Average

Average

$$\text{average} = \frac{\text{sum of observations}}{\text{number of observations}}$$

Weighted Average

If average of n_1 numbers is x_1, n_2 numbers is x_2, and so on, average of all the numbers taken together is $\dfrac{n_1 x_1 + n_2 x_2 + \cdots}{n_1 + n_2 + \cdots}$

Average Speed

If an object covers equal distances at x_1 kmph and x_2 kmph, then the average speed of the whole journey is $\dfrac{2x_1 x_2}{x_1 + x_2}$ kmph

1. 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. 5

B. 7.4

C. 6.25

D. 5.5

Let required run rate is x

$$\frac{10 \times 3.2 + 40x}{10 + 40} = \frac{282}{50}$$

$$\Rightarrow 32 + 40x = 282$$

$$\Rightarrow x = 6.25$$

Runs scored in first 10 overs $= 10 \times 3.2 = 32$

Required runs $= 282$

Remaining runs to be scored $= 282 - 32 = 250$
Remaining overs $= 40$

Required run rate $= \dfrac{250}{40} = 6.25$

2. The average score of a cricket player in 11 matches is 50. If the average score in first six matches is 49 and that of last six is 52, find his score in sixth match.

Total score of 11 matches = 11×50 =550

Total score of first six matches = 6×49=294

Total score of last six matches = 6×52=312

Score of sixth match = 294+312-550

= 56

3. In a family, two grandparents, three grandchildren, and two parents. 67 years is the average age of the grandparents. 35 years is the average age of the parents. 6 years is the average age of the children. Calculate the average age of the family.

Family average age $= \dfrac{(67\times2+35\times2+6\times3)}{2+2+3}$

$= \dfrac{(134+70+18)}{7}$

$= \dfrac{222}{7}$

$= 31.71$

4. A shopkeeper has a sale of Rs. 6359, Rs. 2365, Rs. 5698, Rs. 5690, and Rs. 4560 for successive months. Calculate his sale in the sixth month to make an average sale of Rs. 6400.

Sale for 5 months= 6359 + 2365 + 5698 + 5690 + 4560 = 24672

Required sale = (6400 x 6) - 24672

= 38400- 24672

= 13728

5. The average monthly income of A and B is Rs. 5050, that of B and C is Rs. 6250, and that of A and C is Rs. 5200. Calculate the monthly income of A.

A + B = 5050 x2 = 10100 -----(i)

B + C = 6250 x 2 = 12500-----(ii)

C + A = 5200 x 2 = 10400-----(iii)

Adding the above three equations, we get,

2 (A + B + C) = 33000

Or, A + B + C = 16500-----(iv)

When we subtract (ii) from (iv), we get

A = 4000

Therefore, A's monthly income = Rs. 4000

If the average age of some boys is given and the new average after a new entry is also given, then

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Age of new entrant

= New average + No. of old members ×

Increase in average

6. The average age of 30 girls of a class is equal to 14 years. When the age of class teacher is included the average becomes 15 years. Find the age of class teacher.

Age of class teacher = 15+30(15-14)

= 45

7. In a class, there are 20 boys whose average age is decreased by 2 months when one boy aged 18 years is replaced by a new boy. Find the age of the new boy.

Age of new boy= Age of removed boy-no of boys × decrease in average age

$$= 18 - 20(2 \text{ months})$$

$$= 18 - 20 \times \frac{2}{12}$$

$$= \frac{44}{3}$$

$$= 14\frac{2}{3}$$

The average weight of some persons is given. By the replacement of a person by another, let the average is increased. Then

Weight of new person

= weight of removed person + No. of persons × increase in average

8. The average weight of 4 persons traveling in a taxi is increased by 3Kg when one of them who weighs 100kg is replaced by another man. What is the weight of the new man?

Weight of new man = $100+4\times3$

$= 112$

Let the average of marks obtained by some students is given. If the average marks of passed candidates and failed candidates are given then

Number of passed candidates =

$$\frac{\text{Total candidates(total average - failed average)}}{\text{passed average - failed average}}$$

Number of failed candidates =

$$\frac{\text{Total candidates(passed average - total average)}}{\text{passed average - failed average}}$$

9. In a competitive examination, the average of marks obtained by 150 candidates is 32. If the average marks of passed candidates is 40 and that of the failed candidates is 15. What is the number of candidates who passed the examination?

Number of passed candidate =

$$\frac{\text{Total candidates(total average - failed average)}}{\text{passed average - failed average}}$$

$$= \frac{150(32 - 15)}{40 - 15} = \frac{150 \times 17}{25}$$

$$= 102$$

10. A train travels from A to B at the rate of 26km/hr and from B to A at the rate of 32Km/hr. What is the average rate for the whole journey?

Average speed $= \dfrac{2xy}{x+y}$km\hr

$$= \dfrac{2 \times 26 \times 32}{26 + 32}$$

$$= \dfrac{1664}{58}$$

$$= 28\dfrac{20}{29} \text{ km/hr}$$

11. Ankit while going from Dehradun to Delhi, divides his route of journey into three equal parts and decides to travel the three parts with speeds of 40, 30 and 15km/hr respectively. Find his average speed during the whole journey.

Average speed =

$$\frac{3xyz}{xy + yz + xz}$$

$$= \frac{3 \times 40 \times 30 \times 15}{40 \times 30 + 30 \times 15 + 40 \times 15}$$

= 24km/hr

12. Nine relatives went to a hotel for taking their meals. Eight of them spent Rs.60 each on their meals and the ninth spent Rs.20 more than the average expenditure of all the nine. What was the total money spent by them?

Solution: Let the total expenditure =Rs.x

Then, average $= Rs \dfrac{x}{9}$

$$\therefore 8 \times 60 + \left(\dfrac{x}{9} + 20 \right) = x$$

$$\dfrac{8x}{9} = 500 \qquad x = Rs. \dfrac{500 \times 9}{8}$$

$$= Rs. \, 562.50$$

13 The average temperature for Monday, Tuesday, Wednesday and Thursday was 46° and for Tuesday, Wednesday, Thursday and Friday was 45°. If the temperature on Monday was 40° find the temperature on Friday.

- Solution: Total temperature on Monday, Tuesday, Wednesday and Thursday

$$= 46^\circ \times 4 = 184^\circ$$

Total temperature on Tuesday, Wednesday, Thursday and Friday

$$= 45^\circ \times 4 = 180^\circ$$

Total temperature on Tuesday, Wednesday and Thursday

$$= 184^\circ - \text{temperature on Monday}$$

$$= 184^\circ - 40^\circ = 144^\circ$$

Temperature on Friday

$$= 180^\circ - 144^\circ = 36^\circ$$

14.There are six numbers 30,72,53,68, x and 87, out of which x is unknown. The average of the numbers is 60. what is the value of x ?

Solution: Average of given numbers

$$= \left(\frac{30+72+53+68+x+87}{6} \right)$$

$$= \left(\frac{310+x}{6} \right)$$

$$\therefore \frac{310+x}{6} = 60$$

$$= 310+x = 360$$

Hence   x = 50

15. The average of four consecutive even numbers is 27. The largest of these numbers is?

Let four consecutive even number are x, x + 2, x + 4, x + 6

$\Rightarrow$ Average of 4 consecutive even numbers = 27

$\Rightarrow$ Average = (Sum of all observations)/Numbers of observations

$\Rightarrow$ (x + x + 2 + x + 4 + x + 6)/4 = 27

$\Rightarrow$ (4x + 12)/4 = 27

$\Rightarrow$ x + 3 = 27

$\Rightarrow$ x = 24

$\Rightarrow$ Four consecutive even number are 24, 26, 28, 30

$\therefore$ **The largest of the four consecutive even numbers are 30**

16. Of the three numbers, second is twice the first and is also thrice the third. If the average of the three numbers is 44.Find the largest number.

Let the third number be x

Then second number= 3x

First number= $\dfrac{3x}{2}$

$\therefore$ $x + 3x + \dfrac{3x}{2} = 44 \times 3$

$\Rightarrow 4x + \dfrac{3x}{2} = 132$

$\Rightarrow \dfrac{8x + 3x}{2} = 132$

$\Rightarrow \dfrac{11x}{2} = 132$

$\Rightarrow x = 24$

So largest number=Second number= 3x = 3 × 24 = 72

Try these problems:

1. Mean of eight numbers is 38.4 and the mean of seven of them is 39.2. what is the eight number?

2. The average of first five primer numbers.

3. Average age of a group of 20 boys is 14 years. A boy of 16 years age leaves the group and a new boy replaces him. If the average age becomes 13.8 years, the age of new boy is___