

## Chapter 19. Mean and Median (For Ungrouped Data Only)

### Exercise 19(A)

#### Solution 1:

The numbers given are 43, 51, 50, 57, 54

The mean of the given numbers will be

$$\begin{aligned} &= \frac{43 + 51 + 50 + 57 + 54}{5} \\ &= \frac{255}{5} \\ &= 51 \end{aligned}$$

#### Solution 2:

The first six natural numbers are 1, 2, 3, 4, 5, 6

The mean of first six natural numbers

$$\begin{aligned} &= \frac{1 + 2 + 3 + 4 + 5 + 6}{3} \\ &= \frac{21}{3} \\ &= 3.5 \end{aligned}$$

#### Solution 3:

The first ten odd natural numbers are 1, 3, 5, 7, 9, 11, 13, 15, 17, 19

The mean of first ten odd numbers

$$\begin{aligned} &= \frac{1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19}{10} \\ &= \frac{100}{10} \\ &= 10 \end{aligned}$$

**Solution 4:**

The all factors of 10 are 1, 2, 5, 10

The mean of all factors of 10 are

$$= \frac{1 + 2 + 5 + 10}{4}$$

$$= \frac{18}{4}$$

$$= 4.5$$

**Solution 5:**

The given values are  $x + 3, x + 5, x + 7, x + 9, x + 11$

The mean of the values are

$$= \frac{x + 3 + x + 5 + x + 7 + x + 9 + x + 11}{5}$$

$$= \frac{5x + 35}{5}$$

$$= \frac{5(x + 7)}{5}$$

$$= x + 7$$

**Solution 6:**

(i) The given numbers are 9.8, 5.4, 3.7, 1.7, 1.8, 2.6, 2.8, 8.6, 10.5, 11.1

$$\begin{aligned}\bar{x} &= \frac{x_1 + x_2 + x_3 + x_4 + x_5 + \dots + x_n}{n} \\ &= \frac{9.8 + 5.4 + 3.7 + 1.7 + 1.8 + 2.6 + 2.8 + 8.6 + 10.5 + 11.1}{10} \\ &= 5.8\end{aligned}$$

(ii) The value of  $\sum_{i=1}^{10} (x_i - \bar{x})$

We know that

$$\sum_{i=1}^n (x_i - \bar{x}) = (x_1 - \bar{x}) + (x_2 - \bar{x}) + \dots + (x_n - \bar{x}) = 0$$

Here

$$\bar{x} = 5.8$$

Therefore

$$\begin{aligned}&\sum_{i=1}^{10} (x_i - \bar{x}) \\ &= (9.8 - 5.8) + (5.4 - 5.8) + (3.7 - 5.8) + (1.7 - 5.8) + (1.8 - 5.8) \\ &\quad + (2.6 - 5.8) + (2.8 - 5.8) + (8.6 - 5.8) + (10.5 - 5.8) + (11.1 - 5.8) \\ &= 4 - 4 - 2.1 - 4.1 - 4 - 3.2 - 3 + 2.8 + 4.7 + 5.3 \\ &= 0\end{aligned}$$

**Solution 7:**

Given that the mean of 15 observations is 32

(i)resulting mean increased by 3

$$=32 + 3$$

$$=35$$

(ii)resulting mean decreased by 7

$$=32 - 7$$

$$= 25$$

(iii)resulting mean multiplied by 2

$$=32*2$$

$$=64$$

(iv)resulting mean divide by 0.5

$$= \frac{32}{.5}$$

$$= 64$$

(v)resulting mean increased by 60%

$$= 32 + \frac{60}{100} \times 32$$

$$= 32 + 19.2$$

$$= 51.2$$

(vi)resulting mean decreased by 20%

$$= 32 - \frac{20}{100} \times 32$$

$$= 32 - 6.4$$

$$= 25.6$$

**Solution 8:**

Given the mean of 5 numbers is 18

Total sum of 5 numbers

$$= 18 \times 5$$

$$= 90$$

On excluding an observation, the mean of remaining 4 observation is 16

$$= 16 \times 4$$

$$= 64$$

Therefore sum of remaining 4 observations

$$= \text{total of 5 observations} - \text{total of 4 observations}$$

$$= 90 - 64$$

$$= 26$$

**Solution 9:**

(i) Given that the mean of observations  $x, x + 2, x + 4, x + 6$  and  $x + 8$  is 11

$$\text{Mean} = \frac{\text{observations}}{n}$$

$$11 = \frac{x + x + 2 + x + 4 + x + 6 + x + 8}{5}$$

$$11 = \frac{5x + 20}{5}$$

$$x = \frac{35}{5}$$

$$x = 7$$

(ii) The mean of first three observations are

$$= \frac{x + x + 2 + x + 4}{3}$$

$$= \frac{3x + 6}{3}$$

$$= \frac{3 \times 7 + 6}{3} \quad [\text{since } x=7]$$

$$= \frac{21 + 6}{3}$$

$$= 9$$

**Solution 10:**

Given the mean of 100 observations is 40.

$$\frac{\sum x}{n} = \bar{x}$$

$$\Rightarrow \frac{\sum x}{n} = 40$$

$$\Rightarrow \sum x = 40 \times 100$$

$$\Rightarrow \sum x = 4000$$

Incorrect value of  $\sum x = 4000$

Correct value of  $\sum x =$  Incorrect value of  $\sum x -$  Incorrect observation + correct observation

$$= 4000 - 83 + 53$$

$$= 3970$$

Correct mean

$$= \frac{\text{correct value of } \sum x}{n}$$

$$= \frac{3970}{100}$$

$$= 39.7$$

**Solution 11:**

Given that the mean of 200 items was 50.

$$\text{Mean} = \frac{\sum x}{n}$$

$$\Rightarrow 50 = \frac{\sum x}{200}$$

$$\Rightarrow x = 10000$$

Incorrect value of  $\sum x = 10000$

Correct value of

$$\sum x = 10000 - (92 + 8) + (192 + 88)$$

$$= 10000 - 100 + 280$$

$$= 10180$$

Correct mean

$$= \frac{\text{correct value of } \sum x}{n}$$

$$= \frac{10180}{200}$$

$$= 50.9$$

**Solution 12:**

Mean of 45 numbers = 18

$$\Rightarrow \text{Sum of 45 numbers} = 18 \times 45 = 810$$

Mean of remaining (75 - 45)30 numbers = 13

$$\Rightarrow \text{Sum of remaining 30 numbers} = 13 \times 30 = 390$$

$$\Rightarrow \text{Sum of all the 75 numbers} = 810 + 390 = 1200$$

$$\Rightarrow \text{Mean of all the 75 numbers} = \frac{1200}{75} = 16$$

**Solution 13:**

Mean weight of 120 students = 52.75 kg

$\Rightarrow$  Sum of the weight of 120 students =  $120 \times 52.75 = 6330$  kg

Mean weight of 50 students = 51 kg

$\Rightarrow$  Sum of the weight of 50 students =  $50 \times 51 = 2550$  kg

$\Rightarrow$  Sum of the weight of remaining (120 - 50) 70 students

= Sum of the weight of 120 students - Sum of the weight of 50 students

=  $(6330 - 2550)$  kg

= 3780 kg

$\Rightarrow$  Mean weight of remaining 70 students =  $\frac{3780}{70} = 54$  kg

**Solution 14:**

Let the number of boys and girls be  $x$  and  $y$  respectively.

Now,

Given, Mean marks of  $x$  boys in the examination = 70

$\Rightarrow$  Sum of marks of  $x$  boys in the examination =  $70x$

Given, Mean marks of  $y$  girls in the examination = 73

$\Rightarrow$  Sum of marks of  $y$  girls in the examination =  $73y$

Given, Mean marks of all students ( $x + y$ ) in the examination = 71

$\Rightarrow$  Sum of marks of all students ( $x + y$ ) students in the examination =  $71(x + y)$

Now, Sum of marks of all students ( $x + y$ ) students in the examination

= Sum of marks of  $x$  boys in the examination

+ Sum of marks of  $y$  girls in the examination

$\Rightarrow 71(x + y) = 70x + 73y$

$\Rightarrow 71x + 71y = 70x + 73y$

$\Rightarrow x = 2y$

$\Rightarrow \frac{x}{y} = \frac{2}{1}$

$\Rightarrow x : y = 2 : 1$

Thus, the ratio of number of boys to the number of girls is 2 : 1.

**Exercise 19(B)**



**Solution 1:**

(i) Firstly arrange the numbers in ascending order

16, 16, 19, 25, 26, 28, 31, 32, 35

Now since

$$n=9(\text{odd})$$

Therefore Median

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

$$= \left( \frac{9+1}{2} \right)^{\text{th}}$$

$$= 5^{\text{th}}$$

Thus the median is 26

(ii)

Firstly arrange the numbers in ascending order

241, 243, 257, 258, 261, 271, 292, 299, 327, 347, 350

Now since  $n=11(\text{Odd})$

$$\text{Median} = \text{value of } \left( \frac{n+1}{2} \right)^{\text{th}} \text{ term}$$

$$= 6^{\text{th}} \text{ term}$$

$$= 271$$

Thus median is 271.

(iii) Firstly arrange the numbers in ascending order

9, 14, 17, 21, 25, 34, 43, 50, 50, 63

Now since  $n=10$ (even)

$$\begin{aligned}\text{Median} &= \frac{1}{2} \left[ \text{value of } \left( \frac{n}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\ &= \frac{1}{2} \left[ \text{value of } \left( \frac{10}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{10}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\ &= \frac{1}{2} [25 + 34] \\ &= \frac{1}{2} [59] \\ &= 29.5\end{aligned}$$

Thus the median is 29.5

(iv) Firstly arrange the numbers in ascending order

173, 185, 189, 194, 194, 200, 204, 208, 220, 223

$$\begin{aligned}\text{Median} &= \frac{1}{2} \left[ \text{value of } \left( \frac{n}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\ &= \frac{1}{2} \left[ \text{value of } \left( \frac{10}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{10}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\ &= \frac{1}{2} [200 + 194] \\ &= \frac{1}{2} [394] \\ &= 197\end{aligned}$$

Thus the median is 197

**Solution 2:**

Given numbers are 34, 37, 53, 55, x, x+2, 77, 83, 89, 100

Here  $n = 10$ (even)

$$\begin{aligned}\text{Median} &= \frac{1}{2} \left[ \text{value of } \left( \frac{n}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\&= \frac{1}{2} \left[ \text{value of } \left( \frac{10}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{10}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\&= \frac{1}{2} [\text{value of } (5)^{\text{th}} \text{ term} + \text{value of } (5 + 1)^{\text{th}} \text{ term}] \\&= \frac{1}{2} [\text{value of } (5)^{\text{th}} \text{ term} + \text{value of } (6)^{\text{th}} \text{ term}] \\63 &= \frac{1}{2} [x + x + 2] \\ \Rightarrow \frac{[2 + 2x]}{2} &= 63 \\ \Rightarrow x + 1 &= 63 \\ \Rightarrow x &= 62\end{aligned}$$

**Solution 3:**

For any given set of data, the median is the value of its middle term.

Here, total observations =  $n = 10$  (even)

If  $n$  is even, we have

$$\text{Median} = \frac{1}{2} \left[ \text{value of } \left( \frac{n}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

Thus, for  $n = 10$ , we have

$$\begin{aligned}\text{Median} &= \frac{1}{2} \left[ \text{value of } \left( \frac{10}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{10}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\&= \frac{1}{2} [\text{value of } 5^{\text{th}} \text{ term} + \text{value of } 6^{\text{th}} \text{ term}]\end{aligned}$$

Hence, if 7<sup>th</sup> number is diminished by 8, there is no change in the median value.

**Solution 4:**

Here, total observations =  $n = 10$  (even)

Thus, we have

$$\begin{aligned}\text{Median} &= \frac{1}{2} \left[ \text{value of } \left( \frac{10}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{10}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\ &= \frac{1}{2} \left[ \text{value of } 5^{\text{th}} \text{ term} + \text{value of } 6^{\text{th}} \text{ term} \right]\end{aligned}$$

According to given information, data in ascending order is as follows:

|       | 1 <sup>st</sup><br>Term | 2 <sup>nd</sup><br>Term | 3 <sup>rd</sup><br>Term | 4 <sup>th</sup><br>Term | 5 <sup>th</sup> Term | 6 <sup>th</sup><br>Term | 7 <sup>th</sup> Term | 8 <sup>th</sup> Term | 9 <sup>th</sup> Term | 10 <sup>th</sup><br>Term |
|-------|-------------------------|-------------------------|-------------------------|-------------------------|----------------------|-------------------------|----------------------|----------------------|----------------------|--------------------------|
| Marks | Less than 30            |                         |                         | 35                      | 40                   | 48                      | 66                   | More than 75         |                      |                          |

$$\therefore \text{Median} = \frac{1}{2} (40 + 48) = \frac{88}{2} = 44$$

Hence, the median score of the whole group is 44.

**Solution 5:**

Total number of observations = 9 (odd)

Now, if  $n = \text{odd}$

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

$$\Rightarrow \text{Median} = \left( \frac{9+1}{2} \right)^{\text{th}} \text{ term} = 5^{\text{th}} \text{ term} = x + 5$$

Now, Median = 18 (given)

$$\therefore x + 5 = 18$$

$$\Rightarrow x = 13$$

**Exercise 19(C)**

**Solution 1:**

$$\begin{aligned}\text{Mean of the given data} &= \frac{8 + 12 + 16 + 22 + 10 + 4}{6} \\ &= \frac{72}{6} = 12\end{aligned}$$

**(i) Multiplied by 3**

If  $\bar{x}$  is the mean of  $n$  number of observations  $x_1, x_2, x_3, \dots, x_n$ ,  
then mean of  $ax_1, ax_2, ax_3, \dots, ax_n$  is  $a\bar{x}$ .

Thus, when each of the given data is multiplied by 3,  
the mean is also multiplied by 3.

Mean of the original data is 12.

Hence, the new mean =  $12 \times 3 = 36$ .

**(ii) Divided by 2**

If  $\bar{x}$  is the mean of  $n$  number of observations  $x_1, x_2, x_3, \dots, x_n$ ,

then mean of  $\frac{x_1}{a}, \frac{x_2}{a}, \frac{x_3}{a}, \dots, \frac{x_n}{a}$  is  $\frac{\bar{x}}{a}$ .

Thus, when each of the given data is divided by 2,  
the mean is also divided by 2.

Mean of the original data is 12.

Hence, the new mean =  $\frac{12}{2} = 6$ .

(iii) multiplied by 3 and then divided by 2

If  $\bar{x}$  is the mean of  $n$  number of observations  $x_1, x_2, x_3, \dots, x_n$ ,

then mean of  $\frac{a}{b}x_1, \frac{a}{b}x_2, \frac{a}{b}x_3, \dots, \frac{a}{b}x_n$  is  $\frac{a}{b}\bar{x}$ .

Thus, when each of the given data is multiplied by  $\frac{3}{2}$ ,

the mean is also multiplied by  $\frac{3}{2}$ .

Mean of the original data is 12.

Hence, the new mean  $= \frac{3}{2} \times 12 = \frac{36}{2} = 18$

(iv) increased by 25%

New mean = Original mean + 25% of original mean

$\Rightarrow$  New mean = 12 + 25% of 12

$\Rightarrow$  New mean =  $12 + \frac{25}{100} \times 12$

$\Rightarrow$  New mean =  $12 + \frac{1}{4} \times 12$

$\Rightarrow$  New mean = 12 + 3

$\Rightarrow$  New mean = 15

(v) decreased by 40%

New mean = Original mean - 40% of original mean

$\Rightarrow$  New mean = 12 - 40% of 12

$\Rightarrow$  New mean =  $12 - \frac{40}{100} \times 12$

$\Rightarrow$  New mean =  $12 - \frac{2}{5} \times 12$

$\Rightarrow$  New mean = 12 - 0.4  $\times$  12

$\Rightarrow$  New mean = 12 - 4.8

$\Rightarrow$  New mean = 7.2

**Solution 2:**

$$\text{Mean of given data} = \frac{18 + 24 + 15 + 2x + 1 + 12}{5}$$

$$\Rightarrow 21 = \frac{70 + 2x}{5}$$

$$\Rightarrow 5 \times 21 = 70 + 2x$$

$$\Rightarrow 105 = 70 + 2x$$

$$\Rightarrow 2x = 105 - 70$$

$$\Rightarrow 2x = 35$$

$$\Rightarrow x = \frac{35}{2}$$

$$\Rightarrow x = 17.5$$

**Solution 3:**

Let  $\bar{x}$  be the mean of  $n$  number of observations  $x_1, x_2, x_3, \dots, x_n$

$$\text{Mean of given data} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

Given that mean of 6 numbers is 42.

That is,

$$\frac{x_1 + x_2 + x_3 + \dots + x_6}{6} = 42$$

$$\Rightarrow x_1 + x_2 + x_3 + \dots + x_6 = 6 \times 42$$

$$\Rightarrow x_1 + x_2 + x_3 + x_4 + x_5 = 252 - x_6 \dots (1)$$

Also, given that the mean of 5 numbers is 45.

That is,

$$\frac{x_1 + x_2 + x_3 + x_4 + x_5}{5} = 45$$

$$\Rightarrow x_1 + x_2 + x_3 + x_4 + x_5 = 5 \times 45$$

$$\Rightarrow x_1 + x_2 + x_3 + x_4 + x_5 = 225 \dots (2)$$

From equations (1) and (2), we have,

$$x_1 + x_2 + x_3 + x_4 + x_5 = 252 - x_6 = x_1 + x_2 + x_3 + x_4 + x_5 = 225$$

$$252 - x_6 = 225$$

$$\Rightarrow x_6 = 252 - 225 = 27$$

**Solution 4:**

Let  $\bar{x}$  be the mean of  $n$  number of observations  $x_1, x_2, x_3, \dots, x_n$

$$\text{Mean of given data} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

Given that mean of 10 numbers is 24.

That is,

$$\frac{x_1 + x_2 + x_3 + \dots + x_{10}}{10} = 24$$

$$\Rightarrow x_1 + x_2 + x_3 + \dots + x_{10} = 10 \times 24$$

$$\Rightarrow x_1 + x_2 + x_3 + \dots + x_{10} = 240$$

$$\Rightarrow x_1 + x_2 + x_3 + \dots + x_{10} + x_{11} = 240 + x_{11} \dots (1)$$

Also, given that mean of 11 numbers is 25.

That is,

$$\frac{x_1 + x_2 + x_3 + \dots + x_{10} + x_{11}}{11} = 25$$

$$\Rightarrow x_1 + x_2 + x_3 + \dots + x_{10} + x_{11} = 11 \times 25$$

$$\Rightarrow x_1 + x_2 + x_3 + \dots + x_{10} + x_{11} = 275 \dots (2)$$

From equations (1) and (2), we have:

$$x_1 + x_2 + x_3 + \dots + x_{10} + x_{11} = 240 + x_{11} = 275$$

$$240 + x_{11} = 275$$

$$\Rightarrow x_{11} = 275 - 240 = 35$$

**Solution 5:**

Consider the given data:

44, 47, 63, 65,  $x+13$ , 87, 93, 99, 110

Here the number of observations is 9, which is odd.

Thus, the median of the given data is  $\left(\frac{n+1}{2}\right)^{\text{th}}$  observation.

From the given data,  $\left(\frac{9+1}{2} = 5\right)^{\text{th}}$  observation is  $x + 13$

Also, given that the median is 78.

Thus, we have

$$x + 13 = 78$$

$$\Rightarrow x = 78 - 13$$

$$\Rightarrow x = 65$$



**Solution 6:**

Consider the given data:

24, 27, 43, 48,  $x - 1$ ,  $x + 3$ , 68, 73, 80, 90.

Here the number of observations is 10, which is even.

Thus, the median of given data is  $\frac{1}{2} \left[ \left( \frac{n}{2} \right)^{\text{th}} \text{ term} + \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ term} \right]$ .

From the given data,  $\left( \frac{10}{2} = 5 \right)^{\text{th}}$  observation is  $x - 1$

and  $\left( \frac{10}{2} + 1 = 6 \right)^{\text{th}}$  observation is  $x + 3$ .

Also, given that the median is 58.

Thus, we have

$$\frac{1}{2} [x - 1 + x + 3] = 58$$

$$\Rightarrow 2x + 2 = 116$$

$$\Rightarrow 2x = 116 - 2$$

$$\Rightarrow 2x = 114$$

$$\Rightarrow x = \frac{114}{2}$$

$$\Rightarrow x = 57$$

**Solution 7:**

Let  $\bar{x}$  be the mean of  $n$  number of observations  $x_1, x_2, x_3, \dots, x_n$

$$\text{Mean} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

Therefore,

$$\begin{aligned}\text{Mean of given data} &= \frac{30 + 32 + 24 + 34 + 26 + 28 + 30 + 35 + 33 + 25}{10} \\ &= \frac{297}{10} \\ &= 29.7\end{aligned}$$

(i)

Let us tabulate the observations and their deviations from the mean

| Observations<br>$x_i$ | Deviations<br>$x_i - \bar{x}$ |
|-----------------------|-------------------------------|
| 30                    | 0.3                           |
| 32                    | 2.3                           |
| 24                    | -5.7                          |
| 34                    | 4.3                           |
| 26                    | -3.7                          |
| 28                    | -1.7                          |
| 30                    | 0.3                           |
| 35                    | 5.3                           |
| 33                    | 3.3                           |
| 25                    | -4.7                          |
| Total                 | 0                             |

From the table, it is clear that the sum of the deviations from

(ii)

Consider the given data:

30, 32, 24, 34, 26, 28, 30, 35, 33, 25

Let us rewrite the above data in ascending order.

24, 25, 26, 28, 30, 30, 32, 33, 34, 35

There are 10 observations, which is even.

$$\begin{aligned}\text{Therefore, median} &= \frac{1}{2} \left[ \left( \frac{n}{2} \right)^{\text{th}} \text{ term} + \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\ &= \frac{1}{2} \left[ \left( \frac{10}{2} \right)^{\text{th}} \text{ term} + \left( \frac{10}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\ &= \frac{1}{2} [ (5)^{\text{th}} \text{ term} + (5 + 1)^{\text{th}} \text{ term} ] \\ &= \frac{1}{2} [ 5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term} ] \\ &= \frac{1}{2} [ 30 + 30 ] \\ &= \frac{1}{2} [ 60 ] \\ &= 30\end{aligned}$$

**Solution 8:**

Let  $\bar{x}$  be the mean of  $n$  number of observations  $x_1, x_2, x_3, \dots, x_n$

$$\text{Mean} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

Therefore,

$$\begin{aligned}\text{Mean of given data} &= \frac{35 + 48 + 92 + 76 + 64 + 52 + 51 + 63 + 71}{9} \\ &= \frac{552}{9} \\ &= 61.33\end{aligned}$$

Let us rewrite the given data in ascending order:

Thus, we have

35, 48, 51, 52, 63, 64, 71, 76, 92

There are 9 observations, which is odd.

Therefore, median =  $\left(\frac{n+1}{2}\right)^{\text{th}}$  observation

$$\Rightarrow \text{Median} = \left(\frac{9+1}{2}\right)^{\text{th}} \text{ observation}$$

$$\Rightarrow \text{Median} = \left(\frac{10}{2}\right)^{\text{th}} \text{ observation}$$

$$\Rightarrow \text{Median} = 5^{\text{th}} \text{ observation}$$

$$\Rightarrow \text{Median} = 63$$

If 51 is replaced by 66, the new set of data in ascending order is:

35, 48, 52, 63, 64, 66, 71, 76, 92

Since median =  $5^{\text{th}}$  observation,

We have, new median = 64

**Solution 9:**

Let  $\bar{x}$  be the mean of  $n$  number of observations  $x_1, x_2, x_3, \dots, x_n$

$$\text{Mean} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

Therefore,

$$\begin{aligned}\text{Mean of given data} &= \frac{x + x + 2 + x + 4 + x + 6 + x + 8}{5} \\ &= \frac{5x + 20}{5} \\ &= x + 4\end{aligned}$$

Also, it's given that mean of the given data is 11.

$$\Rightarrow x + 4 = 11$$

$$\Rightarrow x = 7$$

$$\begin{aligned}\text{Hence the mean of the first three observations} &= \frac{x + x + 2 + x + 4}{3} \\ &= \frac{3x + 6}{3} \\ &= x + 2 \\ &= 7 + 2 \\ &= 9\end{aligned}$$

**Solution 10:**

Let us find the factors of 72:

$$\begin{aligned}72 &= 1 \times 72 \\&= 2 \times 36 \\&= 3 \times 24 \\&= 4 \times 18 \\&= 6 \times 12 \\&= 8 \times 9 \\&= 9 \times 8 \\&= 12 \times 6 \\&= 18 \times 4 \\&= 24 \times 3 \\&= 36 \times 2 \\&= 72 \times 1\end{aligned}$$

Therefore, the data set is:

1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

$$\begin{aligned}\text{Mean of the above data set} &= \frac{1+2+3+4+6+8+9+12+18+24+36+72}{12} \\&= \frac{195}{12} \\&= 16.25\end{aligned}$$

Since the number of observations is 12, which is even, median is given by

$$\begin{aligned}\text{Median} &= \frac{1}{2} \left[ \left( \frac{n}{2} \right)^{\text{th}} \text{ term} + \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\&= \frac{1}{2} \left[ \left( \frac{12}{2} \right)^{\text{th}} \text{ term} + \left( \frac{12}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\&= \frac{1}{2} [6^{\text{th}} \text{ term} + 7^{\text{th}} \text{ term}] \\&= \frac{1}{2} [8 + 9] \\&= \frac{1}{2} \times 17 \\&= 8.5\end{aligned}$$