ST. JEAN DE BREBEUF

MATHEMATICS

CHAPTER 3.4

MEASURES OF CENTRAL TENDENCY

CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

KEY CONCEPTS

The **mean**, the **median**, and the **mode** are *measures of central tendency* of a set of data.

MEAN *(commonly known as the* ***average****)*

→Calculated by **adding the data** and **dividing the total by the number of data values**.

MEDIAN

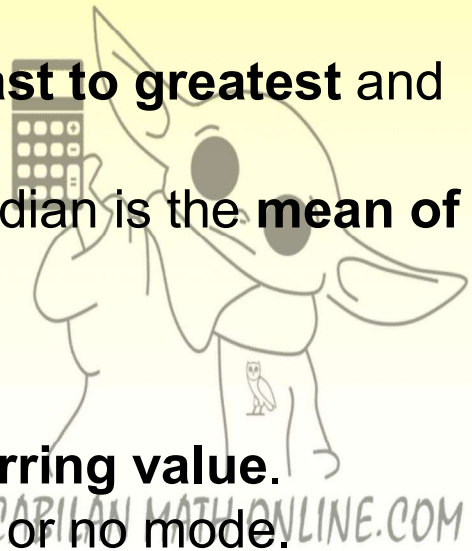
→Found by **listing the data in order from least to greatest** and finding the **middle value**.

→If there is an <u>even</u> number of values, the median is the **mean of the two middle values**.

MODE

→Found by finding the **most frequently occurring value**.

→A set of data <u>can have more than one</u> mode or no mode.

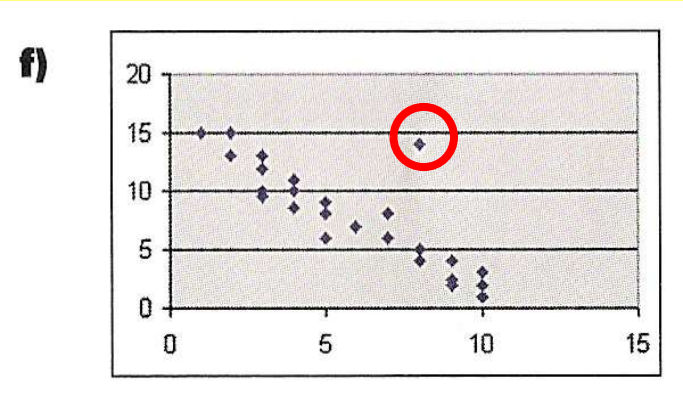


CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

KEY CONCEPTS

Data can also have *extreme* values called **outliers**

→Usually affects the **mean**



CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 1 *Calculating Mean, Median and Mode*

Consider these test scores, all out of 100. There are **16** scores

61, 76, 89, 72, 65, 71, 61, 83, 45, 68, 62, 59, 71, 68, 69, 86

a) Find the **mean** score.

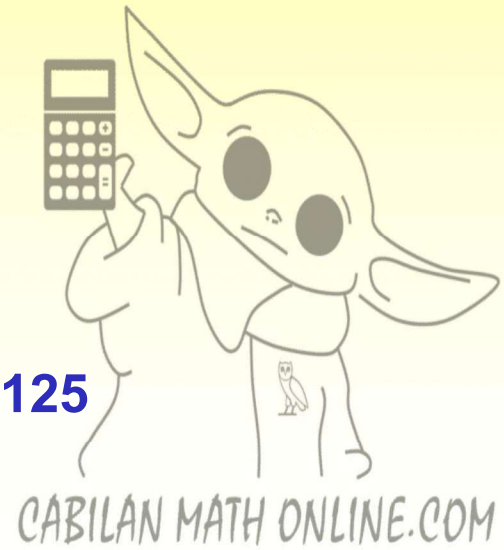
$$Mean = \frac{Sum\ of\ data}{Total\ \#\ of\ data}$$

$$Mean = \frac{61+76+89+\ldots+69+86}{16}$$

$$Mean = \frac{1106}{16}$$

$$\boxed{Mean = 69.125}$$

The mean score is **69.125**



CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 1 *Calculating Mean, Median and Mode*

Consider these test scores, all out of 100. There are **16** scores

61, 76, 89, 72, 65, 71, 61, 83, 45, 68, 62, 59, 71, 68, 69, 86

b) Find the **median** score.

First, arrange data from **lowest** to **highest**

45 59 61 61 62 65 68 68 69 71 71 72 76 83 86 89

There is an even number of data

→ Need to find the **mean** of the two middle values

$$Median = \frac{68+69}{2}$$

$$Median = \frac{137}{2}$$

$$\boxed{Median = 68.5}$$

The median score is **68.5**.

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CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 1 *Calculating Mean, Median and Mode*

Consider these test scores, all out of 100. There are **16** scores

61, 76, 89, 72, 65, 71, 61, 83, 45, 68, 62, 59, 71, 68, 69, 86

c) Find the **mode** score.

Need to find the score(s) which occur the most frequently

45 59 61 61 62 65 68 68 69 71 71 72 76 83 86 89

There is *more than one* mode!

→ **61, 68** and **71** are the mode scores

CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2A *Best Measure of Central Tendency*

The scores on a mathematics quiz, out of **100**, are shown.

63, 71, 40, 99, 52, 94, 83, 67, 94, 89, 14, 76, 68

There are **13** scores

(a) Find the **mean**

$$Mean = \frac{Sum\ of\ data}{Total\ \#\ of\ data}$$

$$Mean = \frac{63+71+40+\ldots+76+68}{13}$$

$$Mean = \frac{910}{13}$$

$$\boxed{Mean = 70}$$

The mean score is **70**.

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EXAMPLE 2A *Best Measure of Central Tendency*

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There are **13** scores

(b) Find the **median**

Need to arrange the data from **lowest** to **highest**

14 40 52 63 67 68 71 76 83 89 94 94 99

Since there is an odd number of data
→ The median is the middle value

The median score is **71**.

CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2A *Best Measure of Central Tendency*

The scores on a mathematics quiz, out of **100**, are shown.

63, 71, 40, 99, 52, 94, 83, 67, 94, 89, 14, 76, 68

There are **13** scores

(c) Find the **mode**

Need to find the value that occurs most frequently

14 40 52 63 67 68 71 76 83 89 94 94 99

The mode score is **94**.

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CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2A *Best Measure of Central Tendency*

The scores on a mathematics quiz, out of **100**, are shown.

63, 71, 40, 99, 52, 94, 83, 67, 94, 89, 14, 76, 68

There are **13** scores

(d) Are there any **outliers**? Did it have any effect on the *mean, median and/or mode*?

Locate the most 'extreme' data point and remove it to see its effects

~~14~~ 40 52 63 67 68 71 76 83 89 94 94 99

There are now **12** scores

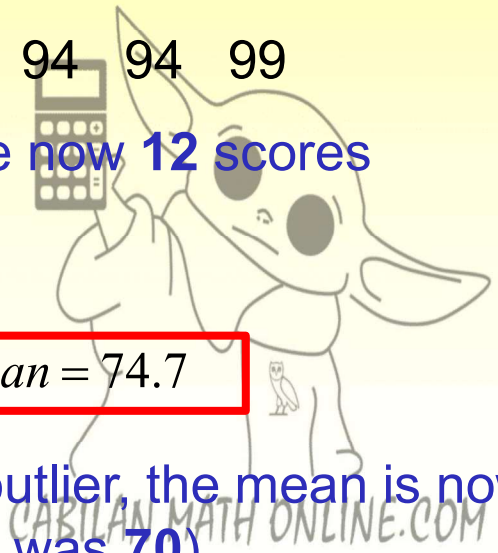
For the **mean** $Mean = \dfrac{Sum\ of\ data}{Total\ \#\ of\ data}$

$$Mean = \frac{40 + 52 + 63 + \ldots + 94 + 99}{12}$$

$$Mean = \frac{896}{12}$$

$$Mean = 74.7$$

Without the outlier, the mean is now **74.7** (original was **70**)



CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2A *Best Measure of Central Tendency*

The scores on a mathematics quiz, out of **100**, are shown.

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There are **13** scores

(d) Are there any **outliers**? Did it have any effect on the *mean, median and/or mode*?

Locate the most 'extreme' data point and remove it to see its effects

~~14~~ 40 52 63 67 68 71 76 83 89 94 94 99

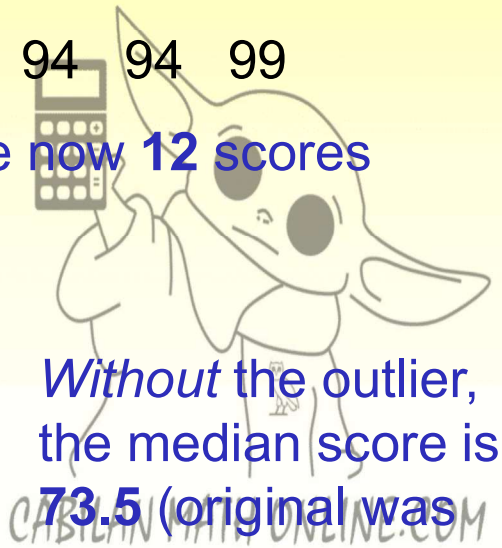
There are now **12** scores

For the **median**
There is an even number of data
→ Need to find the **mean** of the two middle values

$$Median = \frac{71+76}{2}$$

$$Median = \frac{147}{2}$$

$$Median = 73.5$$



Without the outlier, the median score is **73.5** (original was **71**)

CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2A *Best Measure of Central Tendency*

The scores on a mathematics quiz, out of **100**, are shown.

63, 71, 40, 99, 52, 94, 83, 67, 94, 89, 14, 76, 68

There are **13** scores

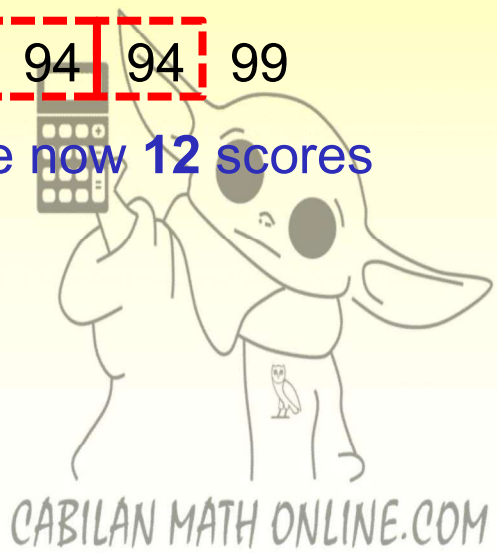
(d) Are there any **outliers**? Did it have any effect on the *mean, median and/or mode*?

Locate the most 'extreme' data point and remove it to see its effects

~~14~~ 40 52 63 67 68 71 76 83 89 94 94 99

There are now **12** scores

For the **mode**
→**NO EFFECT**!
→Mode is still **94**



CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2B

Best Measure of Central Tendency

Complete the table and answer the questions below

# Sold	Price ($)	# sold x Price	Total
4	29.95	4 x $29.95	**$119.80**
10	39.99	10 x $39.99	**$399.90**
12	48.95	12 x $48.95	**$587.40**
6	55.69	6 x $55.69	**$334.14**
5	68.90	5 x $68.90	**$344.50**
3	85.00	3 x $85.00	**$255.00**
TOTAL SOLD 40			**$2040.74**

(a) Find the **mean**

$$Mean = \frac{Total\ price}{Total\ \#\ sold}$$

$$Mean = \frac{\$2040.74}{40}$$

$$Mean = \$51.02$$

The mean price is **$51.02**

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CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2B

Best Measure of Central Tendency

Complete the table and answer the questions below

	# Sold		Price ($)	# sold x Price	Total
1 –	4	4	29.95	4 x $29.95	**$119.80**
5 –	14	10	39.99	10 x $39.99	**$399.90**
15 –	26	12	48.95	12 x $48.95	**$587.40**
27 –	32	6	55.69	6 x $55.69	**$334.14**
33 –	37	5	68.90	5 x $68.90	**$344.50**
38 –	40	3	85.00	3 x $85.00	**$255.00**
	TOTAL SOLD 40				**$2040.74**

(b) Find the **median**

Since there is even number of items sold →need to find the price at which the **20th and 21st** shoe are sold

The median shoe price is **$48.95**

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CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2B

Best Measure of Central Tendency

Complete the table and answer the questions below

(c) Find the **mode** of the following selling prices of running shoes.

Need to find the price where the most shoes were sold

The mode price of the shoes is **$48.95**

# Sold	Price ($)	# sold x Price	Total
4	29.95	4 x $29.95	**$119.80**
10	39.99	10 x $39.99	**$399.90**
12	48.95	12 x $48.95	**$587.40**
6	55.69	6 x $55.69	**$334.14**
5	68.90	5 x $68.90	**$344.50**
3	85.00	3 x $85.00	**$255.00**
TOTAL SOLD 40			**$2040.74**

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CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

EXAMPLE 2B

Best Measure of Central Tendency

Complete the table and answer the questions below

(d) Which measure of central tendency best describes the data?

Since the **median** and **mode** are the same, both of these best describes the data.

# Sold	Price ($)	# sold x Price	Total
4	29.95	4 x $29.95	**$119.80**
10	39.99	10 x $39.99	**$399.90**
12	48.95	12 x $48.95	**$587.40**
6	55.69	6 x $55.69	**$334.14**
5	68.90	5 x $68.90	**$344.50**
3	85.00	3 x $85.00	**$255.00**
TOTAL SOLD 40			**$2040.74**

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CHAPTER 3.4 MEASURES OF CENTRAL TENDENCY

Homework

Page 136 – 139 #1 – 9, 11