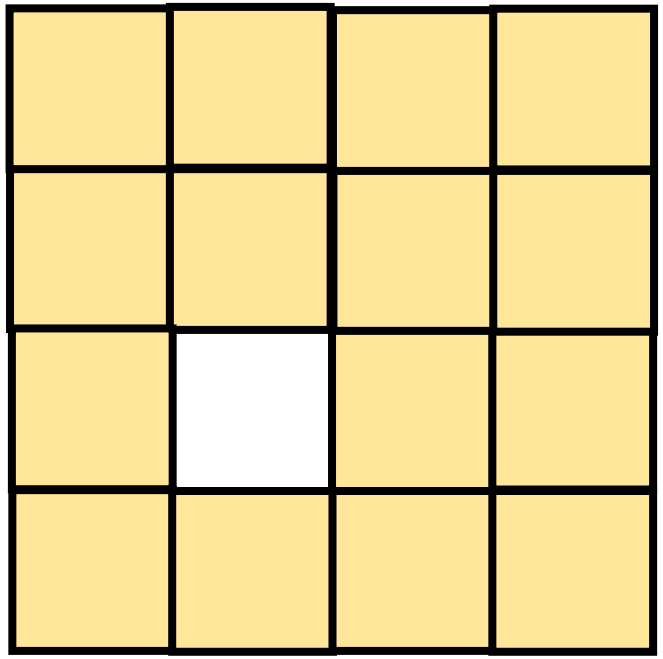
Day 4: Exponents; Ratios/Proportions; Mean/Median/Mode

See the slides from past classes here:

clueslasses.com/ged-math

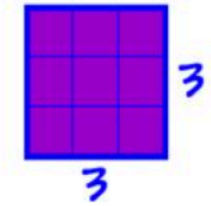
Warm-up

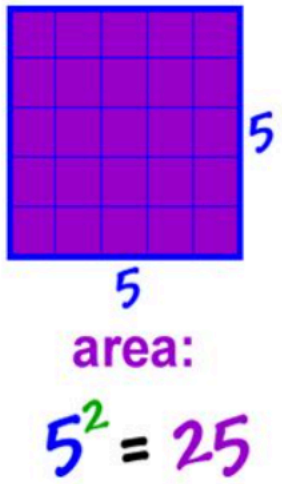
How many yellow boxes are there? Make an equation using integers (whole numbers).

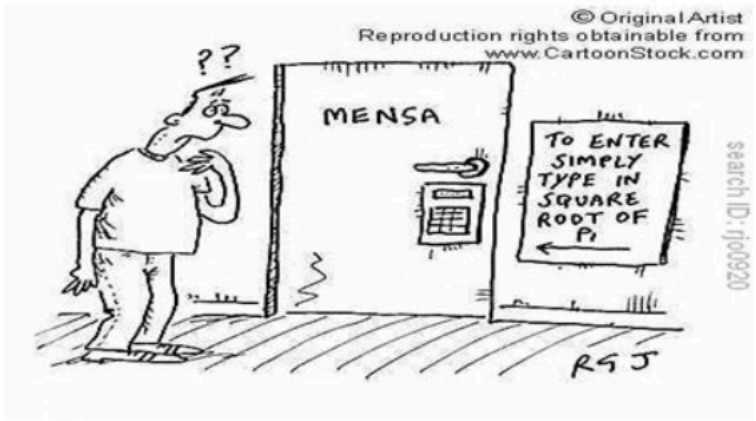


Exponents, Square Roots, Cubes

- When a number or variable is multiplied by itself, the result is called the square of that number or variable.
- Squaring the number 5, for example, is finding the product of 5 x 5= 25, this product is written as 5^2, where the ^{2} indicated that the product is composed of two factors of 5.

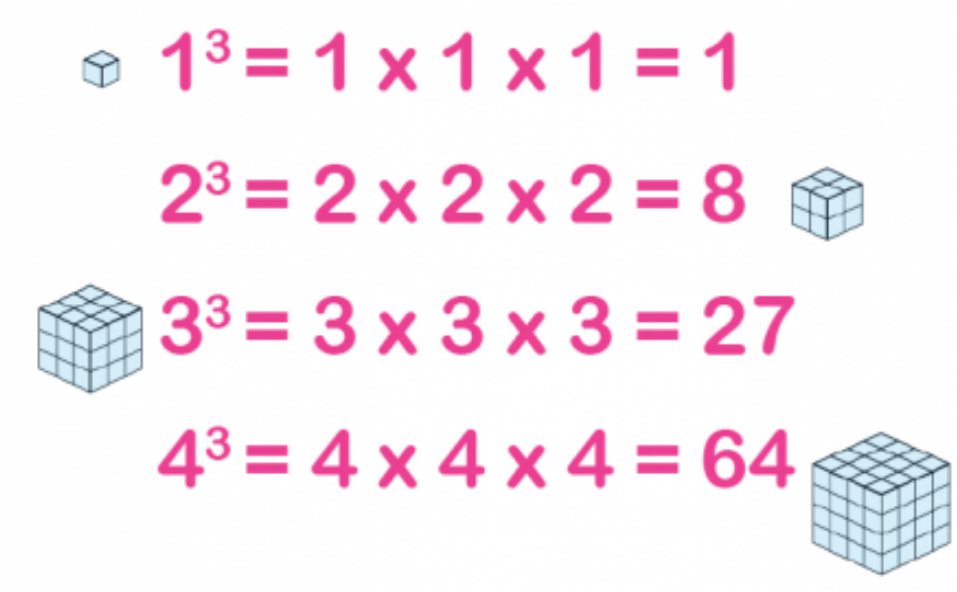


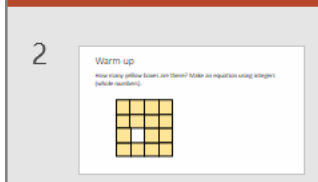
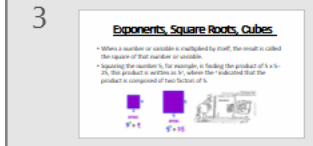
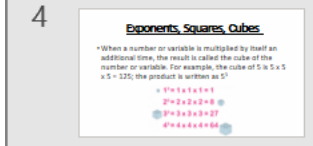


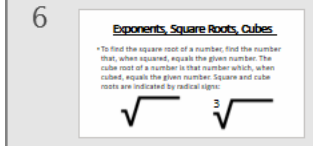
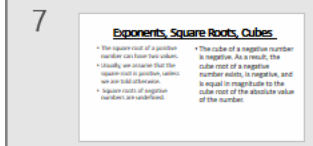
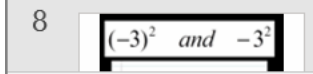


Exponents, Squares, Cubes

- When a number or variable is multiplied by itself an additional time, the result is called the cube of the number or variable. For example, the cube of 5 is 5 x 5 x 5 = 125; the product is written as 5^3



what is the pattern?

+2

+2

+2

Multiply 2 * 1 = 2	Exponents 2 ^ 1 = 2	
2 * 2 = 4	2 ^ 2 = 4 (2 * 2)	*2
2 * 3 = 6	2 ^ 3 = 8 (4 * 2)	*2
2 * 4 = 8	2 ^ 4 = 16 (8 * 2)	*2
2 * 5 = 10	2 ^ 5 = 32 (16 * 2)	

When using exponents, I multiply by the base number each time

$2^2 = 4$ 2^2

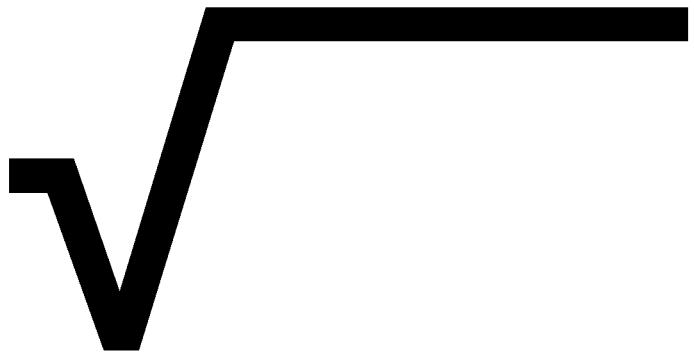
$2^3 = 8$ 2^3

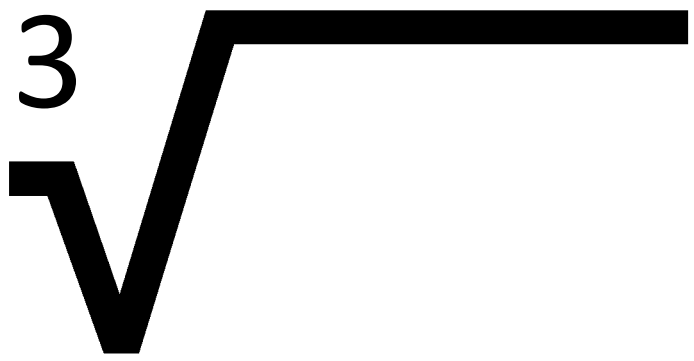
2 * 2 * 2

4 * 2 = 8

Square Root and Cube Root

- To find the square root of a number, find the number that, when squared, equals the given number. The cube root of a number is that number which, when cubed, equals the given number. Square and cube roots are indicated by radical signs:





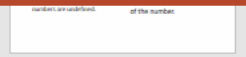
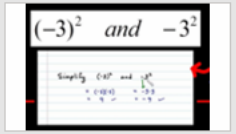
Exponents, Square Roots, Cubes

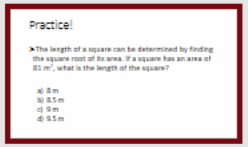
- The square root of a positive number can have two values.
- Usually, we assume that the square root is positive, unless we are told otherwise.
- Square roots of negative numbers are undefined.
- The cube of a negative number is negative. As a result, the cube root of a negative number exists, is negative, and is equal in magnitude to the cube root of the absolute value of the number.

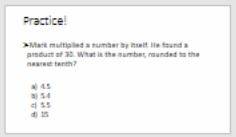
Practice!

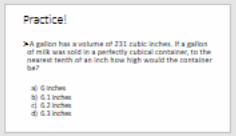
- The length of a square can be determined by finding the square root of its area. If a square has an area of 81 m^2, what is the length of the square?

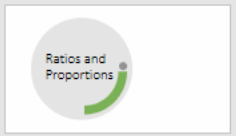
a) 8 m
b) 8.5 m
c) 9 m
d) 9.5 m



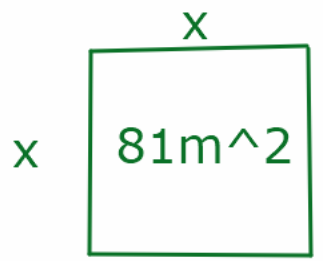






Practice!

area of a square = width * length



➢The length of a square can be determined by finding the square root of its area. If a square has an area of 81 m^2, what is the length of the square?

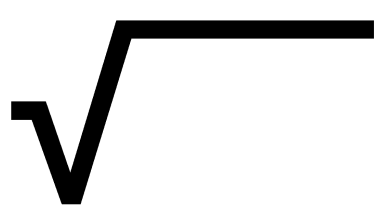
a) 8 m
b) 8.5 m
c) 9 m
d) 9.5 m

9 * 9 = 81

Practice!

- Mark multiplied a number by itself. He found a product of 30. What is the number, rounded to the nearest tenth?

a) 4.5
b) 5.4
c) 5.5
d) 15



Practice!

➢Mark multiplied a number by itself. He found a product of 30. What is the number, rounded to the nearest tenth?

a) 4.5
b) 5.4
c) 5.5
d) 15

5 * 5 = 25
x * x = 30
6 * 6 = 36

$\sqrt{30}$

5.500
= 5.477
5.400

round up to

Practice!

- A gallon has a volume of 231 cubic inches. If a gallon of milk was sold in a perfectly cubical container, to the nearest tenth of an inch how high would the container be?

a) 6 inches
b) 6.1 inches
c) 6.2 inches
d) 6.3 inches

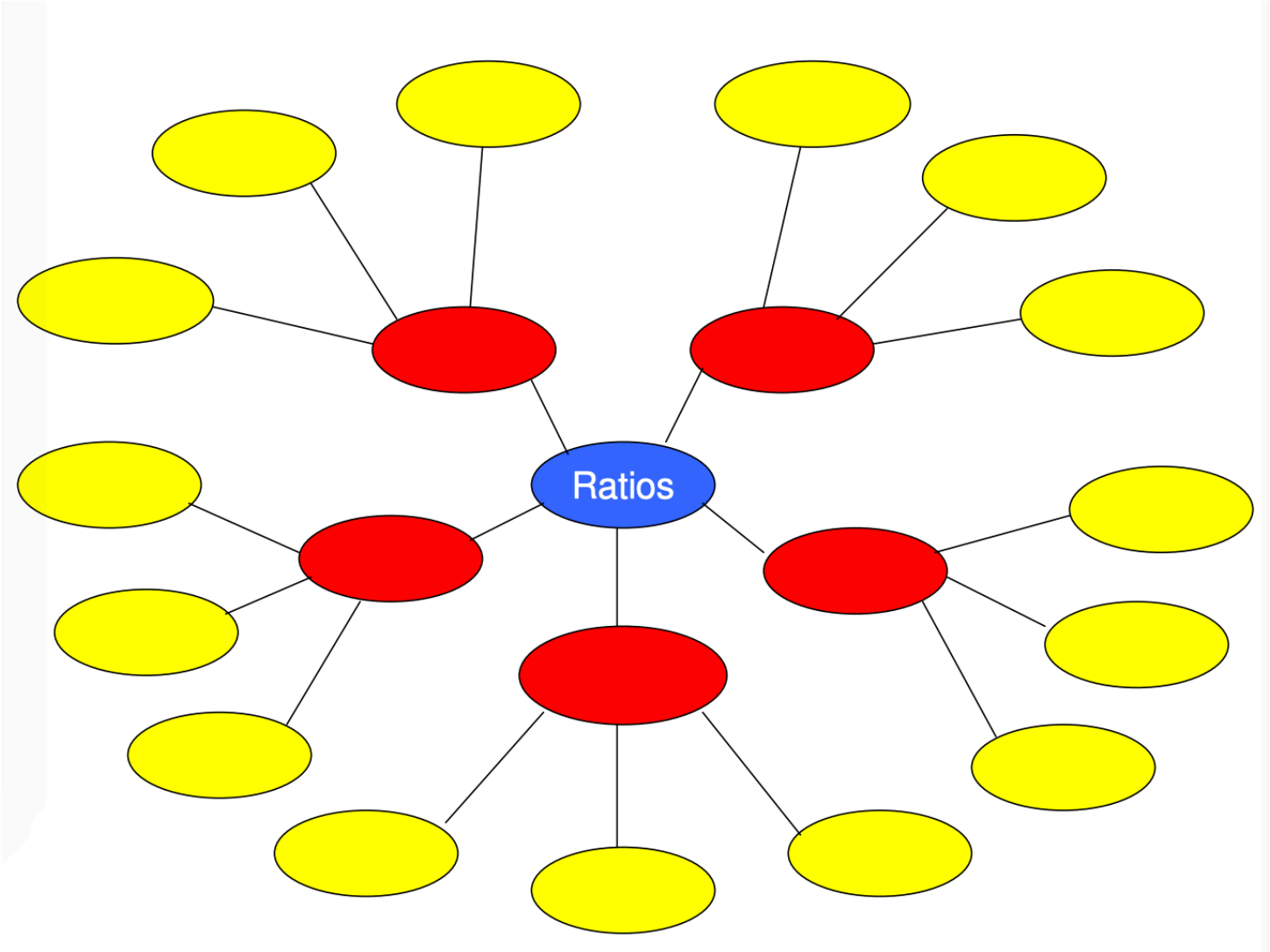
Scientific Notation

Scientific notation uses exponents of 10 to write very large numbers:

- *Approx. distance from the Earth to the moon: 2.389 x 10^5 mi =*
- *Approx. distance from the Earth to the sun: 9.3x10^7mi =*

Ratios and Proportions

Ratios Mind Map:
What do you know?



Discuss

- How are fractions, ratios, and proportions related?
- Where do you see ratios and proportions in the real world?
- Can you create a ratio using an example from your own life?

Example:

- John has 6 pairs of sneakers in his closet: 2 white pairs, 1 red pair, and 3 black pairs. What is the ratio of white sneakers to black ones? What is the ratio of black sneakers to total sneakers?

Ratios

- Jonathan earns $10 in 1 hour (or “$10 per hour”).
- The ratio of dollars earned to hours is 10 to 1, or 10:1.
- A ratio also be written as a fraction: $\frac{10}{1}$

A ratio is different from a fraction. The bottom or second number of a ratio does not necessarily represent a whole. You should still usually simplify (reduce) a ratio when it is your final answer.

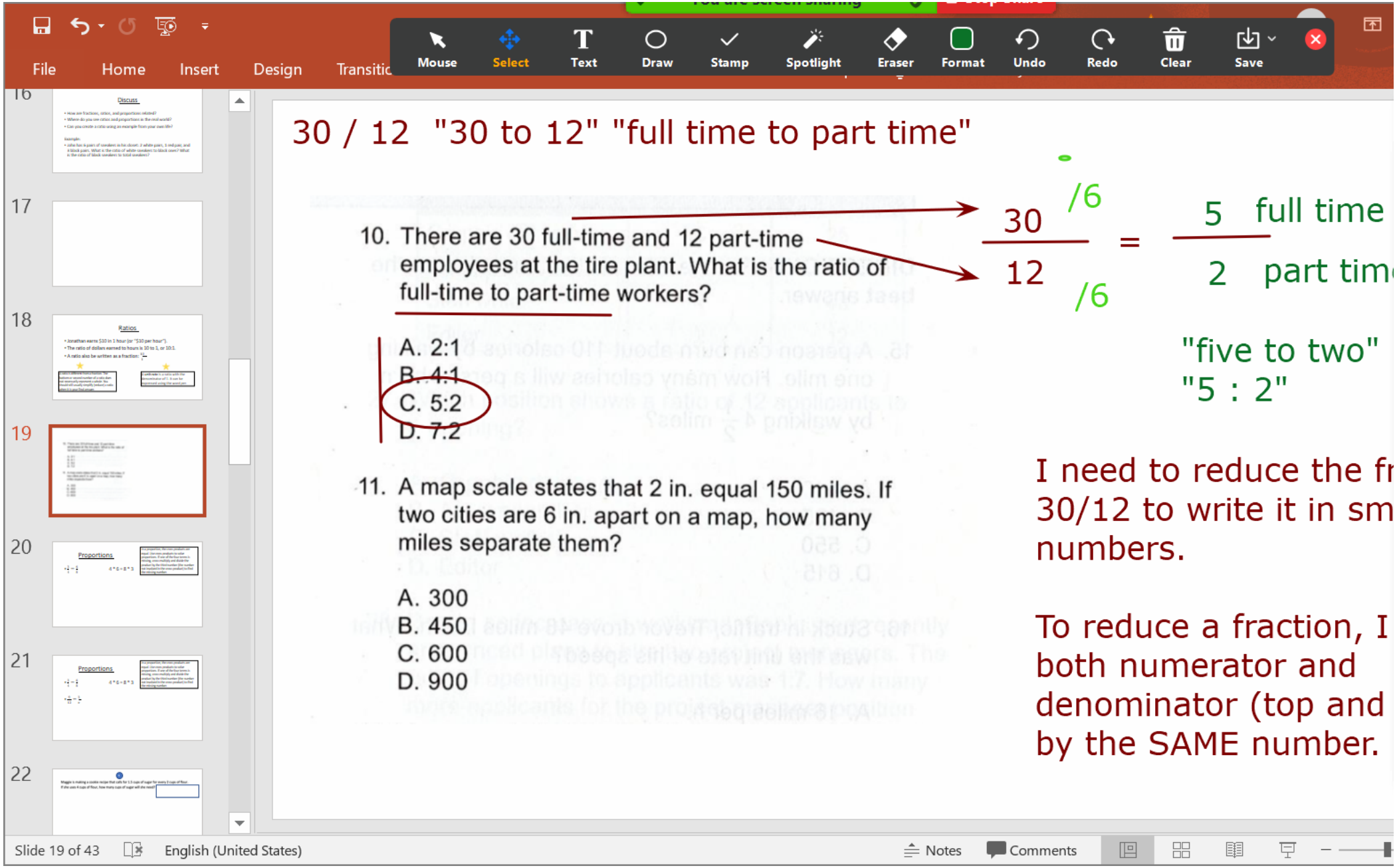
A **unit rate** is a ratio with the denominator of 1. It can be expressed using the word *per.*

10. There are 30 full-time and 12 part-time employees at the tire plant. What is the ratio of full-time to part-time workers?

    A. 2:1
    B. 4:1
    C. 5:2
    D. 7:2

11. A map scale states that 2 in. equal 150 miles. If two cities are 6 in. apart on a map, how many miles separate them?

    A. 300
    B. 450
    C. 600
    D. 900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20
21
22
30 / 12 "30 to 12" "full time to part time"
10. There are 30 full-time and 12 part-time employees at the tire plant. What is the ratio of full-time to part-time workers?
A. 2:1
B. 4:1
C. 5:2
D. 7:2
30 /6
12 /6
= 5 full time
2 part tim
"five to two"
"5 : 2"
11. A map scale states that 2 in. equal 150 miles. If two cities are 6 in. apart on a map, how many miles separate them?
A. 300
B. 450
C. 600
D. 900
I need to reduce the fr
30/12 to write it in sm
numbers.
To reduce a fraction, I
both numerator and
denominator (top and
by the SAME number.
Slide 19 of 43
English (United States)
Notes
Comments

Proportions

- $\frac{3}{4} = \frac{6}{8}$

4 * 6 = 8 * 3

In a proportion, the cross products are equal. Use cross products to solve proportions. If one of the four terms is missing, cross-multiply and divide the product by the third number (the number not involved in the cross-product) to find the missing number.

Proportions

- $\frac{3}{4} = \frac{6}{8}$

$4 * 6 = 8 * 3$

- $\frac{9}{12} = \frac{3}{x}$

In a proportion, the cross products are equal. Use cross products to solve proportions. If one of the four terms is missing, cross-multiply and divide the product by the third number (the number not involved in the cross-product) to find the missing number.

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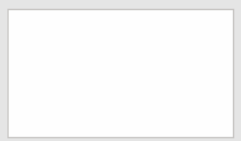



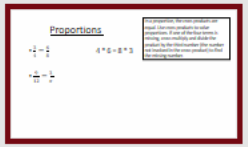

Proportions

- $\frac{3}{4} = \frac{6}{8}$

$4 * 6 = 8 * 3$

- $\frac{9}{12} = \frac{3}{x}$ $= \frac{3}{4}$

$12 * 3 = 9 * x$

$\frac{36}{9} \quad \frac{9x}{9}$

$4 = x$

In a proportion, the cross products
equal. Use cross products to solve
proportions. If one of the four ter
missing, cross-multiply and divide
product by the third number (the
not involved in the cross-product)
the missing number.

x times 9, divided
because 9 divided

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for the proportion to work, i need to make both fractions in the same order : inches / miles

10. There are 30 full-time and 12 part-time employees at the tire plant. What is the ratio of full-time to part-time workers?

A. 2:1
B. 4:1
C. 5:2
D. 7:2

11. A map scale states that 2 in. equal 150 miles. If two cities are 6 in. apart on a map, how many miles separate them?

A. 300
B. 450
C. 600
D. 900

$$\frac{2 \text{ inches}}{150 \text{ miles}} = \frac{6 \text{ inches}}{x \text{ miles}}$$

$$2x = 150*6$$

$$\frac{2x}{2} = \frac{900}{2}$$

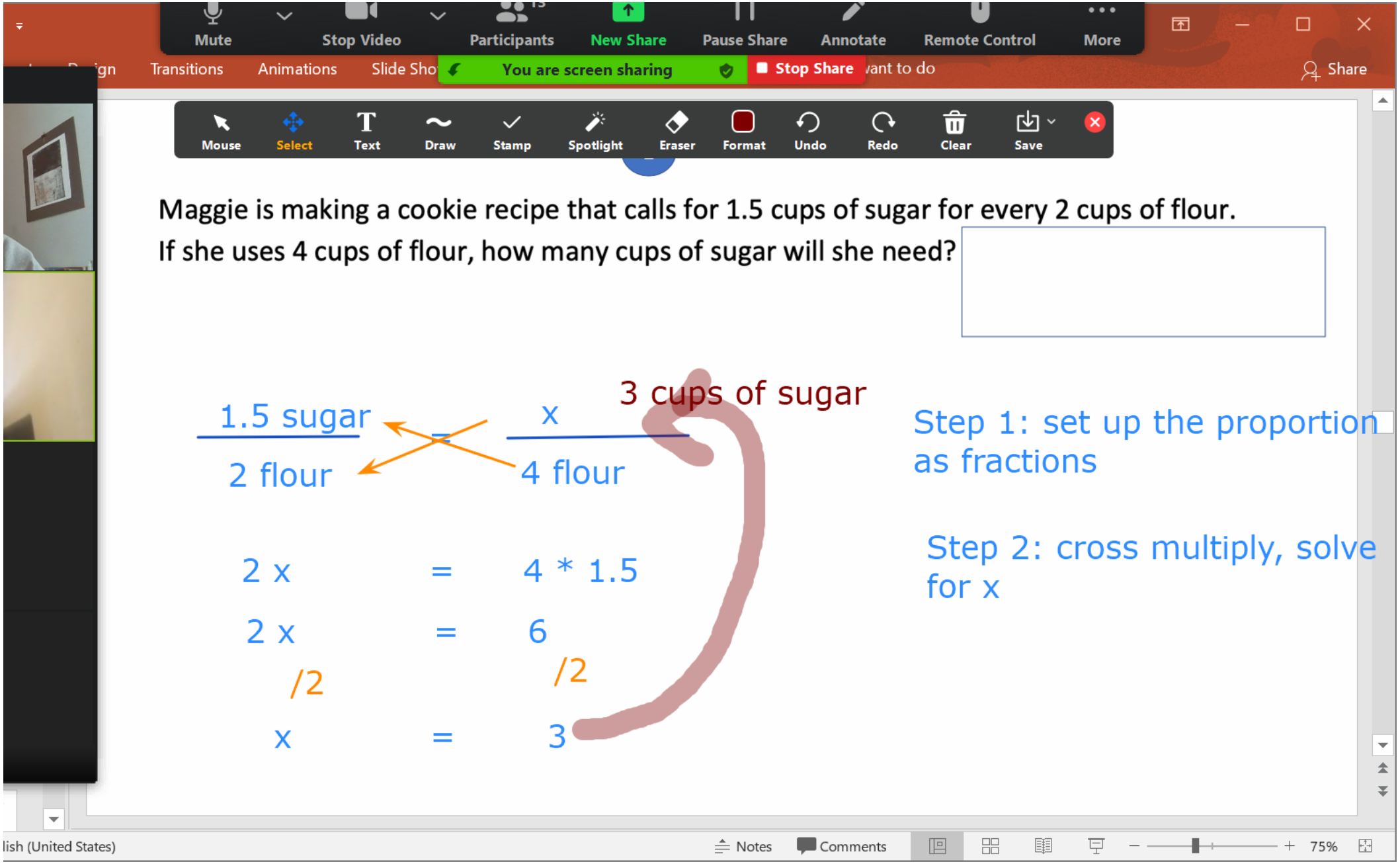
$$x = 450$$

$$\frac{2}{2} = 1$$

1

Maggie is making a cookie recipe that calls for 1.5 cups of sugar for every 2 cups of flour.

If she uses 4 cups of flour, how many cups of sugar will she need?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New Share
Pause Share
Annotate
Remote Control
More
Transitions
Animations
You are screen sharing
Stop Share
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Spotlight
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Format
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Redo
Clear
Save
Maggie is making a cookie recipe that calls for 1.5 cups of sugar for every 2 cups of flour.
If she uses 4 cups of flour, how many cups of sugar will she need?
1.5 sugar / 2 flour = x / 4 flour
3 cups of sugar
2 x = 4 * 1.5
2 x = 6
/2 /2
x = 3
Step 1: set up the proportion as fractions
Step 2: cross multiply, solve for x
lish (United States)
Notes
Comments
75%

2

If Gustav can finish 5 pages in his workbook in 2 days, if he keeps up the same rate for the remaining 12 days of the month, how many pages will he finish in total?

3

James is setting up a fish tank. He is buying a breed of goldfish that typically grows to be 5 inches long. It is recommended that there be 1.5 gallons of water for every inch of fish length in the tank. What is the recommended ratio of gallons of water per fully-grown goldfish in the tank? Complete the ratio table to help answer the following questions:

Number of Fish	Gallons of Water

a. What size tank (in gallons) is needed for James to have full-grown goldfish?
b. b. How many fully-grown goldfish can go in a 40 gallon tank?
c. c. What can you say about the values of the ratios in the table?

Essential Vocabulary

Equation- a mathematical sentence that uses the equal sign (=) to show that two expressions are equal.

Equivalent ratio- two ratios that have the same value when simplified

Fraction- a number that represents part of a whole.

Proportion- two fractions or ratios stating that two things are equal

Rate- a ratio that compares two quantities of different units.

Rate of change- the ratio of the change in the output value and change in the input value of a function

Ratio- a comparison of two numbers by division.

Unit rate- the ratio of two measurements in which the second term is 1.

MEAN
MEDIAN
MODE + RANGE

Let's define these words & learn how to find them.

Mean

- The **mean** is the average value of a data set.
- Find the mean by adding all the values of a set, then divide the sum by the number of values.

Lets find Abby's **MEAN** science test score?

97
84
88
100
95
63
73
86
97

+

783

Add all the values.

Divide the sum by the number of values.

783 ÷ 9

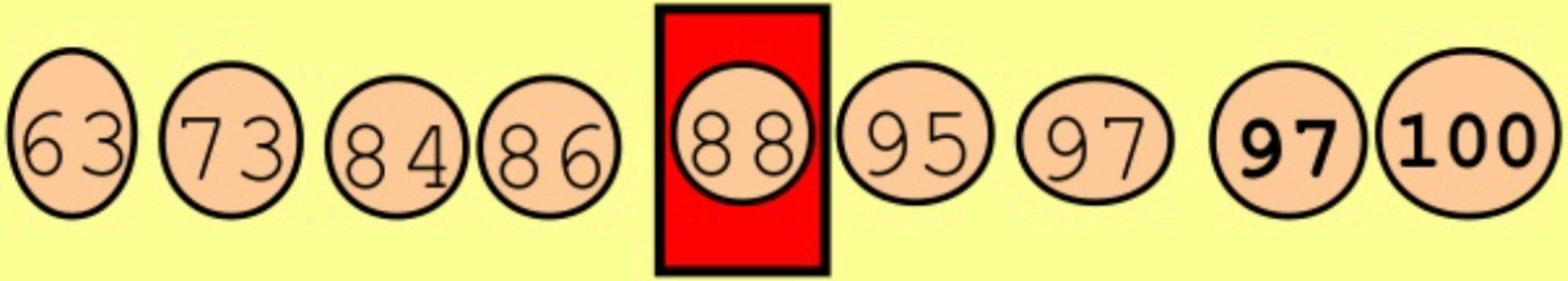
The mean is **87**

Median

- The **median** is the middle number in a set of data.

1. Arrange the numbers in the set from least to greatest.
2. Find the number in the middle.

Arrange values from least to greatest.



Find the number that is in the middle.

The median is **88.**

Half the numbers are <u>less</u> than the median.

Half the numbers are <u>greater</u> than the median.

Median

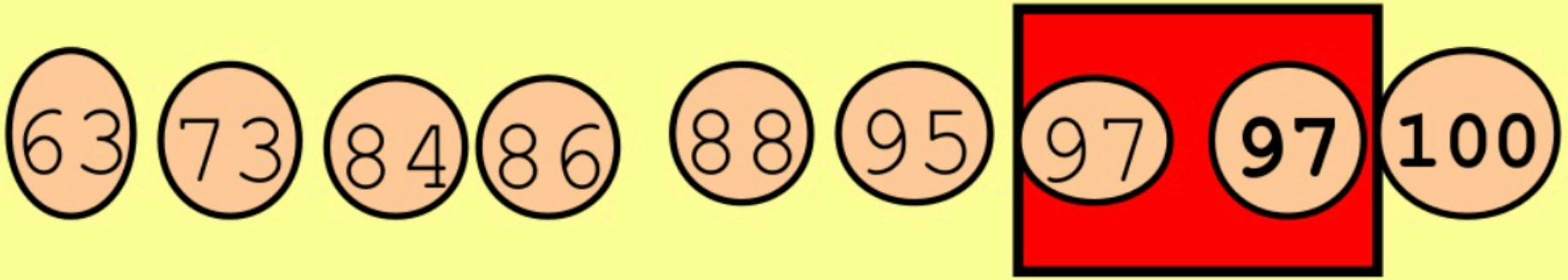
Sounds like
MEDIUM
Think **middle** when you hear median.

Mode

- The mode is the value that occurs most frequently in a set of data.

1. There can be more one mode, more than one mode, or no mode.

Arranging values from least to greatest
makes it easier to find the mode.



Find the number that appears more or most frequently.

The value 97 appears <u>twice.</u>

All other numbers appear just once.

97 is the MODE

MODE

A Hint for remembering the MODE…

The first two letters give you a hint… MOde

Most **O**ften

MODE

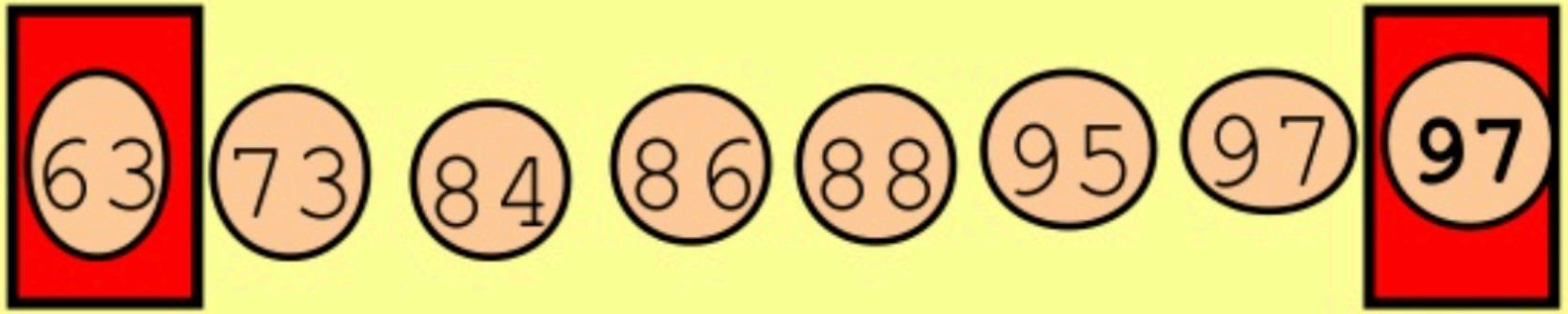
MOST OFTEN

Range

- The range is the difference between the greatest value and the least value in a set of data.

1. Subtract the biggest number from the smallest number in a data set.

Arranging values from least to greatest
makes it easier to find the RANGE.



Subtract the lowest value from the highest.

$$\begin{array}{r} 97 \\ -63 \\ \hline 34 \end{array}$$

34 is the RANGE or spread of this set of data

Runner	Time (Seconds)
David	13.5
Sanya	16
Jeremy	12.6
Erica	15.2
Chen	12.8
Yusuf	11.8
Matt	17.2
Sarah	12.1

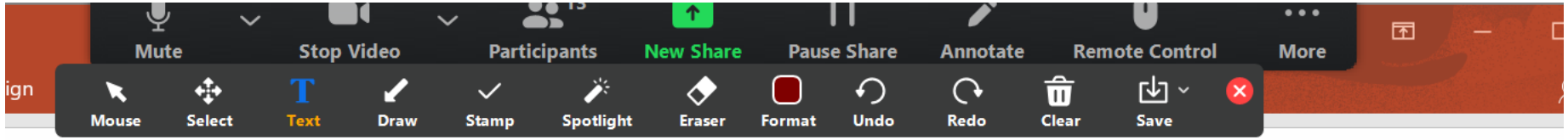
1. What is the range of the runners' times in the 100-meter race?

Runner	Time (Seconds)
David	13.5
Sanya	16
Jeremy	12.6
Erica	15.2
Chen	12.8
Yusuf	11.8
Matt	17.2
Sarah	12.1

2. What is the mean in the race?

Runner	Time (Seconds)
David	13.5
Sanya	16
Jeremy	12.6
Erica	15.2
Chen	12.8
Yusuf	11.8
Matt	17.2
Sarah	12.1

3. What is the median in the race?



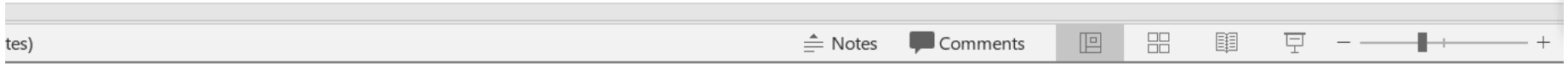
Runner	Time (Seconds)
David	13.5
Sanya	16
Jeremy	12.6
Erica	15.2
Chen	12.8
Yusuf	11.8
Matt	17.2
Sarah	12.1

2. What is the median in the race?

11.8, 12.1, 12.6, 12.8, 13.5, 15.2, 16, 17.2

13.15

(if two numbers are the median, go halfway in between)



In this example, there were TWO numbers that could be the median.

To find a single number, I took the MEAN of those two numbers. The result was 13.15, a different number than the mean of the whole data set, which is 13.9

Runner	Time (Seconds)
David	13.5
Sanya	16
Jeremy	12.6
Erica	15.2
Chen	12.8
Yusuf	11.8
Matt	17.2
Sarah	12.1

3. Describe the relationship between the median and mean in the above race times.

Runner	Time (Seconds)
David	13.5
Sanya	16
Jeremy	12.6
Erica	15.2
Chen	12.8
Yusuf	11.8
Matt	17.2
Sarah	12.1

4. Is there a mode in this data set?

Sneaker World Sales

Day	Total Sales
Monday	**$5,229**
Tuesday	**$3,598**
Wednesday	**$6,055**
Thursday	**$3,110**
Friday	**$3,765**
Saturday	**???**

1. The mean sales for this one week were $4,443. The manager misplaced her records for Saturday. What were the sales on Saturday?

Below are the finish times of 10 high school students in a one-mile race:

- Joe: 10 min
- Jane: 7.5 min
- Jacob: 8.75 min
- Maria: 11 min
- Ralph: 6.5 min
- Susana: 8.25 min
- Larry: 12.5 min
- Norma: 9 min
- Taylor: 15 min
- Marcos: 7.5 min

What is the average (mean) finishing time of this group?

PLATO Homework: Week 4