

Chapter 24: Measure of Central Tendency

Exercise 24.1

1.) If the heights of 5 persons are 140 cm, 150 cm, 152 cm, 158 cm and 161 cm respectively, find the mean height.

→ Here, given that,

The heights of 5 persons are 140 cm, 150 cm, 152 cm, 158 cm & 161 cm respectively.

$$\begin{aligned}\text{Mean height} &= \frac{(140 + 150 + 152 + 158 + 161)}{5} \\ &= 761/5\end{aligned}$$

$$\boxed{\text{Mean height} = 152.2 \text{ cm}}$$

Thus, here for given data the mean height is found to be 152.2 cm

2.) Find the mean of 994, 996, 998, 1002, 1000.

→ Given numbers are 994, 996, 998, 1002 & 1000.

The given numbers are total 5 in quantity.

$$\begin{aligned}\text{Thus, Mean} &= \frac{(\text{sum of all no.})}{5} \\ &= \frac{(994 + 996 + 998 + 1002 + 1000)}{5} \\ &= 4990/5\end{aligned}$$

$$\boxed{\text{Mean} = 998}$$

3.) Find the mean of first five natural numbers.

→ The first five natural numbers are 1, 2, 3, 4, 5.

$$\text{Then, Mean} = \frac{(\text{sum of all no.})}{5} = \frac{(1 + 2 + 3 + 4 + 5)}{5}$$

$$\text{Mean} = \frac{15}{5}$$

$$\boxed{\text{Mean} = 3}$$

Thus, the mean of first five natural numbers is found to be 3.

4.) Find the mean of all factors of 10.

→ Given number is 10.

The factors of 10 are: 1, 2, 5, 10.

$$\text{Sum of all factors} = (1 + 2 + 5 + 10) = 18$$

Total no. of factors are = 4

$$\text{Thus, (Mean of all factors of 10)} = \frac{(\text{Sum of all factors})}{4}$$

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

$$\boxed{\text{Mean} = 4.5}$$

Thus, the mean of all factors of 10 is found to be 4.5.

5.) Find the mean of first 10 even natural numbers.

→ We have,

The first 10 even natural numbers are:

2, 4, 6, 8, 10, 12, 14, 16, 18, 20

$$\begin{aligned} \text{(Sum of first 10 even)} \\ \text{natural no.} &= (2 + 4 + 6 + 8 + 10 + 12 + 14 + 16 + 18 + 20) \\ &= 110 \end{aligned}$$

$$\text{Then, Mean} = \frac{\text{sum of all numbers}}{\text{Total numbers}}$$

$$= \frac{110}{10}$$

$$\boxed{\text{Mean} = 11}$$

Thus, the mean of first 10 even natural numbers is found to be 11.

6.) find the mean of $x, x+2, x+4, x+6, x+8$.

→ Given that,

The numbers are $x, x+2, x+4, x+6, x+8$.

The given total numbers are 5 in quantity.

$$\begin{aligned}\text{Then, Mean} &= \frac{(\text{sum of all no.})}{5} \\ &= \frac{(x + x+2 + x+4 + x+6 + x+8)}{5} \\ &= \frac{(5x+20)}{5}\end{aligned}$$

$$\boxed{\text{Mean} = x+4}$$

Here, the mean of given number is found to be $(x+4)$.

7.) Find the mean of first five multiples of 3.

→ We have,

The first five multiples of 3 are: 3, 6, 9, 12, 15.

$$\text{Sum of all numbers} = (3+6+9+12+15) = 45$$

$$\begin{aligned}\text{Then, Mean} &= \frac{(\text{sum of all numbers})}{5} \\ &= 45/5\end{aligned}$$

$$\boxed{\text{Mean} = 9}$$

Thus, here the mean of first five multiples of 3 is found to be 9.

8.) following are weights (in kg) of 10 new born babies in a hospital on a particular day:

3.4, 3.6, 4.2, 4.5, 3.9, 4.1, 3.8, 4.5, 4.4, 3.6

find the mean.

→ Here, the weights of 10 new born babies in a hospital on a particular day are

3.4, 3.6, 4.2, 4.5, 3.9, 4.1, 3.8, 4.5, 4.4, 3.6.

$$\begin{aligned} \text{Then, Mean} &= \frac{\text{(sum of weights of all 10 new born babies)}}{10} \\ &= \frac{(3.4 + 3.6 + 4.2 + 4.5 + 3.9 + 4.1 + 3.8 + 4.5 + 4.4 + 3.6)}{10} \\ &= 40/10 \end{aligned}$$

$$\boxed{\text{Mean} = 4}$$

Here, the mean weight is found to be 4 kg.

9.) The percentage marks obtained by students of a class in mathematics are: 64, 36, 47, 23, 0, 19, 81, 93, 72, 35, 3, 1. Find their mean.

→ Here, given that

The percentage marks obtained by students of a class in mathematics are: 64, 36, 47, 23, 0, 19, 81, 93, 72, 35, 3, 1.

$$\begin{aligned} \text{Sum of all marks} &= (64 + 36 + 47 + 23 + 0 + 19 + 81 + 93 + 72 + 35 + 3 + 1) \\ &= 474 \end{aligned}$$

$$\text{Total no. of students} = 12$$

$$\begin{aligned} \text{Then, Mean marks} &= \frac{\text{(sum of all marks)}}{12} \\ &= 474/12 \end{aligned}$$

$$\boxed{\text{Mean} = 39.5}$$

Here, the mean marks are found to be 39.5.

10.) The numbers of children in 10 families of a locality are: 2, 4, 3, 4, 2, 3, 5, 1, 1, 5.

Find the number of children per family.

→ Here, the no. of children in 10 families of a locality are given that 2, 4, 3, 4, 2, 3, 5, 1, 1, 5.

$$\begin{aligned} \text{Total no. of children} &= (2 + 4 + 3 + 4 + 2 + 3 + 5 + 1 + 1 + 5) \\ &= 30 \end{aligned}$$

Total families given = 10

Number of children per family = Mean

$$= \frac{(\text{total no. of children})}{\text{total families}}$$

$$= \frac{30}{10}$$

$$\boxed{\text{Mean} = 3}$$

Thus, the no. of children per family may be 3.

Exercise 242

1.) Calculate the mean for the following distribution:

x	5	6	7	8	9	
f	4	8	14	11	3	

→

x	f	fx
5	4	20
6	8	48
7	14	98
8	11	88
9	3	27
	$N=40$	$\Sigma fx=281$

We have,

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{N}$$

$$= \frac{281}{40}$$

$$= 7.025$$

Thus, The mean for the given distribution is found to be 7.025.

2.) Find the mean of the following data.

x_i	19	21	23	25	27	29	31
f_i	13	15	16	18	16	15	13

→

x	f	fx
19	13	247
21	15	315
23	16	368
25	18	450
27	16	432
29	15	435
31	13	403
	$N=106$	$\Sigma fx = 2650$

We have,

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{N}$$

$$= \frac{2650}{106}$$

$$\boxed{\text{Mean} = 25}$$

Thus, for the given data the mean is found to be 25.

3.) The mean of the following data is 20.6. Find the value of p .

x :	10	15	p	25	35
f	3	10	25	7	5

We have,

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{N}$$

$$20.6 = \frac{(25p + 530)}{50}$$

$$25p + 530 = 1030$$

$$25p = 1030 - 530 = 500$$

$$\boxed{p = 20}$$

Thus, for given data the value of p is found to be 20.

4.) If the mean of the following data is 15, find p .

x :	5	10	15	20	25
f :	6	p	6	10	5

We have,

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{N}$$

x	f	fx
5	6	30
10	p	$10p$
15	6	90
20	10	200
25	5	125
	$N = p + 27$	$\Sigma fx = 10p + 445$

We have, Mean (\bar{x}) = $\frac{\Sigma fx}{N}$

$$15 = \frac{(10p + 445)}{(p + 27)}$$

$$10p + 445 = 15p + 27(15)$$

$$10p - 15p = 405 - 445 = -40$$

$$-5p = -40$$

$$\boxed{p = 8}$$

Thus, for given data the value of p is found to be 8.

5.) Find the value of p for the following distribution whose mean is 16.6.

x :	8	12	15	p	20	25	30
f :	12	16	20	24	16	8	4

x	f	fx
8	12	96
12	16	192
15	20	300
p	24	$24p$
20	16	320
25	8	200
30	4	120
	$N = 100$	$\Sigma fx = 24p + 1228$

We have,

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{N}$$

$$16.6 = \frac{(24p + 1228)}{100}$$

$$1660 = 24p + 1228$$

$$24p = 1660 - 1228 = 432$$

$$\boxed{p = 18}$$

Thus, for given data, the value of p is found to be 18.

6.) Find the missing value of p for the following distribution whose mean is 12.58

x	5	8	10	12	p	20	25
f	2	5	8	22	7	4	2

x	f	fx
5	2	10
8	5	40
10	8	80
12	22	264
p	7	$7p$
20	4	80
25	2	50
	$N=50$	$\Sigma fx = 7p + 524$

We have,

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{N}$$

$$12.58 = \frac{(7p + 524)}{50}$$

$$7p + 524 = 12.58 \times 50$$

$$7p + 524 = 629$$

$$7p = 629 - 524$$

$$7p = 105$$

$$\boxed{p = 15}$$

Thus, for given data the value of p is found to be 15.

7.) find the missing frequency (p) for the following distribution whose mean is 7.68.

x :	3	5	7	9	11	13
f :	6	8	15	p	8	4

→

x	f	fx
3	6	18
5	8	40
7	15	105
9	p	$9p$
11	8	88
13	4	52
	$N = p + 41$	$\Sigma fx = 9p + 303$

We have,

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{N}$$

$$7.68 = \frac{(9p + 303)}{(p + 41)}$$

$$9p + 303 = 7.68(p + 41)$$

$$9p + 303 = 7.68p + 314.88$$

$$9p - 7.68p = 314.88 - 303$$

$$1.32p = 11.88$$

$$\boxed{p = 9}$$

Thus, for a given data, the value of p is found to be 9.

Exercise 24.3

1.) Find the median of the following data:

83, 37, 70, 29, 45, 63, 41, 70, 34, 54.

→ Given numbers first we will arrange in ascending order:

29, 34, 37, 41, 45, 54, 63, 70, 70, 83.

Total no. of terms given = 10 (n)

$$\begin{aligned}\text{Then, Median} &= \frac{[\frac{n}{2}\text{th value} + (\frac{n}{2}+1)\text{th value}]}{2} \\ &= \frac{[5\text{th value} + (5+1)\text{th value}]}{2} \\ &= \frac{[45 + 54]}{2}\end{aligned}$$

$$\text{Median} = \frac{(45+54)}{2} = \frac{99}{2} = 49.5$$

Thus, for a given data the median is found to be 49.5.

2.) Find the median of the following data:

133, 73, 89, 108, 94, 104, 94, 85, 100, 120

→ First we will arrange the given numbers in ascending order as follows:

73, 85, 89, 94, 94, 100, 104, 108, 120, 133

The total no. of terms given = n = 10

$$\begin{aligned}\text{Then, Median} &= \frac{[\frac{n}{2}\text{th value} + (\frac{n}{2}+1)\text{th value}]}{2} \\ &= \frac{(5\text{th value} + 6\text{th value})}{2}\end{aligned}$$

$$\text{Median} = \frac{(94+100)}{2} = \frac{194}{2} = 97$$

Thus, for a given data the median is found to be 97.

3.) Find the median of the following data:

31, 38, 27, 28, 36, 25, 35, 40

→ first we will arrange the given numbers in ascending order as follows:

25, 27, 28, 31, 35, 36, 38, 40.

Here, Total no. of terms given = $n = 8$

$$\begin{aligned}\text{Then, Median} &= \frac{[n/2\text{th term} + (\frac{n}{2}+1)\text{th term}]}{2} \\ &= \frac{(4\text{th term} + 5\text{th term})}{2}\end{aligned}$$

$$\text{Median} = \frac{(31+35)}{2} = \frac{66}{2} = 33$$

Thus, for a given data the median is found to be 33.

4.) Find the median of the following data:

15, 6, 16, 8, 22, 21, 9, 18, 25

→ first we will arrange the given numbers in ascending order as follows:

6, 8, 9, 15, 16, 18, 21, 22, 25.

The total no. of terms given = $n = 9$ (odd)

$$\begin{aligned}\text{Then, Median} &= \left(\frac{n+1}{2}\right)\text{th term} \\ &= \left(\frac{9+1}{2}\right)\text{th term} \\ &= \frac{10}{2}\text{th term} = 5\text{th term}\end{aligned}$$

$$\boxed{\text{Median} = 16}$$

Thus, for a given data the median is found to be 16.

5.) Find the median of the following data:

41, 43, 127, 99, 71, 92, 71, 58, 57

→ first we will arrange the given no. in ascending order as follows:

41, 43, 57, 58, 71, 71, 92, 99, 127

The total no. of terms given are $= n = 9$ (odd)

$$\begin{aligned}\text{Then, Median} &= \left(\frac{n+1}{2}\right)\text{th term} \\ &= \left(\frac{9+1}{2}\right)\text{th term} \\ &= 5^{\text{th}} \text{ term}\end{aligned}$$

$$\boxed{\text{Median} = 71}$$

Thus, for a given data the median is found to be 71.

6.) Find the median of the following data:

25, 34, 31, 23, 22, 26, 35, 29, 20, 32

→ First we will arrange the given numbers in ascending order as follows:

20, 22, 23, 25, 26, 29, 31, 32, 34, 35.

The total no. of terms given $= n = 10$ (even)

$$\begin{aligned}\text{Then, Median} &= \frac{\left[\frac{n}{2}\text{th term} + \left(\frac{n}{2} + 1\right)\text{th term}\right]}{2} \\ &= \frac{(5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term})}{2} \\ &= \frac{(26 + 29)}{2} = \frac{55}{2}\end{aligned}$$

$$\boxed{\text{Median} = 27.5}$$

Thus, for a given data the median is found to be 27.5.

7.) Find the median of the following data:

12, 17, 3, 14, 5, 8, 7, 15

→ First we will arrange the given no. in ascending order as follows:

3, 5, 7, 8, 12, 14, 15, 17

Here, total no. of terms given $= 8$ (even)

Then,

$$\begin{aligned}\text{Median} &= \frac{\left[\frac{n}{2}\text{th term} + \left(\frac{n}{2}+1\right)\text{th term}\right]}{2} \\ &= \frac{(4\text{th term} + 5\text{th term})}{2} \\ &= \frac{(8+12)}{2} = \frac{20}{2}\end{aligned}$$

$$\boxed{\text{Median} = 10}$$

Thus, for a given data the median is found to be 10.

8.) Find the median of the following data:

92, 35, 67, 85, 72, 81, 56, 51, 42, 69

→ first we will arrange the given data in ascending order as follows:

35, 42, 51, 56, 67, 69, 72, 81, 85, 92.

Here, the total no. of terms given = $n = 10$ (even).

$$\begin{aligned}\text{Then, Median} &= \frac{\left[\frac{n}{2}\text{th term} + \left(\frac{n}{2}+1\right)\text{th term}\right]}{2} \\ &= \frac{(5\text{th term} + 6\text{th term})}{2} \\ &= \frac{(67+69)}{2} = \frac{136}{2} = 68\end{aligned}$$

$$\boxed{\text{Median} = 68}$$

Thus, for a given data the median is found to be 68.

Exercise 24.4

1.) Find out the mode of the following marks obtained by 15 students in a class:

Marks: 4, 6, 5, 7, 9, 8, 10, 4, 7, 6, 5, 9, 8, 7, 7.

→ From given data we make a frequency table first as given below:

Marks	4	5	6	7	8	9	10
No. of stude.	2	2	2	4	2	2	1

Mode means the term which is occurring most frequently in the given observations.

Thus, here we can see that the term (7) is occurring most frequently. Hence, $\boxed{\text{mode} = 7}$

2.) Find out the mode from the following data:

125, 175, 225, 125, 225, 175, 325, 125, 375, 225, 125

→ From given data we make a frequency table first as shown below:

Values	125	175	225	325	375
Frequency	4	2	3	1	1

Mode means the term which is occurring most frequently in the given observations.

Thus, here we can see that, the term 125 is occurring most frequently. Hence, $\boxed{\text{mode} = 125}$

3.) Find the mode for the following data:

7.5, 7.3, 7.2, 7.2, 7.4, 7.7, 7.7, 7.5, 7.3, 7.2, 7.6, 7.2

→ From given data we will make a frequency table first as given below:

Values	7.2	7.3	7.4	7.5	7.6	7.7
frequency	4	2	1	2	1	2

Mode means the term which is occurring most frequently in the given observations.

Thus, here we can see that, the term 7.2 is occurring most frequently.

Hence, $\boxed{\text{mode} = 7.2}$

Exercise VSAQs

1.) If the ratio of mean & median of a certain data is 2:3, then find the ratio of its mode & mean.

→ Here, given that mean: median = 2:3

We have, $\text{Mode} = 3(\text{median}) - 2(\text{mean})$

If mean = $2x$ then median = $3x$.

$$\Rightarrow \text{Mode} = 3(3x) - 2(2x) \\ = 9x - 4x$$

$$\boxed{\text{Mode} = 5x}$$

Thus, the ratio of mode & mean is found to be

$$\boxed{\text{mode} : \text{mean} = 5 : 2}$$

2.) If the ratio of mode & median of a certain data is 6:5, then find the ratio of its mean & median.

→ Given that, mode: median = 6:5

$$\Rightarrow \frac{\text{Mode}}{\text{median}} = \frac{6}{5}$$

$$\text{Mode} = (6\text{median}) / 5$$

we have, $\text{Mode} = 3(\text{Median}) - 2(\text{Mean})$

$$\frac{(6\text{median})}{5} = 3(\text{median}) - 2(\text{Mean})$$

$$\Rightarrow \frac{(6 \text{ median})}{5} - 3 \text{ median} = -2 \text{ mean}$$

$$[-9 \text{ median}] = (-2 \text{ mean}) \times 5$$

$$\frac{\text{Mean}}{\text{median}} = \frac{91}{2 \times 5} = \frac{9}{10}$$

$$\boxed{\text{Mean} : \text{Median} = 9 : 10}$$

3.) If the mean of $(x+2)$, $(2x+3)$, $(3x+4)$, $(4x+5)$ is $(x+2)$, find x .

→ Given terms are, $(x+2)$, $(2x+3)$, $(3x+4)$, $(4x+5)$.

The total no. of terms are = 4

Mean of given terms = $(x+2)$.

$$\text{Then, sum of all terms} = (x+2+2x+3+3x+4+4x+5) \\ = (10x+14)$$

$$\text{Then, Mean} = \frac{(10x+14)}{4}$$

$$(x+2) = \frac{(10x+14)}{4}$$

$$4x+8 = 10x+14$$

$$\boxed{x = -1}$$

4.) The arithmetic mean & mode of a data are 24 & 12 respectively. then find the median of the data.

→ Given that, Arithmetic mean = 24
Arithmetic mode = 12

Given that, Median = m

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$3(\text{median}) = \text{mode} + 2(\text{mean})$$

$$3(\text{median}) = 12 + 2(24) = 60$$

$$\boxed{\text{Median} = 20}$$