Lesson 3:

Median and Mode

Median and **mode** are two other measures of central tendency.

The median of a set of numbers is the middle value in the data set. It is most easily found when the numbers are listed in ascending or descending order. If there is an even number of values in the data set, the median is the average, or mean, of the two middle numbers.

Median and **mode** are two other measures of central tendency.

The median of a set of numbers is the middle value in the data set. It is most easily found when the numbers are listed in ascending or descending order. If there is an even number of values in the data set, the median is the average, or mean, of the two middle numbers.

median: the midpoint of an ordered data set—half the values are higher and half are lower; a measure of central tendency

The mode of a set of numbers is the number that occurs most often in the list.

The mode of a set of numbers is the number that occurs most often in the list. A set of data can have:

- no mode if each number appears the same number of times;

- one mode if one number occurs more than each of the others; or

- a number of modes if two or more numbers occur the same number of times, and this is the greatest number of times an entry occurs in the data set.

The mode of a set of numbers is the number that occurs most often in the list. A set of data can have:

- no mode if each number appears the same number of times;

- one mode if one number occurs more than each of the others; or

- a number of modes if two or more numbers occur the same number of times, and this is the greatest number of times an entry occurs in the data set.

mode: the value that occurs most often in a set of data; a measure of central tendency

Although the mode is referred to as a measure of central tendency, it does not necessarily lie toward the centre of the list. The mode is used in different situations than the mean or the median. For example, a store owner could use the mode to find out which size of T-shirt is the most popular, and use the information to decide how many T-shirts of each size to order in the future. The mean and median wouldn't help the store owner make this decision.

Example 4

Calculate the median and the mode of the following data sets.

a) 25, 23, 32, 45, 32, 38, 28, 41, 45, 33, 29, 42, 45, 22, 35

b) 11, 3, 16, 29, 31, 65, 79, 51

a)   25, 23, 32, 45, 32, 38, 28, 41, 45, 33, 29, 42, 45, 22, 35

SOLUTION

a)   Arrange the numbers in ascending (or descending) order. You can use the stem and leaf plot method.

Stem	Leaf
2	5, 3, 8, 9, 2
3	2, 2, 8, 3, 5
4	5, 1, 5, 2, 5

Stem	Leaf
2	2, 3, 5, 8, 9
3	2, 2, 3, 5, 8
4	1, 2, 5, 5, 5

In ascending order, the numbers are:

22, 23, 25, 28, 29, 32, 32, 33, 35, 38, 41, 42, 45, 45, 45

a) 25, 23, 32, 45, 32, 38, 28, 41, 45, 33, 29, 42, 45, 22, 35

SOLUTION

a) Arrange the numbers in ascending (or descending) order. You can use the stem and leaf plot method.

Stem	Leaf
2	5, 3, 8, 9, 2
3	2, 2, 8, 3, 5
4	5, 1, 5, 2, 5

Stem	Leaf
2	2, 3, 5, 8, 9
3	2, 2, 3, 5, 8
4	1, 2, 5, 5, 5

In ascending order, the numbers are:

22, 23, 25, 28, 29, 32, 32, 33, 35, 38, 41, 42, 45, 45, 45

There are 15 numbers, so the median is the 8th number in the list. The median is 33.

a) 25, 23, 32, 45, 32, 38, 28, 41, 45, 33, 29, 42, 45, 22, 35

SOLUTION

a) Arrange the numbers in ascending (or descending) order. You can use the stem and leaf plot method.

Stem	Leaf
2	5, 3, 8, 9, 2
3	2, 2, 8, 3, 5
4	5, 1, 5, 2, 5

Stem	Leaf
2	2, 3, 5, 8, 9
3	2, 2, 3, 5, 8
4	1, 2, 5, 5, 5

In ascending order, the numbers are:

22, 23, 25, 28, 29, 32, 32, 33, 35, 38, 41, 42, 45, 45, 45

There are 15 numbers, so the median is the 8th number in the list. The median is 33.

Examine the list to see which number occurs most often.

a) 25, 23, 32, 45, 32, 38, 28, 41, 45, 33, 29, 42, 45, 22, 35

SOLUTION

a) Arrange the numbers in ascending (or descending) order. You can use the stem and leaf plot method.

Stem	Leaf
2	5, 3, 8, 9, 2
3	2, 2, 8, 3, 5
4	5, 1, 5, 2, 5

Stem	Leaf
2	2, 3, 5, 8, 9
3	2, 2, 3, 5, 8
4	1, 2, 5, 5, 5

In ascending order, the numbers are:

22, 23, 25, 28, 29, 32, 32, 33, 35, 38, 41, 42, 45, 45, 45

There are 15 numbers, so the median is the 8th number in the list. The median is 33.

Examine the list to see which number occurs most often. There are three 45s in the list, so the mode is 45.

b)   11, 3, 16, 29, 31, 65, 79, 51

SOLUTION

b)   Arrange the numbers in ascending order.

3, 11, 16, 29, 31, 51, 65, 79

b) 11, 3, 16, 29, 31, 65, 79, 51

SOLUTION

b) Arrange the numbers in ascending order.

3, 11, 16, 29 | 31, 51, 65, 79

There is no middle number

b) 11, 3, 16, 29, 31, 65, 79, 51

SOLUTION

b) Arrange the numbers in ascending order.

3, 11, 16, 29, 31, 51, 65, 79

There are 8 numbers, so the median is the mean of the two middle numbers, 29 and 31.

b) 11, 3, 16, 29, 31, 65, 79, 51

SOLUTION

b) Arrange the numbers in ascending order.

3, 11, 16, 29, 31, 51, 65, 79

There are 8 numbers, so the median is the mean of the two middle numbers, 29 and 31.

$$median = \frac{29 + 31}{2}$$

$$median = \frac{60}{2}$$

$$median = 30$$

b) 11, 3, 16, 29, 31, 65, 79, 51

SOLUTION

b) Arrange the numbers in ascending order.

3, 11, 16, 29, 31, 51, 65, 79

There are 8 numbers, so the median is the mean of the two middle numbers, 29 and 31.

$$\text{median} = \frac{29 + 31}{2}$$

$$\text{median} = \frac{60}{2}$$

$$\text{median} = 30$$

None of the numbers appears more than once in the list, so the data set has no mode.

Example 5

Alexis is a hair stylist in Victoria, BC. In one shift, she earned the following tips:

$$\$5.00, \$2.00, \$0, \$20.00, \$19.65, \$7.89, \$8.50, \$5.00$$

a) What is the mean tip Alexis received?

b) What is the median?

c) What is the mode?

d) Which measure of central tendency best represents the average tip Alexis received?

a) What is the mean tip Alexis received?

$5.00, $2.00, $0, $20.00, $19.65, $7.89, $8.50, $5.00

SOLUTION

a) Calculate the mean.

$$\bar{x} = \frac{\$5.00 + \$2.00 + \$0 + \$20.00 + \$19.65 + \$7.89 + \$8.50 + \$5.00}{8}$$

$$\bar{x} = \frac{\$68.04}{8}$$

$$\bar{x} \approx \$8.51$$

b) What is the median?

$5.00, $2.00, $0, $20.00, $19.65, $7.89, $8.50, $5.00

SOLUTION

b) Calculate the median tip. Organize the tips from lowest to highest.

$0, $2.00, $5.00, $5.00, $7.89, $8.50, $19.65, $20.00

The median is the mean of the two middle values, $5.00 and $7.89.

$$\text{median} = \frac{\$5.00 + \$7.89}{2}$$

$$\text{median} = \frac{\$12.89}{2}$$

$$\text{median} \approx \$6.45$$

c) What is the mode?

$5.00, $2.00, $0, $20.00, $19.65, $7.89, $8.50, $5.00

SOLUTION

c) The value $5.00 occurs twice in the list and it is the only value that appears more than once. It is therefore the mode.

d) Which measure of central tendency best represents the average tip Alexis received?

$5.00, $2.00, $0, $20.00, $19.65, $7.89, $8.50, $5.00

$\bar{x} \approx \$8.51$ median $\approx \$6.45$ **mode = \$5.00**

SOLUTION

d) The mean is not a good measure of central tendency for this data set. The mean of $8.51 is higher than all but two of the values in the data set.

The median and the mode could both be good representations of Alexis's average tip.

Homework:

Build Your Skills

pg. 116-117   pg. 118-119
#9, 10   #11, 12, 13

Practise Your New Skills

pg. 120 - 121
#1, 2, 3, 5