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 $\bar{x} = \frac{x_1 + x_2 + x_3 + \ldots + x_n}{n}$

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 $= \frac{2223}{3} = 741$

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
$= 521 + 522 + 523 + 524 + 525 = 2615$
Therfore, 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 $= \dfrac{2613}{67} = 39$

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

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

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

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 $= \dfrac{42 + 72 + 85 + 64 + 54 + 73}{6}$

$= \dfrac{390}{6} = 65$ 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)

CHAPTER

12

PERCENTAGE AND ITS APPLICATIONS

Percentage

Percentage means per hundred or for every hundred.

Or

The value which is considered for every hundred is termed as percentage and the numerator of such fraction (having denominator 100) is called as the rate of percentage. Percentage is represented by % sign.

Basic Rules Related to Percentage

Per cent as a Fraction

To convert a per cent into a fraction, we divide it by 100 and remove the per cent sign %.

e.g. $5\% = \frac{5}{100} = \frac{1}{20}$

$0.3\% = \frac{0.3}{100} = \frac{3}{1000}$

$0.006\% = \frac{0.006}{100} = \frac{6}{100000} = \frac{3}{50000}$

Fraction as a Per cent

To convert a fraction into a per cent, we multiply it by 100 and apply the per cent sign %.

e.g. $\frac{3}{4} = \left[\frac{3}{4} \times 100\right]\% = 75\%$

$0.4 = [0.4 \times 100]\% = 40\%$

$0.08 = [0.08 \times 100]\% = 8\%$

Conversion of Per cent into Fraction

$1\% = \frac{1}{100}$	$20\% = \frac{1}{5}$
$2\% = \frac{1}{50}$	$25\% = \frac{1}{4}$
$4\% = \frac{1}{25}$	$50\% = \frac{1}{2}$
$5\% = \frac{1}{20}$	$100\% = \frac{1}{1}$
$10\% = \frac{1}{10}$	

Finding a Percentage of a Number

To find a per cent of a given number, we proceed as follows

- Obtain the number, say x.
- Obtain the required per cent, say $p\%$.
- Multiply x by p and divide by 100 to obtain the required $p\%$ of x. *i.e.* $p\%$ of $x = \frac{p}{100} \times x$

Important Formulae

- Rate percentage $= \frac{\text{Result}}{\text{Original number}} \times 100$
- Increased percentage $= \left(\frac{\text{Increment}}{\text{Original number}} \times 100\right)\%$
- Decreased percentage $= \left(\frac{\text{Decrement}}{\text{Original number}} \times 100\right)\%$

Example **1.** 25% is equal to

(1) 1/2 (2) 1/4 (3) 1/8 (4) 1/16

Sol. **(2)** $25\% = \frac{25}{100} = \frac{1}{4}$

Example **2.** Find the value of x, if 3% of x is 9.

(1) 300 (2) 400 (3) 310 (4) 305

Sol. **(1)** As, 3% of x is 9

$$\Rightarrow \quad \frac{3 \times x}{100} = 9 \Rightarrow x = \frac{9 \times 100}{3} \Rightarrow x = 300$$

Example **3.** Reena deposits 60 per month in her post office saving bank account. If this is 10% of her monthly income, find her monthly income.

(1) ₹ 600 (2) ₹ 650 (3) ₹ 630 (4) ₹ 720

Sol. **(1)** Let Reena's monthly salary = ₹ x

Now, 10% of x = ₹ 60

$$\Rightarrow \quad \frac{10}{100} \times x = 60 \Rightarrow x = \frac{60 \times 100}{10} \Rightarrow x = ₹\ 600$$

Example **4.** Kareena went to school for 216 days in a full year. If her attendance is 90%. Find the number of days on which the school opened.

(1) 220 (2) 200 (3) 240 (4) 260

Sol. **(3)** Let the number of days on which the school opened is x.

Now, 90% of $x = 216 \Rightarrow \frac{90}{100} \times x = 216$

$$\Rightarrow \quad x = \frac{216 \times 100}{90}$$

$$\Rightarrow \quad x = 240$$

Thus, the school opened for 240 days.

Example **5.** 40% of (100 – 20% of 300) is equal to

(1) 16 (2) 20 (3) 64 (4) 140

Sol. **(1)** $\left(100 - 300 \times \frac{20}{100}\right) \times \frac{40}{100} = (100 - 60) \times \frac{40}{100}$

$$= \frac{40 \times 40}{100} = 16$$

Entrance Corner

1. 150% is equal to [JNV 2019]

(1) 1.5 (2) 5.1 (3) 0.15 (4) 15.0

2. 84% is equal to [JNV 2018]

(1) $\frac{42}{100}$ (2) $\frac{42}{50}$ (3) $\frac{84}{225}$ (4) 8.4

3. A student scored 18 marks out of 25 marks in the first test of Math. In the second test he scored 22 marks in the second test exceeds his first test by [JNV 2017]

(1) 4% (2) 8%
(3) 16% (4) 80%

4. 90% of 300 + 30% of 90 is equal to [JNV 2017]

(1) 287 (2) 297 (3) 237 (4) 277

5. In an annual examination, Hardik got 500 marks out of 725. What is his approximate per cent in the examination? [JNV 2017]

(1) 88 (2) 79 (3) 54 (4) 70

6. There are 3450 employees in an organisation. Out of which 42% got promoted. How many such employees are there who got promoted? [JNV 2017]

(1) 1449 (2) 1518
(3) 1587 (4) 1656

7. 26.2% is equal to [JNV 2016]

(1) 2.62 (2) 0.262 (3) 0.0262 (4) 262.0

8. $\frac{17}{25}$ can be expressed in percentage is [JNV 2015]

(1) 34% (2) 68% (3) 17% (4) 25%

9. In a musical concert, 15% of the total is reserve for first class. If all the tickets were sold except 171 ticket of first class, then how many tickets were sold? [JNV 2014]

(1) 1710 (2) 1600 (3) 1140 (4) 180

10. Which of the following is equivalent to 1.01? [JNV 2014]

(1) 101% (2) 10.1% (3) 1.01% (4) 1010%

11. Weight of tomato comprises 90% of water. Weight of water in 25 kg of tomato is [JNV 2014]

(1) 24 kg (2) 22.5 kg (3) 21 kg (4) 19.5 kg

12. What is the percentage of 500 g of 4 kg? [JNV 2013]

(1) 12.5 (2) 25 (3) 50 (4) 125

13. A man bought a bicycle for ₹ 1200. He sold it for ₹ 1500. Find the profit per cent. [JNV 2012]

(1) 30 (2) 20 (3) 25 (4) 28

14. A boy gets ₹ 20 per month and spends 50% of it. How much does he save in 1 yr? [JNV 2012]
(1) ₹ 100 (2) ₹ 50
(3) ₹ 120 (4) ₹ 40

15. Rajesh purchased a watch for ₹ 300. He sold it for ₹ 330. Find the profit per cent. [JNV 2012]
(1) 5 (2) 13 (3) 14 (4) 10

16. The original price of a car is ₹ 500000. What is the new price if the original price is reduced by 10%? [JNV 2012]
(1) ₹ 540000 (2) ₹ 460000
(3) ₹ 450000 (4) ₹ 480000

17. Which one of the following is equivalent of 6/20? [JNV 2011]
(1) 6% (2) 20%
(3) 26% (4) 30%

18. Out of 600 students 240 are girls. What is the percentage of girls? [JNV 2011]
(1) 250 (2) 60 (3) 40 (4) 24

19. The population of a district is 20 lakh. It increases by 1.1% every year. What is the population after 1 yr? [JNV 2010]
(1) 21.1 lakh (2) 22 lakh
(3) 22.2 lakh (4) 20.22 lakh

20. 200 students appeared in an examination. If 75% of student passed the examination, find the number of students who passed the examination. [JNV 2008]
(1) 150 (2) 100 (3) 275 (4) 175

21. In per cent, what is 10.01 written as? [JNV 2005]
(1) 10.01% (2) 10%
(3) 1001% (4) 100100%

22. 80% of ₹ 240 is more than 35% of ₹ 400 by [JNV 2004]
(1) ₹ 52 (2) ₹ 42 (3) ₹ 192 (4) ₹ 140

23. 0.075 when expressed as per cent, is [JNV 2002]
(1) 75% (2) 7.5% (3) 0.75% (4) 0.075%

24. Out of a total of 250 marks, a student got 30% marks and failed by 25 marks. The marks necessary for passing is [JNV 2001]
(1) 50 (2) 75 (3) 100 (4) 125

25. 30% of ₹ 40 is equal to [JNV 2000]
(1) ₹ 10 (2) ₹ 11 (3) ₹ 12 (4) ₹ 13

26. $\frac{5}{8}$ may be expressed as [JNV 2000]
(1) $\frac{50}{80}$% (2) 62.5% (3) 55.5% (4) 70.5%

27. 20% of ₹ 70 is equal to [JNV 2000]
(1) ₹ 14 (2) ₹ 15 (3) ₹ 16 (4) ₹ 17

28. 25% of 10 m is [JNV 2000]
(1) 50 cm (2) 100 cm (3) 200 cm (4) 250 cm

29. A person spends 50% of his salary and saves ₹ 200 per month. His monthly salary is [JNV 1999]
(1) ₹ 300 (2) ₹ 400 (3) ₹ 500 (4) ₹ 600

30. 50% is equal to [JNV 1998]
(1) $\frac{1}{2}$ (2) $\frac{1}{3}$ (3) $\frac{1}{4}$ (4) $\frac{1}{5}$

31. The catalogue price of an article is ₹ 200. A reduction of 15% in made for each purchase. The cash price is [JNV 1998]
(1) ₹ 150 (2) ₹ 170 (3) ₹ 180 (4) ₹ 200

32. 20% of ₹ 10 is [JNV 1997]
(1) ₹ 2 (2) ₹ 1 (3) ₹ 3 (4) ₹ 4

33. Find the sum whose 20% is ₹ 240. [JNV 1997]
(1) ₹ 1200 (2) ₹ 1000 (3) ₹ 6000 (4) ₹ 2000

34. John had ₹ 300. He spent ₹ 100 on books. Find his per cent expenditure. [JNV 1997]
(1) 20 (2) 30 (3) $33\frac{1}{3}$ (4) $16\frac{2}{3}$

Answers

1. (1)	**2.** (2)	**3.** (3)	**4.** (2)	**5.** (4)	**6.** (1)	**7.** (2)	**8.** (2)	**9.** (3)	**10.** (1)
11. (2)	**12.** (1)	**13.** (3)	**14.** (3)	**15.** (4)	**16.** (3)	**17.** (4)	**18.** (3)	**19.** (4)	**20.** (1)
21. (3)	**22.** (1)	**23.** (2)	**24.** (3)	**25.** (3)	**26.** (2)	**27.** (1)	**28.** (4)	**29.** (2)	**30.** (1)
31. (2)	**32.** (1)	**33.** (1)	**34.** (3)						

Hints and Solutions

1. Given, 150%

150% is written as $\frac{150}{100}=\frac{15}{10}=1.5$

2. $84\%=\frac{84}{100}=\frac{42}{50}$

3. More marks $=22-18=4$

Required percentage $=\frac{4\times100}{25}=16\%$

4. 90% of 300 + 30% of 90

$$=\frac{90\times300}{100}+\frac{30\times90}{100}$$

$$=90\times3+3\times9=270+27=297$$

5. Required percentage $=\frac{500}{725}\times100=68.9=70$

6. $3450\times\frac{42}{100}=\frac{144900}{100}=1449$ got promotion

7. $26.2\%=\frac{26.2}{100}=0.262$

8. Percentage value of $\frac{17}{25}=\frac{17}{25}\times100=68\%$

9. According to the question,

$15\%=171$

$1\%=\frac{171}{15}$

$\therefore\ 100\%=\frac{171\times100}{15}=1140$

Hence, total number of ticket sold $=1140$

10. $1.01=\frac{101}{100}=101\%$

11. Weight of water in 25 kg of tomato = 90% of 25 kg

$=22.5$ kg

12. $\because$ 1 kg = 1000 g

$\therefore$ 4 kg $=4\times1000$ g $=4000$ g

Hence, required percentage $=\frac{500}{4000}\times100$

$=12.5\%$

13. Given, cost price of the bicycle = ₹ 1200

and selling price of the bicycle = ₹ 1500

Hence, required profit percentage

$=\frac{1500-1200}{1200}\times100=\frac{300}{1200}\times100=25\%$

14. Monthly saving amount by the boy

$=20\times\frac{50}{100}=$ ₹ 10

$\therefore$ Annually saving amount $=10\times12=$ ₹ 120

15. Required profit per cent $=\frac{330-300}{300}\times100$

$=\frac{30}{300}\times100=10\%$

16. New price of the car $=500000\times\frac{(100-10)}{100}$

$=500000\times\frac{90}{100}=$ ₹ 450000

17. $\frac{6}{20}$ in percentage $=\frac{6}{20}\times\frac{100}{1}=30\%$

18. Percentage of girls $=\frac{240}{600}\times100=40\%$

19. District population after one year

$=2000000+2000000\times1.1\%$

$=2000000+2000000\times\frac{1.1}{100}$

$=2000000+22000$

$=2022000$

20. Required number $=200\times\frac{75}{100}=150$

21. $10.01=\frac{1001}{100}=1001\%$

22. 80% of ₹ 240 $=\frac{240\times80}{100}=$ ₹ 192

35% of ₹ 400 $=\frac{400\times35}{100}=$ ₹ 140

$\therefore$ Difference = (192 – 140) = ₹ 52

23. 0.075 = 0.075 $\times100=7.5\%$ (To express number into per cent it is multiplied by 100)

24. $\because$ Total marks = 250

Student got = 30%

i.e., $250\times\frac{30}{100}=75$ marks

Failed by = 25 marks

$\therefore$ Pass marks $=75+25=100$

25. $\because$ Out of 100 = 30

$\therefore$ Out of 1 $=\frac{30}{100}$

$\therefore$ Out of 40 $=\frac{30}{100}\times40=$ ₹ 12

26. $\frac{5}{8}=\frac{5}{8}\times100\%=\frac{500}{8}\%=62.5\%$

27. 20% of ₹ 70 $=\frac{20}{100}\times70=$ ₹ 14

28. 25% of 10 m = 25% of 1000 cm

$=\frac{25}{100}\times1000=250$ cm

29. Savings = 100% − 50% = 50% = ₹ 200

$\therefore$ Total salary = $\frac{100}{50} \times 200$ = ₹ 400

30. $50\% = \frac{50}{100} = \frac{1}{2}$

31. Reduction at 15% on ₹ 200

$= \frac{15}{100} \times 200$ = ₹ 30

$\therefore$ Cash price = Catalogue price − Reduction

= 200 − 30 = ₹ 170

32. 20% of ₹ 10 = $\frac{20}{100} \times 10$ = ₹ 2

33. Let the sum be ₹ x.

Then, 20% of x = ₹ 240

$\Rightarrow \quad x \times \frac{20}{100} = 240$

$\therefore \quad x = \frac{240 \times 100}{20}$ = ₹ 1200

34. $\because$ Out of ₹ 300 expenditure = ₹ 100

$\therefore$ Out of ₹ 1 expenditure = ₹ $\frac{100}{300}$

$\therefore$ ₹ 100 expenditure = $\frac{100}{300} \times 100 = 33\frac{1}{3}\%$

Practice Exercise

1. Which one of the following is equal to 6.25%?
(1) 0.00625 (2) 0.0625
(3) 0.625 (4) 6.25

2. 40% of 20% is equal to
(1) 16% (2) 20% (3) 8% (4) 80%

3. Express 45% in fraction.
(1) $\frac{9}{20}$ (2) $\frac{9}{10}$
(3) $\frac{3}{20}$ (4) $\frac{5}{20}$

4. Express $10\frac{1}{10}$ into percentage.
(1) 1010% (2) 10.10%
(3) 0.101% (4) 101%

5. 50 is what per cent of 75?
(1) $\frac{100}{3}\%$ (2) $\frac{50}{3}\%$
(3) $\frac{200}{3}\%$ (4) None of these

6. 25 g is what per cent of 1 kg?
(1) 25% (2) 2.5%
(3) 0.25% (4) 0.025%

7. 25% of 75 is equal to
(1) 16 (2) 16.35 (3) 17.45 (4) 18.75

8. How many per cent of 72 is 18?
(1) 25% (2) $33\frac{1}{3}\%$
(3) 42% (4) 50%

9. (100% of 5) + (5% of 100) is equal to
(1) 10 (2) 15
(3) 55 (4) 105

10. 12% of 12 + 12 is equal to
(1) 12.36 (2) 12.44 (3) 13.44 (4) 26.40

11. If 5% of X + 16% of 75 = 16. Find the value of X.
(1) 75 (2) 80 (3) 90 (4) 100

12. After spending 30% of her money, a lady has ₹ 70 left. How much had she first?
(1) ₹ 80 (2) ₹ 100
(3) ₹ 120 (4) ₹ 140

13. Ram's monthly salary was ₹ 3000. Find his salary now after an increase of 20%.
(1) ₹ 2400 (2) ₹ 3200
(3) ₹ 3400 (4) ₹ 3600

14. In a class of 50 students, 40% are girls. How many boys are there?
(1) 20 (2) 10 (3) 25 (4) 30

15. Out of 30 students 40% are boys and the remaining are girls. The number of girls in the class
(1) 12 (2) 15 (3) 18 (4) 20

16. A person earns ₹ 1800 per month and saves 10% of it. How much does he save?
(1) ₹ 180 (2) ₹ 1620
(3) ₹ 1790 (4) ₹ 1810

17. A person saves 25% of his income. If he saves ₹ 3000 per month, his monthly income is
(1) ₹ 15000 (2) ₹ 12000
(3) ₹ 9000 (4) ₹ 7500

18. In March, 1994 the price of a car was ₹ 67000. In April, 1994 its price was raised by 10%. The price of the car in April, 1994 was
(1) ₹ 60300 (2) ₹ 66330
(3) ₹ 67670 (4) ₹ 73700

19. If the population of a city recorded in year 2001 and 2011, 560400 and 700500 respectively, then the per cent increase in the population is
(1) 20 (2) 30 (3) 35 (4) 25

20. The total number of students in a school is 5600 out of which 60% are boys, what is the total number of girls in this school?
(1) 2240 (2) 3360
(3) 2860 (4) None of these

21. If a man after spending 85% of the income he saves ₹ 4560 per month, his monthly income is
(1) ₹ 32800 (2) ₹ 31600
(3) ₹ 30400 (4) None of these

22. It is known that 6% of the mangoes are rotten. If the number of rotten mangoes is 54, then the total number of mangoes is
(1) 900 (2) 950
(3) 1010 (4) 1040

23. A total of 20000 votes were polled in an election contested by two candidates. The winning candidate got 60% of the total votes polled. How many votes did the defeated candidate got?
(1) 800 (2) 1200
(3) 8000 (4) 12000

24. A boy gets 25 marks out of 80 and fails by 15 marks. Find the percentage of pass marks.
(1) 40 (2) 30 (3) 33 (4) 50

25. A student has to secure 40% marks to pass. If he gets 20 marks and fails by 20 marks, the maximum marks are
(1) 20 (2) 40
(3) 80 (4) 100

Answers

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

Hints and Solutions

1. $6.25\% = \frac{6.25}{100} = \frac{625}{10000} = 0.0625$

2. $20\% = \frac{20}{100}$ and $40\% = \frac{40}{100}$

$\therefore$ 40% of 20% $= \frac{40}{100} \times \frac{20}{100} = \frac{8}{100}$ or 8%

3. $45\% = \frac{45}{100} = \frac{9}{20}$

4. $10\frac{1}{10} = \frac{101}{10} = \frac{101}{10} \times 100 = 1010\%$

5. Required percentage $= \frac{50}{75} \times 100 = \frac{200}{3}\%$

6. Required percentage $= \frac{25\text{ g}}{1\text{ kg}} \times 100$

$= \frac{25\text{ g}}{1000\text{ g}} \times 100 = 2.5\%$

7. 25% of $75 = \frac{25}{100} \times 75 = \frac{75}{4} = 18.75$

8. Required percentage $= \frac{18}{72} \times 100 = 25\%$

9. (100% of 5) + (5% of 100)

$= \left(\frac{100}{100} \times 5\right) + \left(\frac{5}{100} \times 100\right) = 5 + 5 = 10$

10. 12% of $12 + 12 = \frac{12}{100} \times 12 + 12$

$= 1.44 + 12 = 13.44$

11. $\because$ 5% of X + 16% of 75 = 16

$\therefore$ 5% of $X + \frac{16}{100} \times 75 = 16$

$\Rightarrow$ 5% of $X + 12 = 16$

$\Rightarrow$ 5% of $X = 16 - 12 = 4$

$\Rightarrow \frac{5}{100} \times X = 4 \Rightarrow X = \frac{4 \times 100}{5} = 80$

12. Let the total amount be ₹ x.
Then, $x - 30\%$ of $x = ₹\,70$

$$\Rightarrow \quad x - \frac{30x}{100} = 70$$

$$\Rightarrow \quad \frac{100x - 30x}{100} = 70 \Rightarrow 70x = 70 \times 100$$

$$\therefore \quad x = \frac{70 \times 100}{70} = ₹100$$

13. $\therefore$ Required salary $= 3000 + 20\%$ of 3000

$$= 3000 + 3000 \times \frac{20}{100}$$

$$= 3000 + 600 = ₹3600$$

14. Total students $= 50$
Percentage of girl $= 40\%$
Number of boys $= 50 \times 60\%$

$$= \frac{50 \times 60}{100} = 30$$

15. Total students $= 30$
$\because$ Percentage of boys $= 40\%$
$\therefore$ Percentage of girls $= 100 - 40 = 60\%$

$$\therefore \text{Number of girls} = \frac{60}{100} \times \frac{30}{1} = 18$$

16. His saving $= \dfrac{1800 \times 10}{100} = ₹\,180$

17. Let the monthly income of man is ₹ x.

$$\therefore \quad x \times \frac{25}{100} = 3000$$

$$\therefore \quad x = \frac{3000 \times 100}{25}$$

$$= ₹\,12000$$

18. 10% of $67000 = \dfrac{10}{100} \times 67000 = ₹\,6700$

$\therefore$ Price of the car in April, 1994

$$= (67000 + 6700)$$

$$= ₹\,73700$$

19. Required per cent $= \left[\dfrac{700500 - 560400}{560400}\right] \times 100$

$$= \left[\frac{140100}{560400} \times 100\right] = 25\%$$

20. Number of boys $= 60\%$ of 5600

$$= \frac{60}{100} \times 5600 = 3360$$

Hence, number of girls $= 5600 - 3360 = 2240$

21. Savings of the man $= (100 - 85)\% = 15\%$
Let the monthly income $= ₹\ x$
Then, 15% of $x = 4560$

$$\Rightarrow \quad \frac{15}{100} \times x = 4560$$

$$\therefore \quad x = \frac{4560 \times 100}{15} = ₹\,30400$$

Hence, monthly income of man $= ₹\,30400$

22. Let the total number of mangoes $= x$
Then, 6% of $x = 54$

$$\Rightarrow \quad \frac{6}{100} \times x = 54 \Rightarrow x = \frac{54}{6} \times 100 = 900$$

Hence, total number of mangoes $= 900$

23. Total votes polled $= 20000$
The winning candidate got 60% of the total votes polled.

$$\therefore \quad \frac{20000 \times 60}{100} = 12000 \text{ votes}$$

$\therefore$ The defeated candidate got
$= 20000 - 12000 = 8000$ votes

24. Pass marks $= 25 + 15 = 40$

$$\text{Percentage of pass marks} = \frac{40}{80} \times 100 = 50\%$$

25. Marks required to pass $= 40\% = 20 + 20$

$$\therefore \text{ Maximum marks} = \frac{100 \times 40}{40} = 100$$

Self Practice

1. Which one of the following is equivalent to $16\frac{2}{3}\%$?

(1) $\frac{50}{3}$ (2) $\frac{1}{6}$ (3) $\frac{16}{3}$ (4) $\frac{2}{3}$

2. Which one of the following equivalent to 28%?

(1) 2.8 (2) 0.28 (3) 28 (4) 280

3. Convert $1\frac{1}{4}$ into a percentage.

(1) 80% (2) 125% (3) 1.25% (4) 12.5%

4. What percentage is 40 paise of ₹ 2.50?

(1) 16% (2) 100% (3) 10% (4) 8%

5. If 36% of pupils in a school are girls and the number of boys in the school is 816, how many girls are there in the school?

(1) 459 (2) 357 (3) 457 (4) 359

6. A man get a 10% increase in his salary. His new salary is ₹ 10285, what was his original salary?

(1) ₹ 11313 (2) ₹ 9350 (3) ₹ 8350 (4) ₹ 10350

7. A football team won 40% of the total number of matches it played during a year. If it lost 6 matches in all and no match was drawn, find the total number of matches played by the team during the year.

(1) 20 (2) 8 (3) 12 (4) 10

8. Chalk contains 10% calcium, 3% carbon and 12% oxygen. The amount of each of these in 1 kg of chalk are

(1) 30 g, 20 g, 10 g (2) 30 g, 100 g, 120 g (3) 100 g, 30 g, 120 g (4) 120 g, 30 g, 100 g

9. 1/8 is equal to

(1) 25% (2) 16% (3) $12\frac{1}{2}\%$ (4) 0.12%

10. 600% can be expressed in decimal as

(1) 60.0 (2) 6.0 (3) 6000 (4) 3/5

11. Sachin got 60% marks in Maths and 3 marks less than Maths in Science. If the total marks are 150, how many marks he scored in Science?

(1) 90 (2) 95 (3) 87 (4) 63

12. 20% of 60 is equal to

(1) 12 (2) 1200 (3) 3 (4) 30

13. What per cent of 90 is 27?

(1) 30% (2) 10% (3) 9% (4) 3%

14. What rate per cent is 1 min 12 s to 1h?

(1) 2% (2) 3% (3) 4% (4) 5%

15. A person spends 75% of his salary and saves ₹ 150 per month. His monthly salary is

(1) ₹ 750 (2) ₹ 600 (3) ₹ 400 (4) ₹ 300

Answers

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