Average

Average

The average of a given observation or data is a number which is found on dividing the sum of observations or data by the number of observation or data given.

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

Example 1 Find the average of 3.5, 5.7, 4.6, 2.8, 4.3 and 4.9 is

(a) 4.5 (b) 4.3 (c) 3.8 (d) 3.4

Sol. *(b)* Sum of the given numbers

$= (3.5 + 5.7 + 4.6 + 2.8 + 4.3 + 4.9) = 25.8$

Number of observations = 6

$$\therefore \quad \text{Average} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

$$= \frac{25.8}{6} = 4.3$$

Example 2 Ages of Ajay, Amit and Satish are 10 yr, 12 yr and 14 yr, respectively. Find the average age.

(a) 13 yr (b) 15 yr (c) 12 yr (d) 20 yr

Sol. *(c)* Average age $= \frac{10 + 12 + 14}{3} = \frac{36}{3} = 12$ yr

Example 3 The average of 5 numbers is 306.4. The average of the first two numbers is 431 and the average of the last two numbers is 214.5. What is the third number?

(a) 108 (b) 241

(c) 321 (d) Cannot be determined

Sol. *(b)* According to the question,

Sum of five numbers $= 5 \times 306.4$

$= 1532$

$\therefore$ Third number $= 1532 - 2 \times 431 - 2 \times 214.5$

$= 1532 - 862 - 429 = 241$

Example 4 The average weight of a group of 75 girls was calculated as 47 kg. It was later discovered that the weight of one of the girl was read as 45 kg, whereas her actual weight was 25 kg. What is the actual average weight of the group of 75 girls? (Rounded off to two digits after decimal)

(a) 46.73 kg
(b) 46.64 kg
(c) 45.96 kg
(d) Cannot be determined

Sol. *(a)* Total actual weight of all girls

$= 47 \times 75 - 45 + 25$

$= 3525 - 20 = 3505$ kg

$\therefore$ Average weight $= \frac{3505}{75} = 46.73$ kg

Helping Tips

If average of the given observations is 'x' then

- If each observation is increased by a, then new average $= x + a$
- If each observation is decreased by a, then new average $= x - a$
- If each observation is multiplied by a, then new average $= x \times a$
- If each observation is divided by a, then new average $= x \div a$

Important Formulae Related to Average of Number

- Average of first n natural numbers $= \left(\frac{n+1}{2}\right)$
- Average of first n even numbers $= (n + 1)$
- Average of first n odd numbers $= n$
- Average of consecutive numbers
$$= \frac{\text{First number + Last number}}{2}$$
- Average of n multiples of any number
$$= \frac{\text{Number} \times (n+1)}{2}$$

Example 5 What will be the average of numbers from 1 to 51?
(a) 26 (b) 25 (c) 20 (d) 21
Sol. *(a)* According to the formula,
The average of first n natural numbers $= \left(\frac{n+1}{2}\right)$
Here, $n = 51$
$\therefore$ Required average $= \frac{51+1}{2} = \frac{52}{2} = 26$

Example 6 Find out the average of 2, 4, 6, 8, 10, 12 and 14.
(a) 7 (b) 8 (c) 9 (d) 10
Sol. *(b)* As we know, average of first n even numbers $= (n + 1)$
$\therefore$ Required average $= (7 + 1) = 8$

Example 7 Calculate the average of 1, 3, 5, 7, 9, 11, 13, 15 and 17.
(a) 5 (b) 7 (c) 9 (d) 8
Sol. *(c)* As we know, average of first n odd numbers $= n$
Here, $n = 9$
$\therefore$ Required average $= 9$

Example 8 What will be the average of 1, 2, 3, 4, …, 51, 52, 53?
(a) 24 (b) 25
(c) 26 (d) 27
Sol. *(d)* As we know, average of consecutive numbers
$$= \frac{\text{First number + Last number}}{2}$$
Here, first number $= 1$ and the last number $= 53$
$\therefore$ Required average $= \frac{1+53}{2} = \frac{54}{2} = 27$

Example 9 What will be the average of first 9 multiples of 5?
(a) 25 (b) 24
(c) 23 (d) 26
Sol. *(a)* According to the formula,
Average of n multiples of a number
$$= \frac{\text{Number} \times (n+1)}{2}$$
Here, $n = 9$ and number $= 5$
$\therefore$ Required average $= \frac{5 \times (9+1)}{2} = \frac{50}{2} = 25$

Practice Exercise

1. Find the average of three quantities a, b and c.
(a) $\frac{a+b}{2} = c$ (b) $\frac{a+b+c}{3}$
(c) $\frac{a+b-c}{3}$ (d) $\frac{a-b-c}{3}$

2. Find the average of 9,11, 13, 15 and 17.
(a) 13 (b) 15 (c) 12 (d) 14

3. Find the average of $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ and $\frac{1}{6}$.
(a) 1/4 (b) 5/16 (c) 15/4 (d) 3/13

4. The prices of 6 tables are ₹ 732, ₹ 750, ₹ 690, ₹ 793, ₹ 700 and ₹ 745. Find the average price of a table.
(a) ₹ 700 (b) ₹ 735 (c) ₹ 835 (d) ₹ 435

5. What will be the average of first ten counting numbers?
(a) 7 (b) 5 (c) 5.5 (d) 6.5

6. Find the average of first six multiple of 3 is
(a) 10 (b) 8 (c) 9 (d) 10.5

7. Find the average of all prime numbers between 20 and 40 is
(a) 30 (b) 50 (c) 60 (d) 40

8. What is the average of 2 kg, 200 g and 500 g?
(a) 800 g (b) 200 g (c) 900 g (d) 500 g

9. If the average of 20 numbers is 100, then find the sum of the numbers.
(a) 2000 (b) 200
(c) 3000 (d) 1500

10. The average of 7.5, 3.2, 11.3, 20.5 and x is 10. Find the value of x.
(a) 5.5 (b) 4 (c) 6.5 (d) 7.5

11. 30 pens and 75 pencils were purchased for ₹ 510. If the average price of a pencil was ₹ 2.00, find the average price of a pen.
(a) ₹15 (b) ₹12 (c) ₹16 (d) ₹18

12. The average of 5 quantities is 6. The average of three of them is 4. What is the average of remaining two quantities?
(a) 7 (b) 11 (c) 9 (d) 8

13. The average age of 40 students in a class is 15 yr. When 10 new students are admitted, the average is increased by 0.2 yr. Find the average age of the new students.
(a) 19 yr (b) 18 yr (c) 15 yr (d) 16 yr

14. The average age of 4 sisters is 7 yr. If the age of the mother is included the average is increased by 6 yr. Find the age of the mother.
(a) 38 yr (b) 37 yr (c) 39 yr (d) 40 yr

15. The average age of 6 students is 11 yr. If two more students of age 14 yr and 16 yr join. Find their average age.
(a) 12 yr (b) 15 yr
(c) 13 yr (d) 22 yr

16. Average age of 5 boys is 16 yr of which that of 4 boys is 16 yr 3 months. The age of fifth boy is
(a) 15 yr (b) 15 yr 6 months
(c) 15 yr 4 months (d) 15 yr 2 monts

Answers

1	(b)	2	(a)	3	(b)	4	(b)	5	(c)	6	(d)	7	(a)	8	(c)	9	(a)	10	(d)
11	(b)	12	(c)	13	(d)	14	(b)	15	(a)	16	(a)								

Hints & Solutions

1. Average $= \frac{a+b+c}{3}$

2. Average $= \frac{9+11+13+15+17}{5} = \frac{65}{5} = 13$

3. Sum of the given number $= \frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{6}$
$= \frac{6+4+3+2}{12} = \frac{15}{12} = \frac{5}{4}$
Number of observations $= 4$
Average $= \frac{5}{4} \div 4 = \frac{5}{4} \times \frac{1}{4} = \frac{5}{16}$

4. Sum of the given prices
$= ₹(732+750+690+793+700+745) = ₹4410$
Number of tables $= 6$
$\therefore$ Average $= ₹\ \frac{4410}{6} = ₹\ 735$

5. Sum of first ten counting numbers
$= (1+2+3+4+5+6+7+8+9+10) = 55$
Number of observations $= 10$
Average $= \frac{55}{10} = 5.5$
Alternate method
Average of first 10 counting number $= \left(\frac{10+1}{2}\right)$
$= \frac{11}{2} = 5.5$

6. First six multiples of 3 are 3, 6, 9, 12, 15, 18.
Sum of these numbers
$= 3+6+9+12+15+18 = 63$
Number of observations $= 6$
$\therefore$ Average $= \frac{63}{6} = 10.5$
Alternate method
Average of 6 multiples of number 3
$= \frac{3\times(6+1)}{2} = \frac{3\times 7}{2} = \frac{21}{2} = 10.5$

7. Prime numbers in between 20 and 40 are 23, 29, 31 and 37
Average $= \frac{23+29+31+37}{4} = \frac{120}{4} = 30$

8. 2 kg = 2000 g
$\therefore$ Average $= \left[\frac{2000+200+500}{3}\right] = \left[\frac{2700}{3}\right] = 900\,g$

9. Average $= \frac{\text{Sum of observations}}{\text{Number of observations}}$
$100 = \frac{\text{Sum of observations}}{20}$
$\Rightarrow$ 2000 = Sum of observations

10. Average $= \dfrac{7.5+3.2+11.3+20.5+x}{5}$

$\dfrac{42.5+x}{5} = 10 \Rightarrow x = 50-42.5 \Rightarrow x = 7.5$

11. Let the average price of a pen is ₹ x.

$\therefore$ Total cost of 30 pens = ₹ 30x

and total cost of 75 pencils = ₹ 75 × 2 = ₹ 150

According to the question,

$30x+150 = 510 \Rightarrow 30x = 510-150$

$\Rightarrow 30x = 360 \Rightarrow x = \dfrac{360}{30} = 12$

$\therefore$ Average price of a pen = ₹ 12

12. The value of 5 quantities = $5 \times 6 = 30$

The value of three quantities = $3 \times 4 = 12$

$\therefore$ The value of remaining two quantities

$= 30-12 = 18$

$\therefore$ Average of remaining two quantities $= \dfrac{18}{2} = 9$

13. Total age of 40 students = $(40 \times 15) = 600$ yr

Now, number of students = 40 + 10 = 50

Now, average = 15.2

$\because$ Total age of 50 students = $(50 \times 15.2) = 760$ yr

Total age of 10 students = $(760-600) = 160$ yr

$\therefore$ Average age of 10 students $= \dfrac{160}{10} = 16$ yr

14. Average age of 4 sisters = 7 yr

$\therefore$ Total age of 4 sisters = $7 \times 4 = 28$ yr

Average age of 4 sisters and mother

$= (7+6) = 13$ yr

$\therefore$ Total age of 4 sisters and mother

$= (5 \times 13) = 65$ yr

Thus, mother's age = $(65-28) = 37$ yr

15. Average age of 6 students = 11 yr

$\because$ Total age of 6 students = $(6 \times 11) = 66$ yr

$\therefore$ Total age of 6 studens and two new students

$= (66+14+16) = 96$ yr

$\therefore$ Average age of 8 students $= \dfrac{96}{8} = 12$ yr

16. Average age of 5 boys = 16 yr

Total age of 5 boys = $16 \times 5 = 80$ yr

$\therefore$ Average age of 4 boys = 16 yr 3 months

$= 16 \text{ yr} + \dfrac{3}{12} \text{ yr} = 16 \text{ yr} + \dfrac{1}{4} \text{ yr}$

Total age of 4 boys $= 4 \times \left(16 + \dfrac{1}{4}\right)$ yr

$= 64 + 1 = 65$ yr

$\therefore$ Age of fifth boy = $(80-65)$ yr = 15 yr

Try Yourself

1) Find the average of 9.3, 6.7, 7.4 and 8.2.

(a) 7.5 (b) 7.8 (c) 8.5 (d) 7.9

2) Find the average of $6\frac{2}{5}, 5\frac{3}{4}, 4\frac{1}{5}$ and $7\frac{7}{10}$.

(a) $5\frac{1}{80}$ (b) $6\frac{1}{80}$ (c) $4\frac{1}{80}$ (d) $7\frac{2}{80}$

3) Find the average of 20, 30, 40, 50 and 60.

(a) 35 (b) 49 (c) 45 (d) 40

4) Find the average of all odd numbers between 40 and 50.

(a) 42 (b) 46 (c) 45 (d) 50

5) What is the average of all the even numbers between 5 and 15?

(a) 10 (b) 8 (c) 12 (d) 9

6) The length of three pieces of wire are 6 m 80 cm, 18 m 26 cm and 12 m 65 cm. What is the average length of a piece of wire?

(a) 12 m 57 cm (b) 12 m 40 cm

(c) 10 m 50 cm (d) 11 m 35 cm

7) The weight of 8 boys are 51 kg, 54 kg, 60 kg, 65 kg, 49 kg, 55 kg, 45 kg and 62 kg. Find the average weight of boys.

(a) 55.125 kg (b) 50.254 kg

(c) 53.152 kg (d) 45.125 kg

8) The temperature (in °C) of a town during a week was 41, 39.5, 40, 37.5, 36, 35.5 and 40. What was the average daily temperature of the town for the week?

(a) 40.5° (b) 35.8° (c) 30.8° (d) 38.5°

9) In a test match, average of five players are 84 runs. If runs scored by four players are 122, 62, 79 and 24 respectively, then find out the runs scored by fifth player.

(a) 135 (b) 133 (c) 140 (d) 125

10) A man earned ₹ 6570 per month for first 7 months of an year and ₹ 7260 per month for the next 5 months. Find his average monthly income during the year.

(a) ₹ 6755.50 (b) ₹ 6025.25

(c) ₹ 6857.50 (d) ₹ 6587.50

Answers

1	*(d)*	2	*(b)*	3	*(d)*	4	*(c)*	5	*(a)*
6	*(a)*	7	*(a)*	8	*(d)*	9	*(b)*	10	*(c)*