

# Notes Unit 8: Mean, Median, Standard Deviation



## I. Mean and Median

The MEAN is the numerical average of the data set.

The mean is found by adding all the values in the set, then dividing the sum by the number of values.



The MEDIAN is the number that is in the middle of a set of data

- 1. Arrange the numbers in the set in order from least to greatest.**
- 2. Then find the number that is in the middle.**

Ex 1: These are Abby's science test scores. Find the mean and median.

86

97

84

73

63

88

97

100

95

Lets find Abby's  
MEAN science test  
score?

97

84

88

100

95

63

73

86

97

Add all  
the values.

Divide the sum  
by the number  
of values.

+

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783

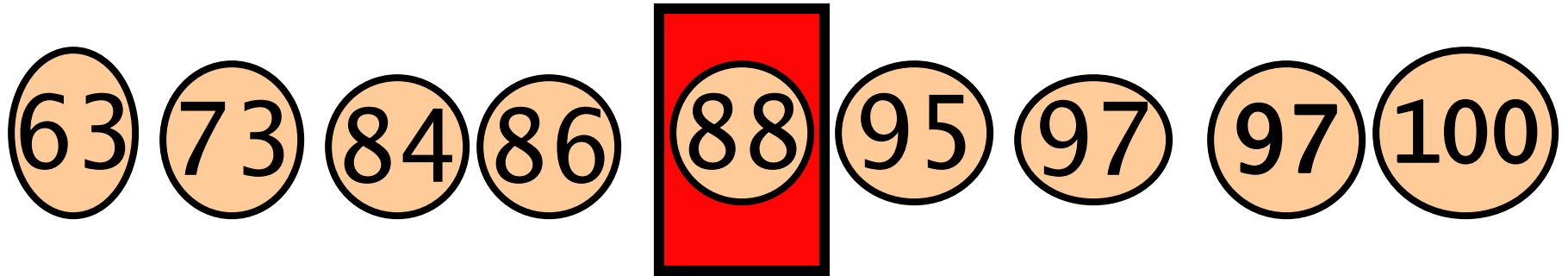
783

÷

9

The mean is **87**

Arrange values from  
least to greatest.



Find the number that is in the middle.

The median is **88**.

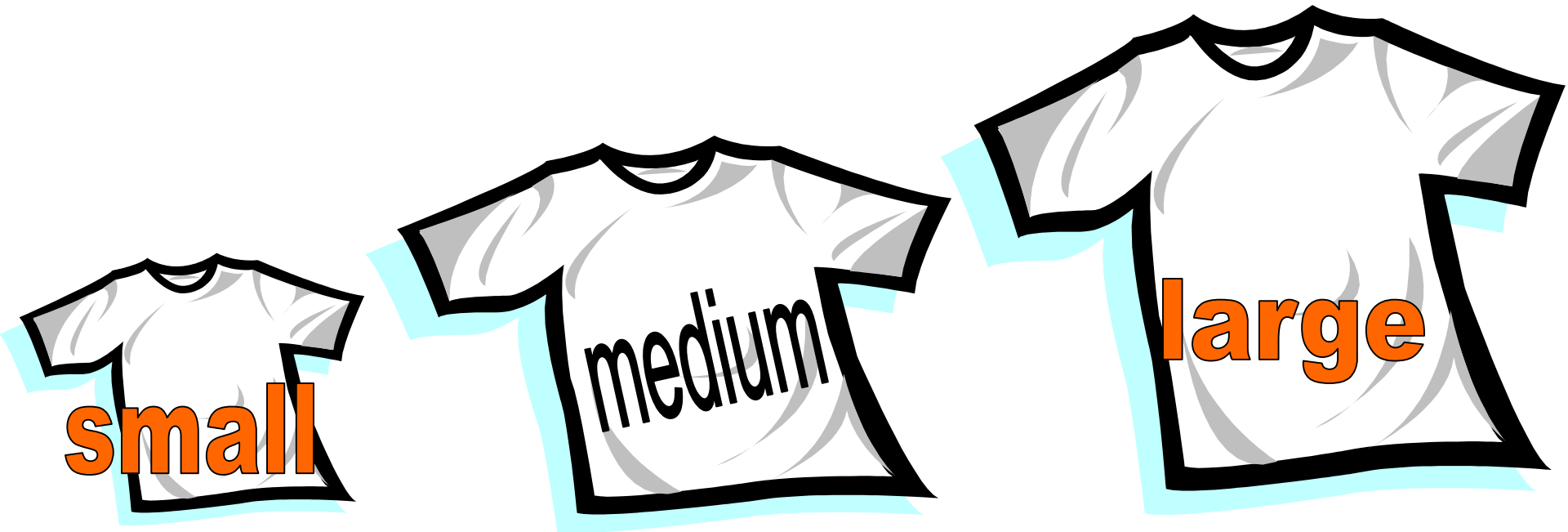
Half the numbers are  
less than the median.

Half the numbers are  
greater than the median.

# Median

Sounds like  
MEDIUM

Think middle when you hear median.



**How do we find  
the MEDIAN  
when two numbers are in the middle?**

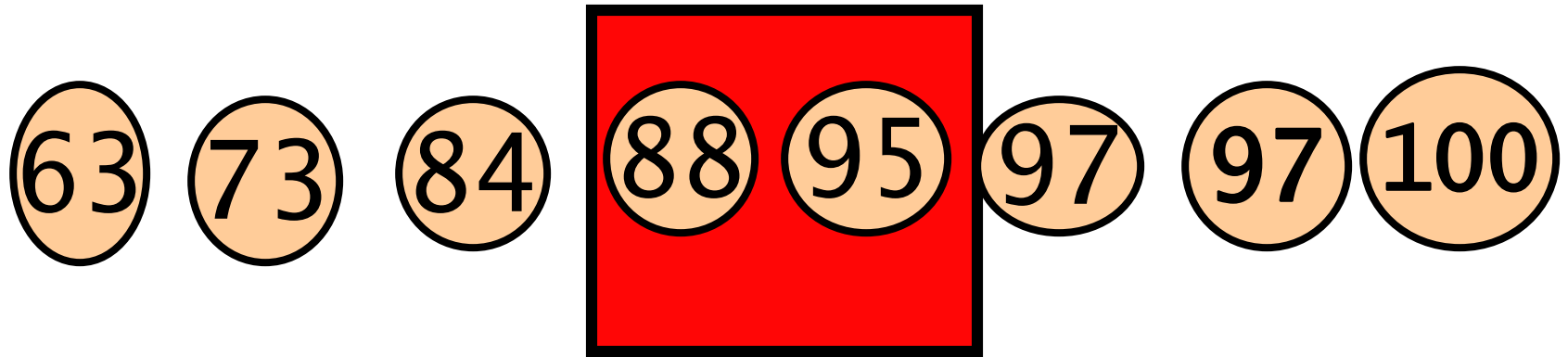
**1. Add the two numbers.**

**2. Then divide by 2.**



Ex 2: Find the median.

Arrange values from least to greatest.



There are two numbers in the middle.

Add the 2 numbers.

$$88 + 95 = 183$$

Divide by 2.

$$183 \div 2$$

The median is  
**91.5**



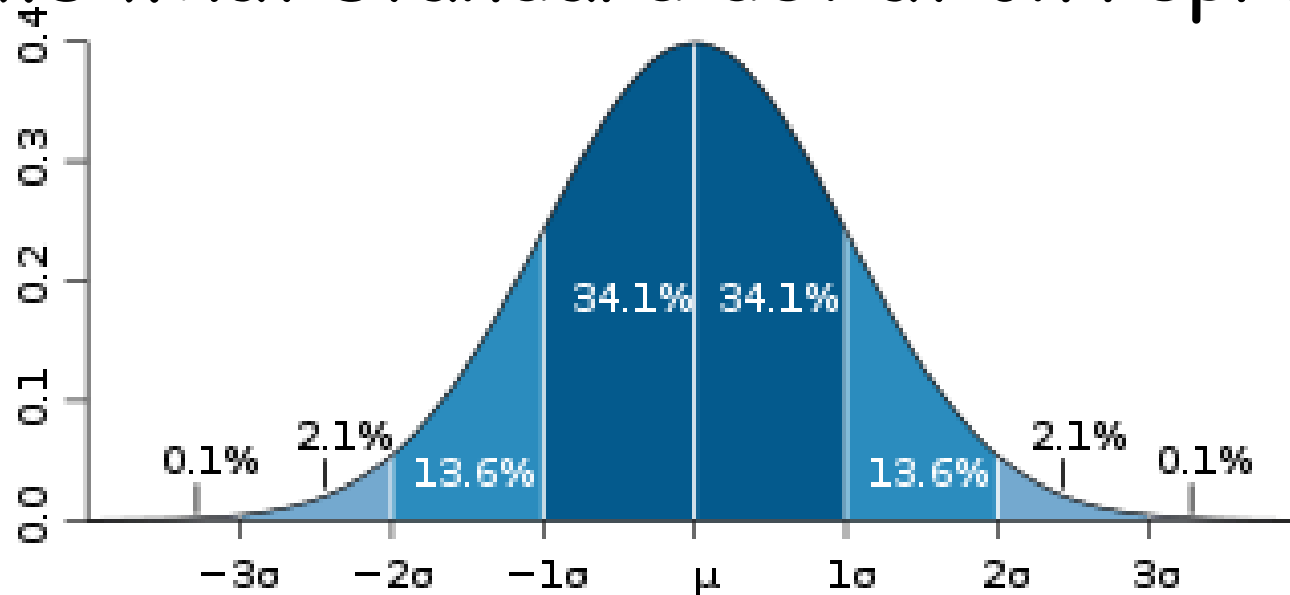
# II. Standard Deviation

## A. Definition and Notation

**Standard Deviation** shows the variation in data. If the data is close together, the standard deviation will be small. If the data is spread out, the standard deviation will be large.

**Standard Deviation** is often denoted by the lowercase Greek letter sigma,  $\sigma$ .

B. Bell Curve: The **bell curve**, which represents a normal distribution of data, shows what standard deviation represents.



One standard deviation away from the mean ( $\mu$ ) in either direction on the horizontal axis accounts for around **68 percent** of the data. Two standard deviations away from the mean accounts for roughly **95 percent** of the data with three standard deviations representing about **99 percent** of the data.

## C. Steps to Finding Standard Deviation

- 1) Find the **mean** of the data.
- 2) Subtract the mean from each value.
- 3) Square each deviation of the mean.
- 4) Find the sum of the squares.
- 5) Divide the total by the number of items.
- 6) Take the square root.

# D. Standard Deviation Formula

The standard deviation formula can be represented using Sigma Notation:

$$\sigma = \sqrt{\frac{\sum (x - \mu)^2}{n}}$$

The expression under the radical is called the 'variance'.

The standard deviation formula is the square root of the variance.

# Ex 1: Find the standard deviation

The math test scores of five students are: 92, 88, 80, 68 and 52.

1) Find the **mean**:  $(92+88+80+68+52)/5 = 76$ .

2) Find the **deviation from the mean**:

$$92-76=16$$

$$88-76=12$$

$$80-76=4$$

$$68-76= -8$$

$$52-76= -24$$

3) Square the deviation from the mean:

$$(16)^2 = 256$$

$$(12)^2 = 144$$

$$(4)^2 = 16$$

$$(-8)^2 = 64$$

$$(-24)^2 = 576$$

4) Find the sum of the squares of the deviation from the mean:

$$256+144+16+64+576= 1056$$

5) Divide by the number of data items:

$$1056/5 = 211.2$$

6) Find the square root of the variance:  $\sqrt{211.2} = 14.53$

Thus the **standard deviation** of the test scores is **14.53**.

## Ex 2: Standard Deviation

A different math class took the same test with these five test scores: 92,92,92,52,52.

Find the **standard deviation** for this class.



# Remember:

- 1) Find the **mean** of the data.
- 2) Subtract the mean from each value.
- 3) Square each deviation of the mean.
- 4) Find the sum of the squares.
- 5) Divide the total by the number of items.
- 6) Take the square root.

The math test scores of five students are: 92,92,92,52 and 52.

1) Find the **mean**:  $(92+92+92+52+52)/5 = 76$

2) Find the deviation from the mean:

$$92-76=16 \quad 92-76=16 \quad 92-76=16$$

$$52-76= -24 \quad 52-76= -24$$

3) Square the deviation from the mean:

$$(16)^2 = 256 \quad (16)^2 = 256 \quad (16)^2 = 256$$

$$(-24)^2 = 576 \quad (-24)^2 = 576$$

4) Find the sum of the squares:

$$256+256+256+576+576= 1920$$

5) Divide the sum of the squares  
by the number of items :

$$1920/5 = 384 \text{ variance}$$

6) Find the square root of the variance:

$$\sqrt{384} = 19.6$$

Thus the **standard deviation** of the  
second set of test scores is 19.6.

### III. Analyzing the Data:

Consider both sets of scores. Both classes have the same mean, 76. However, each class does not have the same scores. Thus we use the standard deviation to show the variation in the scores. With a standard variation of 14.53 for the first class and 19.6 for the second class, what does this tell us?

Class A: 92,88,80,68,52

Class B: 92,92,92,52,52

With a standard variation of 14.53 for the first class and 19.6 for the second class, the scores from the second class would be more spread out than the scores in the second class.

## Summary:

The **mean** is the average, and the **median** is the number in the middle when you order all the numbers from least to greatest.

As we have seen, **standard deviation** measures the dispersion of data.

The greater the value of the **standard deviation**, the further the data tend to be dispersed from the mean.