

## EXERCISE 23.4

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**1. Find the mode and median of the data: 13, 16, 12, 14, 19, 12, 14, 13, 14**  
**By using the empirical relation also find the mean.**

**Solution:**

Arranging the data in ascending order such that same numbers are put together, we get:

12, 12, 13, 13, 14, 14, 14, 16, 19

Here,  $n = 9$ .

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

Median = value of 5<sup>th</sup> term

Median = 14

Here, 14 occurs the maximum number of times, i.e., three times. Therefore, 14 is the mode of the data.

Now,

Mode = 3 Median – 2 Mean

14 = 3 x 14 – 2 Mean

2 Mean = 42 – 14 = 28

Mean =  $28 \div 2$

= 14.

**2. Find the median and mode of the data: 35, 32, 35, 42, 38, 32, 34**

**Solution:**

Arranging the data in ascending order such that same numbers are put together, we get:

32, 32, 34, 35, 35, 38, 42

Here,  $n = 7$

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

Median = value of 4<sup>th</sup> term

Median = 35

Here, 32 and 35, both occur twice. Therefore, 32 and 35 are the two modes.

**3. Find the mode of the data: 2, 6, 5, 3, 0, 3, 4, 3, 2, 4, 5, 2, 4**

**Solution:**

Arranging the data in ascending order such that same values are put together, we get:

0, 2, 2, 2, 3, 3, 3, 4, 4, 4, 5, 5, 6

Here, 2, 3 and 4 occur three times each. Therefore, 2, 3 and 4 are the three modes.

**4. The runs scored in a cricket match by 11 players are as follows:**

**6, 15, 120, 50, 100, 80, 10, 15, 8, 10, 10**

**Find the mean, mode and median of this data.**

**Solution:**

Arranging the data in ascending order such that same values are put together, we get:

6, 8, 10, 10, 15, 15, 50, 80, 100, 120

Here,  $n = 11$

Therefore median =  $((n+1)/2)^{\text{th}}$  term

Median = value of 6<sup>th</sup> term

Median = 15

Here, 10 occur three times. Therefore, 10 is the mode of the given data.

Now,

Mode = 3 Median – 2 Mean

$10 = 3 \times 15 - 2 \text{ Mean}$

$2 \text{ Mean} = 45 - 10 = 35$

$\text{Mean} = 35 \div 2$

$= 17.5$

**5. Find the mode of the following data:**

**12, 14, 16, 12, 14, 14, 16, 14, 10, 14, 18, 14**

**Solution:**

Arranging the data in ascending order such that same values are put together, we get:

10, 12, 12, 14, 14, 14, 14, 14, 14, 16, 18

Here, clearly, 14 occurs the most number of times.

Therefore, 14 is the mode of the given data.

**6. Heights of 25 children (in cm) in a school are as given below:**

**168, 165, 163, 160, 163, 161, 162, 164, 163, 162, 164, 163, 160, 163, 163, 164, 163, 160, 165, 163, 162**

**What is the mode of heights?**

**Also, find the mean and median.**

**Solution:**

Arranging the data in tabular form, we get:

Height of Children (cm )	Tally marks	Frequency
160		3
161		1
162		4
163		10
164		3
165		3
168		1
Total		25

Therefore median =  $((n+1)/2)^{\text{th}}$  term

Median = value of 13<sup>th</sup> term

Median = 163 cm

Here, clearly, 163 cm occurs the most number of times. Therefore, the mode of the given data is 163 cm.

Mode = 3 Median – 2 Mean

163 = 3 x 163 – 2 Mean

2 Mean = 326

Mean = 163 cm.

**7. The scores in mathematics test (out of 25) of 15 students are as follows:**

**19, 25, 23, 20, 9, 20, 15, 10, 5, 16, 25, 20, 24, 12, 20**

**Find the mode and median of this data. Are they same?**

**Solution:**

Arranging the data in ascending order such that same values are put together, we get:

5, 9, 10, 12, 15, 16, 19, 20, 20, 20, 20, 23, 24, 25, 25

Here,  $n = 15$

Therefore median =  $((n+1)/2)^{\text{th}}$  term

Median = value of 8<sup>th</sup> term

Median = 20

Here, clearly, 20 occurs most number of times, i.e., 4 times. Therefore, the mode of the given data is 20.

Yes, the median and mode of the given data are the same.

**8. Calculate the mean and median for the following data:**

Marks	10	11	12	13	14	16	19	20
Number of students	3	5	4	5	2	3	2	1

Using empirical formula, find its mode.

**Solution:**

Calculation of mean

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i}$$

$$= 332/25$$

$$= 13.28$$

Here,  $n = 25$ , which is an odd number. Therefore,

Therefore median =  $((n+1)/2)^{\text{th}}$  term

Median = value of 13<sup>th</sup> term

$$\text{Median} = 13$$

Now, by using empirical formula we have,

$$\text{Mode} = 3\text{Median} - 2\text{Mean}$$

$$\text{Mode} = 3(13) - 2(13.28)$$

$$\text{Mode} = 39 - 26.56$$

$$\text{Mode} = 12.44.$$

9. The following table shows the weights of 12 persons.

Weight (in kg)	48	50	52	54	58
Number of persons	4	3	2	2	1

Find the median and mean weights. Using empirical relation, calculate its mode.

**Solution:**

$x_i$	$f_i$	$x_i f_i$
48	4	192
50	3	150
52	2	104
54	2	108
58	1	58
Total	$\sum f_i = 12$	$\sum f_i x_i = 612$

Calculation of mean

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i}$$

$$= 612/12$$

$$= 51 \text{ kg}$$

Here  $n = 12$

Therefore median =  $(n/2)^{\text{th}}$  term +  $((n + 1)/2)^{\text{th}}$  term  
Median = (value of 6<sup>th</sup> term + value of 7<sup>th</sup> term)/2  
=  $(50 + 50)/2$   
= 50

Now by empirical formula we have,

Now,

Mode = 3 Median – 2 Mean

Mode =  $3 \times 50 - 2 \times 51$

Mode =  $150 - 102$

Mode = 48 kg.

Thus, Mean = 51 kg, Median = 50 kg and Mode = 48 kg.

