CHAPTER

11

AVERAGE

Average

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

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

If $x_1, x_2, x_3, \ldots, x_n$ are n numbers, then the average of these numbers is $\bar{x} = \dfrac{x_1 + x_2 + x_3 + \ldots + x_n}{n}$

Example **1.** The marks obtained by a student are 40, 50, 60, 70, 80. Find his average marks.

(1) 60 (2) 50
(3) 40 (4) 30

Sol. (1) Average marks

$$= \frac{40 + 50 + 60 + 70 + 80}{5}$$

$$= \frac{300}{5} = 60$$

Example **2.** Rahul Dravid in his 12th inning makes a score of 63 runs and thereby increase his average score by 2. What is his average after the 12th inning?

(1) 50 (2) 41 (3) 25 (4) 30

Sol. (2) Let the average of Dravid's 11 innings be x.

Then, the average of 12 innings = $x + 2$

$$\therefore \frac{11x + 63}{12} = x + 2 \Rightarrow 12x + 24 = 11x + 63 \Rightarrow x = 39$$

Hence, the average of 12 innings = 39 + 2 = 41

Example **3.** The average of 5 numbers is 496. If two of them are 117 and 140, find the average of remaining three numbers.

(1) 239 (2) 717
(3) 741 (4) 637

Sol. (3) Sum of 5 numbers = $496 \times 5 = 2480$

Sum of two given numbers = $117 + 140 = 257$

Sum of remaining 3 numbers = $2480 - 257 = 2223$

$\therefore$ Average of these 3 numbers = $\dfrac{2223}{3} = 741$

Entrance Corner

1. The mean of 20 observations was found to be 65 but later on it was found that 69 was misread as 96. Find the correct mean. **[JNV 2017]**

(1) 63.65 (2) 12.37
(3) 69.50 (4) 65.95

2. Find the average of the following set of scores 567, 434, 323, 290, 401 **[JNV 2017]**

(1) 398 (2) 412
(3) 407 (4) 403

3. The average of 20 values is 18. If 3 is subtracted from each of the values, then the new average will be **[JNV 2017]**

(1) 21 (2) 15
(3) 16 (4) 17

4. The average of 4 numbers is 7. If the sum of first 3 numbers is 20, find the fourth number. **[JNV 2012]**

(1) 7 (2) 10
(3) 9 (4) 8

5. Find the average of the following numbers.
06, 0, 12, 14, 13 **[JNV 2012]**
(1) 9 (2) 7 (3) 12 (4) 11

6. The average of the height of 5 students having height 30, 40, 50, 60, 70 is **[JNV 2011]**
(1) 40 (2) 50 (3) 55 (4) 45

7. The average score of a cricketer in 2 matches is 27 and in 3 other matches is 32. Then, his average score in all the 5 matches is **[JNV 2011]**
(1) 28 (2) 29 (3) 30 (4) 31

8. The average of 20 values is 18. If 3 is subtracted from each of the values, then the new average will be **[JNV 2009]**
(1) 21 (2) 15 (3) 16 (4) 17

9. The average age of 4 children is 11yr. If the ages of 3 children are 9 yr, 12 yr and 10 yr, find the age of the fourth child. **[JNV 2001]**
(1) 12 yr (2) 24 yr
(3) 13 yr (4) None of these

10. The average of the first 5 even-numbers is **[JNV 2001]**
(1) 4 (2) 5 (3) 6 (4) 7

11. Find the average of 3, 5, 7, 8, 9. **[JNV 2000]**
(1) 6 (2) 6.4 (3) 7.4 (4) 8.4

12. The average of 3 numbers is 10. If the average of first 2 numbers is 9, find the third number. **[JNV 2000]**
(1) 12 (2) 13 (3) 14 (4) 15

13. Find the average of 10, 9, 8, 7 and 6. **[JNV 1999]**
(1) 6 (2) 7 (3) 8 (4) 9

14. Average of 2 numbers is 17. If 1 number is 21, find the other number. **[JNV 1999]**
(1) 7 (2) 8 (3) 12 (4) 13

15. The average age of a group of 5 boys is 15 yr. If an other boy of 15 yr joins them, find the average of the whole group. **[JNV 1998]**
(1) 14 yr (2) 16 yr (3) 17 yr (4) 15 yr

16. The heights of 5 students are 140, 135, 142, 138, 140. Their average height is **[JNV 1998]**
(1) 136 (2) 138 (3) 139 (4) 140

17. The average of 4, 5, 3.5, 7.5, 9.5 and 6.5 is **[JNV 1997]**
(1) 6.0 (2) 5.2 (3) 5.5 (4) 5.0

18. The average of 3 numbers is 24. If one of the numbers is 18 and the other is 29, find the third number. **[JNV 1996]**
(1) 24 (2) 25 (3) 26 (4) 27

19. In a family consisting of 10 persons father, mother and the eldest son earn ₹ 4000, ₹ 3000 and ₹ 4400 per month. What is the average monthly income of a family member? **[JNV 1996]**
(1) ₹ 1260 (2) ₹ 1600
(3) ₹ 1140 (4) ₹ 3800

20. Average score in 10 matches of a cricket player was 45.6 runs. If the average score in first 6 matches was 48 runs, find the average score in last 4 matches. **[JNV 1995]**
(1) 42 runs (2) 44 runs
(3) 46 runs (4) 48 runs

21. The average of 5 consecutive even numbers, starting with 2 is **[JNV 1995]**
(1) 4 (2) 6 (3) 7 (4) 5

22. The lengths (in m) of 5 pieces of a string are 5, 5.2, 6.3, 7.2, 6.3. The average length (in m) of a piece is **[JNV 1995]**
(1) 5.8 (2) 6.0 (3) 6.1 (4) 6.2

23. The average expenditure of a man for first 7 months is ₹ 800 and for the next 5 months is ₹ 900. Find his average monthly expenditure. **[JNV 1994]**
(1) ₹ 600 (2) ₹ 700 (3) ₹ 800 (4) ₹ $841\frac{2}{3}$

24. Find the average of $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}$. **[JNV 1994]**
(1) 0.26 (2) 4.17 (3) 4.18 (4) 4.19

25. Average of 8, 6, 0, 9 and 7 is **[JNV 1994]**
(1) 6 (2) 8 (3) 3 (4) 5

26. Average of class I to class V is 29. Average of class I to class III is 31. Average of class IV to class V is **[JNV 1993]**
(1) 25 (2) 26
(3) 27 (4) 28

27. Marks obtained by 10 students are 23, 25, 37, 36, 27, 28, 29, 34, 36, 38. The average marks are **[JNV 1993]**
(1) 30 (2) 30.3 (3) 31 (4) 31.3

Answers

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

Hints and Solutions

1. Sum of 20 observation $= 20 \times 65 = 1300$
after subtract 96 and add 69, we get
sum of correct 20 observation
$= 1300 - 96 + 63 = 1273$
Hence, mean of correct 20 observation
$= \frac{1273}{20} = 63.65$

2. Average $= \frac{567 + 434 + 323 + 290 + 401}{5}$
$= \frac{2015}{5} = 403$

3. Now, total values $= 20 \times 18 = 360$
New total $= 360 - 3 \times 20 = 360 - 60 = 300$
$\therefore$ New average $= \frac{300}{20} = 15$

4. $\because$ Average of 4 numbers $= 7$
$\therefore$ Sum of 4 numbers $= 4 \times 7 = 28$
Sum of first 3 numbers $= 20$
Hence, fourth number $= 28 - 20 = 8$

5. Required average
$= \frac{6 + 0 + 12 + 14 + 13}{5} = \frac{45}{5} = 9$

6. Average height of the students
$= \frac{30 + 40 + 50 + 60 + 70}{5} = \frac{250}{5} = 50$

7. Total score in first two matches $= 2 \times 27 = 54$
Total score in other 3 matches $= 3 \times 32 = 96$
$\therefore$ Average of 5 matches $= \frac{54 + 96}{5} = \frac{150}{5} = 30$

8. Sum of 20 values $= 18 \times 20 = 360$
after subtract 3 from each, value, we get
Sum of new 20 values $= 360 - 3 \times 20$
$= 360 - 60 = 300$
Therefore, new averagee $= \frac{300}{20} = 15$

9. Total Ages of 3 children $= 9 + 12 + 10 = 31$ yr
Total age of 4 children $= 11 \times 4 = 44$ yr
$\therefore$ Age of 1 child $= 44 - 31 = 13$ yr

10. $\because$ First five even numbers are = 2, 4, 6, 8, 10
Their average $= \frac{2 + 4 + 6 + 8 + 10}{5}$
$= \frac{30}{5} = 6$

11. Average $= \frac{3 + 5 + 7 + 8 + 9}{5} = \frac{32}{5} = 6.4$

12. Average of 3 numbers $= 10$
$\therefore$ Sum of 3 numbers $= 10 \times 3 = 30$
$\therefore$ Average of first 2 numbers $= 9$
$\therefore$ Sum of first 2 numbers $= 9 \times 2 = 18$
$\therefore$ Third number $= 30 - 18 = 12$

13. Average $= \frac{10 + 9 + 8 + 7 + 6}{5} = \frac{40}{5} = 8$

14. Average of two numbers $= 17$
$\therefore$ Sum of two numbers $= 17 \times 2 = 34$
One number $= 21$
Then, other number $= 34 - 21 = 13$

15. Sum of the age of 5 boys $= 15 \times 5 = 75$ yr
Other boy join, whose age $= 75 + 15 = 90$ yr
$\therefore$ Average age of the whole group
$= \frac{90}{6} = 15$ yr

16. Required average
$\frac{140 + 135 + 142 + 138 + 140}{5} = \frac{695}{5} = 139$

17. Average $= \frac{4 + 5 + 3.5 + 7.5 + 9.5 + 6.5}{6}$
$= \frac{36}{6} = 6$

18. Average of 3 numbers $= 24$
$\therefore$ Sum of 3 numbers $= 24 \times 3 = 72$
$\therefore$ Third number $= 72 - (18 + 29)$
$= 72 - 47 = 25$

19. Average income of family member
$= \frac{4000 + 3000 + 4400}{3} = \frac{11400}{3}$
$= ₹\ 3800$

20. ∵ Average score in 10 matches = 45.6 runs
∴ Total score in 10 matches
$= 45.6 \times 10 = 456$ runs
∵ Average score in 6 matches = 48 runs
∴ Total score in 6 matches $= 48 \times 6 = 288$ runs
∴ Sum of the runs scored in last 4 matches
$= 456 - 288 = 168$ runs
∴ Average score in last 4 matches
$= \frac{168}{4} = 42$ runs

21. Sum of 5 consecutive even numbers starting with 2
$= 2 + 4 + 6 + 8 + 10 = 30$
Average $= \frac{30}{5} = 6$

22. Average length $= \frac{5 + 5.2 + 6.3 + 7.2 + 6.3}{5}$
$= \frac{30}{5} = 6$

23. Total sum of 7 months expenditure
$= 7 \times 800 = ₹\ 5600$
Total sum of 5 months expenditure
$= 5 \times 900 = ₹\ 4500$
∴ Average expenditure $= \frac{5600 + 4500}{12}$
$= \frac{10100}{12} = \frac{2525}{3} = ₹\ 841\frac{2}{3}$

24. Average $= \frac{\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8}}{4} = \frac{\frac{12 + 6 + 4 + 3}{24}}{4}$
$= \frac{\frac{25}{24}}{4} = \frac{25}{24 \times 4} = \frac{25}{96} = 0.26$

25. Average $= \frac{8 + 6 + 0 + 9 + 7}{5} = \frac{30}{5} = 6$

26. Total students in class I to V $= 29 \times 5 = 145$
Total students in class I to III $= 31 \times 3 = 93$
Total students in class IV to V $= 145 - 93 = 52$
∴ Average of class IV and V $= \frac{52}{2} = 26$

27. Average marks
$= \frac{[23 + 25 + 37 + 36 + 27 + 28 + 29 + 34 + 36 + 38]}{10}$
$= \frac{313}{10} = 31.3$

Practice Exercise

1. The average of all natural numbers from 521 and 525, is
(1) 525 (2) 251 (3) 526 (4) 523

2. The average of first 9 prime numbers is
(1) 9 (2) 11 (3) $11\frac{2}{9}$ (4) $11\frac{1}{9}$

3. The average of first 6 even numbers is
(1) 7 (2) 6 (3) 8 (4) 5

4. Find the average of first 10 natural numbers.
(1) 5 (2) 5.5
(3) 4.5 (4) 6

5. Find the average of first 5 multiples of 3.
(1) 45 (2) 9
(3) 10 (4) 15

6. The average age of 25 boys in a class decreases by 6 months when a new boy takes the place of a 20 yr old boy. Find the age of new boy.
(1) 7 yr (2) 7.5 yr
(3) 8 yr (4) 8.5 yr

7. The average age of 30 boys of a class is equal to 14 yr. When the age of the class teacher is included the average becomes 15 yr. The age of the class teacher is
(1) 40 yr (2) 42 yr
(3) 48 yr (4) 45 yr

8. The average marks of 4 men is increased by 3 when one of them whose marks are 120 is replaced by another man. What is the marks of new man?
(1) 123 (2) 124
(3) 132 (4) 133

9. The average of 11 results is 30 that of the first 5 is 25 and that of the last 5 is 28. The value of the 6th number is
(1) 64 (2) 65 (3) 66 (4) 45

10. Sachin Tendulkar in his 17th inning makes a score of 85 and thereby increase his average by 3. What is his average after the 17th inning?
(1) 37 (2) 35 (3) 33 (4) 39

11. The average of 67 values is 35. If in each of these values 4 is added, the average of the new values will be
(1) 37 (2) 39
(3) 40 (4) 35

12. The average of 25 observations was found to be 78.4. But later on it was detected that 96 was misread as 69. The new correct average is
(1) 79.48
(2) 79
(3) 78.48
(4) 80

13. The average temperature from Monday to Thursday was 48°. The average temperature from Tuesday to Friday was 52°. If temperature of Monday was 42°, what is the temperature of Friday?
(1) 56° (2) 54°
(3) 58° (4) 60°

14. The body weight of 6 boys is recorded as 42 kg, 72 kg, 85 kg, 64 kg, 54 kg and 73 kg. What is the average body weight of all 6 boys?
(1) 64 kg (2) 67 kg (3) 62 kg (4) 65 kg

15. The average age of 5 officers in a department is 32 yr. If the age of their supervisor is added the average increased by 1. What is the supervisor's age?
(1) 32 yr (2) 48 yr (3) 38 yr (4) 42 yr

16. The average age of a brother and sister was 35 yr, 5 yr ago. What will be their average age (in yr) at present?
(1) 37.5 (2) 42 (3) 40 (4) 40.5

17. In a cricket team, the average age of 11 players and the coach is 18 yr. If the age of the coach is not considered, the average decreases by 1 yr. Find out the age of coach.
(1) 27 yr (2) 28 yr (3) 29 yr (4) 31 yr

Answers

1. (4)	**2.** (4)	**3.** (1)	**4.** (2)	**5.** (2)	**6.** (2)	**7.** (4)	**8.** (3)	**9.** (2)	**10.** (1)
11. (2)	**12.** (1)	**13.** (3)	**14.** (4)	**15.** (3)	**16.** (3)	**17.** (3)			

Hints and Solutions

1. ∵ Sum of all natural number from 521 to 525
$= 521 + 522 + 523 + 524 + 525 = 2615$
Therefore, average of all natural number from 521 to 525 $= \frac{2615}{5} = 523$

2. The average of first 9 prime number
$= \frac{2+3+5+7+11+13+17+19+23}{9}$
$= \frac{100}{9} = 11\frac{1}{9}$

3. ∵ Sum of first 6 even number
$= 2 + 4 + 6 + 8 + 10 + 12 = 42$
Therefore, average of first 6 even number
$= \frac{42}{6} = 7$

4. ∵ Sum of first 10 natural number
$= 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55$
Therfore, Average of first 10 natural number
$= \frac{55}{10} = 5.5$

5. Required average $= \frac{3 + 6 + 9 + 12 + 15}{5}$
$= \frac{45}{5} = 9$

6. Total age decreased
= (Average age × Average decrement)
$= 25 \times \frac{1}{2} = 12.5$
Thus, age of new boy $= 20 - 12.5 = 7.5$ yr

7. Total age of the boys of a class
$= 14 \times 30 = 420$ yr
Total age when class teacher's age is included
$= 15 \times 31 = 465$ yr
∴ Age of class teacher $= 465 - 420 = 45$ yr

8. Marks of new man $= 120 + 3 \times 4$

$= 120 + 12 = 132$

9. Total of 11 results $= 11 \times 30 = 330$

Total of first 5 results $= 25 \times 5 = 125$

Total of last 5 results $= 28 \times 5 = 140$

6th value $= 330 - (125 + 140)$

$= 330 - 265 = 65$

10. Let the average of Sachin's of the 16th inning be x.

Then, the sum of 17 innings $= 16x + 85$

and $(16x + 85) = 17(x + 3)$

$\therefore \quad x = 85 - 51 = 34$

$\therefore$ Average after 17 innings $= 34 + 3 = 37$

11. Total of 67 values $= 67 \times 35 = 2345$

Value to be added in all $= 4 \times 67 = 268$

$\therefore$ Total value now $= 2345 + 268 = 2613$

$\therefore \quad$ Average $= \frac{2613}{67} = 39$

12. Previous total $= 25 \times 78.4 = 1960$

$\therefore \quad$ New total $= 1960 + 96 - 69 = 1987$

$\therefore$ New average $= \frac{1987}{25} = 79.48$

13. Average temperature from Monday to Thursday

$= 48°$

$\therefore$ Total temperature $= 48° \times 4 = 192°$

Temperature of Monday $= 42°$

$\therefore$ Temperature of Tuesday to Thursday

$= 192° - 42° = 150°$

Now, total temperature from Tuesday to Friday

$= 52° \times 4 = 208°$

$\therefore$ Temperature of Friday $= 208° - 150° = 58°$

14. Average weight $= \frac{42 + 72 + 85 + 64 + 54 + 73}{6}$

$= \frac{390}{6} = 65$ kg

15. Total age of 5 officers $= 32 \times 5 = 160$

Let the age of their supervisor be x. Then

$160 + x = 6 \times 33 \Rightarrow x = 198 - 160 = 38$ yr

16. In present situation, their average age

$= (35 + 5) = 40$ yr

17. Total age of 11 players + 1 coach

$= 12 \times 18 = 216$ yr

Total age of 11 players $= 11 \times 17 = 187$ yr

$\therefore$ Age of coach $= 216 - 187 = 29$ yr

Self Practice

1. The average of 3 numbers is 9. If the average of first 2 numbers is 12, what is the third number?
(1) 5 (2) 4 (3) 3 (4) 8

2. Average age of 5 boys is 13 yr. One more boy joins them and the average age becomes 12 yr. The age of the boy who joins last is
(1) 12 yr (2) 13 yr (3) 14 yr (4) 7 yr

3. The average of three numbers is 12. The 2 numbers are 15 and 10, respectively. What is the third number?
(1) 11 (2) 12 (3) 13 (4) 14

4. The rainfall of 4 cities is 52.96 cm, 62.56 cm, 53.91 cm and 35.93 cm, respectively. What is the average rainfall?
(1) 50.25 cm (2) 60.05 cm (3) 55.80 cm (4) 51.34 cm

5. Rohit got marks in different subjects as 46, 55, 65, 34 and 40, respectively. What is the average of his marks?
(1) 52 (2) 50 (3) 47 (4) 48

6. A cricket team scored 212, 170, 210, 260 and 398 runs respectively, in 5 cricket matches. What was the average number of runs in the 5 matches?
(1) 250 (2) 240 (3) 245 (4) 260

7. The average of first 10 even numbers is
(1) 5 (2) 12 (3) 10 (4) 11

8. The average of first 6 multiple of 15 is
(1) 52.5 (2) 50 (3) 53.5 (4) 67.5

9. The average of the first 5 even numbers is
(1) 4 (2) 5 (3) 6 (4) 7

10. The average of 4 numbers is 30. If the sum of first 3 numbers is 85, the fourth number is
(1) 30 (2) 35 (3) 45 (4) 55

Answers

1. (3)	**2.** (4)	**3.** (1)	**4.** (4)	**5.** (4)	**6.** (1)	**7.** (4)	**8.** (1)	**9.** (3)	**10.** (2)