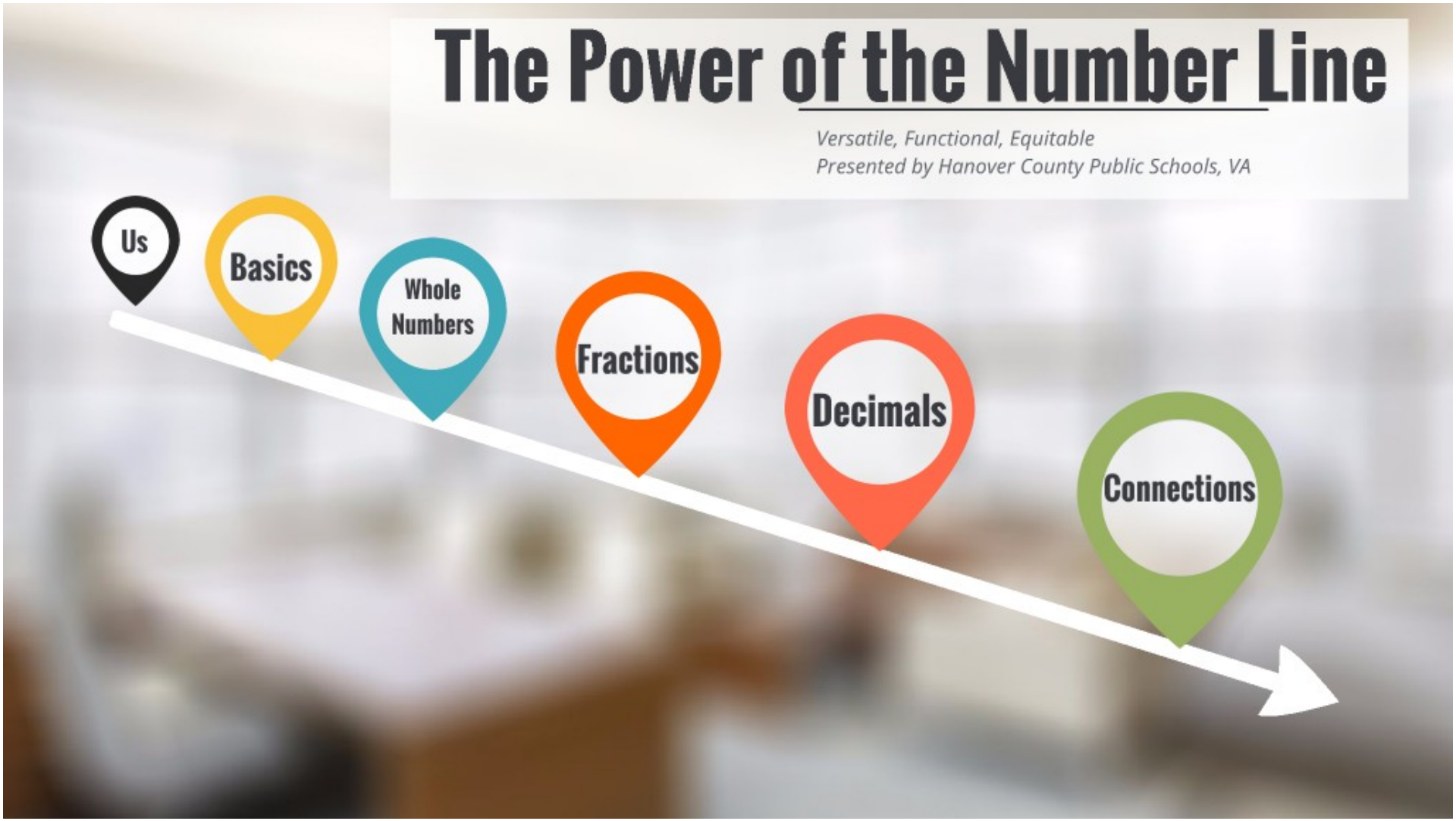
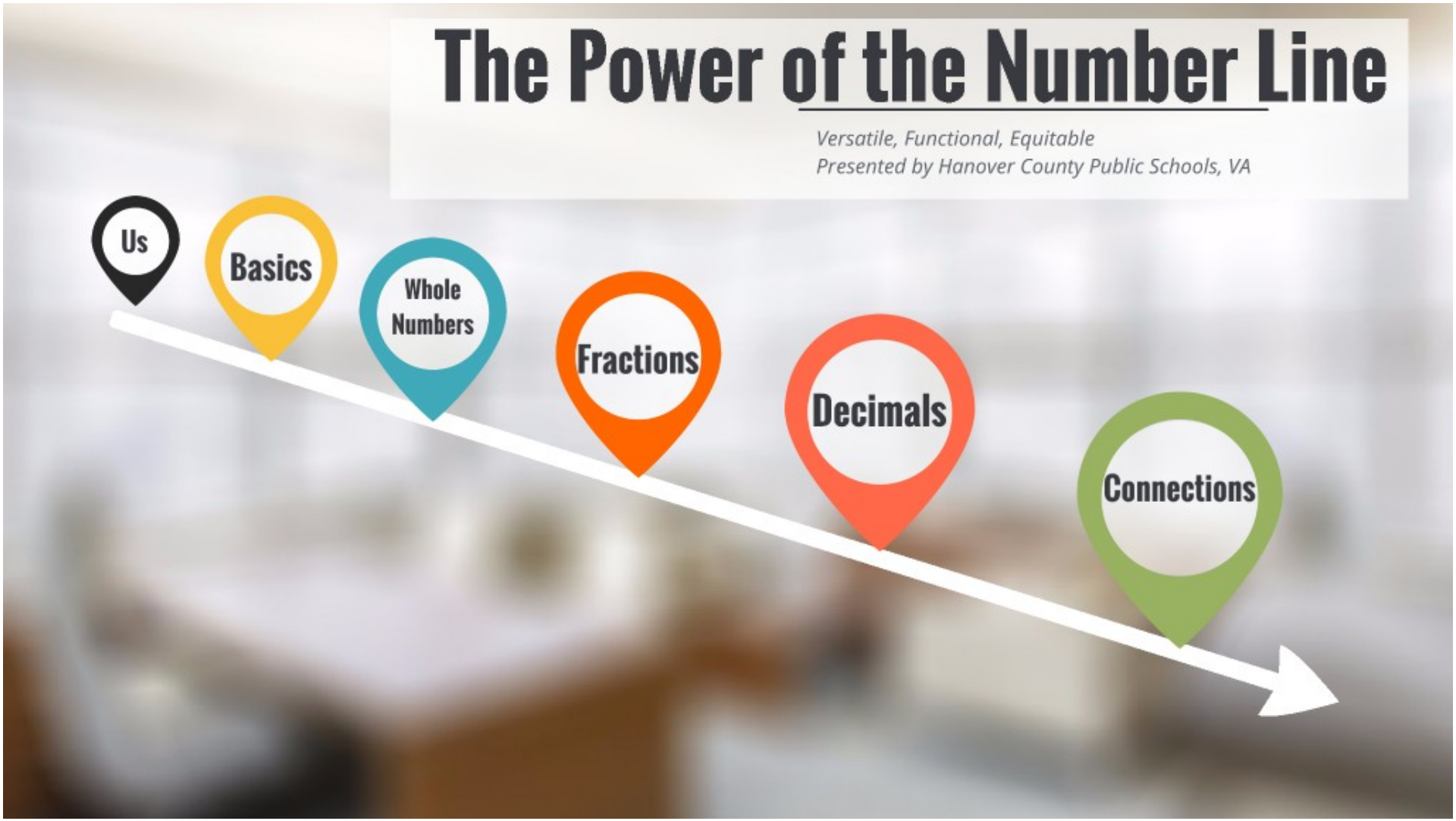

The Power of the Number Line
Versatile, Functional, Equitable
Presented by Hanover County Public Schools, VA
Us
Basics
Whole Numbers
Fractions
Decimals
Connections

Hanover County Public Schools
Ashland, Virginia

Kim Lawrence
Laura Scearce
Kasey Warren
Whitney Wells-Corfield

Description of Presentation

The number line is a powerful model for students. It can be integrated throughout many math strands as a natural way to think about number relationships. In this session, we will explore hands-on activities using the number line. Come discover how you can use a number line and meter stick to find fraction and decimal equivalencies and more!


The Power of the Number Line
Versatile, Functional, Equitable
Presented by Hanover County Public Schools, VA
Us
Basics
Whole Numbers
Fractions
Decimals
Connections

Why Number Lines?

When numbers are placed on a number line, numbers are represented as points and distances. Number lines are useful because they provide linear representation of all numbers, in order of size. They can represent whole numbers, negative numbers, fractions, decimals, and/or irrational numbers all on one diagram. They are also useful to model number computations.

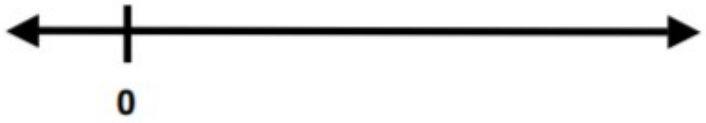
Reading a number line has many practical uses! Scales on instruments like thermometers are examples of number lines. Graph axes are also number lines.

The Research

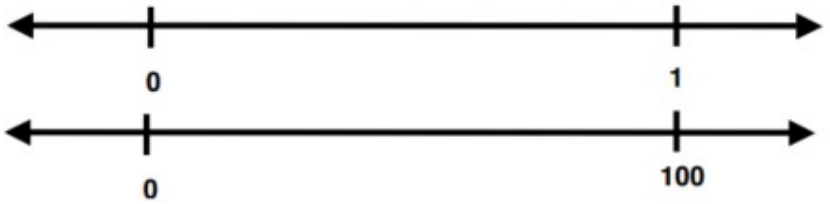
Research suggests that the number line is an important tool for helping children develop greater flexibility with mental arithmetic. Number lines allow students to actively construct mathematical meaning, number sense, and better understand number relationships.

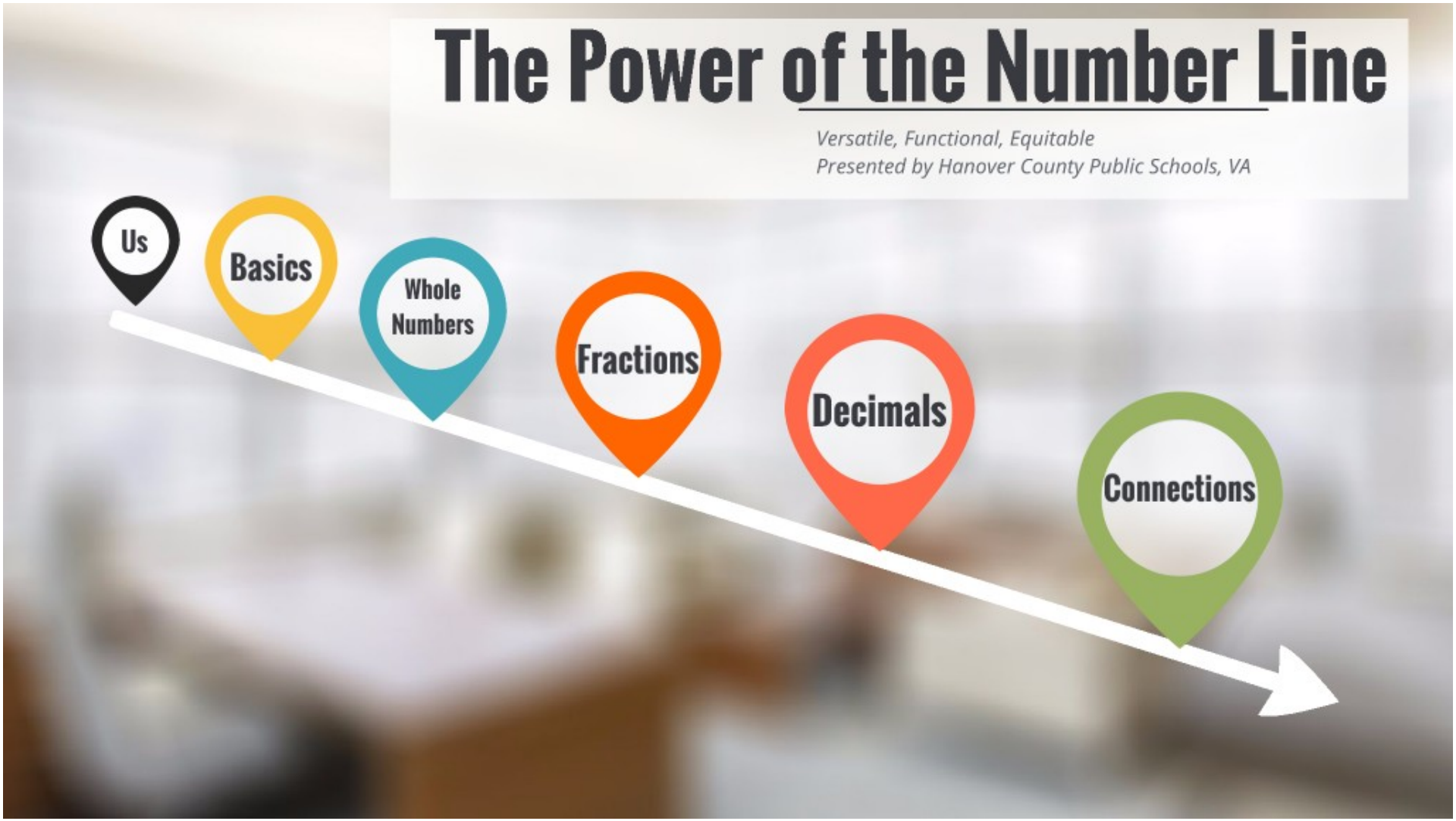
Types of Number Lines

Open Number Line

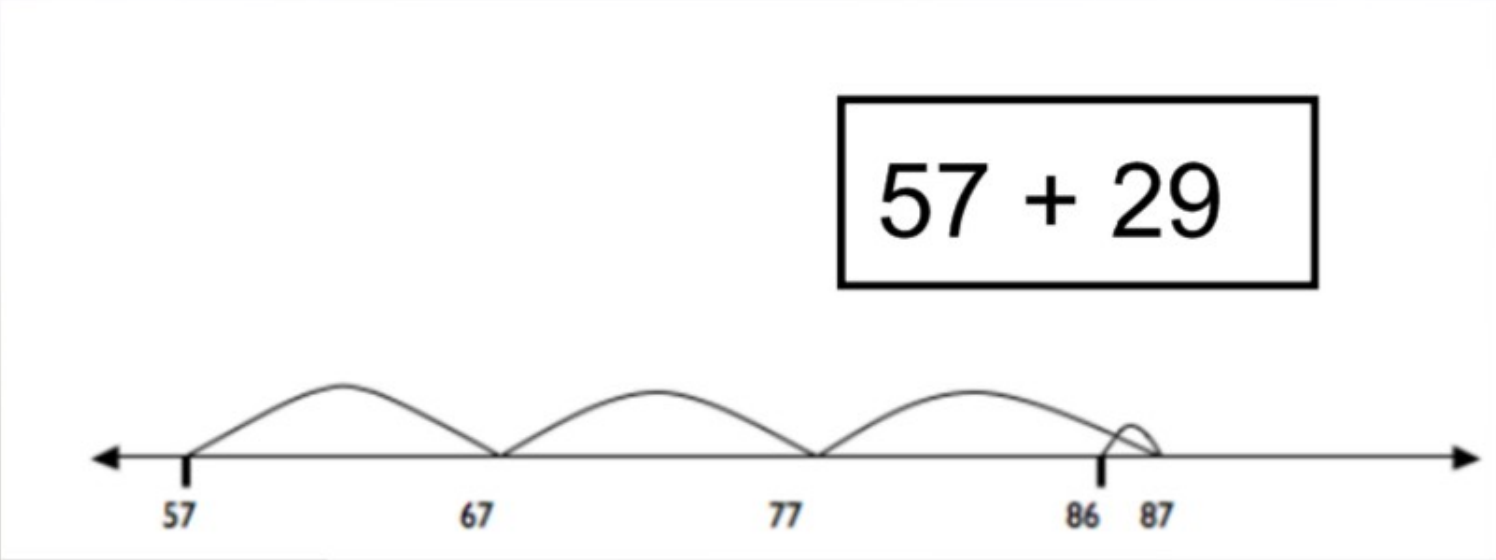


Closed Number Line




The Power of the Number Line
Versatile, Functional, Equitable
Presented by Hanover County Public Schools, VA
Us
Basics
Whole Numbers
Fractions
Decimals
Connections

The number line models the natural way in which we think about all number relationships and number equations.

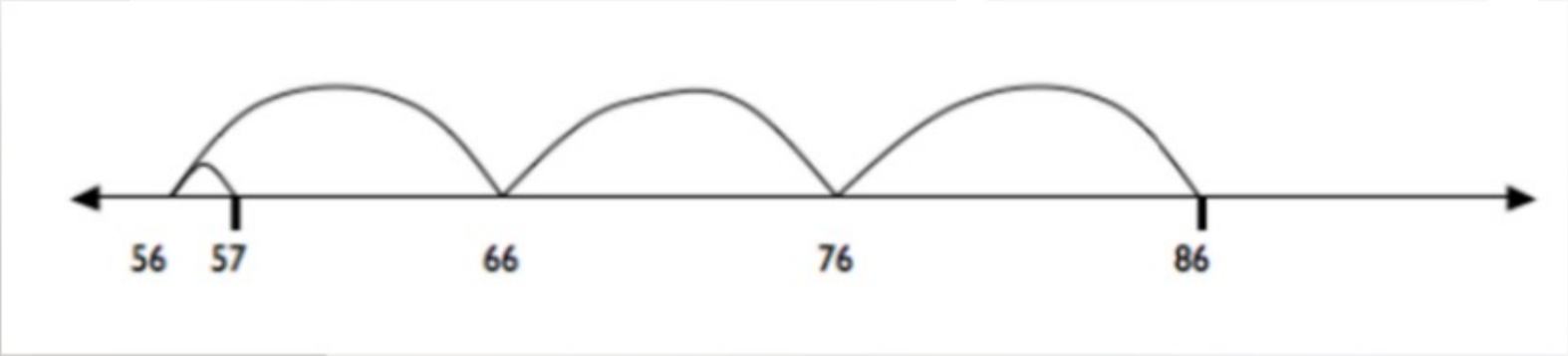


This solution shows a student who counts on from 57, first by 10's. After completing three jumps of 10 and landing at 87, the student realizes that she needs to compensate by hopping back by one to arrive at the correct answer.

57 + 29

The second solution shows the student chose to add 3 to get to a friendly number of 60. Now the student simply needs to add 26 to 60.

57 + 29



The student who came up with the third solution took one away (57-1=56), and then added 30 (instead of 29) to 56 to arrive at a total of 86.

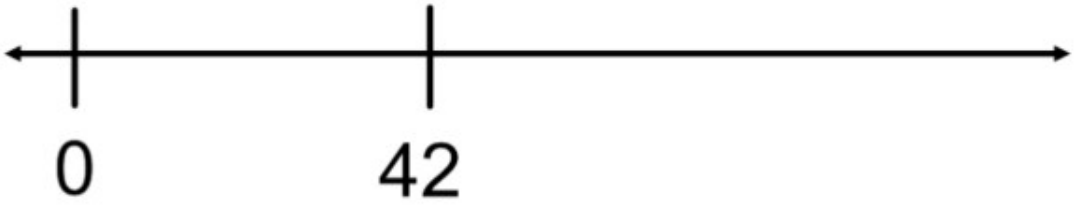
Whole Numbers

Identify the number 12,750 on the number line shown below.

How would you decide where to place it?

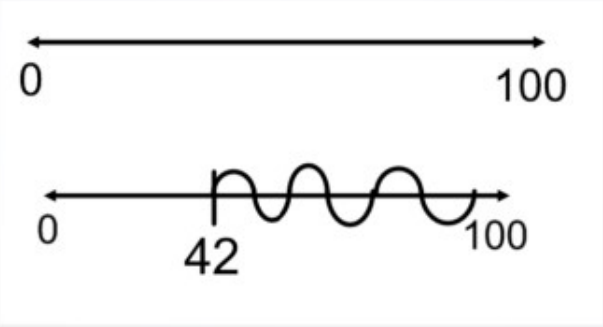
Whole Numbers

Where would the following numbers be located on the number line?



85 21 31

Guess My Number

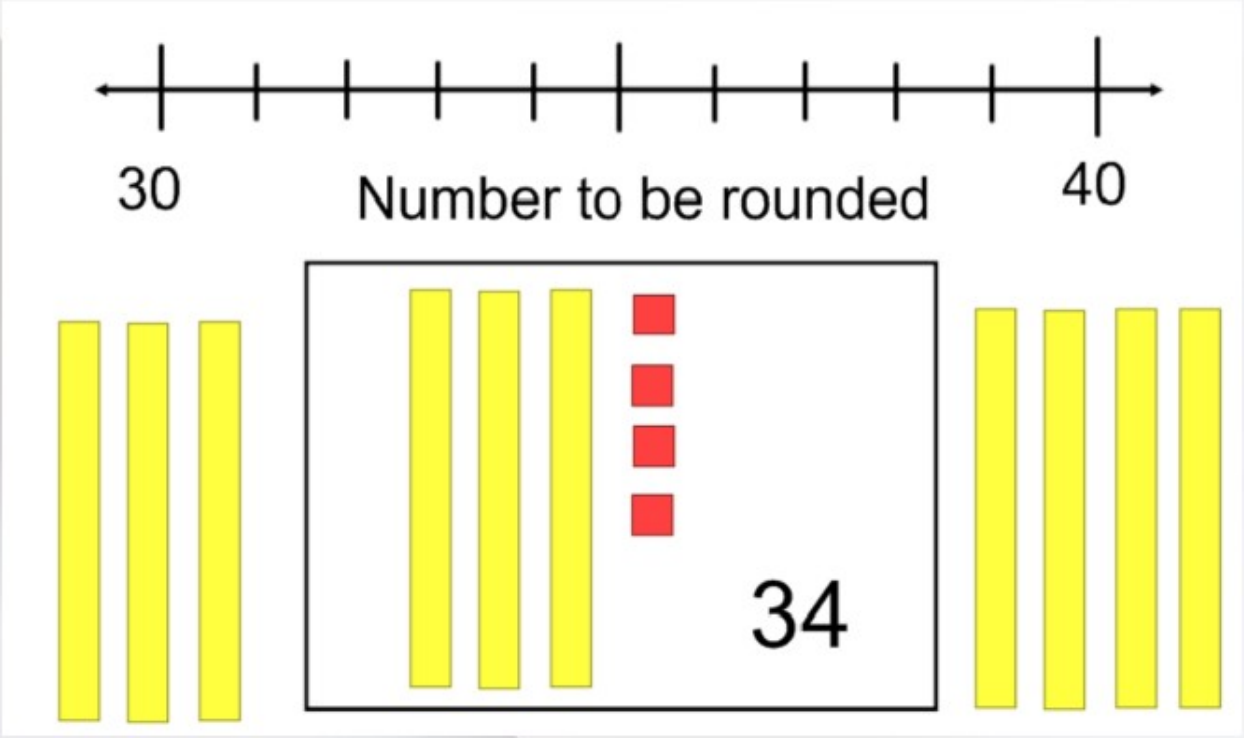


Object of the game: Figure out the Secret Number with as few questions as possible.

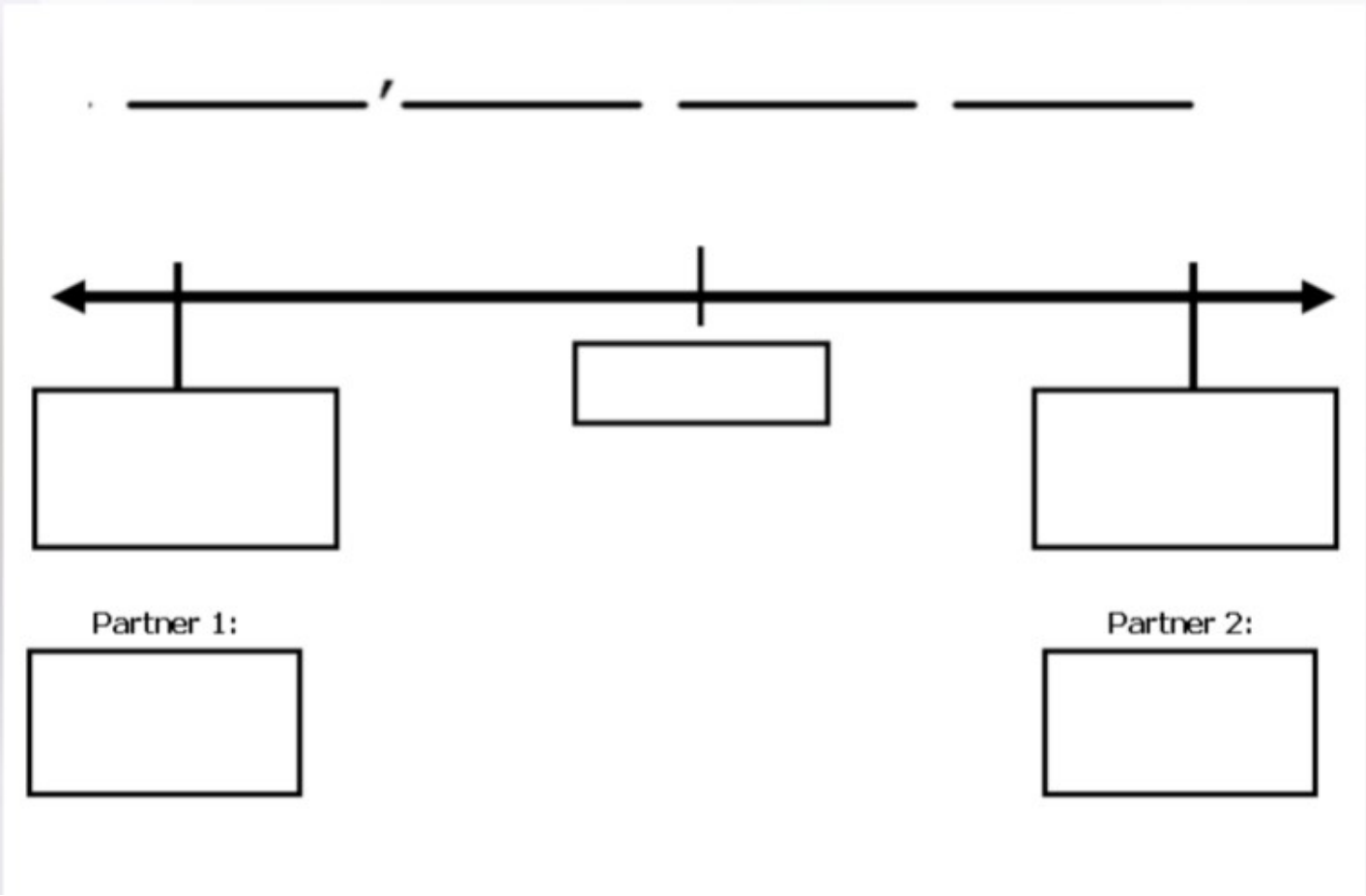
Basic game: One player chooses a Secret Number between 0 and 100 and secretly writes it down. This player also draws a basic number line for all players to see. The other players ask yes-or-no questions such as "Is it greater than 50?" "Is it less than 74?" Each time they ask, the player who chose the Secret Number answers. Then, he adds the guess to the number line and scribbles out the part of the number line that has been ruled out.

For example, here's what the number line would look like if a child had guessed, "Is the number greater than 42?" and the answer was no.

Round Away Using Base Ten Blocks: Rounding to Nearest Tens or Hundreds



Round Away: Rounding to Nearest ...



Round Away Extension Questions

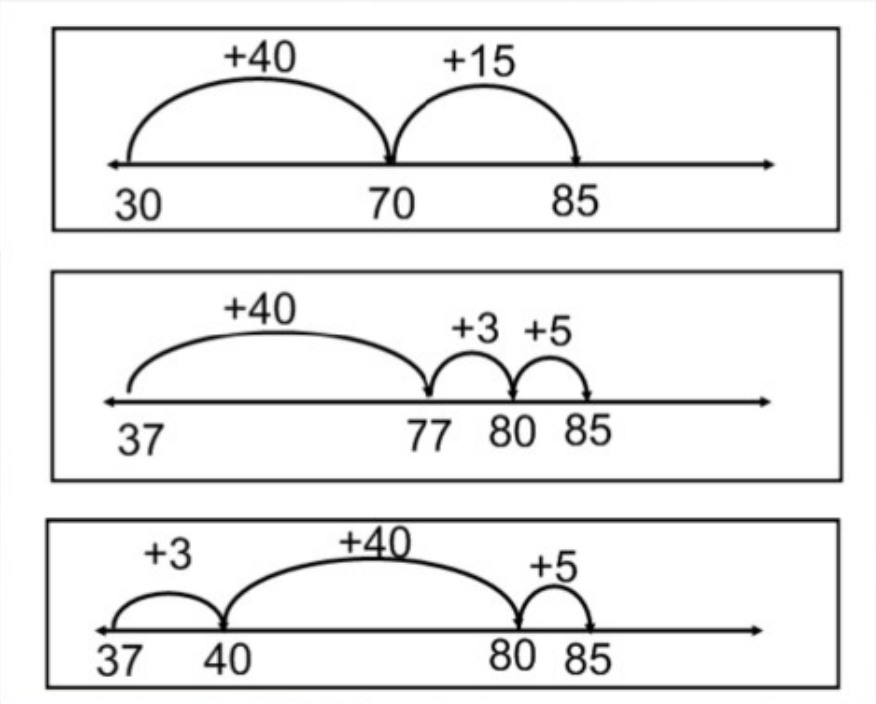
Question 1:
Would the results of the game change if we used a six-sided die?

Question 2:
If you were able to pick the location of each number, would that change the outcome of the game?

Question 3: When rounding to the nearest hundred, what number would each player want to be rolled and placed in the tens place? Why?

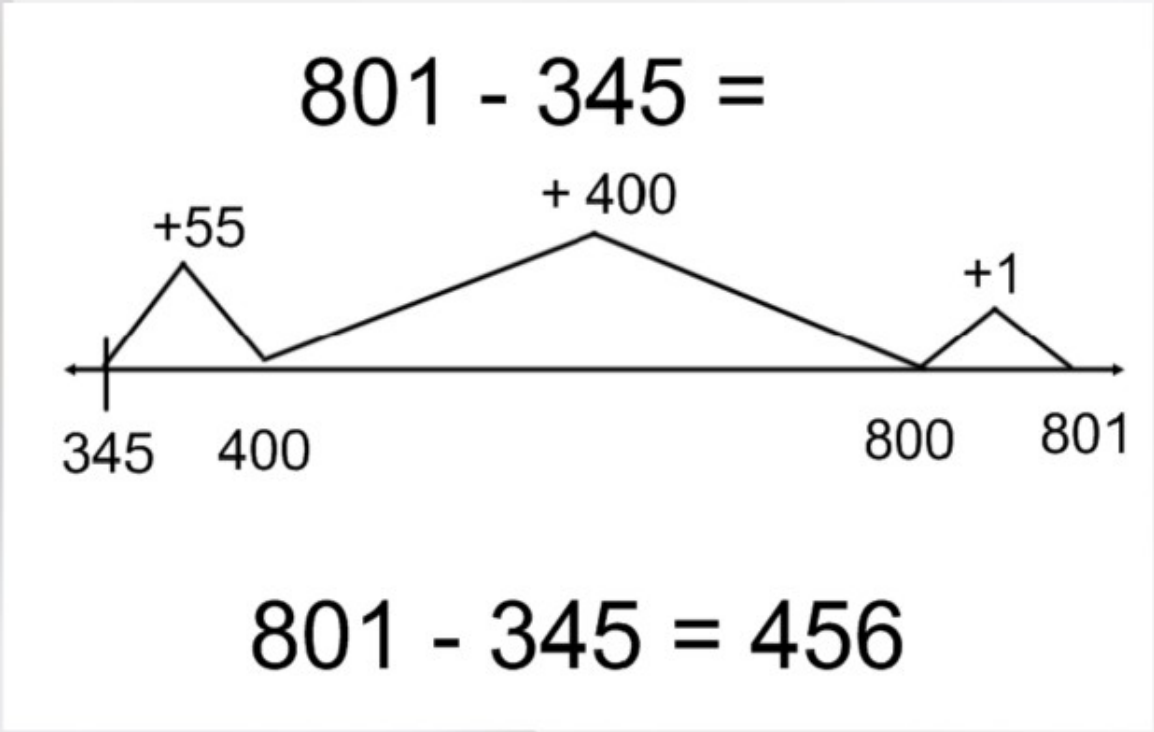
Whole Number Computation: Addition

Three ways to solve 37 + 48



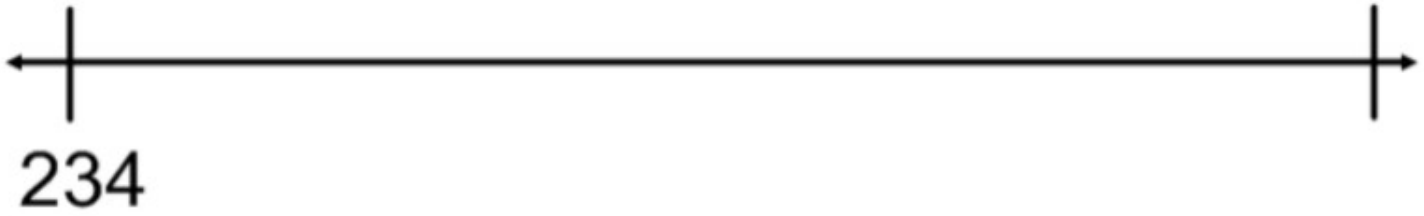
Whole Number Computation: Subtraction

Remember you can add on when finding the difference between two numbers.



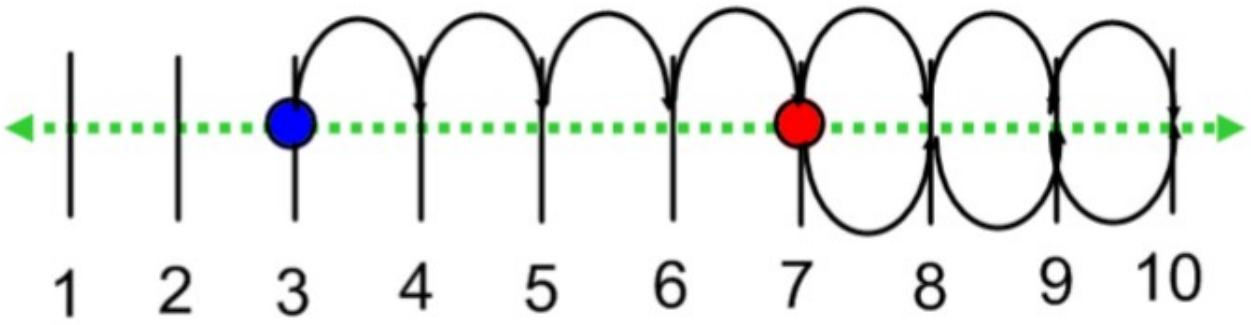
Is there another way you could solve this problem?

500 - 234 =



Commutative Property of Addition

Count on from the chosen number. Stop at ten.

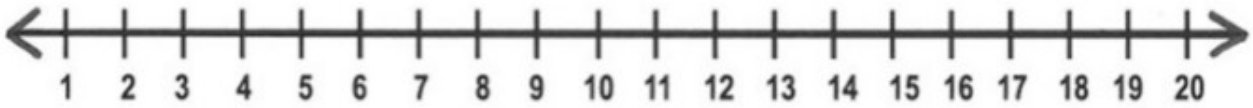


3 + 7 = 10

7 + 3 = 10

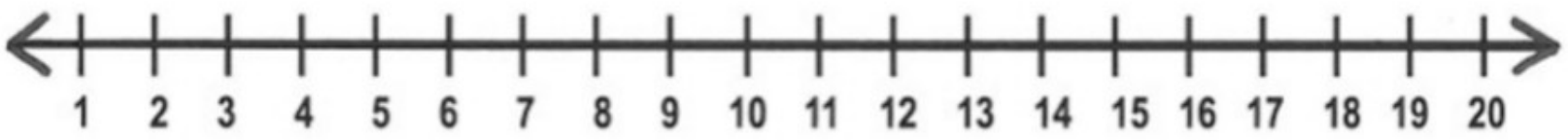
How can we model 3 x 4 on a number line?

3 groups of 4 = 3 jumps of 4

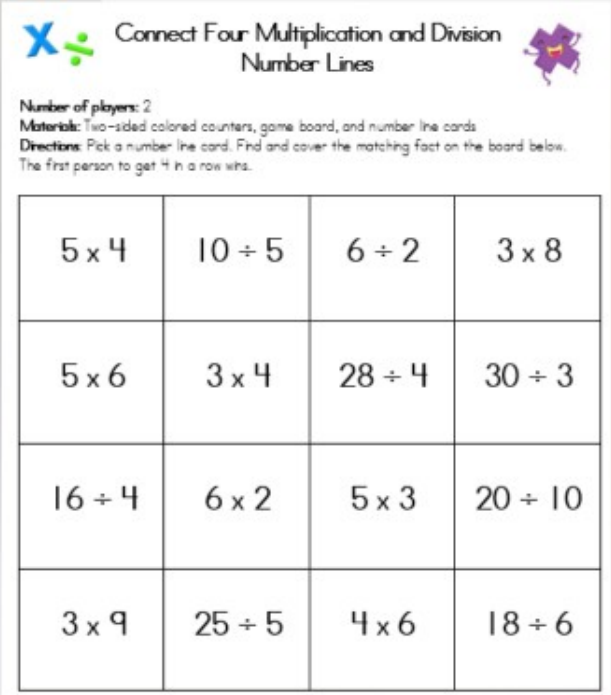


How can we model 15 ÷ 5 on the number line?

Repeated Subtraction: How many jumps of 5 are in the number 15?



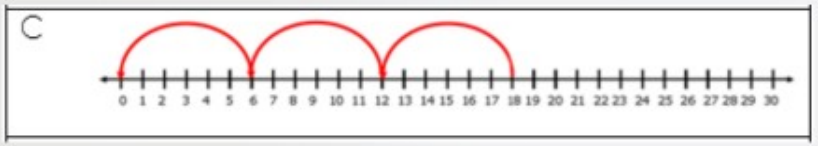
Connect Four: Multiplication and Division Number Lines

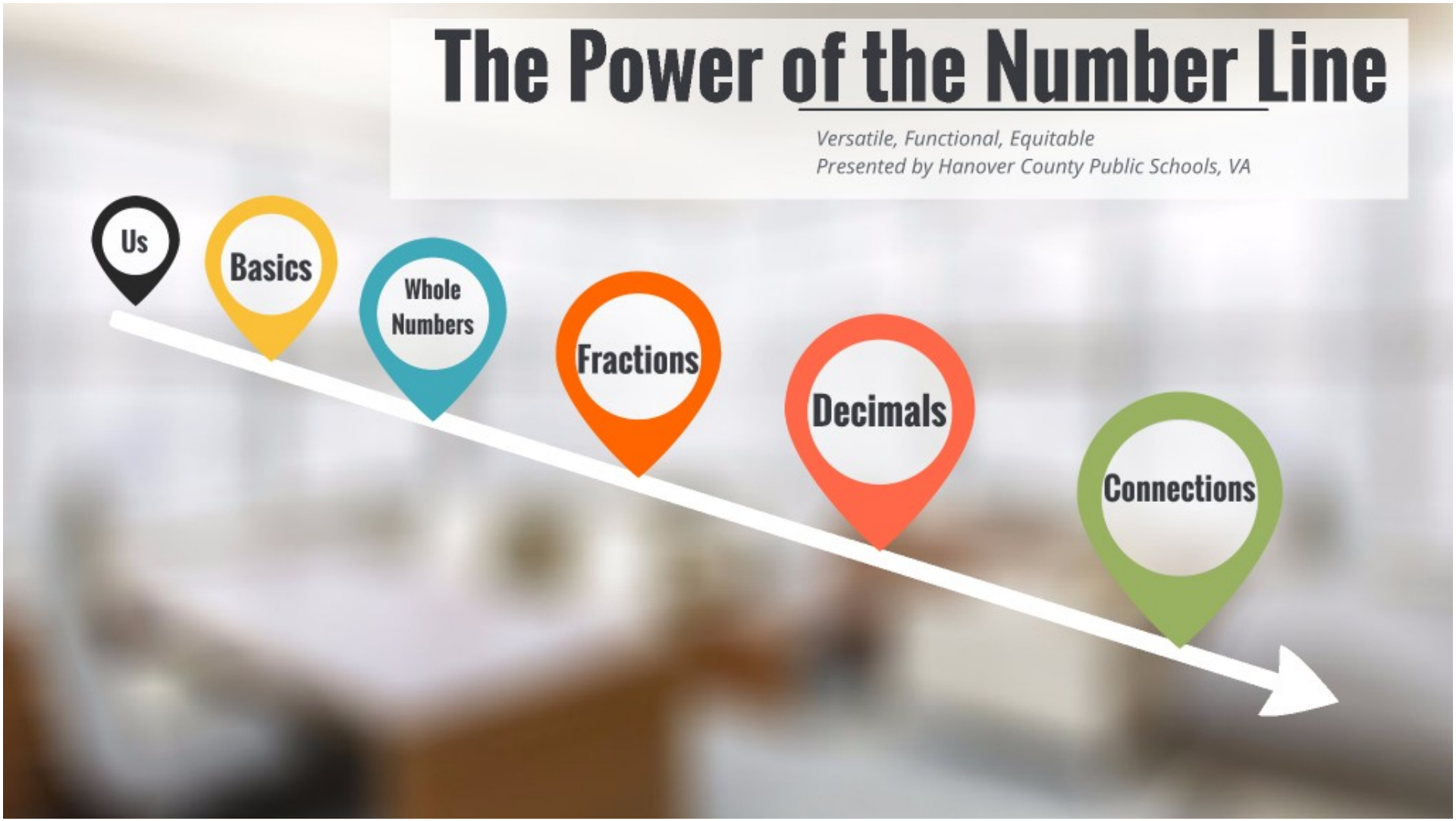


Connect Four Multiplication and Division Number Lines

Number of players: 2
Materials: Two-sided colored counters, game board, and number line cards
Directions: Pick a number line card. Find and cover the matching fact on the board below. The first person to get 4 in a row wins.

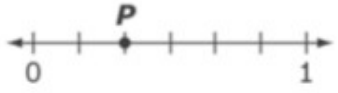
5 x 4	10 ÷ 5	6 ÷ 2	3 x 8
5 x 6	3 x 4	28 ÷ 4	30 ÷ 3
16 ÷ 4	6 x 2	5 x 3	20 ÷ 10
3 x 9	25 ÷ 5	4 x 6	18 ÷ 6




The Power of the Number Line
Versatile, Functional, Equitable
Presented by Hanover County Public Schools, VA
Us
Basics
Whole Numbers
Fractions
Decimals
Connections

Number Line Task with Equivalent Fraction

Look at point *P* on the number line.



Look at number lines A – E. Is the point on each number line equal to the number shown by *P*? Choose Yes or No and EXPLAIN your reasoning.

A. 

○ Yes ○ No

B. 

○ Yes ○ No

C. 

○ Yes ○ No

D. 

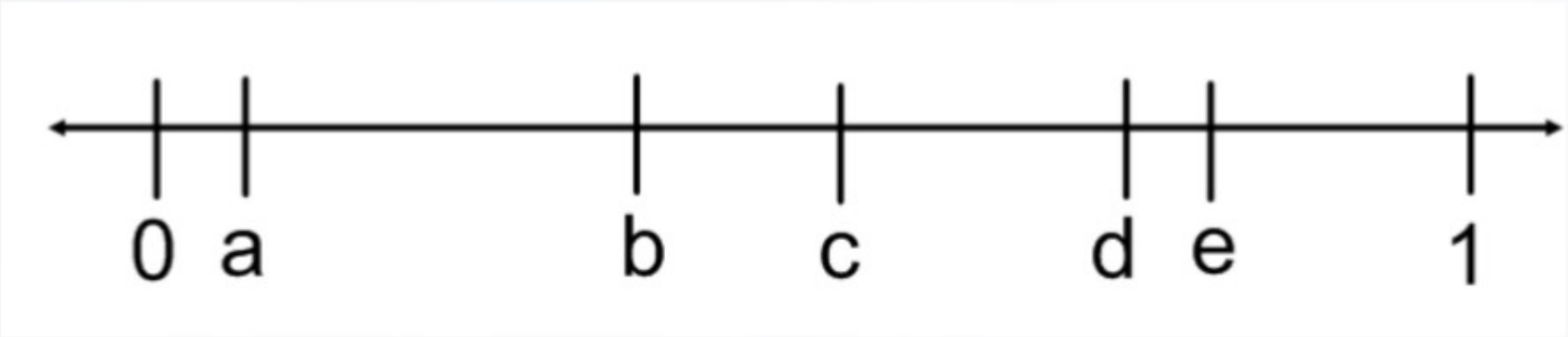
○ Yes ○ No

E. 

○ Yes ○ No

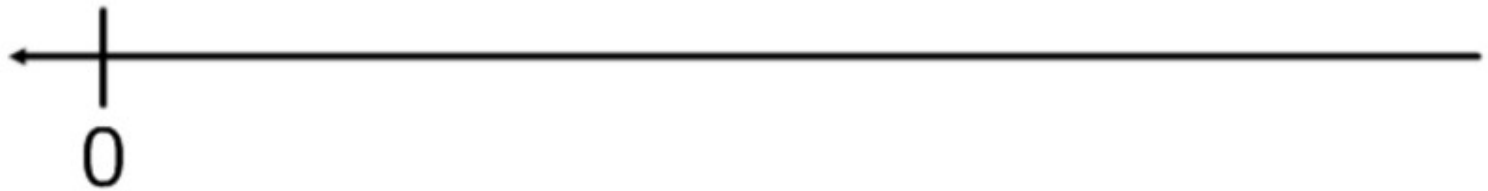
Fractions on a Number Line

Where would you place the fraction 1/3?
What fraction best represents point a? Why?
About how far apart are a and b?

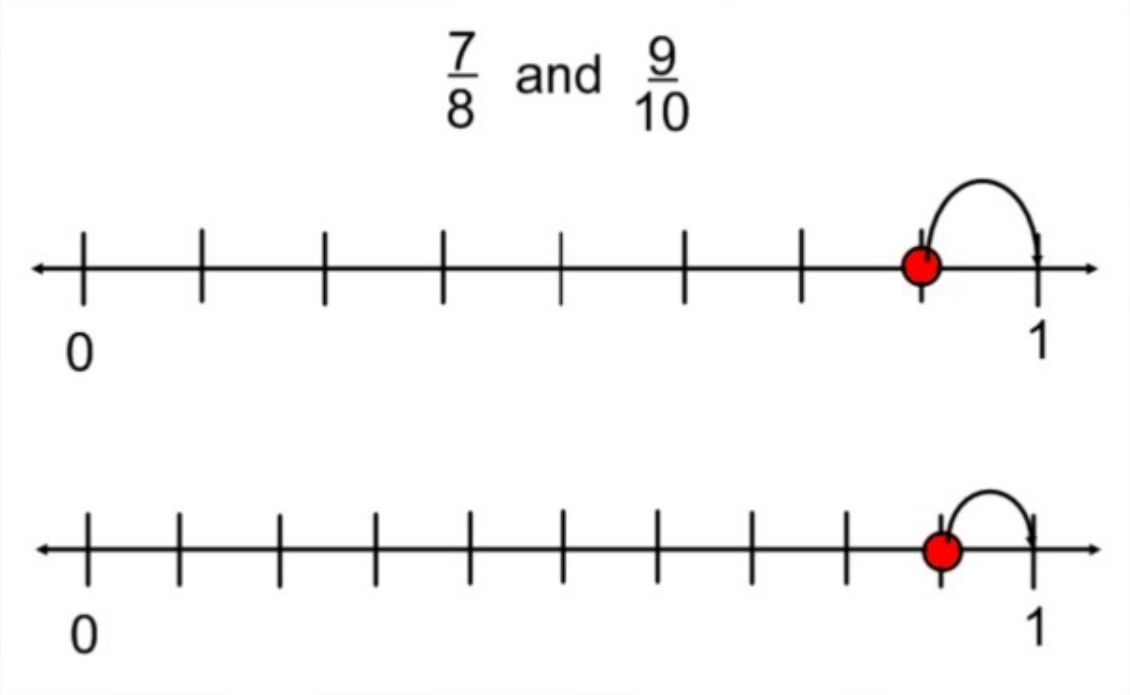


Draw an open number line.

Locate 1/4 on the number line.
Locate 1 1/2 on the number line.
Locate 0.50 on the number line.
Locate 0.75 on the number line.

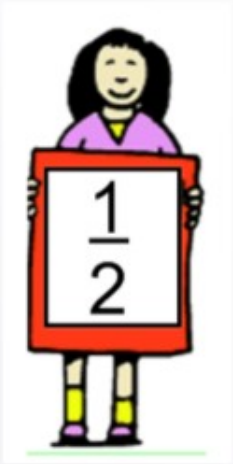


Comparing Fractions on a Number Line



What could these different number line tasks reveal to a teacher about student understanding with fractions?

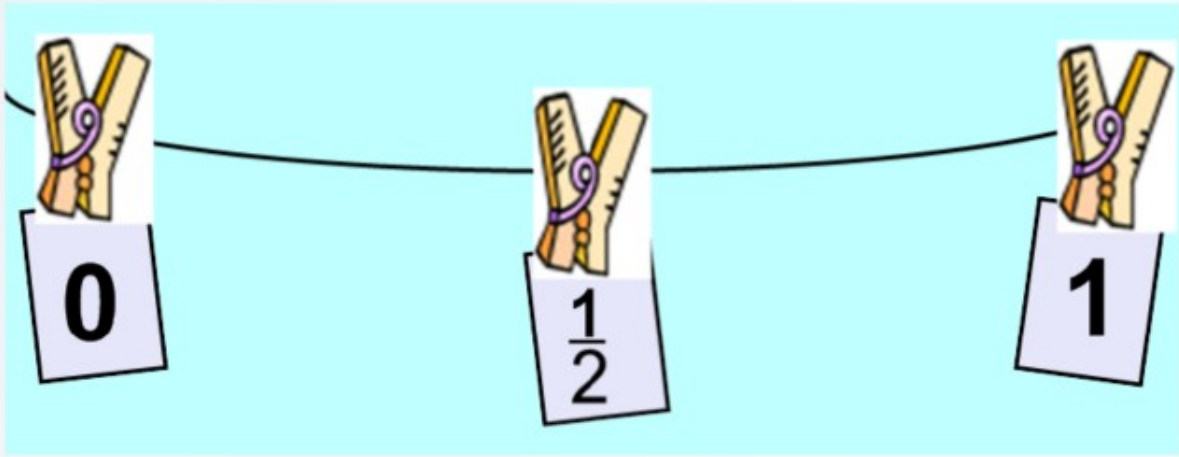
Human Number Line with Fractions



"I know that 4/7 is more than 1/2."

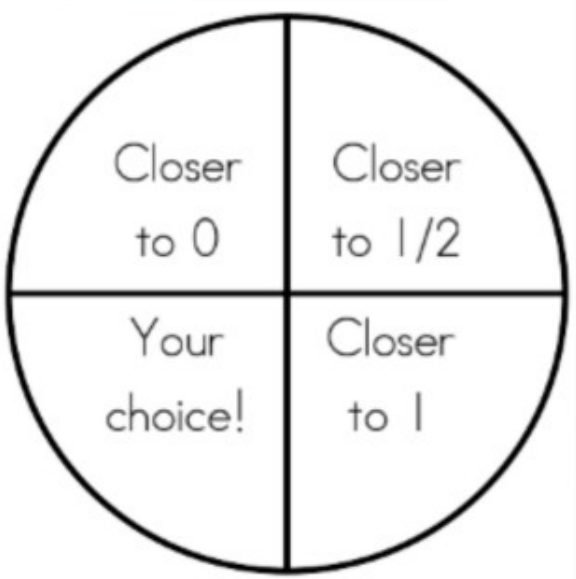
Clothesline Fractions

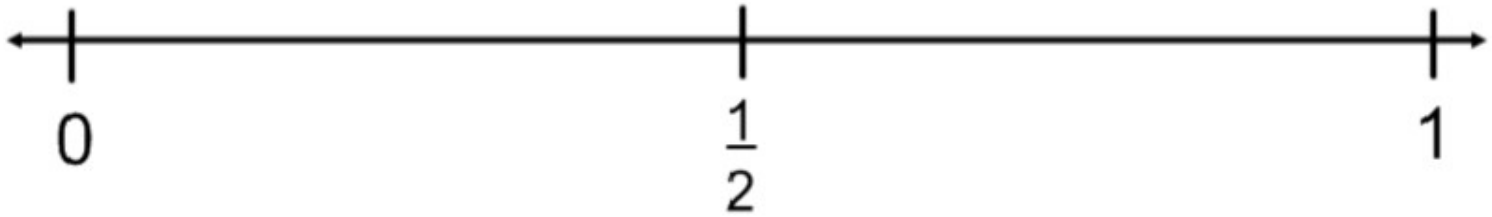
Hang a clothesline in your classroom for a work station and have the pair of students order the cards on the number line. You can provide an answer key based on the symbols on the cards.



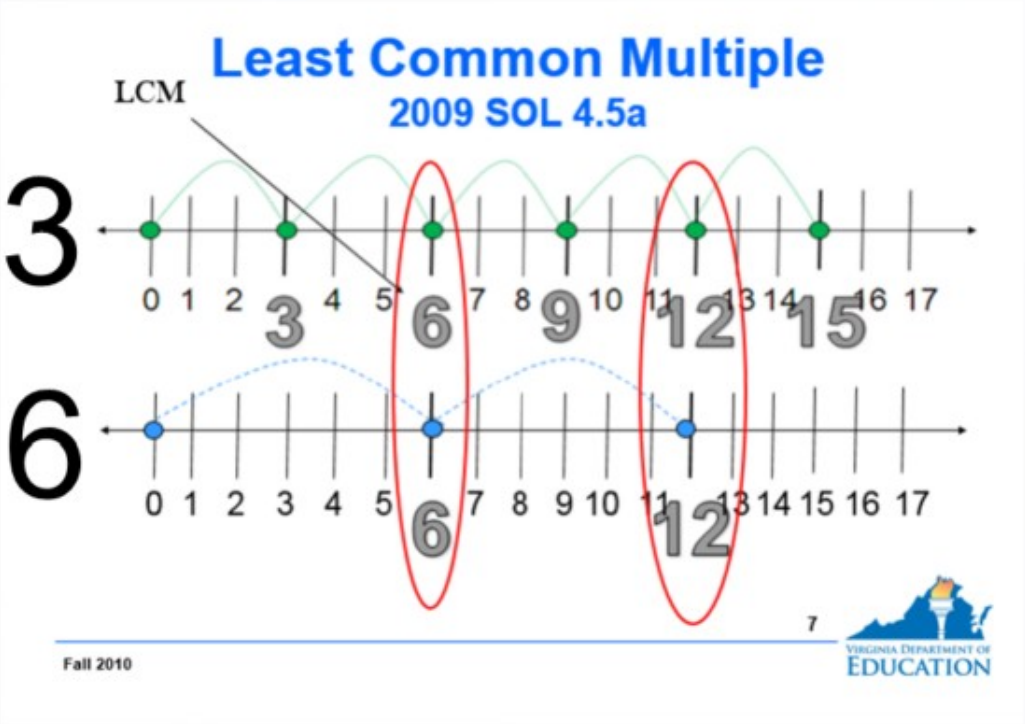
Who's Closer?

$\frac{8}{10}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{5}{6}$





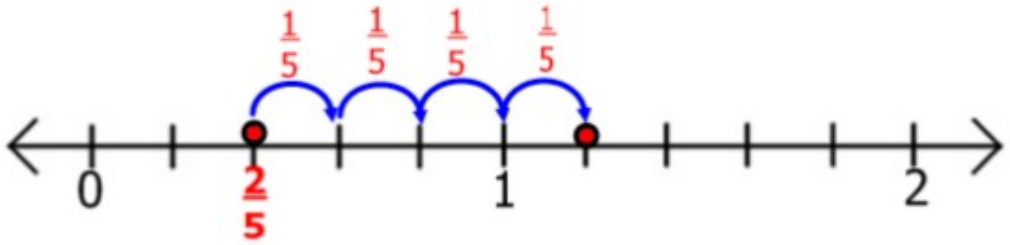
Least Common Multiples



Adding Fractions on a Number Line

Record the sum as a mixed number and improper fraction.

$$\frac{2}{5} + \frac{4}{5} =$$



Subtracting Fractions Misconceptions

Misconception: Many students find the common denominator and subtract the differences without regard for the whole numbers.

$$\begin{array}{r} 4\frac{1}{3} \\ -\,2\frac{3}{6} \\ \hline \end{array} \quad = \quad \begin{array}{r} 4\frac{2}{6} \\ -\,2\frac{3}{6} \\ \hline \end{array}$$

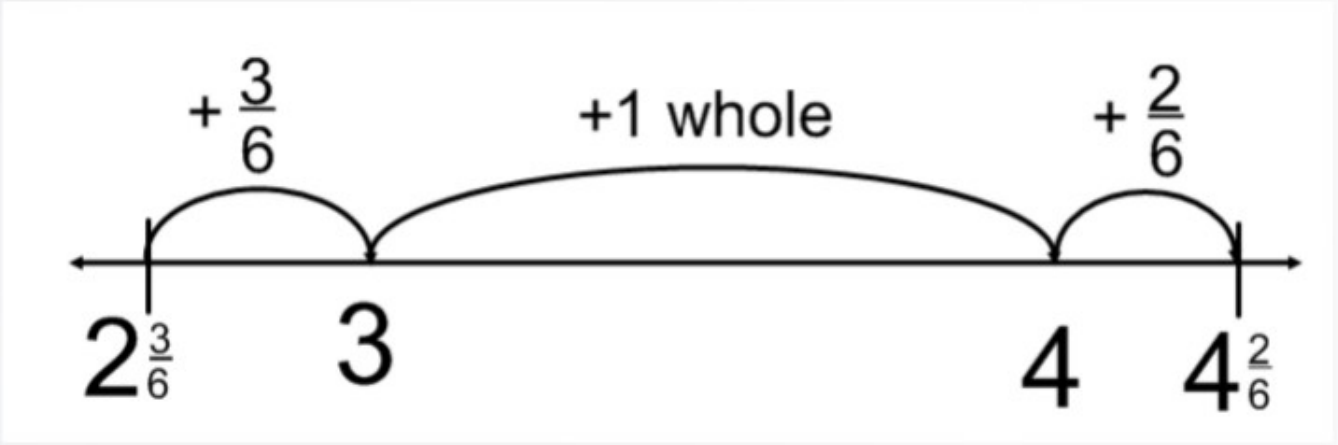
How many students find a common denominator and then just subtract getting the differences of of $2\frac{1}{6}$

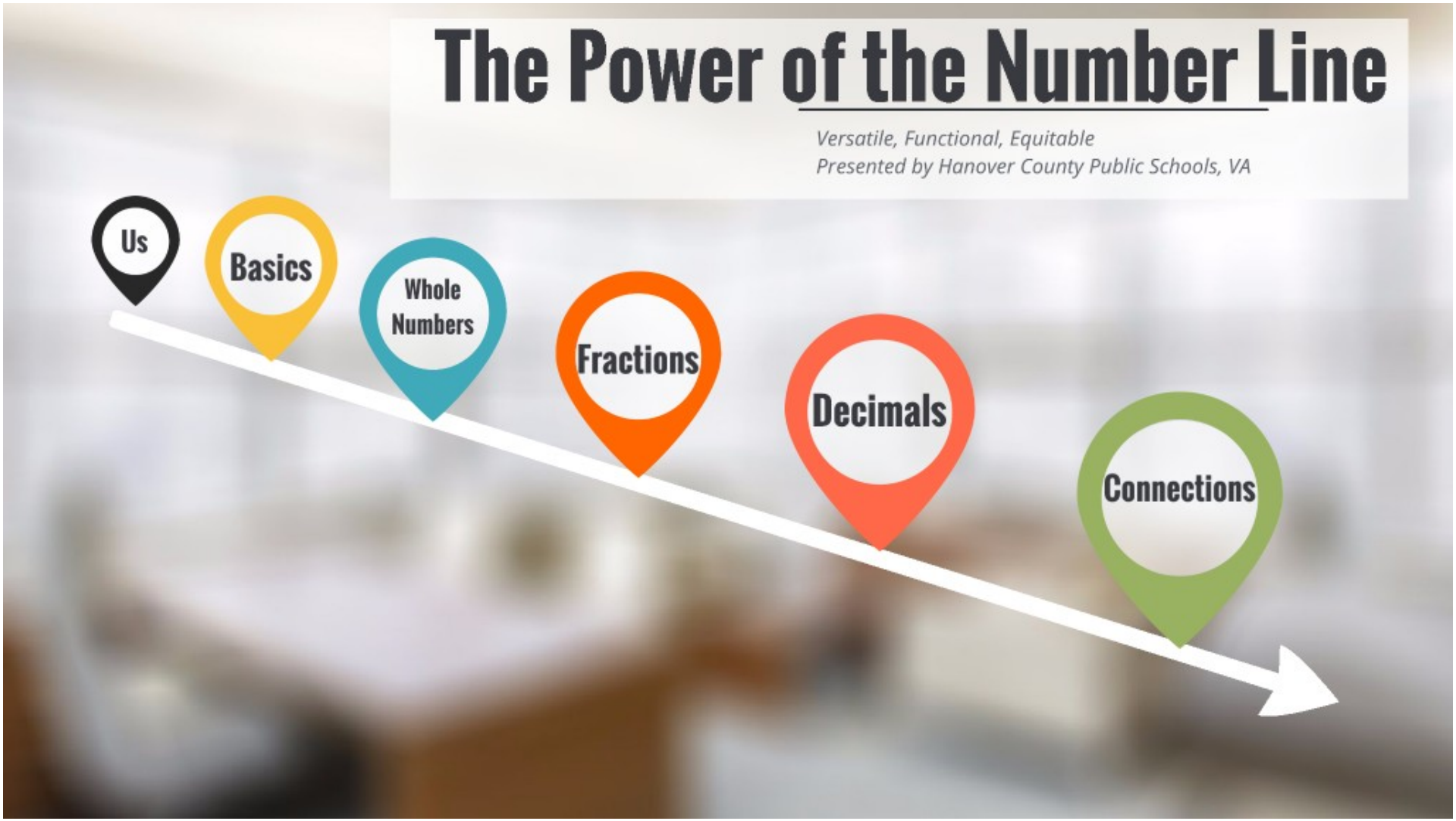
Subtracting Fractions on a Number Line

Use a number line to add on when subtracting fractions on a number line.

$$4\tfrac{2}{6} - 2\tfrac{3}{6}$$

The difference is $1\tfrac{5}{6}$




The Power of the Number Line
Versatile, Functional, Equitable
Presented by Hanover County Public Schools, VA
Us
Basics
Whole Numbers
Fractions
Decimals
Connections

Be the Middle

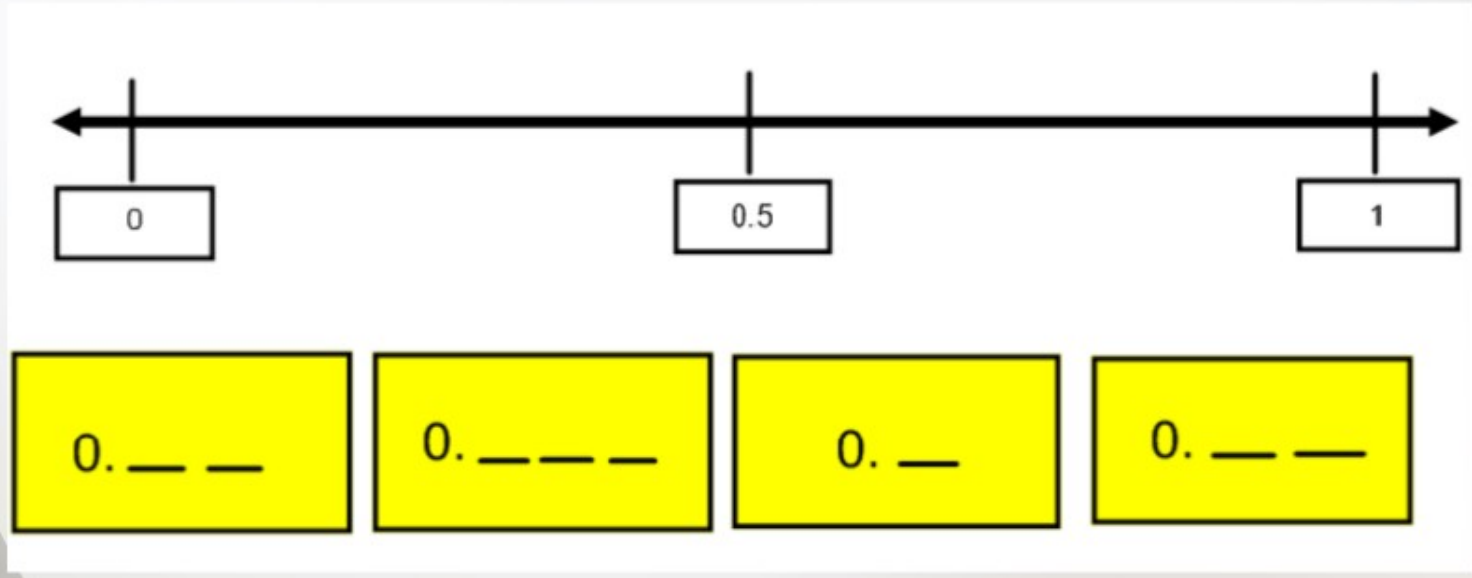
2.839
2.401
2.590
2.2
2.710

2.18
2.137
2.04
2.708
2.08
2.4

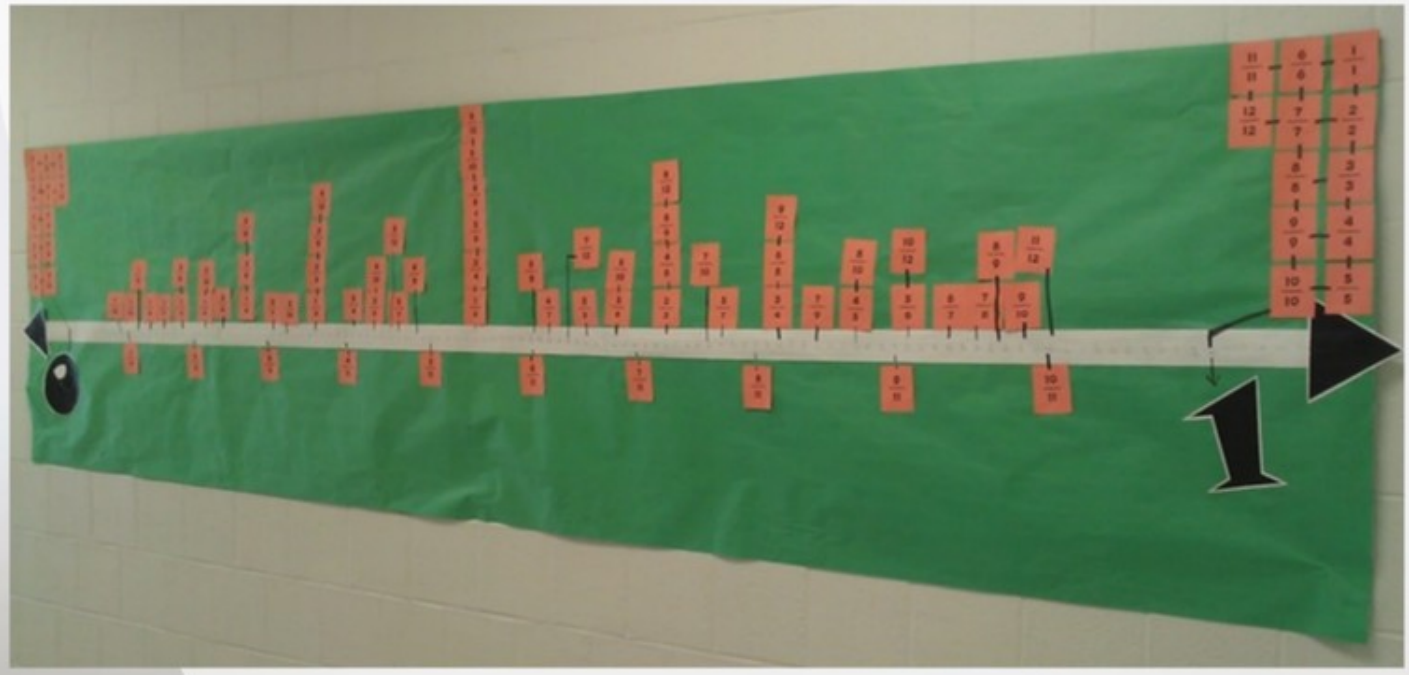
2.61
2.07
2.302
2.7
2.35

Ordering Decimals

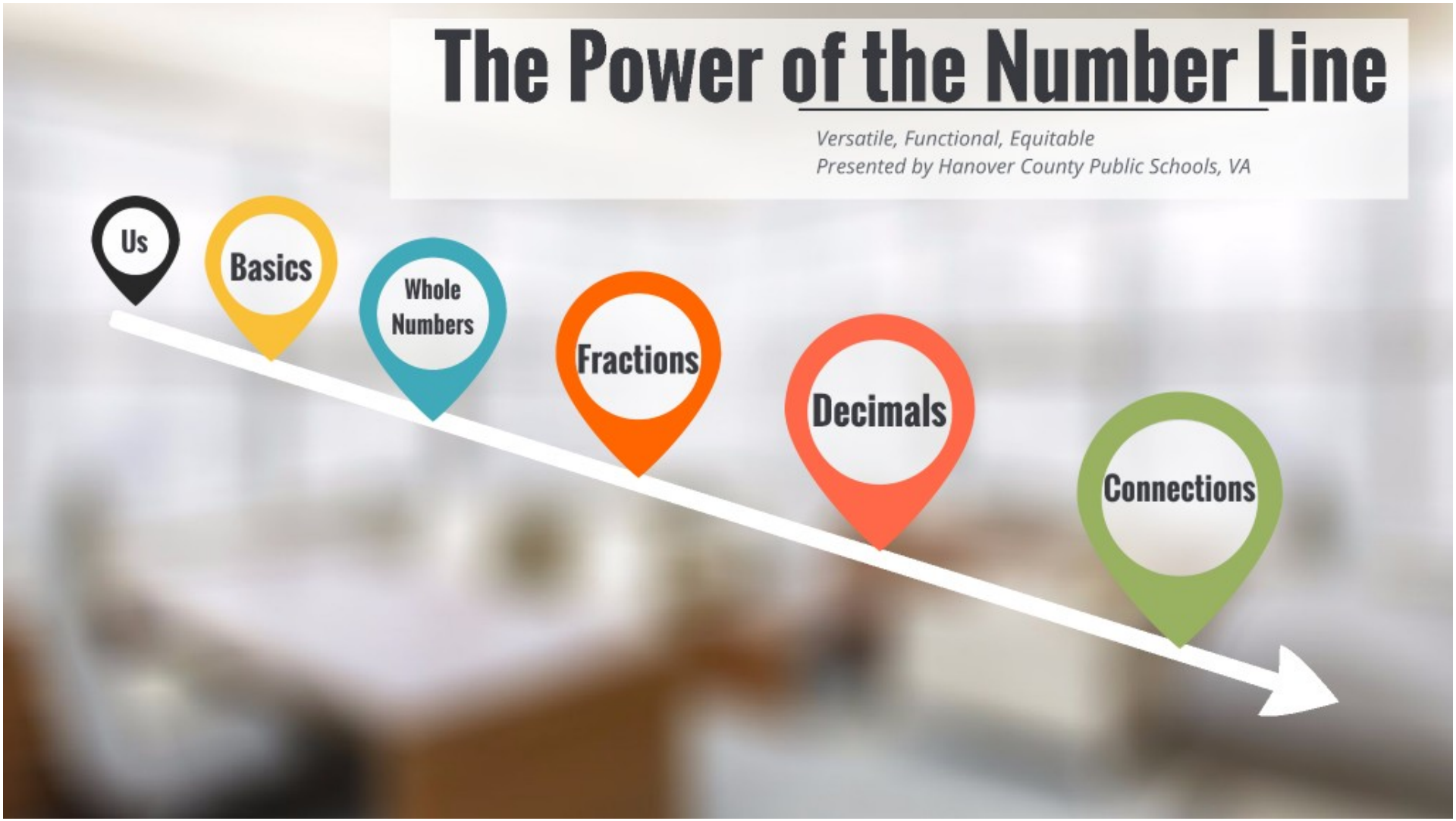
Directions: Spin or Roll to create four different decimals. Partner 1 will order the decimals from least to greatest. Use the number line to help you order your decimals. Partner 2 will check the answer. If Partner 1 is correct, then they receive 1 point. If Partner 2 finds an error, then they receive a point. Then switch roles.



Fraction and Decimal Equivalencies



Use the chart paper and create a number line using the meter sticks. Your number line should be 100 centimeters long.


The Power of the Number Line
Versatile, Functional, Equitable
Presented by Hanover County Public Schools, VA
Us
Basics
Whole Numbers
Fractions
Decimals
Connections

Elapsed Time

Use a number line to find the start time, end time, and/or elapsed time.

3 Elements to Elapsed Time:

- Start time
- Elapsed time
- End time

Students should be able to provide the missing element if given any of the other two.

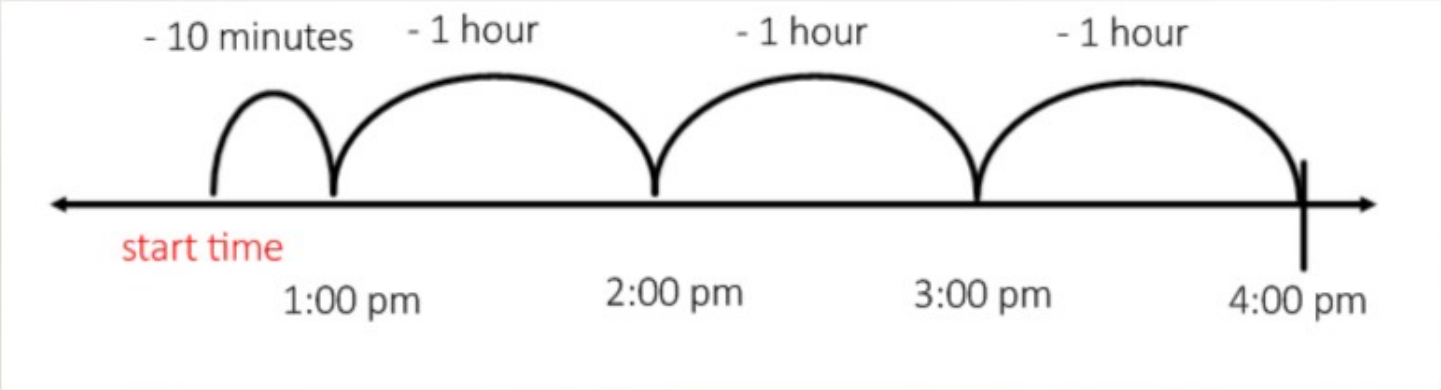
Examples:

Taylor played basketball for 2 hours and 30 minutes. If she finished playing at 4:00 PM, what time did she start?

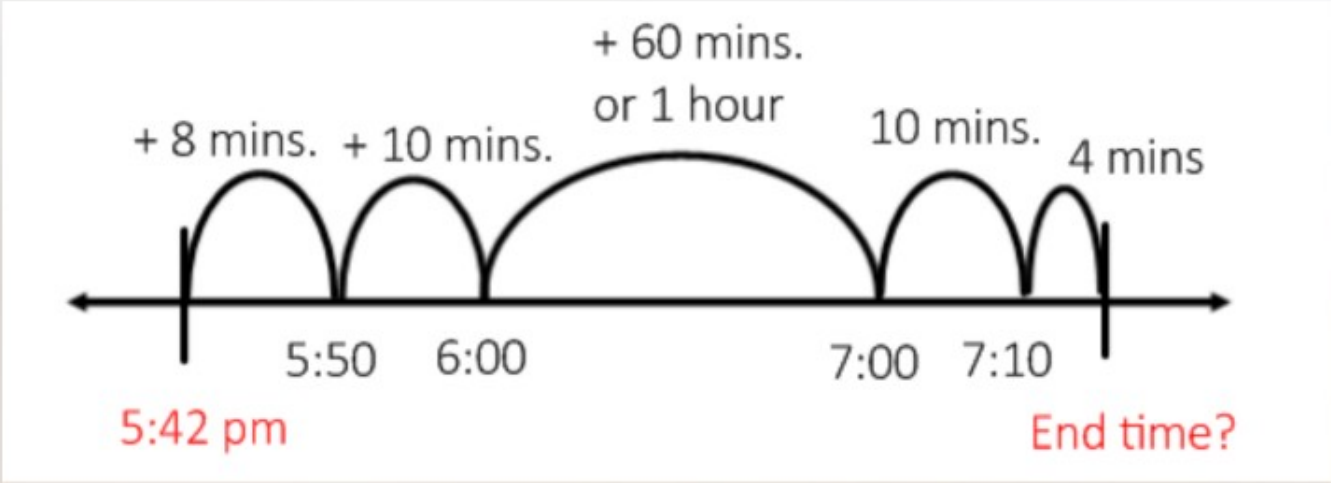
It took Jaylen 1 hour and 10 minutes to mow his lawn. If he started at 12:00 PM, what time did he finish?

Tesha left her house to go to the pool at 3:30 PM and returned at 5:05 PM. How long was she away from her home?

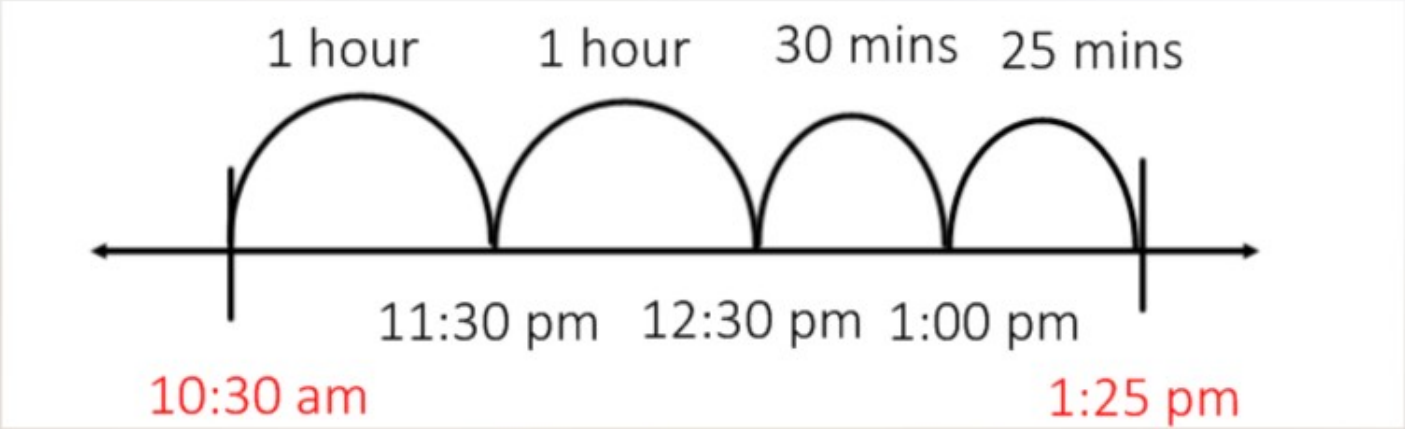
Nico had a snack 3 hours and 10 minutes after eating lunch. He ate snack at 4:00. What time did Nico eat lunch?



Sam spent 92 minutes working on a school project. If he started at 5:42 p.m., then what time did he finish the project?

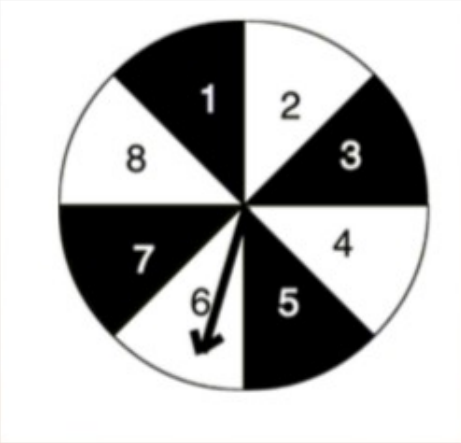


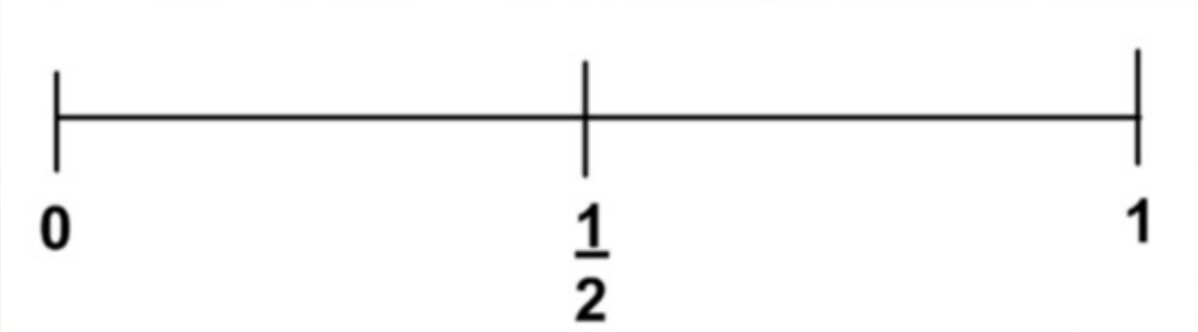
Amy went to soccer practice at 10:30 a.m. She returned home at 1:25 p.m. How long was Amy at soccer practice?



Probability

Use a number line to show probability.

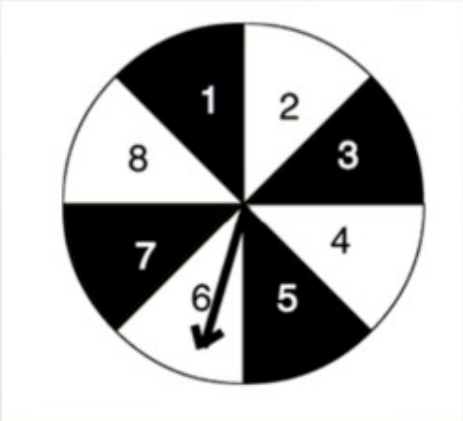




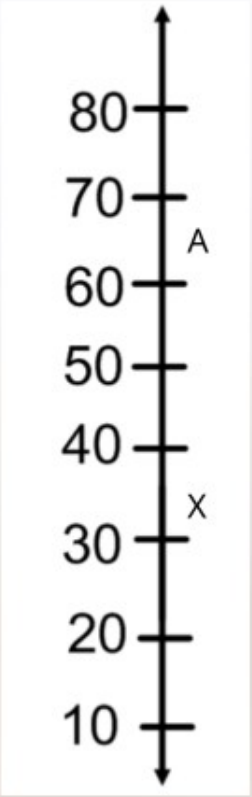
Robert was recording the number of times a quarter landed on heads and tails. Place the dot on the number line that best describes the chances that the quarter will land on tails.

The picture below shows how a game spinner looked before Tim spun it.

Place the dot on the number line that best describes the chances that Tim will spin the number 9.



Graphs



What is the scale of this number line?

What is A?

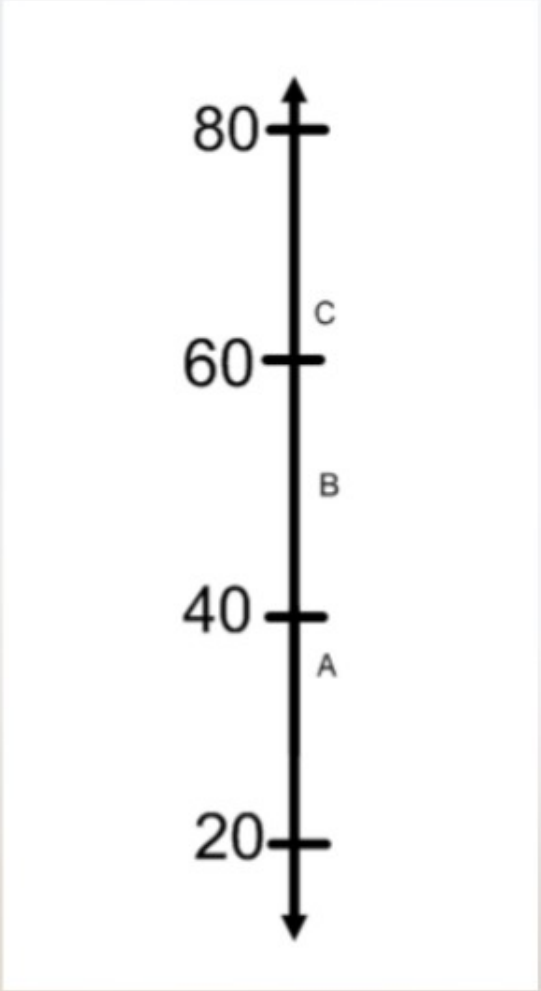
What is X?

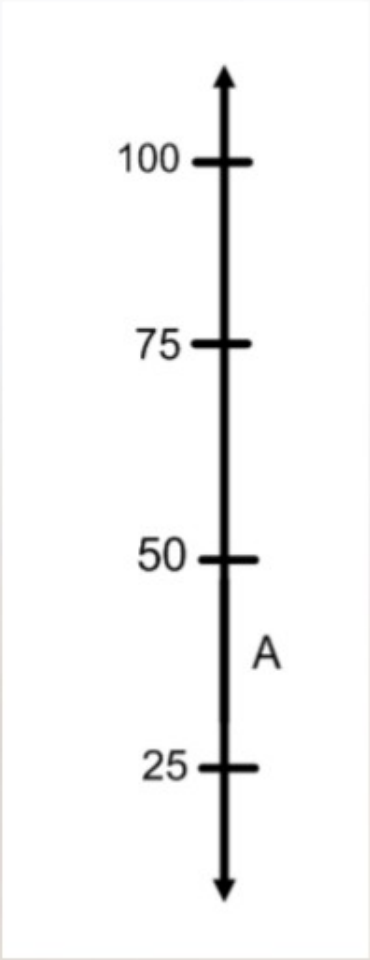
What is the scale of this number line?

What is A?

What is B?

What is C?





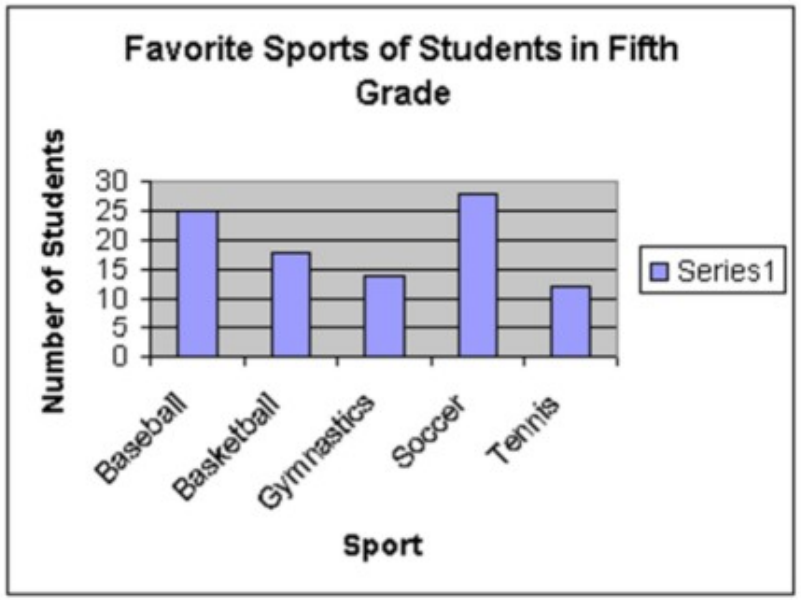
What is the scale of this number line?

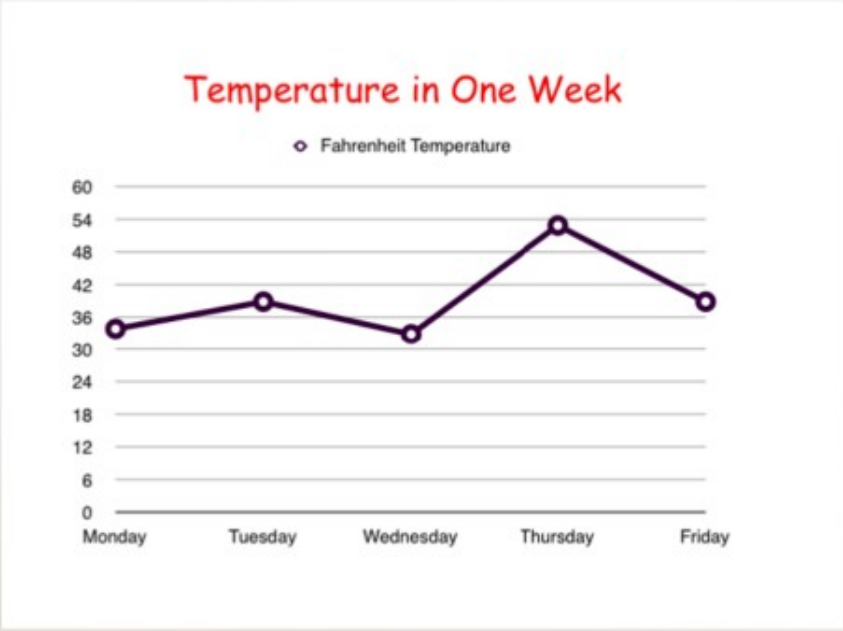
What is A?

Place the letter B at 55.

Place the letter C at 10.

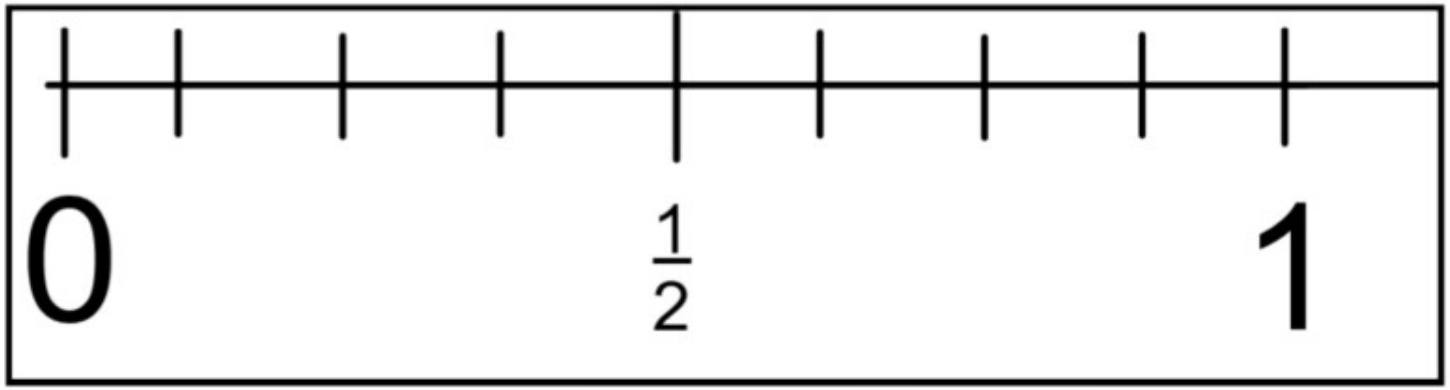
What is the scale and value of each data point?





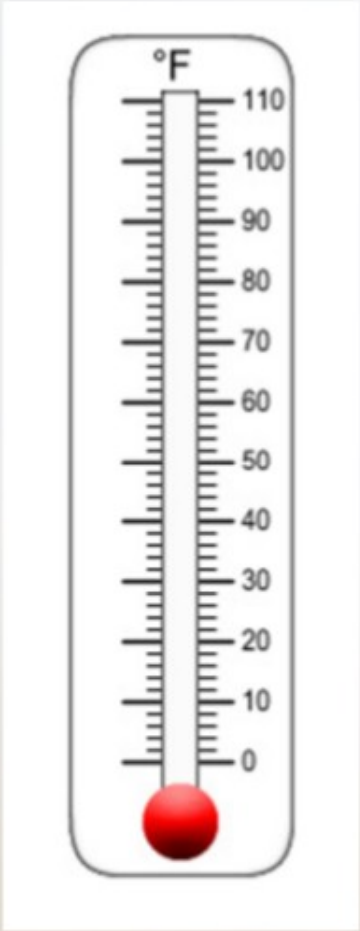
Measurement

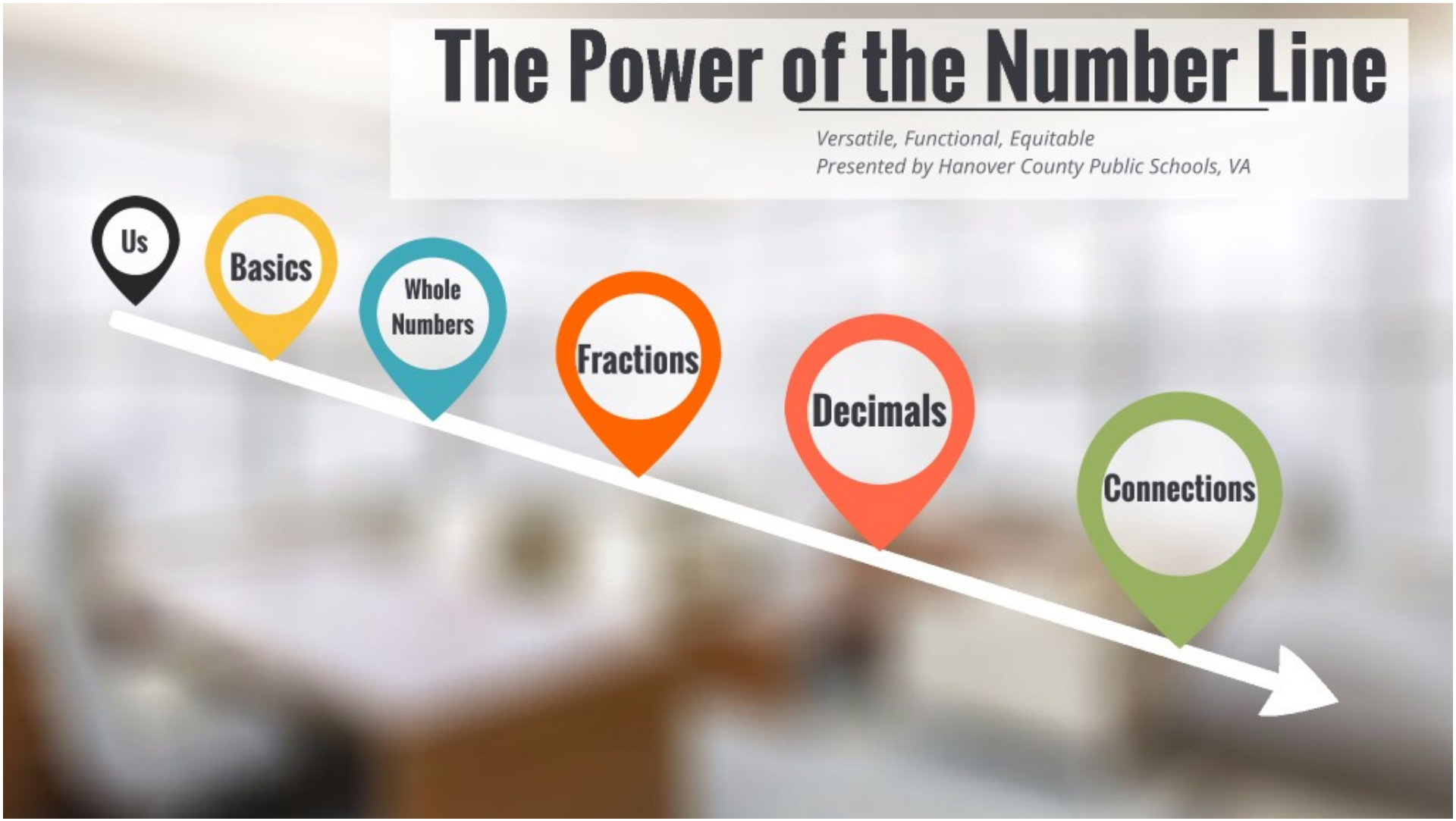
A ruler is similar to a number line. The ruler is broken into equal parts. How many equal parts are there in this inch?



Thermometer

Identify the scale. Is it counting by 1, 2, or 5?




The Power of the Number Line
Versatile, Functional, Equitable
Presented by Hanover County Public Schools, VA
Us
Basics
Whole Numbers
Fractions
Decimals
Connections