 6)$$

$$\quad \quad \quad = 202 - 162 = 40$$

EXAMPLE 31 The average age of A, B, C, D and E is 40 years. The average age of A and B is 35 years and the average age of C and D is 42 years. The average age of E is :

- (a) 46 (b) 48
 (c) 32 (d) none of these

SOLUTION $A + B + C + D + E = 40 \times 5 = 200$

$$A + B = 35 \times 2 = 70$$

$$C + D = 42 \times 2 = 84$$

$$\begin{aligned} \text{Therefore } E = (A + B + C + D + E) - [(A + B) + (C + D)] \\ = 200 - (70 + 84) = 46 \end{aligned}$$

Thus the average age of $E = 46$ years.

EXAMPLE 32 The average temperature on Monday, Tuesday and Wednesday is 38°C . The average temperature on Tuesday, Wednesday and Thursday is 43°C . If the average temperature on Monday and Thursday is 18.5°C . The average temperature on Monday is :

- (a) 11°C (b) 21°C (c) 35°C (d) 27°C

SOLUTION
$$(M + T + W) = 38 \times 3 = 114 \quad \dots \text{(i)}$$

$$(T + W + Th) = 43 \times 3 = 129 \quad \dots \text{(ii)}$$

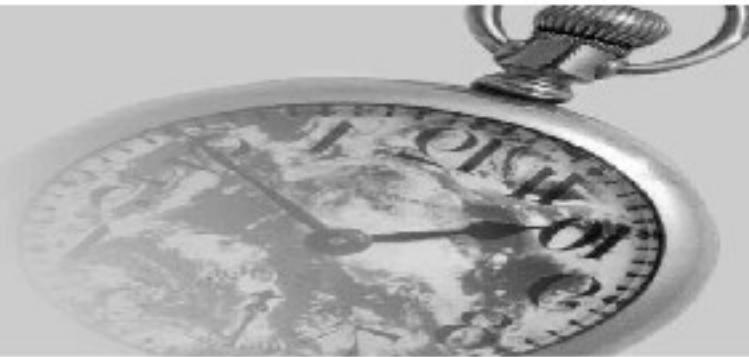
$$\begin{aligned} \text{Therefore } Th - M = 15 & \quad \quad \quad \text{[(ii) - (i)]} \\ \text{and } Th + M = 37 & \end{aligned}$$

Thus the temperature on Monday is 11°C and on Thursday is 26°C .

12. Average of Some Important Series of Numbers :

- Average of first ' n ' natural numbers = $\frac{n+1}{2}$
- Average of first ' n ' even numbers = $(n+1)$
- Average of first ' n ' odd numbers = n
- If there are $(p+q)$ elements in a set or group but the average of p elements is r and the average of q elements is s , then the average of all the elements of the set (or group) is $\frac{(pr+sq)}{(p+q)}$.

EXERCISE



LEVEL 1

1. The average weight of a class of 20 students is 45 kgs. A new student whose weight is 40 kgs replaces an old student of this class. Hence, the average weight of the whole class decreases by 1 kg. The weight of the replaced student is :
 (a) 55 kgs (b) 50 kgs
 (c) 60 kgs (d) none of these

2. The average length of first 3 fingers is 3 inches and the average length of the other 2 fingers i.e., thumb and the index finger is 2.8 inches. If the length of the index fingers is 3 inches then the length of the thumb is :
 (a) 2 inches (b) 2.6 inches
 (c) 3 inches (d) none of these

3. Three types of rice whose rates are Rs. 38, Rs. 43 and Rs. 49 per kg are blended together to make a 15 kg of new blend of rice in which there are 8 kgs, 4 kgs 3 kgs of the respective types of rice. The average price of the new blend of rice is :
 (a) Rs. 41.53 (b) Rs. 43
 (c) Rs. 40 (d) Rs. 43.3

4. Pankaj went to the post-office at the speed of 60 km/hr while returning for his home he covered the half of the distance at the speed of 10 km/hr, but suddenly he realized that he was getting late so he increased the speed and reached the home by covering rest half of the distance at the speed of 30 km/hr. The average speed of the Pankaj in the whole length of journey is :
 (a) 5.67 km/hr (b) 24 km/hr
 (c) 22.88 km/hr (d) 5.45 km/hr

5. 123 typists typed 984 papers in $\frac{1}{15}$ hour. The number of papers typed per minute by an average typist is :
 (a) 1 (b) 2
 (c) 3 (d) 5

6. The cost of the Red, Green and Blue colours per kg is Rs. 20, Rs. 15 and Rs. 18 respectively. Rang Mahal is a renowned building in which these three colours are being used in the ratio of 3 : 2 : 4. The average cost of all the three colours used per kg is :
 (a) 18 (b) 20
 (c) 17.66 (d) can't be determined

7. Rajeev earns $\frac{3}{2}$ times in January, April, July and October than his average earning of Rs. 600 per month in the rest of the months. So his savings in the January, April, July and October goes to $\frac{5}{4}$ times that of the rest months saving of Rs. 400 per month in the year. The average expenditure of per month is :
 (a) Rs. 266.66 (b) Rs. 250
 (c) Rs. 233.33 (d) Rs. 433.33

8. The average of 3 prime numbers lying between 47 and 74 is $19\frac{1}{3}$. The greatest possible difference between any two out of the 3 prime numbers is :
 (a) 12 (b) 14
 (c) 18 (d) can't be determined

9. The average of 9 numbers is 11. If each of these 9 numbers is multiplied by 5 and then 5 is added to each of these resultant numbers, then the new average is :
 (a) 20 (b) 30
 (c) 60 (d) 50

10. The average score of Dhoni after 48 innings is 48 and in the 49th innings Dhoni scores 97 runs. In the 50th innings the minimum number of runs required to increase his average score by 2 than it was before the 50th innings :
 (a) 99 (b) 149
 (c) 151 (d) can't be determined

11. The average age of Sachin and Ganguli is 35 years. If Kaif replaces Sachin, the average age becomes 32 years and if Kaif replaces Ganguli, then the average age becomes 38 years. If the average age of Dhoni and Irfan be half of the average age of Sachin, Ganguli and Kaif, then the average age of all the five people is :
 (a) 28 years (b) 32 years
 (c) 25 years (d) none of these

12. Out of these five people (in question no. 11) whose age is the greatest?
 (a) Sachin (b) Ganguli
 (c) Kaif (d) can't be determined

13. In a village the average age of n people is 42 years. But after the verification it was found that the age of a person had been considered 20 years less than the actual age, so the new average, after the correction, increased by 1. The value of n is :
 (a) 21 (b) 20
 (c) 22 (d) none of these

14. The average rainfall in the months of January and February is 6 cm and in the months of March to June is 5 cm and July to October is 10 cm and in the November and December, it is 6 cm. The average rainfall for the whole year is :
 (a) 7 (b) 5.5
 (c) 7.5 (d) none of these

15. On an average 300 people watch the movie in Sahu Cinema hall on Monday, Tuesday and Wednesday and the average number of visitors on Thursday and Friday is 250. If the average number of visitors per day in the week be 400, then the average number of people who watch the movie in weekends (i.e., on Saturday and Sunday) is :

- (a) 500 (b) 600
(c) 700 (d) none of these
16. The average weight of 11 players of Indian cricket team is increased by 1 kg, when one player of the team weighing 55 kg replaced by a new player. The weight of the new player is :
(a) 55 kg (b) 64 kg
(c) 66 kg (d) none of these
17. The average age of a family of 6 members 4 years ago was 25 years. Mean while a child was born in this family and still the average age of the whole family is same today. The present age of the child is :
(a) 2 years (b) $1\frac{1}{2}$ years
(c) 1 year (d) data insufficient
18. Amitabh's average expenditure for the January to June is Rs. 4200 and he spends Rs. 1200 in January and Rs 1500 in July. The average expenditure for the months of February to July is :
(a) Rs. 4250 (b) Rs. 4520
(c) Rs. 4060 (d) none of these
19. The average of $a, 11, 23, 17$ is 15 and the average of $a, b, 12, 25$ is 16. The value of $\frac{a}{b}$ is :
(a) $\frac{1}{3}$ (b) $\frac{1}{2}$
(c) $\frac{2}{3}$ (d) $\frac{3}{4}$
20. The average salary is being paid to all its employees by the Biotech corporation is Rs. 15,500. The average salary of the senior employees is Rs. 18000 per month and the average salary of the junior employees is Rs. 12,000 per month. If there are only two levels of employees viz junior and senior level, then what fraction of the total employees is the junior level employees are :
(a) $\frac{7}{10}$ (b) $\frac{5}{12}$
(c) $\frac{5}{10}$ (d) none of these
21. The average of any 5 consecutive odd numbers a, b, c, d, e is :
(a) $\frac{(abcde)}{5}$ (b) $\frac{bd}{3}$
(c) $\left(\frac{a+c+e}{5}\right)$ (d) none of these
22. The average age of 30 students of a class is 30 years. When the average age of class teacher is also included, the average age of the whole class increases by 1 year. The age of the class teacher is :
(a) 31 years (b) 60 years
(c) 61 years (d) none of these
23. There were five sections in MAT paper. The average score of Pooja in first 3 sections was 83 and the average in the last 3 sections was 97 and the average of all the sections (i.e., whole paper) was 92, then her score in the third section was :
(a) 85 (b) 92
(c) 88 (d) none of these
24. The average age of 18 pupils of Dronacharya was 25 years. If the age of Dronacharya was also included, the average age of 19 people becomes 26 years. The average age of the Dronacharya at that time was :
(a) 33 (b) 44
(c) 50 (d) 51
25. The average of 7 consecutive odd numbers if the smallest of those numbers is denoted by k :
(a) $k+4$ (b) $k+7$
(c) $k+6$ (d) $7k$
26. If the average marks of $\frac{1}{4}$ th class is 85% and that of $\frac{1}{3}$ rd class is 70% and the average marks of the rest class is 56%, then the average of the whole class is (for the given subjects) :
(a) 67.916% (b) 72.33%
(c) 69.165% (d) can't be determined
27. The average length of any four fingers of my left hand is 600 mm. Then the average length of all the five fingers of my left hand is :
(a) 800 mm (b) 750 mm
(c) 480 mm (d) can't be determined
28. The average of $4\frac{3}{5}, 2\frac{2}{3}, 6\frac{8}{9}, 7\frac{7}{15}, 3\frac{5}{9}$ is :
(a) $5\frac{3}{225}$ (b) $5\frac{8}{225}$
(c) $6\frac{3}{45}$ (d) $25\frac{8}{45}$
29. The average of 1000.0001, 100.001, 10.01, 1.1 is :
(a) 277.777 (b) 322.222
(c) 11.11 (d) 233.333
30. The average of 7 consecutive numbers which are positive integers is 10. The average of lowest and highest such numbers is :
(a) 7 (b) 10
(c) 15 (d) data insufficient
31. The average of first 100 natural number is :
(a) 100 (b) 50
(c) 50.50 (d) 55
32. The average of first 50 odd natural numbers is :
(a) 50 (b) 55
(c) 51 (d) 101
33. The average of first 99 even numbers is :
(a) 9999 (b) 100
(c) 9801 (d) 9009
34. The average of a, b and c is 79 and the average of a and c is also 79. Then the value of b is :
(a) 0 (b) 79
(c) -79 (d) none of these
35. The average value of property of Mittal, Ambani and Singhania is Rs. 11111 crore. The property of Singhania is as less as the property of Mittal is greater than the average property of both the Singhania and Mittal. The value of property of Ambani is :
(a) Rs. 111 crore (b) Rs. 11111 crore
(c) Rs. 3703.7 crore (d) can't be determined
36. I went to Delhi @ speed of 200 km/hr but suddenly I returned to the same place @ speed of 600 km/hr. What is my average speed :
(a) 300 km/hr (b) 400 km/hr
(c) 366.66 km/hr (d) none of these
37. The average of A and B is 400 and the average of C and D is 600 the average of A, B, C and D is :
(a) 500 (b) 450
(c) 525 (d) 625

38. The average weight of liquid in 100 bottles is 500 gm. The total weight of all the bottles is 20 kg. The average weight of a bottle with liquid is :
 (a) 0.65 kg (b) 0.7 kg
 (c) 70 ml (d) none of these
39. The average score of Sehwag in 10 innings was 77 runs. In the 11th innings he had scored zero runs. The overall average score of Sehwag in all the 11 innings was :
 (a) 77 (b) 7.7
 (c) 11 (d) none of these
40. The average age of 3 children of Arihant Singh is 12 years and their ratio of ages is 3 : 4 : 5. The average age of the youngest and eldest child is if he had only 3 children :
 (a) 12 (b) 21
 (c) 8 (d) 9
41. The average income of all the Infosys employees is Rs. 20,000 per month. Recently the company announced the increment of Rs. 2,000 per month for all the employees. The new average of all the employees is :
 (a) Rs. 22,000 (b) Rs. 40,000
 (c) Rs. 22,00 (d) data insufficient
42. The average age of 10 students in a class is 20 years, if a new student is also included, then the new average age of all the students increases by 1 year. The age of the new student is :
 (a) 21 years (b) 30 years
 (c) 31 years (d) none of these
43. The average weight of 20, four wheelers is 180 kg. If an old car is removed from this group of four wheelers, the new average weight decreases by 2 kg. The weight of the removed car is :
 (a) 220 (b) 218
 (c) 182 (d) none of these
44. The average price of 3 diamonds of same weights is Rs. 5 crore, where the average price of the two costliest diamonds is double the price of the cheapest diamond. The price of the cheapest diamond is :
 (a) 3 crore (b) 5 crore
 (c) 1.66 crore (d) can't be determined
45. In the previous question, the price of the costliest diamond is :
 (a) 5 crore (b) 6 crore
 (c) 8 crore (d) can't be determined
46. Praveen gets 40 marks out of 50 in Computer Science, 70 out of 100 in Manufacturing science and 142 out of 150 in professional communication. The average marks of Praveen (in percent) in all the three subjects is :
 (a) 84% (b) 76%
 (c) 71% (d) 60%
47. The average of all the prime and composite numbers upto 100 is :
 (a) 51 (b) 49.50
 (c) 50.50 (d) 55
48. The average of all the perfect squares upto 100 is :
 (a) 38.5 (b) 1000
 (c) 100 (d) 385
49. The average of all the non-negative integers upto 99 is :
 (a) 50.49 (b) 49.50
 (c) 50.50 (d) 99
50. The average of 7, 14, 21, 28 ... 77 is :
 (a) 7 (b) 11
 (c) 42 (d) 66
51. The average weight of A, B, C and D is 40 kg. A new person E is also included in the group, then the average weight of the group is increased by 1 kg. Again a new person F replaces A, then the new average of 5 persons becomes 42. The average weight of B, C, D, F is :
 (a) 42 (b) 41.25
 (c) 42.5 (d) none of these
52. The average of 3 consecutive natural numbers (which are in increasing order) is k . If two more consecutive numbers, just next to the first set of numbers, is added, then the new average becomes :
 (a) $k + 2$ (b) $k + 1$
 (c) $\frac{2k + 1}{2}$ (d) $2k - 1$
53. The average of any 5 consecutive odd natural numbers is k . If two more such numbers, just next to the previous 5 numbers are added, the new average becomes :
 (a) $\frac{2}{7}(k + 1)$ (b) $2k - 3$
 (c) $2k + 1$ (d) $k + 2$
54. The average weight of the 5 officers of a regiment is 42 kg. If a senior officer was replaced by a new officer and thus the average increased by 500 gm, the weight of the new officer is :
 (a) 44.5 kg (b) 45 kg
 (c) 42.5 kg (d) none of these
55. The average age of 6 servants in my farm house is 28 years. A new and young servant replaces an old servant, then the new average reduces by 1 year, the age of the new servant is :
 (a) 26 years (b) 22 years
 (c) 35 years (d) can't be determined
56. In the above question (no. 55) if the age of the replaced servant was 31 years, then the age of the new servant is :
 (a) 25 years (b) 35 years
 (c) 24 years (d) none of these
57. The average income of A, B and C is Rs. 12,000 per month and the average income of B, C and D is Rs. 15,000 per month. If the average salary of D be twice that of A, then the average salary of B and C is (in Rs.) :
 (a) 8,000 (b) 18,000
 (c) 13,500 (d) 9,000
58. The average price of 80 computers in an electronic shop is Rs. 30,000. If the highest and lowest price computers are sold out then the average price of the remaining 78 computers is Rs. 29,500. The cost of the highest price computer is Rs. 80,000. The cost of lowest price computer is :
 (a) Rs. 19,000 (b) Rs. 20,000
 (c) Rs. 29,000 (d) can't be determined
59. A has 50 coins of 10 paise denominations. While B has 10 coins of 50 paise denominations. C has 20 coins of 25 paise denominations while D has 25 coins of 20 paise denominations. The average number of paise per person is :
 (a) 450 paise (b) 500 paise
 (c) 600 paise (d) can't be determined

60. A travel agency has three types of vehicles viz. four seater, autorickshaw, 10 seater maxi cab and 20 seater minibus. The rate of each passenger (irrespective of its age or weight or seniority) for the auto rickshaw is Rs. 12 and for the maxicab is Rs. 15 and for the minibus is Rs. 8 for the one round. The

LEVEL 2

average occupancy of the seats is 100%, 80% and 75% respectively. If he has only one vehicle of each kind, then the average earning for one round of each vehicle is :

- (a) Rs. 96 (b) Rs. 90
(c) Rs. 86 (d) Rs. 70

average age of the members of Lok Sabha and Rajya Sabha is 40 years and 50 years respectively. A member of the Rajya Sabha when elected for the Lok Sabha also, he left the Rajya Sabha and becomes the member of the Lok Sabha. Thus the average age of both the houses increases. Which one of the following statements is true?

- (a) The age of this member is greater than 50 years
 - (b) The age of this member is less than 40 years
 - (c) The age of this member is greater than 40 but less than 50 years
 - (d) none of these

Directions for questions 7, 8 and 9 : Eight years ago there were 5 members in the Arthur's family and then the average age of the family was 36 years. Mean while Arthur got married and gave birth to a child. Still the average age of his family is same now.

7. The present age of his wife is :
(a) 25 years (b) 26 years
(c) 32 years (d) data insufficient

8. The age of his wife at the time of his child's birth was. If the difference between the age of her child and herself was 26 years :
(a) 25 years (b) 26 years
(c) 20 years (d) can't be determined

9. The age of Arthur at the time of his marriage was :
(a) 22 years (b) 23 years
(c) 26 years (d) can't be determined

10. Eleven years earlier the average age of a family of 4 members was 28 years. Now the age of the same family with six members is yet the same, even when 2 children were born in this period. If they belong to the same parents and the age of the first child at the time of the birth of the younger child was same as there were total family members just after the birth of the youngest members of this family, then the present age of the youngest member of the family is :
(a) 3 years (b) 5 years
(c) 6 years (d) none of these

11. Mr. Patel walked 6 km to reach the station from his house, then he boarded a train whose average speed was 60 km/hr and thus he reached his destination. In this way he took total of 3 hours. If the average speed of the entire journey was 32 km/hr then the average speed of walking is :
(a) 3 km/hr (b) 4.5 km/hr
(c) 4 km/hr (d) none of these

Directions for question numbers 12 and 13: During the winter session all the women which constitutes $\frac{1}{5}$ th strength of the Lok Sabha, left the house (i.e., parliament) due to the

rejection of their demand. Actually they were asking for the 50% reservation of seats for the women in the Lok Sabha. Thus the average age of the remaining members of the house (i.e., the Lok Sabha) increases by $\frac{1}{4}$ th than it was earlier when all the members (i.e., men and women) were present.

- (a) 1 (b) 2
 (c) 3 (d) data insufficient

21. The average age of all the 20 students of a class is 24. The minimum age of a student is 18 and the maximum age of another student in the same class is 30 years. When the two students whose average age was 26 years resticated from the class but later on one of the resticated student was readmitted. Now the average age of the class is :
 (a) 23.89 years (b) 28.39 years
 (c) 25 years (d) can't be determined

22. In a set of prime and composite numbers, the composite numbers are twice the number of prime numbers and the average of all the numbers of the set is 9. If the number of prime numbers and composite numbers are exchanged then the average of the set of numbers is increased by 2. If during the exchange of the numbers the average of the prime numbers and composite numbers individually remained constant, then the ratio of the average of composite numbers to the average of prime numbers (initially) was :
 (a) $\frac{7}{13}$ (b) $\frac{13}{7}$
 (c) 9/11 (d) none of these

23. The total age of all the guests in the party was 540 years. If a South Indian couple (guests) left the party, then the average of the remaining guests still remained unchanged, where the age of both the husband and wife (the South Indian couple) was same, then the average age of this couple and the total number of guests in the party, respectively, can be :
 (a) 18, 27 (b) 20, 27
 (c) 15, 38 (d) can't be determined

24. In the command hospital Lucknow the sum of the ages of all the 29 people i. e., physicians, surgeons and nurses is 696. If the age of each physician, each surgeon and each nurse be 1 year, 6 years and 3 years more, then the average age of the whole staff would have been 3 years more. If the number of surgeon is a square root of a two digit number which is also a perfect cube, then the number of nurses in the hospital is :
 (a) 12 (b) 15
 (c) 16 (d) none of these

25. The average expenditure of Sarvesh for the January to June is Rs. 4200 and he spends Rs. 1200 in January and Rs. 1500 in July. The average expenditure for the months of February to July is :
 (a) 4250 (b) 4520
 (c) 4060 (d) none of these

26. The average marks of Sameer decreased by 1, when he replaced the subject in which he has scored 40 marks by the other two subjects in which he has just scored 23 and 25 marks respectively. later he has also included 57 marks of Computer Science, then the average marks increased by 2. How many subjects were there initially?
 (a) 6 (b) 12
 (c) 15 (d) can't be determined

27. In a combined family the average age of 4 males and 7 females is 42 and 20 years respectively. If two persons whose average age is 13 years have left the family and other three

- people joined the family whose respective ages are 11, 15 and 28 years, then the average age of the new family is increased by :
 (a) 4 years (b) 1 year
 (c) 3 years (d) none of these
28. A teacher gave sum to his class to find the average of n numbers viz. 1, 2, 3, 4, 5, 6 ... etc. But when the teacher checked the solution, he has found that during the calculation a student just missed a number for the addition thus his average of the n numbers was 15. The value of n is :
 (a) 30 (b) 26
 (c) 31 (d) not unique
29. The average earning of a group of persons is Rs. 50 per day. The difference between the highest earning and lowest earning of any two persons of the group is Rs. 45. If these two people are excluded the average earning of the group decreases by Re. 1. If the minimum earning of the person in the group lies between 42 and 47 and the number of persons initially in the group was equal to a prime number, with both its digits prime. The number of persons in the group initially was :
 (a) 29 (b) 53
 (c) 31 (d) none of these
30. There are three categories of jobs A , B and C . The average salary of the students who got the job of A and B categories is 26 lakh per annum. The average salary of the students who got the job of B and C category is 44 lakh per annum and the average salary of those students who got the job of A and C categories is 34 lakh per annum. The most appropriate (or closest) range of average salary of all the three categories (if it is known that each student gets only one category of jobs i. e., A , B and C) :
 (a) lies between 30 and 44 (b) lies between 28 and 34
 (c) lies between 34 and 43 (d) lies between 29 and 48
31. Out of the five integral numbers C is the average of A and D . B is greater than C and less than D . Also B is the average of A and E . The middle most number in the sequence is :
 (a) A (b) B
 (c) C (d) D
32. The average age of Donald, his wife and their two children is 23 years. His wife is just 4 year younger than Donald himself and his wife was 24 years old when his daughter was born. He was 32 years old when his son was born. The average age of Donald and his daughter is :
 (a) 25 years (b) 22.5 years
 (c) 26 years (d) can't be determined
33. There are only five people in the Aman Verma's family. Aman, his wife, a son and two daughters. The younger daughter's age is $\frac{4}{5}$ th of the elder daughter's age. The age of eldest daughter is $\frac{3}{8}$ times that of her father Aman and the age of the son is $\frac{1}{5}$ th that of his father Aman. 4 years ago the age of her wife was 8 times that of his son and now the sum of the ages of the younger daughter and wife is same as the sum of the ages of Aman and his son. The average age of the family is :
 (a) 22.22 years (b) 25.4 years
 (c) 21.2 years (d) none of these
34. The average weight of a political party is decreased by 1, when some new politicians joined the party, whose strength is $\frac{1}{4}$ th of the existing (or old) politicians and the total weight of the new politicians is 209 kgs. What is the new average weight of all the politicians if it is known that in any case the number of politicians always must be greater than 50 but less than 100 :
 (a) 15 kgs (b) 16 kgs
 (c) 18 kgs (d) 19 kgs
35. Ravi went to Kanpur from Lucknow by his four wheeler. During the journey he had to use the spare wheel (i. e., stepney). Thus he finished his 160 km journey. The average distance covered by the wheels of his car is :
 (a) 40 km (b) 120 km
 (c) 128 km (d) 48 km
36. There are 6 consecutive odd numbers in increasing order. The difference between the average of the squares of the first 4 numbers and the last four numbers is 64. If the sum of the squares of the first and the last element (i. e., odd numbers) is 178, then the average of all the six numbers is :
 (a) 7 (b) 8
 (c) 9 (d) 10
37. The average age of board of directors of a company, having 10 directors was 48 years. Coincidentally when a director aged 53 resigned from the board of directors, another director died on the same day. So a new director joined the board of directors aged 34. Next year in the same month the average age of all the 9 directors was found to be 46 years. The age of the late (i. e., dead) director at the time of his death was :
 (a) 56 years (b) 53 years
 (c) 57 years (d) 61 years
38. In an office the average weight of 24 employees is 60 kg. If n employees were included whose average weight was 54 kg, then the total number of employees in the office, (given that the new average weight of all the $(24 + n)$ employees is a whole number) :
 (a) 36 (b) 30
 (c) 34 (d) 25
39. The average age of 100 nurses in a nursing home in 1982 was 50 years. In 1984, 20 nurses retired from their job, whose average age was 60 years. After a huge gap in 1987, 40 nurses were employed whose average age was 38 years. The average age of all the nurses in 1990 was :
 (a) 53 years (b) 51 years
 (c) 48.5 years (d) data insufficient

Directions for question numbers 40, 41, 42, 43 and 44: *Bhartiya Idol* is a talent search programme launched and run by TV Tarana. In this programme each participating candidate has to appear for the audition in such a manner that a candidate will play the Antakchhary with its aspiring opponent until he fails, otherwise he can continue and become winner. If a candidate fails on his part, he will have to leave

the contest and in place of it another candidate will start off with the same existing opponent. The number of points a candidate scores is equal to the number of times he responds correctly to his opponents. The candidate who finishes the game (or who wins over the last opponent) will be declared as a winner, even if he/she has scored less points and started as the last participant. The points scored individually by all the 10 candidates are as shown below. Besides if a person loses the contest only if he/she responds incorrectly.

	Participant	Points
1.	Rajesh	8
2.	Radhe	10
3.	Harish	7
4.	Prajakta	12
5.	Aditya	25
6.	Rahul	24
7.	Shekhar	18
8.	Amit Tandon	23
9.	Amit Sana	29
10.	Abhijeet	30



Final Round

4. Directions for question numbers 1 to 15: There are 3 sets of natural numbers 1 to 100. Set A contains all the natural numbers which are prime, upto 100. Set B contains all the non-prime even natural numbers upto 100. Set C contains all the non-prime odd natural numbers upto 100 i.e.,

$$A = \{2, 3, 5, 7, 11, \dots, 89, 97\}$$

$$B = \{4, 6, 8, 10, 12, \dots, 98, 100\}$$

$$C = \{1, 9, 15, 21, 25, 27, 33, \dots, 95, 99\}$$

all the literate (educated) and illiterate employees is decreased by Rs. 10 per day. The number of educated employees working in the NGO is :

- (a) 15 (b) 20
 (c) 10 (d) data insufficient

46. Mr. Tyagi while going from Meerut to Saharanpur covered half the distance by train at the speed of 96 km/hr then he covered half of the rest distance by his scooter at the speed of 60 km/hr and finally he covered the rest distance at the speed of 40 km/hr by car. The average speed at which Mr. Tyagi completed his journey is :
 (a) 64 km/hr (b) 56 km/hr
 (c) 60 km/hr (d) 36 km/hr

47. There are four types of candidates in our coaching preparing for the CAT. The number of students of Engineering, Science, Commerce and Humanities is 40, 60, 50 and 30 respectively and the respective percentage of students who qualified the CAT is 80%, 75%, 60% and 50% respectively the overall percentage of successful candidates in our institute is :
 (a) 67.77% (b) 66.66%
 (c) 68.5% (d) none of these

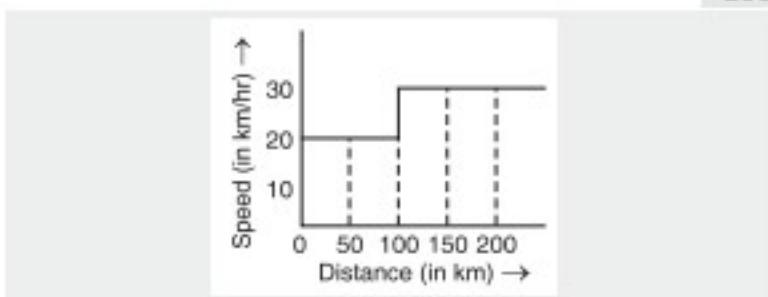
48. Mr. Manmohan calculated the average of 10, 'three digit numbers'. But due to mistake he reversed the digits of a number and thus his average increased by 19.8. The difference between the unit digit and hundreds digit of that number is :
 (a) 8 (b) 4
 (c) 2 (d) can't be determined

49. Once my peon went to the office of SKYLINE COURIER with 4 different envelopes. The clerk in the office measured the weights in all possible pairs. The weights obtained are 59 gm, 61 gm, 62 gm, 63 gm, 64 gm and 66 gm. The weight of the heaviest envelope is :
 (a) 35 gm (b) 36 gm
 (c) 34 gm (d) can't be determined

50. The average expenditure of the hotel when there are 10 guests is Rs. 60 per guests and the average expenditure is Rs. 40 when there are 20 guests. If it is known that there are some fixed expenses irrespective of the number of guests then the average expenditure per guest when there are 40 guests in the hotel :
 (a) Rs. 30 (b) Rs. 25
 (c) Rs. 20 (d) can't be determined

Directions for question number 12, 13, 14: 5 elements below 25 from the Set A are transferred to Set B, and 10 elements lying between 25 and 50 from the Set B are transferred to Set C and 15 elements above 50 from the Set C are transferred to Set A.

4. Directions for question numbers 16 and 17: In the following graph the relation between speed and distance is given:



16. The average speed for the first 200 kms. (in km/hr)
 (a) 24 (b) 25
 (c) 26 (d) 40

17. The average speed for the first 150 km :
 (a) 15 (b) 18
 (c) 25 (d) none of these

18. Abhay working in Tele Bharti as a salesperson. His monthly salary is just Rs. 200. But he gets the bonus as per the given rule. If he sells the simcards of Rs. x then his bonus will be Rs. $\left[\left(\frac{x}{100} \right)^2 + 10 \right]$. In the first quarter of the year his average sale was Rs. 3000 per month. In the next 5 months his average sale was Rs. 5000 per month. In the last four months his average sale was Rs. 8000 per month. What is the average earning per month for the whole year?
 (a) Rs. 3350 (b) Rs. 3610
 (c) Rs. 3560 (d) none of these

19. The price of Shirts at Sahara Ganj is defined as Rs. $(100 + 10x^2)$, where x is the number of shirts. Mallika purchased 5 shirts from the above shop. The average price of a shirt is :
 (a) Rs. 70 (b) Rs. 50
 (c) Rs. 75 (d) none of these

20. In the above question if the sister of Mallika purchased k shirts but the average price was same as that of Mallika. The value of k could be :
 (a) 6 (b) 4
 (c) 2 (d) none of these

21. There are 10 compartments in passenger train which carries on an average 20 passengers per compartment. If atleast 12 passengers were sitting in each compartment and no any compartment has equal number of passengers then maximum how many passengers can be accomodated in any compartment :
 (a) 64 (b) 45
 (c) 56 (d) none of these

22. There are twice the number of two wheelers as there are three wheelers and the number of 4 wheelers are equal to the number of two wheelers. The average number of wheel per vehicle is :
 (a) 3 (b) 4
 (c) 5 (d) none of these

23. Sone lal has ' n ' magical eggs whose average weight is ' k ' gm. Each of the ' n ' eggs produces ' n ' eggs next day such that the average weight of ' n ' eggs produced is same as that of the parental (previous generation) egg for each ' n ' groups individually i.e., each egg produces ' n ' eggs in its next generation and the average weight of all the ' n ' eggs of next generation is same as the weight of the mother egg. This process is continued without any change in pattern. What is the total weight of all the eggs of r^{th} generation, where the initial number of eggs with Sone Lal are considered as the eggs of first generation :
 (a) rnk (b) n^rk
 (c) rnk' (d) $n^{r+1}k$

Directions for question numbers 24 to 27 : A CAT training institute was established on January 1, 2004 with 3, 4, 5 and 6 faculty members in the Logical Reasoning (LR), Data Interpretation (DI), English Language and Quantitative Analysis (QA) areas respectively, to start with. No faculty member retired or joined the institute in the first three months, of the year 2004. In the next four years, the institute recruited one faculty member in each of the four areas. All these new faculty members, who joined the institute subsequently over the years were 25 years old at the time of their joining the institute. All of them joined the institute on April 1. During these four years, one of the faculty members retired at the age of 60. The following diagram gives the area-wise average age (in terms of number of completed years) of faculty members as on April 1 of 2004, 2005, 2006 and 2007.

Faculty	2004	2005	2006	2007
LR	49.33	44	45	46
DI	50.5	51.5	52.5	47.8
English	50.2	49	45	46
Quants	45	43	44	45

24. In which year did the new faculty member join as the faculty of English?
(a) 2004 (b) 2005
(c) 2006 (d) 2007

25. What was the age of the new faculty member, who joined the faculty of QA, as on April 1, 2007?
(a) 25 (b) 26
(c) 27 (d) 28

26. From which area did the faculty member retire?
(a) English (b) LR
(c) DI (d) Quants

27. Professors Sarvesh and Manish, two faculty members in the LR area, who have been with the Institute since its inception, share a birthday, which falls on 30th November. One was born in 1951 and the other one in 1954. On April 1, 2009, what was the age of the third faculty member, who has been in the same area since inception?
(a) 47 (b) 50
(c) 51 (d) 52



Answers

LEVEL-1

1 (c)	2. (b)	3. (a)	4. (b)	5. (b)	6. (a)	7. (a)	8. (c)	9. (c)	10. (b)
11. (a)	12. (a)	13. (b)	14. (a)	15. (c)	16. (c)	17. (c)	18. (a)	19. (b)	20. (b)
21. (d)	22. (c)	23. (d)	24. (b)	25. (c)	26. (a)	27. (b)	28. (b)	29. (a)	30. (b)
31. (c)	32. (a)	33. (b)	34. (b)	35. (b)	36. (a)	37. (a)	38. (b)	39. (d)	40. (a)
41. (a)	42. (c)	43. (b)	44. (a)	45. (d)	46. (a)	47. (a)	48. (a)	49. (b)	50. (c)
51. (b)	52. (b)	53. (d)	54. (d)	55. (d)	56. (a)	57. (c)	58. (a)	59. (b)	60. (a)

LEVEL-2

1 (a)	2. (c)	3. (b)	4. (b)	5. (b)	6. (c)	7. (d)	8. (b)	9. (d)	10. (a)
11. (c)	12. (d)	13. (d)	14. (a)	15. (c)	16. (b)	17. (a)	18. (d)	19. (a)	20. (b)
21. (d)	22. (a)	23. (b)	24. (d)	25. (a)	26. (c)	27. (d)	28. (d)	29. (d)	30. (a)
31. (b)	32. (a)	33. (a)	34. (a)	35. (c)	36. (b)	37. (a)	38. (a)	39. (b)	40. (b)
41. (b)	42. (d)	43. (c)	44. (a)	45. (c)	46. (a)	47. (a)	48. (c)	49. (c)	50. (a)

FINAL ROUND

1 (b)	2. (a)	3. (c)	4. (a)	5. (b)	6. (c)	7. (d)	8. (a)	9. (c)	10. (c)
11. (b)	12. (b)	13. (a)	14. (c)	15. (d)	16. (a)	17. (d)	18. (b)	19. (a)	20. (c)
21. (c)	22. (a)	23. (b)	24. (c)	25. (c)	26. (a)	27. (d)			



Hints & Solutions

LEVEL 1

1. Initially the total weight = $20 \times 45 = 900$

Now, the total weight when a student has been replaced = $20 \times 44 = 880$

It means the weight of the new student is 20 kgs less than the replaced student. Hence the weight of the replaced student = $40 + 20 = 60$ kgs

Alternatively: Since you know that there are total 20 students and when their average weight decreases by 1, it means on an average 1 kg weight is reduced from each of the students. Thus there is 20 kg weight loss, in total. Again this happens due to the student whose weight is 40 kg replaces an old student. Thus we can say that the weight of the old (or existing) student of the class was 60 kg, which is reduced by a 40 kg student.

2. The only useful data is that the average length of the thumb and index finger is 2.8 and the length of index finger is 3 inches.

Now the total length of index finger and thumb

$$= 2.8 \times 2 = 5.6 \text{ inches}$$

Thus the length of thumb is $(5.6 - 3) = 2.6$ inches.

3. The average price of the new mixture

$$= \frac{(38 \times 8) + (43 \times 4) + (49 \times 3)}{15} = 41.53$$

4. Average speed when Pankaj was returning

$$= \frac{2 \times 10 \times 30}{40} = 15 \text{ km/hr}$$

Now the average speed of the whole journey

$$= \frac{2 \times 15 \times 60}{75} = 24 \text{ km/hr}$$

5. Use unitary method :

In $\frac{1}{15}$ hours, 123 typists can type 984 papers

In 1 minute, 123 typists can type $\frac{984}{4} = 246$ papers

In 1 minute, 1 typist can type $\frac{246}{123} = 2$ papers

(Hint : $\frac{1}{15}$ hours = 4 minutes)

6. Average cost = $\frac{20 \times 3x + 15 \times 2x + 18 \times 4x}{9x} = 18$

7. Earning in the 8 months = $600 \times 8 = 4800$

Earning in the 4 months = $\left(600 \times \frac{3}{2}\right) \times 4 = 3600$

Total earning = Rs. 8400

Saving in 8 months = $400 \times 8 = 3200$

Saving in 4 months = $\left(400 \times \frac{5}{4}\right) \times 4 = 2000$

Total savings = 5200

Total expenditure for 12 months

$$= 8400 - 5200 = 3200$$

Therefore average saving per month = $\frac{3200}{12} = 266.66$

8. There are 6 prime numbers between 47 and 74 as given below :
53, 59, 61, 67, 71, 73

There are only two combinations whose average is $\frac{191}{3}$ or whose total sum is 191.
These are, {53, 67, 71} and {59, 61, 71}
We observe that in the first set the difference between greatest and smallest prime number is 18.
Hence choice (c) is correct.

9. Go back to the fundamentals and see the property number 4 and 2 of averages.

Hence required average = $11 \times 5 + 5 = 60$

10. The average score after 48th innings = 48

The average score after 49th innings = 49

Since $\frac{(48 \times 48 + 97)}{49} = 49$

Now the requirement of runs = $49 + (50 \times 2) = 149$

or $(50 \times 51) - (49 \times 49) = 149$

11.

	Average	Total
$S + G$	→ 35	70
$K + G$	→ 32	64
$S + K$	→ 38	76
$S + K + G$	→ 35	105
$D + I$	→ $\frac{35}{2}$	35
$S + K + G + D + I$	$\frac{105 + 35}{5} = 28$	

$$\therefore \frac{S + K + G + D + I}{5} = \frac{105 + 35}{5} = 28$$

12.

Kaif → 35

Sachin → 41

Ganguli → 29

Dhoni < 35 and Irfan < 35

Hence Sachin is the senior person

13. It is the same as a person with 20 years more age replaces an existing person of the group (or village)

Since the total age of the village having n persons, is being increased by 20 years and the average age of village is being increased by 1 year, hence there are total 20 people in the village.

Alternatively : $(n \times 42) + 20 = (n \times 43)$

$$\Rightarrow n = 20$$

14. Average rainfall = $\frac{2 \times 6 + 4 \times 5 + 4 \times 10 + 2 \times 6}{12} = 7$

15. $400 \times 7 = (300 \times 3) + (250 \times 2) + (n \times 2) \Rightarrow 700$

16. The new player must be 11 kg heavier than the replaced one. Hence the weight of the new person = $55 + 11 = 66$ kg.

	No. of family members	Average age	Total age
4 years ago	6	25	150
Presently	6	29	174

But the no. of family members (presently) = 7

and average age (presently) = 25

Therefore the total age = $25 \times 7 = 175$

Hence, the age of child = $175 - 174 = 1$ year

18. Amitabh's total expenditure for Jan-June = $4200 \times 6 = 25200$

Expenditure for February-June = $25200 - 1200 = 24000$

Expenditure for the months of February-July

$$= 24,000 + 1500 = 25,500$$

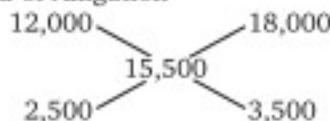
$$\text{The average expenditure} = \frac{25,500}{6} = 4250$$

19. Total value of $a + 11 + 23 + 17 = 60 \Rightarrow a = 9$

again $a + b + 12 + 25 = 64 \Rightarrow b = 18$

$$\text{therefore } \frac{a}{b} = \frac{1}{2}$$

20. By the method of Alligation



Therefore the ratio of number of Jun. level employee to the senior level employee = 5 : 7

$$\text{Hence the required fraction} = \frac{5}{(5+7)} = \frac{5}{12}$$

Alternatively: Go through options

$$\frac{J}{J+S} = \frac{5x}{12x}$$

$$\Rightarrow \frac{J}{S} = \frac{5x}{7x}$$

$$\text{Therefore } 15,500 \times 12x = 12,000 \times 5x + 18,000 \times 7x$$

L.H.S. = R.H.S., Hence correct

21. None of a, b, c is correct.

$$\text{The correct answer can be } \frac{a+b+c+d+e}{5}$$

$$\text{or } \frac{a+e}{2} = \frac{b+d}{2} = c$$

where a, b, c, d, e are consecutive odd numbers.

22. $31 \times 31 - 30 \times 30 = 61$ years

23. $a + b + c + d + e = 5 \times 92 = 460$

$$a + b + c = 3 \times 83 = 249$$

$$c + d + e = 3 \times 97 = 291$$

$$\therefore c = (a + b + c) + (c + d + e) - (a + b + c + d + e)$$

$$\text{or } c = 540 - 460 \text{ or } c = 80$$

24. $19 \times 26 - 18 \times 25 = 44$ years

$$25. \frac{k+k+2+k+4+k+6+k+8+k+10+k+12}{7} = k+6$$

$$\frac{x \times \frac{85}{100} + x \times \frac{70}{100} + \frac{5x}{12} \times \frac{56}{100}}{x} \times 100 = 67.916$$

Here, x is the total number of students in the whole class.

27. Since there are five possibilities or combinations (as ${}^5C_4 = 5$) therefore average = $\frac{5 \times 600}{4} = 750$ mm

$$28. \frac{\frac{23}{5} + \frac{8}{3} + \frac{62}{9} + \frac{112}{15} + \frac{32}{9}}{5} = 5 \frac{8}{225}$$

$$29. \frac{1000.0001 + 100.001 + 10.01 + 1.1}{4} = \frac{1111.1111}{4} = 277.777$$

$$30. \frac{7+8+9+10+11+12+13}{7} = 10$$

$$\Rightarrow \frac{7+13}{2} = 10$$

$$31. \left(\frac{1+2+3+\dots+100}{100} \right) = \left(\frac{\frac{100 \times 101}{2}}{100} \right) = 50.50$$

$$32. \left(\frac{1+3+5+7+\dots+99}{50} \right) = \left(\frac{50 \times 50}{50} \right) = 50$$

$$33. \frac{2+4+6+\dots+198}{99} = \frac{99 \times 100}{99} = 100$$

$$34. \begin{aligned} a+b+c &= 237 \\ a+c &= 158 \\ \Rightarrow b &= 79 \end{aligned}$$

$$35. \frac{M+A+S}{3} = 11111$$

$$\text{also } \frac{S+M}{2} = 11111 \quad (\because M - 11111 = 11111 - S)$$

$$\Rightarrow A = 11111$$

$$36. \frac{2 \times 200 \times 600}{800} = 300 \text{ km/hr}$$

$$37. \frac{A+B+C+D}{4} = \frac{400 \times 2 + 600 \times 2}{4} = 500$$

$$38. \text{Average weight} = \frac{20+50}{100} = 0.7 \text{ kg} \quad (\because 1 \text{ kg} = 1000 \text{ gm})$$

$$39. \text{Average} = \frac{770}{11} = 70$$

$$40. \frac{3x+4x+5x}{3} = 12 \Rightarrow x = 3$$

∴ The ages are 9, 12 and 15 years

$$\text{and the required average} = \frac{9+15}{2} = 12$$

41. Since the salary of each employee is being increased therefore the average salary will also increased by Rs. 2000. Thus the required average = 22,000.

$$42. 11 \times 21 - 10 \times 20 = 31$$

$$43. 20 \times 180 - 19 \times 178 = 218$$

44. Let the price of A > B > C

$$\text{then } \frac{A+B}{2} = 2C$$

$$A+B = 4C$$

$$\text{Now, } A+B+C = 5 \times 3 = 15 \text{ crore}$$

$$\Rightarrow 5C = 15 \text{ crore}$$

$$\Rightarrow C = 3 \text{ crore}$$

45. Since we don't know about the price of B.

46. $\left(\frac{40+70+142}{50+100+150} \right) \times 100 = 84\%$

47. Since 1 is neither prime nor composite number. Thus there are only 99 numbers viz. 2, 3, 4, 5, 6, ... 99, 100.

Hence
$$\begin{aligned} & \left(\frac{2+3+4+5+6+\dots+100}{99} \right) \\ &= \left(\frac{(1+2+3+4+\dots+100)-1}{99} \right) \\ &= \frac{5050-1}{99} = \frac{5049}{99} = 51 \end{aligned}$$

48.
$$\frac{1+4+9+16+\dots+100}{10}$$

$$= \left(\frac{10 \times 11 \times 21}{6 \times 10} \right)$$

$$\left[\because 1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6} \right]$$

$= 38.5$

49. The non-negative integers upto 99 are 0, 1, 2, 3, ... 99.

Therefore average $= \left(\frac{0+1+2+3+\dots+99}{100} \right)$

$= \frac{\left(99 \times \frac{100}{2} \right)}{100} \quad \left[\because 1+2+3+\dots+n = \frac{n(n+1)}{2} \right]$

$= 49.5$

50.
$$\frac{7+14+21+\dots+77}{11} = \frac{7(1+2+\dots+11)}{11}$$

$= \frac{7 \times 11 \times 12}{11 \times 2} = 42 \quad \left[\because 1+2+3+\dots+n = \frac{n(n+1)}{2} \right]$

Alternatively: Since all the numbers are in A.P. Further there are odd number of numbers (i.e., 11) in the sequence. Thus the middle most term is the average of the sequence, which is 42.

	Average	Total
A, B, C, D	40	160
A, B, C, D, E	41	205
F, B, C, D, E	42	210

Thus $E = 205 - 160 = 45$

Hence $F, B, C, D = 210 - 45 = 165$

Therefore average of $F, B, C, D = 41.25$

52. Three consecutive natural numbers whose average is k are $(k-1), (k), (k+1)$

The next two numbers will be $(k+2)$ and $(k+3)$

LEVEL (2)

1. For this type of questions take the LCM of speeds and assume the LCM as the distance

then the time taken @ speed of 60 km/hr $= \frac{300}{60} = 5 \text{ hrs}$

again the time taken @ speed of 50 km/hr $= \frac{300}{50} = 6 \text{ hrs}$

Therefore average of $(k-1), (k), (k+1)$ and $(k+3)$ is $(k+1)$

Alternatively: Consider any 3 consecutive natural numbers eg. 4, 5, 6 the average is 5

Again 4, 5, 6, 7, 8 the average is 6.

To verify it consider some different numbers eg. 10, 11, 12 average = 11 and 10, 11, 12, 13, 14 average = 12

Hence, proved that the average is increased by 1.

53. The 5 consecutive odd numbers whose average is k are $(k-4), (k-2), k, (k+2), (k+4)$

Again the average of $(k-4), (k-2), (k), (k+2), (k+4), (k+6), (k+8)$ is $(k+2)$

Alternatively: Consider some appropriate numbers.

54. The increase in weight $= (5 \times 42.5) - (5 \times 42) = 2.5 \text{ kg}$
But we don't know the weight of the replaced officer. So we can't determine.

55. The decrease in age $= 6 \times (28 - 27) = 6 \text{ years}$
But we don't know the age of the old servant which is being replaced. So we cannot determine the average age of new servant.

56. The age of new servant $= 31 - 6 = 25 \text{ years}$

57.
$$\begin{aligned} A + B + C &= 12,000 \times 3 \\ B + C + D &= 15,000 \times 3 \\ \Rightarrow D - A &= 3000 \times 3 \\ D - A &= 9000 \\ \text{also } D &= 2A \\ \Rightarrow D &= 18,000 \text{ and } A = 9000 \\ \text{Therefore average salary of } B \text{ and } C &= \frac{(45,000 - 18,000)}{2} \\ &= 13,500 \end{aligned}$$

58. The price of the costliest and cheapest computer

$= (80 \times 30,000) - (78 \times 29,500) = 99,000$

Therefore the price of the cheapest computer

$= 99,000 - 80,000 = 19,000$

59.
$$\frac{10 \times 50 + 50 \times 10 + 20 \times 25 + 25 \times 20}{4} = 500$$

	Auto Rickshaw	Maxi. cab	Mini. Bus
No. of seats	4	10	20
No. of seats occupied	4	8	15
Rate per seat	12	15	8
Total amount (in Rs.)	48	120	120

Therefore average earning $= \frac{48 + 120 + 120}{3} = 96$

Thus we see that in place of 5 hrs train takes 6 hours. It means the train takes 1 hour extra and this one hour is stopping period in the total time of 6 hours. Thus in 6 hour train halts for 1 hour. So in 1 hour train will stop for $\frac{1}{6}$ hours or 10 minutes.

Alternatively : (short cut)

$$\begin{aligned}\text{Halting (or stopping) time} &= \left(1 - \frac{\text{slower speed}}{\text{faster speed}}\right) \text{ hours} \\ &= 1 - \frac{50}{60} = \frac{10}{60} = \frac{1}{6} \text{ hours} \\ &= 10 \text{ minutes} \\ &\quad (\because 1 \text{ hour} = 60 \text{ minutes})\end{aligned}$$

$$\begin{aligned}2. \quad \frac{[r + (p - q)] + p + q}{3} &= 21 + \frac{p + q + r}{3} \\ \Rightarrow \quad \frac{2p + r - 21}{3} &= \frac{p + q + r}{3} \\ \Rightarrow \quad \frac{p - q}{3} &= 21 \\ \Rightarrow \quad p - q &= 63\end{aligned}$$

3. Let the speed for the first hour be x km/hr

$$\text{then the speed for the second hour be } \frac{7}{5}x \text{ km/hr}$$

$$\text{then the speed for the third hour be } \frac{10}{7} \times \frac{7}{5}x = 2x \text{ km/hr}$$

$$\text{then the speed for the fourth hour be } 2x \times \frac{7}{5} = \frac{14x}{5} \text{ km/hr}$$

$$\begin{aligned}\text{Therefore total distance in four hours} &= x + \frac{7}{5}x + 2x + \frac{14x}{5} \\ &= \frac{36x}{5} \text{ km}\end{aligned}$$

$$\therefore \text{Average speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{\left(\frac{36x}{5}\right)}{4} = \frac{9x}{5} \text{ km/hr}$$

Again the distance in 4 hours @ speed of x km/hr which is half of the third hour's speed is $4x$ km

$$\text{Hence } \frac{36x}{5} - 4x = 160 \text{ km}$$

$$\Rightarrow x = 50$$

$$\text{Hence, the average speed} = \frac{9 \times 50}{5} = 90 \text{ km/hr}$$

4. The total score of 3 toppers $= 123 \times 120 - 120 \times 118.5 = 540$

The highest possible score of the third highest topper is possible when the score of other two toppers was minimum So,

$$\begin{aligned}1^{\text{st}} \text{ rankers score} &= 187 \text{ (minimum)} \\ 2^{\text{nd}} \text{ rankers score} &= 186 \text{ (minimum)} \\ 3^{\text{rd}} \text{ rankers score} &= 167 \text{ (maximum)}\end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} 540$$

5. Go through options : $40 \times 35 + 60 \times 25 = 29 \times 100$

Since there are 40 ladies and 60 gents

Alternatively: $40 \times 7x + 60 \times 5x = 29 \times 100$

$$\Rightarrow x = 5 \quad \therefore 7x = 35$$

6.	Lok Sabha	Rajya Sabha
No. of MPs	300	200
Ave. Age	40	50

Since when a member of Rajya Sabha joins the Lok Sabha and the average age of both the houses increases, it means the average age of this member must lie between 40 and 50. When the age of this member is greater than 40, then the average age of the Lok Sabha increases.

Again when the age of this member is less than 50, then after leaving it, the average age of the Rajya Sabha increases.

7. **Solutions for question numbers 7, 8 and 9:**

	No. of family members	Average	Total
8 years ago \rightarrow	5	36	180
Presently \rightarrow	(if) 5 7	$(36 + 8) = 44$ 36	220 252

7. From the above explanation we have no any clue about his wife's age.

8. Since we know that the difference between the age of any two persons remains always constant, while the ratio of their ages gets changed as the time changes.

So, if the age of his child be x (presently)

Then the age of wife be $x + 26$ (presently)

Thus, the total age $= x + (x + 26) = 32$ $[\because 252 - 220 = 32]$

$$\Rightarrow x = 3$$

Therefore the age of her child is 3 years and her self is 29 years. Hence her age at the time of the birth of her child was 26 years.

Alternatively: As we have mentioned above that the age difference remains always constant. Therefore her age at the time of her child's birth was 26 years.

9. Since there is no clue. So we can't determine.

10.	No. of family members	Average	Total
Eleven years earlier	4	28	112
Presently	if 4 6	39 28	156 168

Since it is obvious that just after the birth of the youngest member (i.e., child) was 6 family members in the family. Therefore at the time of the birth of the youngest child the elder child's age was 6 years.

Now the sum of their ages $= x + (x + 6) = 12 = (168 - 156)$

$$\Rightarrow x = 3 \quad \text{and} \quad (x + 3) = 9$$

11. Go through options

$$\frac{6}{4} = 1.5 \text{ hour, when he was walking}$$

Therefore time of journey by train $= 3 - 1.5 = 1.5$

Now, the distance travelled by train $= 1.5 \times 60 = 96 - 6 = 90$
Hence correct.

Alternatively: Total distance $= 32 \times 3 = 6 + 60 \times x$

$$\Rightarrow x = 1.5 \text{ hours}$$

$$\text{Thus, the speed of walking} = \frac{6}{1.5} = 4 \text{ km/hr}$$

12. Let the number of total Mps $= n$ and their average age be x then

$$n \times x = \frac{4}{5} n \times \frac{5}{4} x + \frac{n}{5} \times y$$

$$\Rightarrow \text{either } n = 0 \text{ or } y = 0$$

[Since there are only 80% MPs remained in the house which

is equal to $\frac{4}{5}n$ and the increase in average age = $20\% = \frac{5}{4}x$]

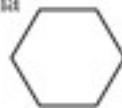
Thus, there cannot be any possible value of n .

13. $nx = \frac{4}{5}n \times \frac{5}{4}x + \frac{n}{5} \times 30$

$\Rightarrow n = 0$ which is impossible

So, there is no any woman MP in the Lok Sabha

14. Average speed = $\frac{\text{Total distance}}{\text{Total time}}$



$$= \frac{6 \times 20}{9} = 13.33 \text{ m/s}$$

Hexagonal path has six sides

15. Average of 26, 29, 35 and 43 is 33.25. Also the average of 26, 29, n , 35 and 43 lies between 25 and 35 i.e.,

$$25 < \frac{26 + 29 + n + 35 + 43}{5} < 35$$

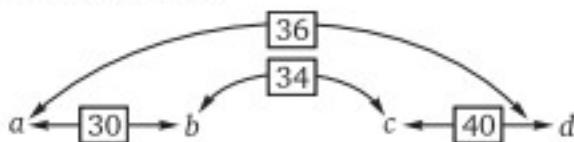
$$\Rightarrow 125 < 26 + 29 + n + 35 + 43 < 175$$

$$\Rightarrow 125 < 133 + n < 175$$

$$\Rightarrow n < 42$$

Since the value of n is an integer and greater than 33.25 then $33 < n < 42$; for every integer n .

16. Given that $a < b < c < d$



The only possible prime number between 30 and 34 is 31

Hence $b = 31$, therefore $a = 29$

Similarly $c = 37$ and $d = 43$

Therefore $d - a = 43 - 29 = 14$

17. $9261000 = 2^3 \times 3^3 \times 5^3 \times 7^3$

$$= (2 \times 3 \times 5) \times (2 \times 3 \times 7) \times (2 \times 5 \times 7) \times (3 \times 5 \times 7)$$

$$= 30 \times 42 \times 70 \times 105$$

Therefore the average of 30, 42, 70 and 105 is 61.75.

18. Since the number is as below 270 as its multiple is as above 270. It means these two numbers are equidistant from 270. Hence their average is 270.

Alternatively : Let the number be x then.

$$270 - x = 8x - 270$$

$$\Rightarrow x = 60 \text{ and } 8x = 480$$

Therefore the average of 60 and 480 is 270.

19. The average of 60 and 270 is 165

20. Number of days in a week = 7

Average number of visitors = 40

Total visitors = 280 ($= 7 \times 40$)

Now, if n be the number of holidays in a week then

$$(7 - n) \times 56 = 280 \quad (40 + 16 = 56)$$

$$\Rightarrow n = 2$$

The rest data is redundant or useless, since our problem is solved here without using it.

Alternatively : Go through options

$$40 \times 7 = 280 = 56 \times 5 \text{ hence proved.}$$

21. Since we don't know their ages individually so we cannot calculate the average of the class when a student of unknown age readmitted in the class.

22. Let the average of prime numbers be P and average of composite numbers be C .

Again the number of prime numbers be x , then the number of composite numbers be $2x$.

Then $\frac{Px + 2Cx}{3x} = 9 \Rightarrow P + 2C = 27 \quad \dots(1)$

and $\frac{2Px + Cx}{3x} = 11 \Rightarrow 2P + C = 33 \quad \dots(2)$

on adding eq. (1) and (2)
we get $P + C = 20$

and on subtracting eq. (1) from (2)
we get $P - C = 6$

Therefore $P = 13$ and $C = 7$

Thus $\frac{C}{P} = \frac{7}{13}$

23. Solve through option $\frac{540}{27} = 20$

$$\frac{540 - (2 \times 20)}{25} = \frac{500}{25} = 20$$

Hence option (b) is correct.

24. Number of members in the staff \times average age = Total age

$$29 \times 24 = 696$$

$$29 \times 27 = 783$$

hence change in total age = 87

	Physician	Surgeon	Nurse
No. of members	$(21 - x)$	8	x
Increase in average age	1	6	3
Increase in total age	$(21 - x)$	48	$3x$

Since $P + S + N = 29$

therefore if there would be x nurses then there must be $(21 - x)$ physicians.

Again total change (or increase) in age

$$= (21 - x) + 48 + 3x = 87$$

$$\Rightarrow x = 9$$

25. Total exp. Jan-June = $4200 \times 6 = \text{Rs. 25200}$

Total exp. Feb-June = $25200 - 1200 = \text{Rs. 24000}$

Total exp. Feb-July = $24000 + 1500 = \text{Rs. 25500}$

$$\text{The average expenditure Feb-July} = \frac{25500}{6} = 4250$$

26. Let the number of subjects be n and average marks be x , then, total marks = nx

Again $(n + 1)(x - 1) = (nx - 40) + (23 + 25)$

$$\Rightarrow x - n = 9 \quad \dots(1)$$

Further $(n + 2)(x + 1) = (nx - 40) + (23 + 25) + 57$

$$\Rightarrow nx + 2x + n + 2 = nx + 65$$

$$\Rightarrow 2x + n = 63 \quad \dots(2)$$

Solving equations (1) and (2), we get

$$n = 15 \text{ and } x = 24$$

27. Initially, the total age of family = $4 \times 42 + 7 \times 20 = 308$

and the average age = $\frac{308}{11} = 28$

$$\text{Now, the total age of family} = 308 - (2 \times 13) + (11 + 15 + 28) \\ = 308 + 28 = 336$$

$$\text{Now, the new average of the family} = \frac{336}{12} = 28$$

Since the average age of the original family and that of new family is same (i.e., 28)

Hence, the average age of the new family is increased by 0 year.

28. Let there be n number and he missed a number k , then the average (which he has calculated) = $\frac{\left(\frac{n(n+1)}{2} - k\right)}{n} = 15$

$$\Rightarrow n^2 - 29n = 2k$$

$$\Rightarrow n(n-29) = 2k$$

Thus at $n = 29$ or $n < 29$, the expression is invalid since the value of k is neither zero nor negative, which is actually a natural number. So for the least possible value of $n = 30$

$$k = 15$$

and for $n = 31, k = 31$

Again for $n > 31$, k is beyond the range i.e., greater than n . Since k can not be greater than n . Hence there are only two values of k . So there is no unique value of n .

29. Let there be n people (initially) in the group, then the total earning of the group = $n \times 50$

$$\text{Again } n \times 50 = (n-2) \times 49 + (2x+45)$$

$\Rightarrow n = 2x - 53$; where x is the lowest earning of any person.

Now, since $42 < x < 47$ and $n \in \text{prime numbers}$

Then the only possible value of $n = 37$ for $x = 45$

30. Let the number of students who got the jobs of A, B and C categories is a, b and c respectively,

$$\text{then the total salary} = \frac{26(a+b) + 44(b+c) + 34(c+a)}{2(a+b+c)} \\ = \frac{60a + 70b + 78c}{2(a+b+c)} \\ = \frac{30(a+b+c) + (5b+9c)}{a+b+c} \\ = 30 + \text{some positive value}$$

So the minimum salary must be Rs. 30 lakh and the maximum salary can not exceed 44, which is the highest of the three.

31. $D - C - A$... (1)
 $D > B > C$... (2)

from (1) and (2)

$$D > B > C > A \quad \dots (3)$$

Again $E - B - A$

but $B > A$, from (3)

$$\text{So } E > D > B > C > A \quad \left[\begin{array}{l} \text{Since } B \text{ is the average of} \\ E \text{ and } A \text{ so it is equidistant} \\ \text{from both } E \text{ and } A. \end{array} \right]$$

32. Let Donald be denoted by H (Husband)

His wife be denoted by W (Wife)

His daughter be denoted by D (Daughter)

His son be denoted by S (Son)

$$\text{The average age of 4 persons} = \frac{(H + W + D + S)}{4} = 23$$

\Rightarrow

Again

$$H = W + 4$$

So

At the time when
daughter is born
↓
At the time when
son is born

H	W	D	S
28	$\xleftarrow{(+4)}$	24	0
32	$\xrightarrow{(-4)}$	28	4

So at the time of birth of his son, total age of his family = 64 years ($32 + 28 + 4 + 0 = 64$)

and presently the total age of his family = 92 years

It means total increase in age of the whole family = 28 years

$$\text{Thus the average increase in age} = \frac{28}{4} = 7 \text{ years}$$

It means the age of Donald = 39 years

and age of his daughter = 11 years

Therefore the average age of Donald and his daughter is 25 years.

33. Aman Wife Son El. D Yg. D

$$5x \xleftarrow{\quad} \xrightarrow{\quad} x \quad 5z \xleftarrow{\quad} \xrightarrow{\quad} 4z$$

$$8y \xleftarrow{\quad} \xrightarrow{\quad} 3y \quad \Rightarrow 40K \quad (W) \quad 8K \quad 15K \quad 12K$$

$$\text{Again since } Yg. D + W = A + S \quad (K = x, y)$$

$$\Rightarrow 12K + W = 40K + 8K \quad W \rightarrow \text{Age of wife}$$

$$\Rightarrow W = 36K$$

Thus 4 years ago

$$(36K - 4) = 8(8K - 4)$$

$$\Rightarrow 28K = 28 \Rightarrow K = 1$$

Therefore, the age of Aman = 40

$$\text{Wife} = 36$$

$$\text{Son} = 8$$

$$\text{Elder daughter} = 15$$

$$\text{Younger daughter} = 12$$

$$\text{Hence, the average age of the family} = \frac{111}{5} = 22.22 \text{ years}$$

34. Let there be n politicians (initially) in the party and their average weight be x kg, then

$$nx + 209 = \frac{5}{4}n(x-1)$$

$$\frac{n}{4}(x-5) = 209$$

$$x = \frac{209 \times 4}{n} + 5$$

$$x = \frac{4 \times 11 \times 19}{n} + 5$$

So the possible value of n is 76 ($= 19 \times 4$)

$$\text{Thus } x = 16$$

Therefore the average weight of all the politicians is 15 kg.

35. Total distance covered by all the wheels = 4×160

$$\text{Number of wheels used} = 5$$

Therefore average distance covered by each wheel

$$= \frac{4 \times 160}{5} = 128 \text{ km}$$

36. Let the numbers be $(a-5), (a-3), (a-1), (a+1), (a+3), (a+5)$

then their average

$$= \frac{(a-5) + (a-3) + (a-1) + (a+1) + (a+3) + (a+5)}{6} = a$$

Again the value of 'a' can be found by using the last statement

$$\text{i.e., } (a-5)^2 + (a+5)^2 = 178$$

$$\Rightarrow a^2 = 64 \Rightarrow a = 8$$

	No. of Directors	Average Age	Total Age
Just before death and resignation	10	48	480
Just after death and resignation	9		$(480 - (53 + x)) + 34$
One year later	9	46	414

So one year later, after the incident

$$\text{total age} = \{480 - (53 + x) + 34\} + 9 \times 1 = 414$$

$$\Rightarrow x = 56 \text{ years}$$

where x is the age of the dead person at the time of his death.

38. Go through options $= \frac{24 \times 60 + 12 \times 54}{(24 + 12)}$

$$= 58, \text{ which is a whole number.}$$

	Year/Time	No. of Nurses	Average Age	Total Age
	1982	100	50	5000
Just before retirement	1984	100	52	5200
Just after retirement	1984	80	50	$(5200 - 20 \times 60) = 4000$
Just before recruitment	1987	80	53	4240
Just after recruitment	1987	$(80 + 40) = 120$	48	$(4240 + 38 \times 40) = 5760$
	1990	120	51	6120

40. Average score

$$= \frac{8 + 10 + 7 + 12 + 25 + 24 + 18 + 23 + 29 + 30}{10} = \frac{186}{10} = 18.6$$

41. The candidate who has scored maximum (means continuing for long time and number of responses were maximum) can be such a required person.

Now, consider Abhijeet, whose score was 30.

Again consider Rajesh, Radhe, Harish and one more candidate since $8 + 10 + 7 < 30 \Rightarrow 25 < 30$

So there are exactly 3 persons which can be full time opponents. Further there are 5 ($= 30 - 25$) more chances. So these chances can be utilised by any other candidate but he or she must be in the beginning or in the ending of the Abhijeet, since the score of all the candidates is greater than 5. Hence there can be maximum $3 + 1 = 4$ opponents of Abhijeet.

42. There is no such an information.

43. The minimum number of participants who have lost the game before Abhijeet started will be possible only when the number of participant with Abhijeet be maximum, which is 4. Hence excluding these 4 players (opponents of Abhijeet) and Abhijeet himself there are 5 people left. So minimum 5 players have lost the game (or contest).

44. The opponents of Abhijeet (as per the requirement) are Rajesh, Radhe, Harish and Amit Sana

$$\text{So, the average score} = \frac{8 + 10 + 7 + 29}{4} = 13.5$$

45. Go through options

$$\text{or Total employs} = \frac{(25 - 10) \times 20}{10} = 30$$

Hence number of educated employees $= 30 - 20 = 10$

46. Average speed of the later half journey

$$= \frac{2 \times 40 \times 60}{100} = 48 \text{ km/hr}$$

Now the average speed of the whole journey

$$= \frac{2 \times 48 \times 96}{144} = 64 \text{ km/hr}$$

47. $\frac{40 \times 0.8 + 60 \times 0.75 + 50 \times 0.6 + 30 \times 0.5}{180} \times 100$

$$= \frac{122}{180} \times 100 = 67.777 \dots \%$$

abc

48. Remember $\frac{abc - cba}{99(a-c)}$

where abc and cba are the three digit numbers and $(a, c) \neq 0$

Again since the difference in average $= 19.8$

Therefore the difference in total $= 19.8 \times 10 = 198$

Thus, $99 \times (a-c) = 198$

$$\Rightarrow (a-c) = 2$$

49. If the highest weight be 35 gm, then the second highest weight will be 31 gm. Again if the second highest will be 31, then the third highest will be 33 which is inadmissible, since $35 + 33 = 68$ which is not the greatest possible combination. Hence wrong.

Similarly 36 (i.e., option b) is also invalid

$$\begin{array}{lll} \text{Highest} & \text{Sec. Highest} & \text{Third Highest} \\ 36 & 30 & 34 \end{array}$$

Thus $36 + 34 = 70 > 66$, hence wrong.

The greatest possible combination can not be greater than 66.

Now, consider option (c)

$$\begin{array}{lll} \text{Highest} & \text{Sec. Highest} & \text{Third Highest} \\ 34 & 32 & 32 \end{array}$$

(since weights are different)

$$\begin{array}{lll} 32 & 31 & 31 \end{array}$$

(since 65 is not a combination)

$$\begin{array}{ll} 32 & 30 \end{array}$$

✓

So, the highest weight 34

Sec. highest weight 32

Third highest weight 30

Lowest weight 29

Since, all the weights obtained give all the 6 different combinations, hence 34 is the highest possible weight of an envelope.

50. Let the fixed expenditure of the hotel be Rs. x and the variable expenditure (which is dependent on the guest) is Rs. y , then

$$x + 10y = 600 \quad \dots(1)$$

$$x + 20y = 800 \quad \dots(2)$$

$$\Rightarrow 10y = 200$$

$$y = \text{Rs. } 20 \text{ and } x = 400$$

hence the total expenditure when there are 40 guests

$$= 400 + 40 \times 20 = 1200$$

$$\text{Therefore average expenditure} = \frac{1200}{40} = \text{Rs. } 30$$



Final Round

1. Since all the total 100 elements of Sets A, B, C are the natural numbers upto. Thus the average of these first 100 natural numbers is the required average.

$$\therefore \text{Average} = \frac{1+2+3+4 \dots 100}{100} = \frac{100 \times 101}{2 \times 100} = 50.50$$

2. Except to 2 there are all the even numbers upto 100

$$\text{So, the required average} = \frac{(2+4+6+\dots+100)-2}{49} = \frac{50 \times 51 - 2}{49} = \frac{2548}{49} = 52$$

NOTE There are only 49 elements in the Set B. Apply the formula of sum of first even numbers. Also use the property of AP.

3. The total value of all the 25 elements of the Set A

$$= 25 \times 42.4 = 1060$$

Since, there are 25 prime numbers upto 100 in the Set A. Again in the Set A and C there are 50 odd numbers and one even number. So the sum of all the elements of A and C

$$\begin{aligned} &= (1+3+5+7+\dots+99)+2 \\ &= (50)^2 + 2 = 2502 \end{aligned}$$

Therefore the sum of all the elements of Set C

$$= 2502 - 1060 = 1442$$

Hence, the average of the Set C = $\frac{1442}{26} = 55.4615$

4. The average of all the elements of the Set A and C

$$= \frac{2502}{51} = 49.0588$$

Solutions for question number 5 to 15 :

Set	No. of elements	Average	Least element	Greatest element
A	25	42.4	2	97
B	49	52	4	100
C	26	55.46	1	99

5. Since the value of element which is transferred to Set B is less than 50, which in turn less than the average of Set B, hence the average of Set B decreases.

NOTE If a quantity which is less than the average of the group introduces from outside then the new average of the group decreases.

6. The least possible numbers of Set A which are greater than 50 are 53 and 59 whose average is always greater than the average of C. Hence the average of C will necessarily increases.

7. Can't say, since we don't know which 10 numbers are being transferred. Whether their average is greater, less or equal to the average of B.

8. Definitely increases, since the average of those numbers (viz. 1 and 99) is 50 which is greater than the average of Set A.

9. The average of those numbers (viz. 4 and 100) is 52. Hence average of A will increase and average of B will remain constant and the average of C remains unaffected because Set C is not involved.

NOTE If an element or average of some elements is equal to the average of the group then this element (or subset of elements) does not change the average of the group, when it joins the group or leaves the group.

10. After the insertion of new element viz. 2 in the Set B the new average = $\frac{2+4+6+\dots+100}{50} = 51$

Hence, the new average of Set B decreases by 1.

11. The perfect square number of the Set C are 1, 9, 25, 49, 81

Hence, the average of these number = $\frac{165}{5} = 33$

12. Since there is no net change (i. e., all the elements even after being transferred are same). Hence their average is also same as in question no. 1.

13. Obviously A. Since the average of all those 15 elements which are joining the Set A is greater than the average of all those 5 elements which are leaving the Set A and this difference in average is largest in comparison to Set B or Set C. Even in Set C there is decrease in average.

14. To minimize the loss in average of Set B, we have to transfer the least possible values of the given range and have to bring the highest possible values from the Set A to the Set B.

Thus the absolute decrease in Set B

$$\begin{aligned} &= (26+28+30+32 \dots 44) - (23+19+17+13+11) \\ &= 350 - 83 = 267 \end{aligned}$$

Hence, the decrease in total value of Set B

$$= 2548 - 267 = 2281$$

Therefore, new average = $\frac{2281}{44} = 51.84$

NOTE Now there are only 44 elements in Set B.

15. There is no relevant information regarding the numbers which are being transferred from one set to another set.

16. Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{200}{\left(5 + \frac{10}{3}\right)} = \frac{200 \times 3}{25} = 24 \text{ km/hr}$$

Since for the first 100 km time required is $\frac{100}{20} = 5$ hrs and for

the last 100 km time required = $\frac{100}{30} = \frac{10}{3}$ hours

17. The average speed = $\frac{150}{5 + \frac{5}{3}} = \frac{150 \times 3}{20} = 22.5 \text{ km/hr}$

18. Average bonus for the first 3 months = $\left(\frac{3000}{100}\right)^2 + 10 = 910$

Average bonus for the next 5 months = $\left(\frac{5000}{100}\right)^2 + 10 = 2510$

Average bonus for the last 4 months = $\left(\frac{8000}{100}\right)^2 + 10 = 6410$

His average bonus for the whole year

$$= \frac{910 \times 3 + 2510 \times 5 + 6410 \times 4}{12} = \text{Rs. 3410}$$

Hence his average earning per month

$$= 3410 + 200 = \text{Rs. 3610}$$

19. Total price of 5 shirts = $\text{Rs. } [100 + 10 \times (5)^2] = \text{Rs. } 350$

Hence, the average price = $\frac{350}{5} = \text{Rs. } 70$

20. Check the option (c).

$$\text{Total price} = 100 + 10 \times (2)^2 = \text{Rs. } 140$$

$$\text{Average price} = \frac{140}{2} = \text{Rs. } 70$$

Hence, the average price is same as that of Mallika.

21. Total number of passengers $= 10 \times 20 = 200$

In the 9 compartments the total number of passengers

$$= 144 (= 12 + 13 + 14 + 15 + 16 + 17 + 18 + 19 + 20)$$

So the no. of passengers in the 10th coach $= 200 - 144 = 56$

22.

	No. of 2 wheelers	No. of 3 wheelers	No. of 4 wheelers
No. of wheels	$2x$	x	$2x$
	$2 \times 2x = 4x$	$3 \times x = 3x$	$2x \times 4 = 8x$

$$\text{Therefore average number of wheels} = \frac{4x + 3x + 8x}{5x} = 3$$

23. The average weight of eggs of first generation is k gm and the no. of eggs is ' n '.

Let $a_1, a_2, a_3, \dots, a_n$ be the weights of n eggs of the first generation

$$\therefore k = \frac{a_1 + a_2 + a_3 + \dots + a_n}{n}$$

$$\therefore nk = a_1 + a_2 + a_3 + \dots + a_n \quad \dots(1)$$

where a_1 is the average weight of its ' n ' child eggs, a_2 is the average weight of its own ' n ' child eggs and so on. Child egg is referred to the egg of next generation produced by its mother egg.

$$\therefore a_1 = \frac{a_1 + b_1 + c_1 + \dots + n_1}{n}$$

$$a_2 = \frac{a_2 + b_2 + c_2 + \dots + n_2}{n}$$

$$a_3 = \frac{a_3 + b_3 + c_3 + \dots + n_3}{n} \text{ etc.}$$

Substituting the values of a_1, a_2, a_3, \dots in equation ... (1)

$$nk = \left(\frac{a_1 + b_1 + c_1 + \dots}{n} \right) + \left(\frac{a_2 + b_2 + c_2 + \dots}{n} \right) + \left(\frac{a_3 + b_3 + c_3 + \dots}{n} \right) + \dots + \left(\frac{a_n + b_n + c_n + \dots}{n} \right)$$

$$\therefore nk = \frac{(a_1 + b_1 + c_1) + (a_2 + b_2 + c_2 + \dots) + (a_3 + b_3 + c_3 + \dots)}{n}$$

\Rightarrow Therefore n^2k is the total weight of all the eggs of second generation.

Similarly, each of $a_1, b_1, c_1, a_2, b_2, c_2, \dots$ are the average weights of n eggs of their child eggs. Hence in the third generation total weight will be n^3k . Thus the total weight of all the eggs of r^{th} generation is $n^r k$.

24. **Solutions for question number 24 to 27 :** Before going for the final solution we need to look for the fundamental concept of averages i.e., if a person of higher age than the average age of the group leaves the group, then the average age of the group

decreases. Also if a person of less age than the average age of the existing group joins the group, then the average age of the group increases.

Besides it we also know that the average age of the same group after k years increases by K years.

Faculty of LR :

Year	No. of faculty	Average age	Total age
2004	3	49.33	148
2005	4	44	$176 = 148 + 3 + 25$
2006	4	45	$180 = 176 + 4$
2007	4	46	$184 = 180 + 4$

$176 = 148 + 3 + 25$, implies that due to 3 existing professors their total age will be increased by 3 years after one year time period and 25 years age will be added due to a new entrant in the faculty of LR.

Faculty of DI :

Year	No. of faculty	Average age	Total age
2004	4	50.5	202
2005	4	51.5	$206 = 202 + 4$
2006	4	52.5	$210 = 206 + 4$
2007	5	47.8	$239 = 210 + 4 + 25$

Faculty of English :

Year	No. of faculty	Average age	Total age
2004	5	50.2	251
2005	4	49	$196 = 251 + 5 - 60$
2006	5	45	$225 = 196 + 4 + 25$
2007	5	46	$230 = 225 + 5$

Faculty of Quants :

Year	No. of faculty	Average age	Total age
2004	6	45	270
2005	7	43	$301 = 270 + 6 + 25$
2006	7	44	$308 = 301 + 7$
2007	7	45	$315 = 308 + 7$

24. In the year 2006, a new faculty member joined the English faculty.

25. The new faculty member who joined on April 1, 2005 became 27 years old on April 1, 2007.

26. From the faculty of English a professor retired on April 1, 2005.

27. Age of Sarvesh on April 1, 2004 = 52 years + 4 months \approx 52 years
Similarly age of Manish on April 1, 2004

$$= 49 \text{ years} + 4 \text{ months} \approx 49 \text{ years}$$

\therefore Age of the third professor on April 1, 2004

$$= 148 - (52 + 49) = 47 \text{ years}$$

Hence the age of the third professor on April 1, 2009

$$= 47 + 5 = 52 \text{ years}$$

