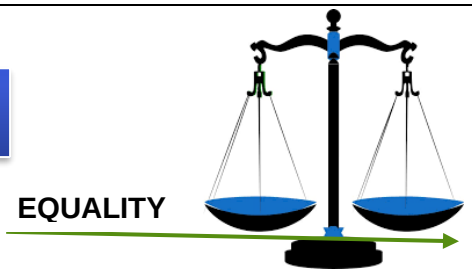
AVERAGES



Averages : Average is the sum of all numbers divided by the total number of numbers. Average is the another name of mean.

$$\text{Average} = \frac{\text{Sum of Values}}{\text{Number of Values}}$$

E.g. for example the score obtained by 3 students in an examination is 50 , 70 , 60 out of 100, then the average marks is

$$\frac{(50 + 70 + 60)}{3} = 60 \text{ (Average Marks)}$$

- Sum of first n natural numbers $= \frac{n\,(n+1)}{2}$

  Average of first n natural numbers $= \frac{(n+1)}{2}$

- Sum of first n natural odd numbers $= n^2$

  Average of first n natural odd number $= n$

- Sum of first n natural even numbers $= n\,(n+1)$

  Average of first n natural even numbers $= n + 1$

❖ **Sum of squares of first n natural numbers** = $\frac{n(n+1)(2n+1)}{6}$

Average of squares of first n natural numbers = $\frac{(n+1)(2n+1)}{6}$

❖ **Sum of cube of first n natural numbers** = $n^2\left[\frac{n+1}{2}\right]^2$

Average of cube of first n natural numbers = $n\left[\frac{n+1}{2}\right]^2$

BASIC PROBLEMS :

1) (i) Find the average of all numbers between 1 to 6. **Ans: 3.5**

(ii) Find the average of 20,40,60,80,100 . **Ans: 60**

(iii) Rs.666 is shared between three friends in the ratio of 1: 1: 1, find the amount that each friend get . **Ans: 222**

(iv) A mobile is sold at profit of 50%, this profit is shared between two friends equally, if the cost price of the mobile is 20,000₹. Then find the average profit received by each friend.
Ans: 5000

2) The average of four consecutive even numbers is 33. Find the second consecutive even number. **Ans: 32**

3) The average age of three boys is 15 years and their ages are in proportion 3:5:7. What is the age in years of the youngest boy ?
Ans: 9

4) The arithmetic mean of the first five prime numbers is _____
Ans: 5.6

5) In the first 20 overs of a cricket game, the run rate was only 5.8 What should be the run rate in the remaining 30 overs to reach the target of 362 runs ? **Ans: 8.2**

MODEL : 1

1) The average of 50 numbers is 38. If two numbers 45 and 55 are discarded. The average of remaining is_____.

a) 39.5 b) 37.5 c) 34.5 d) 42

2) The average weight of a group of 8 people increases by 2.5 kg when a new person replaces one of them who's weight is 65 kg. What might be the weight of the new person ?

a) 75 b) 82 c) 85 d) 70

3) Average age of a family of 6 persons four years ago was 'x' years . A baby is born in between these years. Now the average age of the family is same as it was four years ago. If the present age of baby is 2 years, then find the average age of the family after 3 years

a) 29 b) 31 c) 33 d) 30

4) The average age of a group of 10 men decreased by 1 year , when a man aged 23 years joined the group and an existing man left. What is the age of the man who left the group ?

a) 30 b) 33 c) 34 d) 38

5) The average of 4 children is 12 years. If the age of the father be included. The average increased by 10 years. Find the age of the father.

a) 50 b) 56 c) 58 d) 62

MODEL: 2

1) The average of 13 observations is 23. The average of first 7 is 27 and that of last 7 is 24. What is the value of the seventh observation.

a) 46 b) 102 c) 78 d) 58

2) The mean of 25 observations is 36. If the mean of the first 13 observations is 32 and that of the last 13 observations is 39, find the 13th observation .

a) 16 b) 23 c) 27 d) 34

3) The average of 13, 15, 20 and **x** is 18 and the average of 10, 14, **x** and **y** is 16. What is the value of **y**.

a) 13 b) 16 c) 24 d) 28

MISCELLANEOUS :

1) If 30% of **a** = 40% of **b** and the average of **a** and **b** is 42, what is the value of **a** ?

a) 54 b) 44 c) 48 d) 36

2) A batsman makes a score of 58 runs in the15th innings and thus increases his average by 3 runs. What is the average after 15^{th} innings

a) 13 b) 15 c) 24 d) 16

3) The average weight of P and his three friends is 55 kg. If P is "4" kg more than the average weight of his three friends, what is P's weight (in kg)?

a) 48 b) 58 c) 62 d) 84

4) The average marks of class is 35. There are 5 girls and the average is 15. The remaining boys have 39 as their average mark. The number of students in the class is .

a) 34 b) 45 c) 30 d) 56

5) There are certain numbers of students in a class and the average weight of 30 boys is 10 kg more than the average weight of 20 girls. If the total weight of 20 girls is 600 kg, then find the average weight of students in the class ?

a) 36 kg b) 38 kg c) 42 kg d) 44 kg

6)The Average of 8 numbers is 12. If one of them exceeds the average of remaining by 8. The number is

a) 14 b) 20 c) 18 d) 24

7) The average of five numbers is 20. The first number is increased by 4, second by 5, third by 6, forth by 7 and fifth by 8. What is the new average of 5 numbers ?

a) 26 b) 22 c) 28 d) 32

8) The average expenditure of a clerk for first 5 months in a year is Rs.1200 and that for next 7 months is Rs. 1300. If his savings in that year is Rs.2900. What is the average monthly income ?

a) 1400 b) 1500 c) 1600 d) 2000

9) The average of 20 numbers is zero. Of them, at the most, how many may be greater than zero ?

a) 10 b) 15 c) 19 d) 20

10) Average weight of A, B and C is 44 kg. If the average weight of A, B and C is 10% more than the average weight of A, B, C, D and E, then find the weight of D and E together ?

a) 36 b) 42 c) 22 d) 28

11) Ratio of the height of A and B is 9:7 and the height of C is 66.67% of the height of A. If the difference between the height of B and C is 21 cm, then find the average height of A and B together ?

a) 192 cm b) 154 cm c) 146 cm d) None of these.

12) There are certain numbers of students in a class and the average weight of 30 boys is 10 kg more than the average weight of 20 girls. If the total weight of 20 girls is 600 kg, then find the average weight of students in the class ?

a) 45 b) 36 c) 54 d) 28

13) The average weight of Anil, Tinu, Kavi and Divya is 68 kg. Ratio of the weight of Anil to Tinu is 6:5 and Anil's weight is 48 kg, then what is the average weight of Kavi and Divya ?

a) 92 b) 96 c) 54 d) 85

CHALLENGES:

1. There are three persons A, B and C in a room. If a person D joins the room, the average weight of the persons in the room reduces by x kg Instead of D, if person E joins the room, the average weight of the persons in the room increases by 2x kg. If the weight of E is 12 kg more than that of D, then the value of x is ?

a) 2 b) 1 c) 0.5 d) 1.5

(ANS: b)

2. If a certain amount of money is divided equally among n persons, each one receives Rs. 352. However, if two persons receive Rs. 506 each and the remaining is divided equally among the other persons, each of them receive less than or equal to Rs. 330. Then, the maximum possible value of n is _____

a) 12 b) 14 c) 16 d) 22 (ANS: 16)

3. The average of three integers is 13 When a natural number n is included, the average of these four integers remains an odd integer The minimum possible value of n is _____.

a) 3 b) 4 c) 5 d) 1 (ANS: C)