

Average

Average

Important terms:

Average is defined as the ratio of sum of all terms in a group to the number of terms in the group.

Example:

There are two batches A and B in a class. If we have to find the average of the whole class use the formula shown below:

Batch A: Number of students = a

Average of batch A = x

Batch B: Number of students = b

Average of batch B = y

Average of whole class (Batch 1 and Batch 2) =

$$\frac{(ax + by)}{(a + b)}$$

Average - Important Formulas

1. Average:

$$\text{Average} = \left(\frac{\text{Sum of observations}}{\text{Number of observations}} \right)$$

2. Average Speed:

Suppose a man covers a certain distance at x kmph and an equal distance at y kmph.

Then, the average speed during the whole journey is $\left(\frac{2xy}{x + y} \right)$ kmph.

Quick Tips and Tricks:

- 1) Average of n natural numbers $= (n + 1) / 2$
- 2) Average of n even numbers $= (n + 1)$
- 3) If value of each term increases/decreases by x , then the average of the group also increases/decreases by x .
- 4) If we know average of two groups individually, then the average of combined group cannot be determined.
- 5) In **Arithmetic Progression**, if number of terms are
 - i) Odd - Average is the **middle term**.
 - ii) Even - Average is the **average of two middle terms**.

Examples:

Q 1. Find the average of all numbers between 4 and 49 which are divisible by 5.

- a. 20
- b. 25
- c. 30
- d. 35

Correct Option: (b)

The numbers divisible by 5 are: 5, 10, 15, 20, 25, 30, 35, 40, 45.

$$\text{Sum of Quantities} = (5 + 10 + 15 + 20 + 25 + 30 + 35 + 40 + 45) + 225$$

$$\text{Average} = \frac{\text{Sum of Quantities}}{\text{Number of Quantities}} = \frac{225}{9} = 25$$

Example

Q 2. The average of 11 numbers is 30. If the average of first six numbers is 17.5 and that of last six is 42.5, then what is the sixth number?

- a. 30
- b. 36
- c. 45
- d. 47

Correct Option : (a)

Given: Average of 11 numbers = 30

Step 1: Calculate total of 11 numbers by multiplying it by average value $30 = 11 \times 30 = 330$

Step 2: Calculate total of first six members by multiplying it by average value $17.5 = 17.5 \times 6 = 105$

Step 3: Calculate total of last six members by multiplying it by average value $42.5 = 42.5 \times 6 = 255$

Therefore, we can find sixth number by **adding** value of **first six and last six** numbers and **subtracting** it from the total value of 11 numbers.

Sixth number = $(105 + 255) - 330 = 30$

Example

Q 3. The average of four consecutive even numbers is 27.
Find the largest of these numbers.

- a. 28
- b. 30
- c. 32
- d. 34

Correct Option: (b)

Consider the consecutive even numbers as : x , $(x + 2)$, $(x + 4)$ and $(x + 6)$

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

$$= \frac{x + (x + 2) + (x + 4) + (x + 6)}{4} = \frac{(4x + 12)}{4} = 27$$

Simplifying we get, $x = 24$

Therefore,

$$\text{Largest number} = (x + 6) = (24 + 6) = 30$$

$$\text{Smallest number} = 24$$

Examples:

Q 4. There are two batches A and B of a class. Batch A consists of 36 students and batch B consists of 44 students. Find the average weight of whole class, if average weight of batch A is 40 kg and that of batch B is 35 kg.

- a. 29.23 kg
- b. 32.56 kg
- c. 35.66 kg
- d. 37.25 kg

Correct Option : (d)

Given: Average weight of batch A = 40 kg , average weight of batch B = 35 kg

1) First find the total weight of all students

- Weight of batch A = $(36 \times 40) = 1440$

- Weight of batch B = $(44 \times 35) = 1540$

Total weight of all students = $(1440 + 1540) = 2980$ kg

2) Find average weight of whole class

(Batch A + Batch B) students = $(36 + 44) = 80$ students

$$\text{Average Weight} = \frac{\text{Total weight of all the students}}{\text{No. of Students}} = \frac{2980}{80} = 37.25 \text{ kg}$$

Average MCQs

1. The average of first five multiples of 3 is:

- A. 8
- B. 9
- C. 10
- D. 11

Solution:

Option **(B)** is correct

Basic Formula: $1, 2, 3, \dots, n$

If n is odd, the formula is $\left(\frac{n+1}{2}\right)^{th}$ term

The five multiples of 3 is 3, 6, 9, 12, 15

$$\left(\frac{n+1}{2}\right) \Rightarrow \left(\frac{5+1}{2}\right)^{th} \text{ term}$$

$$\Rightarrow \left(\frac{6}{2}\right)^{th} \text{ term} = 3^{rd} \text{ term}$$

Here 3^{rd} term is **9**

2. Average age of 7 family members is 75 years. But average age of 6 of them is 74 years 6 months. What is the age of the 7th family member?

- a. 75.5
- b. 78
- c. 68
- d. 80

ANSWER: 78

Explanation:

74 years 6 months = 74.5 years

Total age of 6 members = $6 \times 74.5 = 447$ years

Total age of 7 family members = $7 \times 75 = 525$ years

Age of the 7th family member = $525 - 447 = 78$ years

3. The distance between two stations A and B is 778 km. A train covers the journey from A to B at 84 km per hour and returns back to A with a uniform speed of 56 km per hour. Find the average speed of train during the whole journey.

- A. 60.3 km/hr
- B. 35.0 km/hr
- C. 57.5 km/hr
- D. 67.2 km/hr

Solution:

Option(D) is correct

$$\text{Average Speed} = \left(\frac{2xy}{x+y} \right) \text{ km/hr}$$

$$= \left(\frac{2 \times 84 \times 56}{84 + 56} \right)$$

$$= \left(\frac{2 \times 84 \times 56}{140} \right)$$

$$= \mathbf{67.2 \text{ km/hr}}$$

4. The average of 50 numbers is 30. If two numbers, 35 and 40 are discarded, then the average of the remaining numbers is nearly:

- A. 28.32
- B. 29.68
- C. 28.78
- D. 29.27

Solution:

Option(B) is correct

$$\text{Total sum of 48 numbers} = (50 \times 30) - (35 + 40)$$

$$= 1500 - 75$$

$$= 1425$$

$$\text{Average} = \left(\frac{1425}{48} \right)$$

$$= \mathbf{29.68}$$

5. The average score of a cricketer for ten matches is 38.9 runs. If the average for the first six matches is 42, then find the average for the last four matches.

- A. 33.25
- B. 33.5
- C. 34.25
- D. 35

Solution:

Option(C) is correct

Total sum of last 4 matches

$$= (10 \times 38.9) - (6 \times 42)$$

$$= 389 - 252 = 137$$

Average

$$= \frac{137}{4}$$

$$= 34.25$$

6. A batsman makes a score of 87 runs in the 17th inning and thus increases his average by 3. Find his average after 17th inning.

- A. 40
- B. 39
- C. 52
- D. 55

Solution:

Option(B) is correct

Let the average after 17th innings = x

Then average after 16th innings = $(x - 3)$

Therefore $16(x - 3) + 87 = 17x$

Therefore $x = 39$

7. There were 35 students in a hostel. Due to the admission of 7 new students the expenses of the mess were increased by Rs.42 per day while the average expenditure per head diminished by Re 1. What was the original expenditure of the mess?

- A. Rs. 450
- B. Rs. 320
- C. Rs. 550
- D. Rs. 420

Solution:

Option(D) is correct

Let the original average expenditure be Rs. x then,

$$42(x - 1) - 35x = 42$$

$$\Rightarrow 7x = 84$$

$$\Rightarrow x = 12$$

Therefore original expenditure

$$= \text{Rs. } (35 \times 12)$$

$$= \text{Rs. } 420$$

8. Nine persons went to a hotel for taking their meals. Eight of them spent Rs.12 each on their meals and the ninth spent Rs.8 more than the average expenditure of all the nine. What was the total money spent by them.

- A. Rs. 115
- B. Rs. 116
- C. Rs. 117
- D. Rs. 118

Solution:

Option(C) is correct

Let the average expenditure of all the nine be Rs. x

$$\text{Then, } 12 \times 8 + (x + 8) = 9x$$

$$\text{Therefore } x = 13$$

$$\text{Total money spent} = 9x = \text{RS. } (9 \times 13) = \text{Rs.117}$$

9. Avid obtained 76, 65, 82, 67 and 85 marks (out of 100) in English, mathematics, physics, chemistry and biology. What are his average marks?

- A. 65
- B. 69
- C. 75
- D. None of above

Solution:
Option(C) is correct

Average

$$= \frac{76 + 65 + 82 + 67 + 85}{5}$$

$$= \frac{375}{5}$$

$$= 75$$

10. The average of runs of a cricket player of 10 innings was 32. How many runs must be made in his next innings so as to increase his average of runs by 4?

- A. 72
- B. 74
- C. 70
- D. 76

Solution:

Option(D) is correct

Average after 11 innings = 36

$$\begin{aligned}\text{Required number of runs} &= (36 \times 11) - (32 \times 10) \\ &= 396 - 320 \\ &= 76\end{aligned}$$

11. The average of three numbers is 77. The first number is twice the second and the second number is twice the third. Find the first number.

- a. 33
- b. 66
- c. 77
- d. 132

ANSWER: 132

Explanation:

Let the third number be 'a'

So the second number will be '2a'

And the first number = $2(2a) = 4a$

$$\text{AVERAGE} = \frac{\text{Sum of Observations}}{\text{Number of Observations}}$$

$$\text{Average} = 77 = \frac{4a + 2a + a}{3} = \frac{7a}{3}$$

$$\therefore a = 33$$

$$\therefore \text{First number} = 4a = 132$$

12. The average age of a family of 5 members is 20 years. If the age of the youngest member be 10 years then what was the average age of the family at the time of the birth of the youngest member?

- A. 13.5
- B. 14
- C. 15
- D. 12.5

Solution:

Option(D) is correct

At present the total age of the family = $5 \times 20 = 100$

The total age of the family at the time of the birth of the youngest member:

$$= \left[100 - \underbrace{10}_{\text{age of youngest}} - \underbrace{(10 \times 4)}_{10 \text{ years} \times \text{remaining family members}} \right] = 50$$

Therefore, average age of the family at the time of birth of the youngest member :

$$= \frac{50}{4} = 12.5$$

13. Average cost of 5 apples and 4 mangoes is Rs. 36. The average cost of 7 apples and 8 mangoes is Rs. 48. Find the total cost of 24 apples and 24 mangoes.

- A. 1044
- B. 2088
- C. 720
- D. 324

Solution:

Option(B) is correct

Average cost of 5 apples and 4 mangoes = Rs. 36

$$\text{Total cost} = 36 \times 9 = 324$$

Average cost of 7 apples and 8 mangoes = 48

$$\text{Total cost} = 48 \times 15 = 720$$

$$\text{Total cost of 12 apples and 12 mangoes} = 324 + 720 = 1044$$

$$\text{Therefore, cost of 24 apples and 24 mangoes} = 1044 \times 2 = 2088$$

14. 3 boxes have some average weight. When one box which weighs 89 kg is replaced by another box, the average weight increases by 5 kg. How much the new box weighs?

- a. 109 kg
- b. 94 kg
- c. 104 kg
- d. 84 kg

ANSWER: 104 kg

Explanation:

Since increase in average is by 5 kg, weight of each box would increase by 5 kg.

So total increase in weight = $5\text{kg} \times 3 \text{ boxes} = 15 \text{ kg}$.

So weight of new box needs to be $= 89 + 15 = 104 \text{ kg}$.

Remember:

We may think that weight should be $89 + 5 = 94 \text{ kg}$.

But it is 104 kg \rightarrow because the new box must include the increase in weight for other 2 boxes too. So $5\text{kg} + 5\text{kg}$ of other two boxes must be added in new box.

15. The average monthly income of P and Q is Rs. 5050. The average monthly income of Q and R is Rs. 6250 and the average monthly income of P and R is Rs. 5200. The monthly income of P is:

- A. 3500
- B. 4000
- C. 4050
- D. 5000

Answer: Option B

Explanation:

Let P, Q and R represent their respective monthly incomes. Then, we have:

$$P + Q = (5050 \times 2) = 10100 \dots (i)$$

$$Q + R = (6250 \times 2) = 12500 \dots (ii)$$

$$P + R = (5200 \times 2) = 10400 \dots (iii)$$

$$\text{Adding (i), (ii) and (iii), we get: } 2(P + Q + R) = 33000 \text{ or } P + Q + R = 16500 \dots (iv)$$

Subtracting (ii) from (iv), we get $P = 4000$.

P's monthly income = Rs. 4000.

16. A car owner buys petrol at Rs.7.50, Rs. 8 and Rs. 8.50 per litre for three successive years. What approximately is the average cost per litre of petrol if he spends Rs. 4000 each year?

- A. Rs. 7.98
- B. Rs. 8
- C. Rs. 8.50
- D. Rs. 9

Answer: Option A

Explanation:

$$\begin{aligned}
 \text{Total quantity of petrol consumed in 3 years} &= \left(\frac{4000}{7.50} + \frac{4000}{8} + \frac{4000}{8.50} \right) \text{ litres} \\
 &= 4000 \left(\frac{2}{15} + \frac{1}{8} + \frac{2}{17} \right) \text{ litres} \\
 &= \left(\frac{76700}{51} \right) \text{ litres}
 \end{aligned}$$

Total amount spent = Rs. (3 x 4000) = Rs. 12000.

$$\therefore \text{Average cost} = \text{Rs.} \left(\frac{12000 \times 51}{76700} \right) = \text{Rs.} \frac{6120}{767} = \text{Rs. } 7.98$$

17. A library has an average of 510 visitors on Sundays and 240 on other days. The average number of visitors per day in a month of 30 days beginning with a Sunday is:

- A. 250
- B. 276
- C. 280
- D. 285

Answer: Option D

Explanation:

Since the month begins with a Sunday, to there will be five Sundays in the month.

$$\text{Required average} = \left(\frac{510 \times 5 + 240 \times 25}{30} \right)$$

$$= \frac{8550}{30}$$

$$= 285$$

18. If the average marks of three batches of 55, 60 and 45 students respectively is 50, 55, 60, then the average marks of all the students is:

- A. 53.33
- B. 54.68
- C. 55
- D. None of these

Answer: Option **B**

Explanation:

$$\begin{aligned}\text{Required average} &= \left(\frac{55 \times 50 + 60 \times 55 + 45 \times 60}{55 + 60 + 45} \right) \\ &= \left(\frac{2750 + 3300 + 2700}{160} \right) \\ &= \frac{8750}{160} \\ &= 54.68\end{aligned}$$

19. A pupil's marks were wrongly entered as 83 instead of 63. Due to that the average marks for the class got increased by half ($1/2$). The number of pupils in the class is:

- A. 10
- B. 20
- C. 40
- D. 73

Answer: Option **C**

Explanation:

Let there be x pupils in the class.

$$\text{Total increase in marks} = \left(x \times \frac{1}{2} \right) = \frac{x}{2}$$

$$\therefore \frac{x}{2} = (83 - 63) \Rightarrow \frac{x}{2} = 20 \Rightarrow x = 40.$$

20. In the first 10 overs of a cricket game, the run rate was only 3.2. What should be the run rate in the remaining 40 overs to reach the target of 282 runs?

- A. 6.25
- B. 6.5
- C. 6.75
- D. 7

Answer: Option A

Explanation:

$$\text{Required run rate} = \left(\frac{282 - (3.2 \times 10)}{40} \right) = \frac{250}{40} = 6.25$$