

Mean, Median, and Mode for Grouped Data

Part A – Frequency Tables

The following table shows the annual salaries earned by employees of a small company:

Annual salary (\$)	Frequency	
35 500	3	106 500
42 750	5	213 750
51 000	5	255 000
99 000	1	99 000
150 000	1	150 000
Totals	15	824 250

a) What is the mean salary?

To find the mean of data in a frequency table: for each row...

- multiply each value by its frequency
- add up these values
- divide by the frequency total

$$\begin{aligned}
 & \frac{3(106500) + 5(213750) + 5(255000) + 1(99000) + 1(150000)}{15} \\
 &= \frac{824250}{15} \\
 &= 54950
 \end{aligned}$$

b) What is the median salary?

There are 15 employees. $\therefore$ the salary of the 8th employee is the median. The median salary is \$42 750 (count down from the top of the frequency table).

c) What is the mode salary?

There are two mode salaries. They are \$42 750 and \$51 000 (both with a frequency of 5).

Part B – Grouped Data

If data is already grouped into intervals, only an approximation of the centre of the data can be made.

For grouped data, we use the midpoint of each interval.

The following table shows the number of hours per day of watching TV in a sample of 500 people:

Hours	0-1	2-3	4-5	6-7	8-9	10-11	12-13
Frequency	55	87	145	90	73	35	15

- What is the mean number of TV viewing hours in this group?
- What length of time is most often spent in front of a TV for this group (mode)?
- What is the median number of TV viewing hours?

To help find these answers, construct a frequency table like the following:

Interval	Midpoint (x)	Frequency (f)	Cumulative Frequency	fx
0-1	0.5	55	55	$55(0.5) = 27.5$
2-3	2.5	87	142	$87(2.5) = 217.5$
4-5	4.5	145	287	$145(4.5) = 652.5$
6-7	6.5	90	377	$6.5(90) = 585$
8-9	8.5	73	450	$8.5(73) = 620.5$
10-11	10.5	35	485	$10.5(35) = 367.5$
12-13	12.5	15	500	$12.5(15) = 187.5$
Total				2658

To get the mean, use this formula:

add $\rightarrow \frac{\sum fx}{n}$

... where f is the frequency, x is the midpoint of each interval, and n is the total number of data values.

The median will occur in an interval. Find the middle data value, and then find what interval this value occurs in. The median is the midpoint of that interval.

The mode is the midpoint of the interval that occurs most frequently.

a) mean

$$\frac{\sum fx}{n} = \frac{2658}{500} = 5.316$$

b) mode

Looking at the frequency column, we can see that the “4-5” interval occurs most often. So, the mode is the midpoint of that interval, which is 4.5 . We could also say that the *modal interval* is “4-5”.

c) median

The middle data value is between values 250 and 251. Both these data values occur in the “4-5” interval (look at the Cumulative Frequency column).

So the median is 4.5, the midpoint of the “4-5” interval.

Part C – The Effect of Outliers

Two classes that wrote the same physics examination had the following results:

Class A: 71, 82, 55, 76, 66, 71, 90, 84, 95, 64, 71, 70, 83, 45, 73, 51, 68

Class B: 54, 80, 12, 61, 73, 69, 92, 81, 80, 61, 75, 74, 15, 44, 91, 63, 50, 84

Class A:

Class B:

Mean:

Mean:

Median:

Median:

Mode:

Mode:

Circle the outliers. What effect do outlier values have on the mean?

What measure of central tendency is a better choice when dealing with small data sets that contain outliers?

Part D – Calculating a Weighted Mean

To learn about calculating weighted means, read example 3 on page 130 of your textbook. Take notes in the space below, if you wish.

OTL

Pg. 125 Investigate and Inquire #1-5

Pg. 133 #1a, 2, 3, 5, 7, 8, 9abc, 11