

What AI Cannot Do:

Create Students with Number Sense



WELCOME

- Hope Phillips
- Columbus Regional Mathematics Collaborative
- Columbus State University

How do you open class?



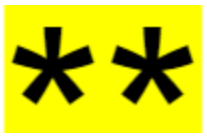
the
class?

students to thinking?

How are the following
images the
same *and* different?

$$\frac{2}{5}$$

$$\frac{5}{2}$$



$$2 \div 5$$

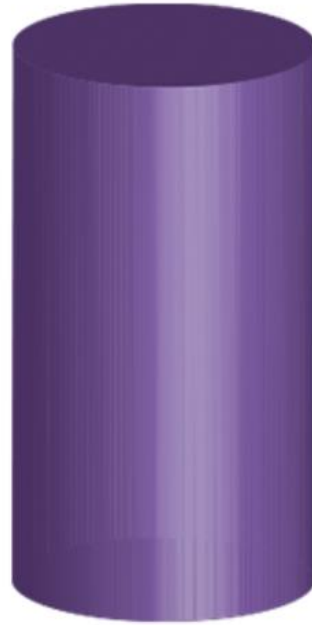
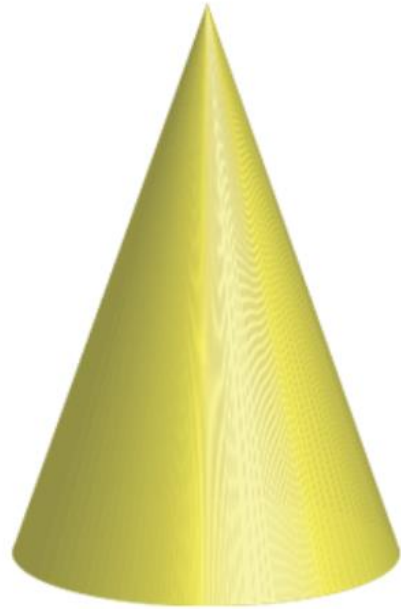
$$5 \div 2$$

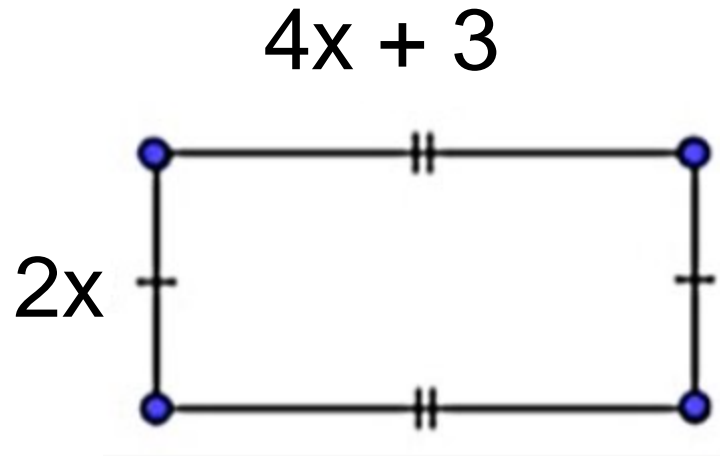
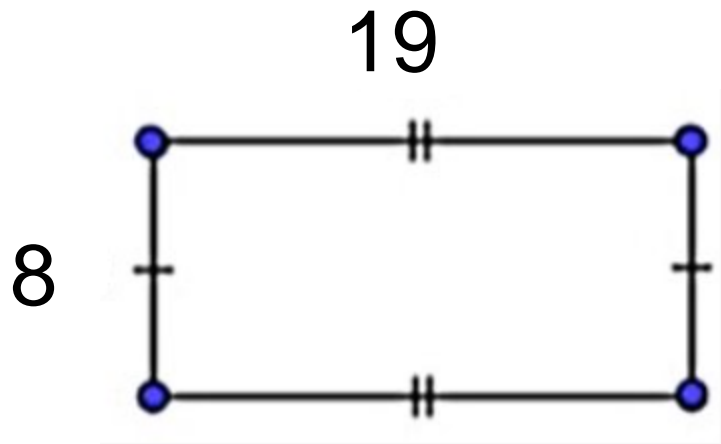
$$\frac{a}{b}$$

$$\frac{ax}{bx}$$

$$y = 2x + 12$$

$$2x - y = -12$$





Same but Different



- How can two ideas be *both*?
- Flexible thinking is *grayscale thinking*.
- Making connections

A mathematical conversation using the language *same but different* that calls attention to how a new concept in math is the same as that other familiar and comfortable concept but different in a specific way could be a tremendously useful conversation in growing that network of connections.

g)

- Looking at representations (visual and/or symbolic) with a different eye.
- Creating flexible student thinkers

Takeaways

How many
glass gems are
in the jar?



The Reveal



37 glass gems



The Reveal

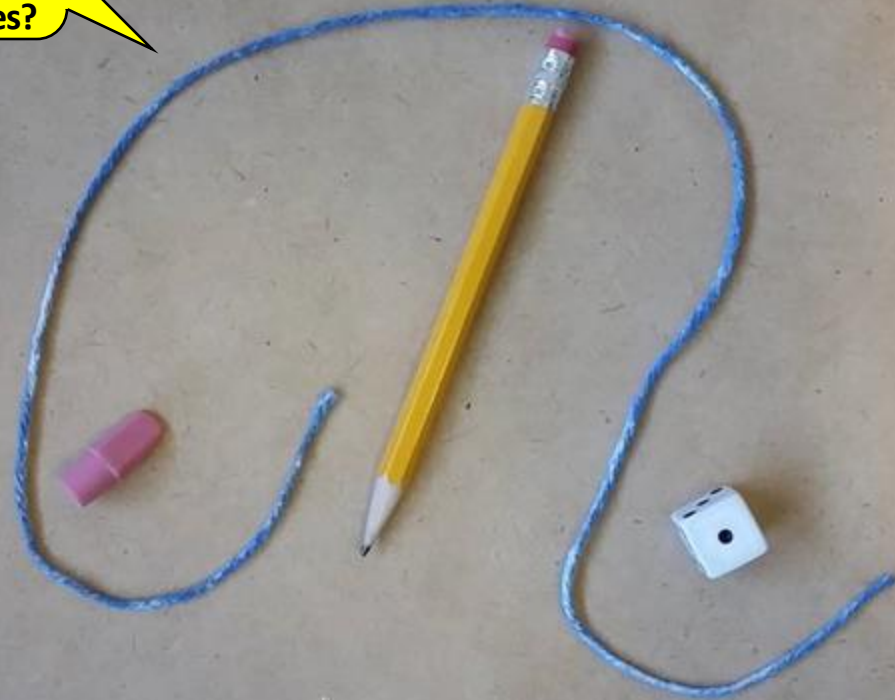


The Reveal

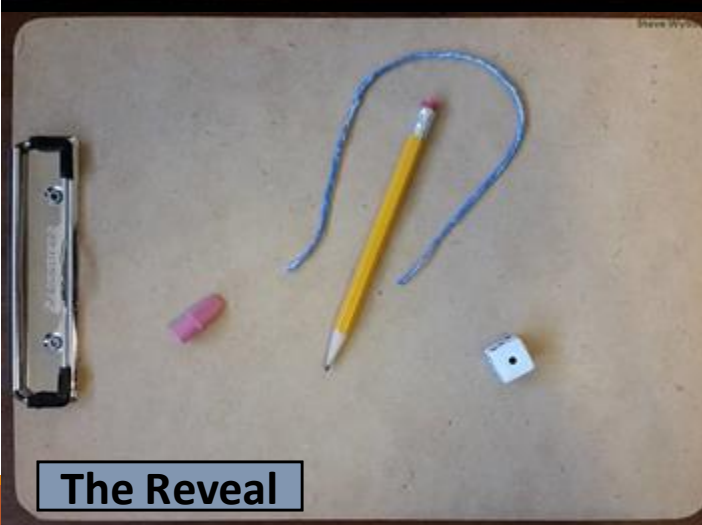
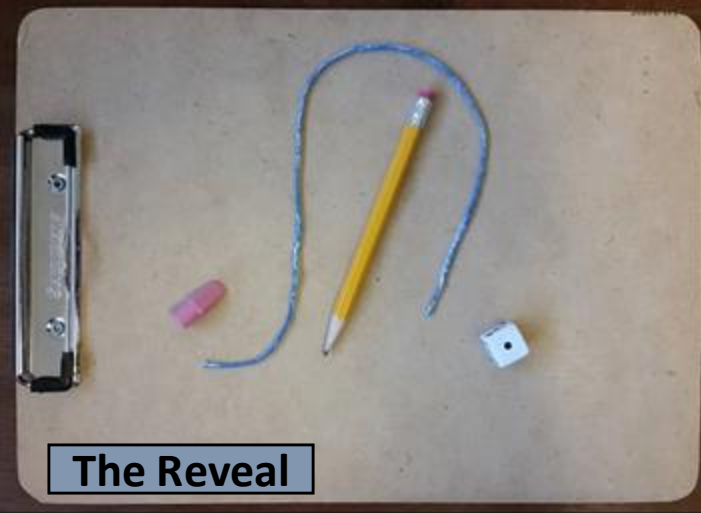
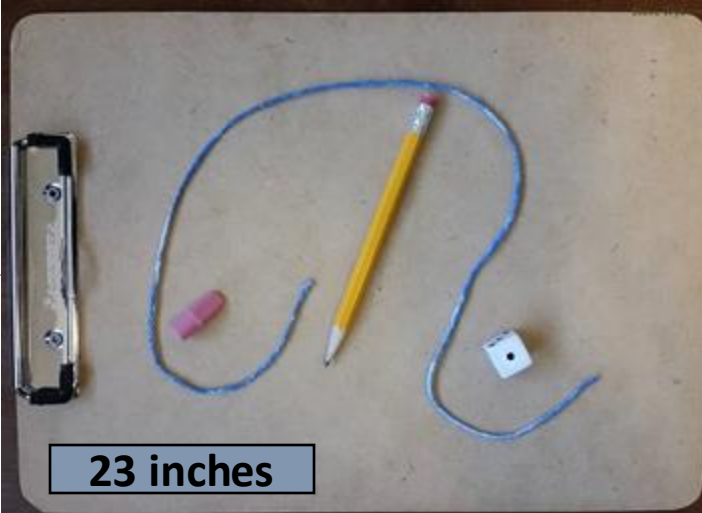


The Reveal

What is the length of the string in whole inches?



The Reveal



The 20% Rule

- ✓ According to Steve Wyborney, most estimates are off by 20 percent. Estimates are 20% *below* the actual amount.
- ✓ How can we use this information to improve our estimates?

Content Connections

Fractions/decimals/percent

Percent increase/decrease

Spatial Reasoning

Multiplicative reasoning

And?



What
characteristics
comprise
number sense?

Magnitude

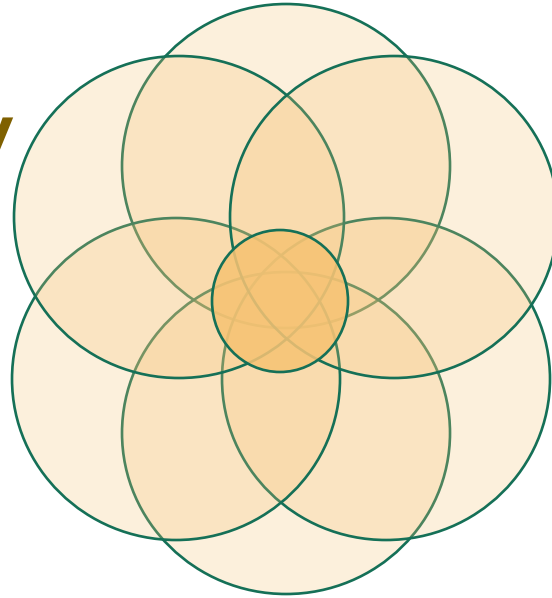
Flexibility

Estimation

Reasoning

Mental Math

Decomposition



What do you notice?

Think?

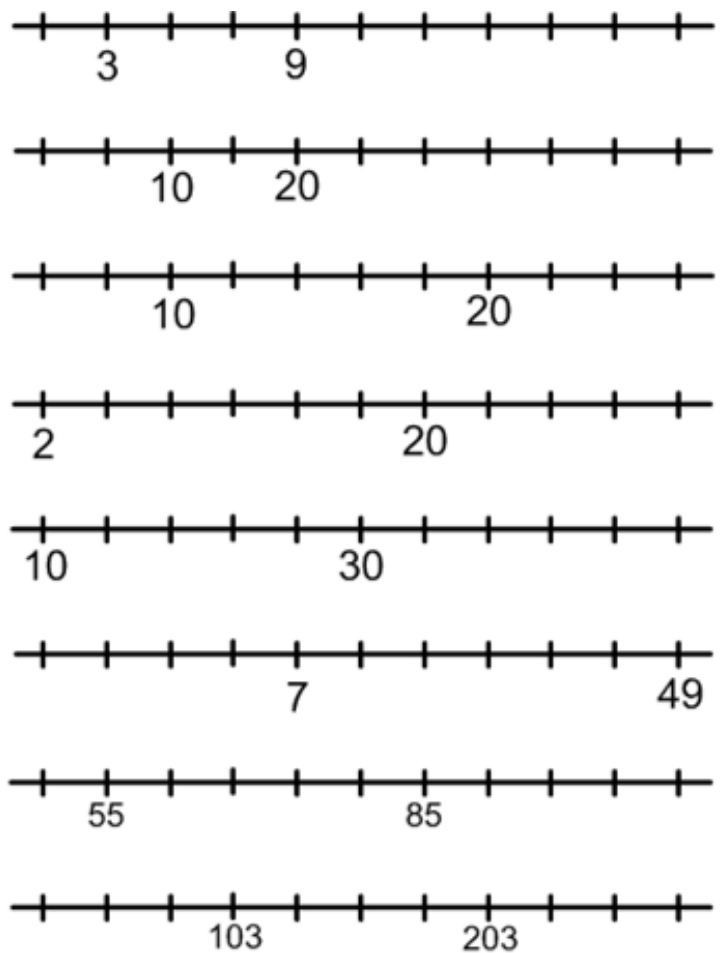
Wonder?

Suppose?

Believe?



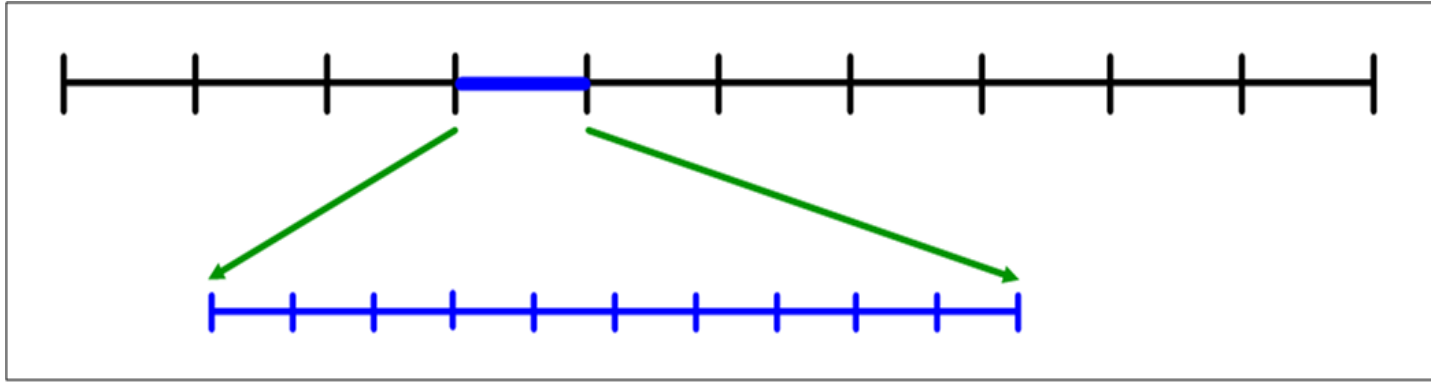
- Inquiry Maths
- Start with whole numbers before transitioning to decimal numbers, fractions, and/or integers.



Density Property of Rational Numbers

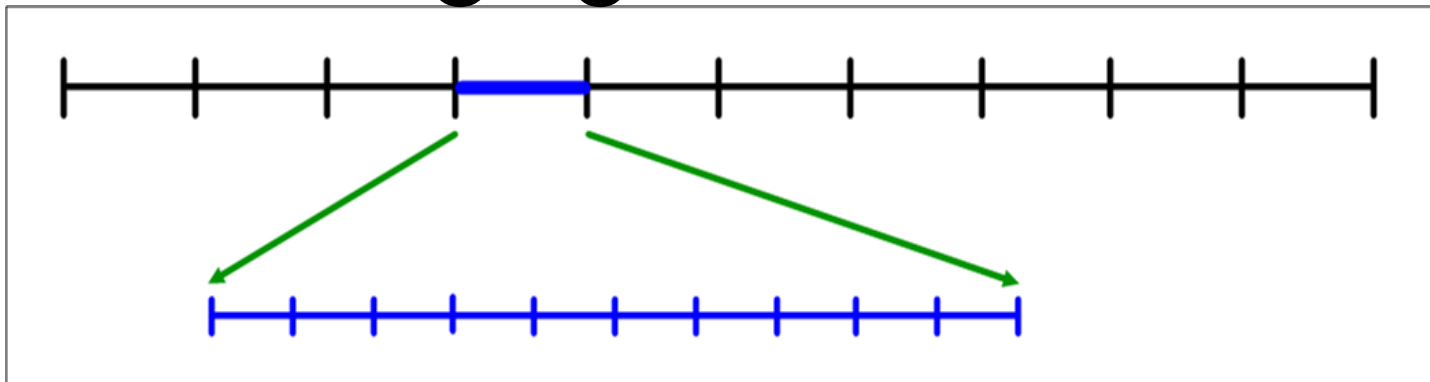
In between two specified rational numbers,
there exists another rational number.





Tell me about this image.

5 6

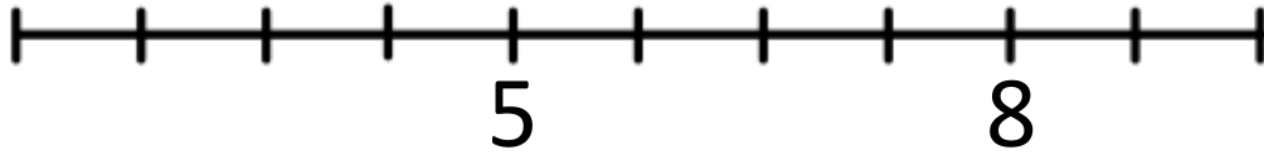


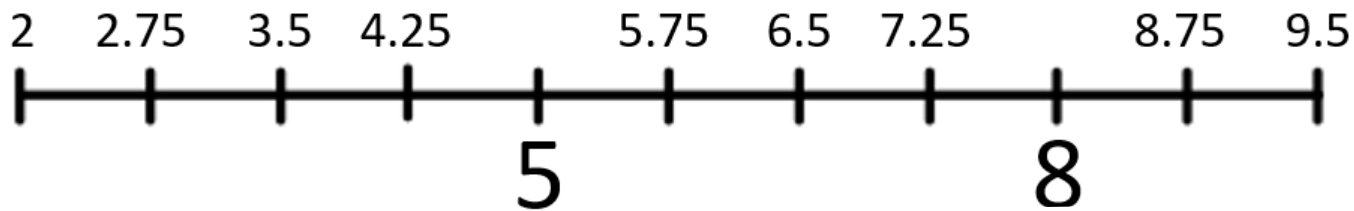
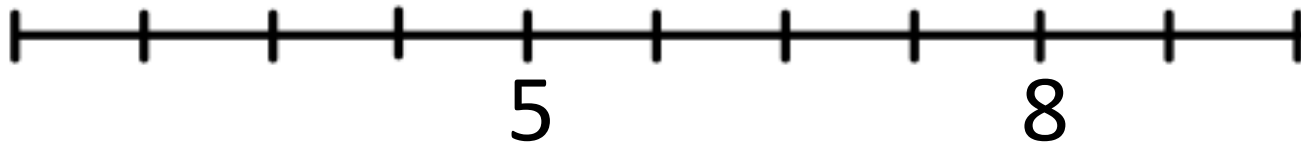
$$6 - 5$$

$$1 \div 10 = 0.1$$

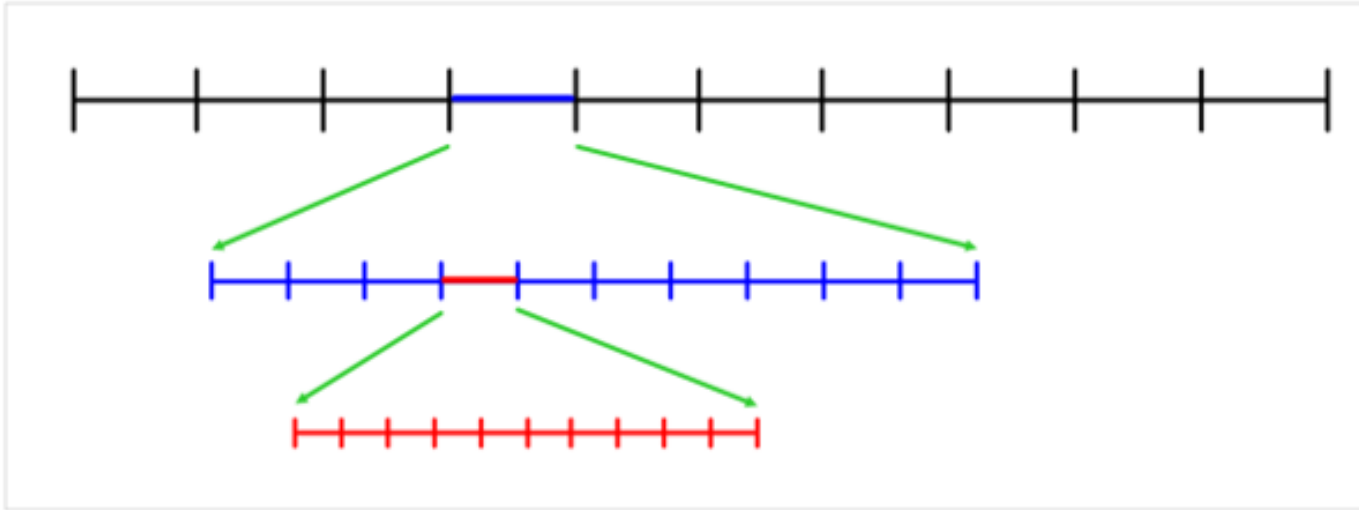
5, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 6

Start number	End number
5	8

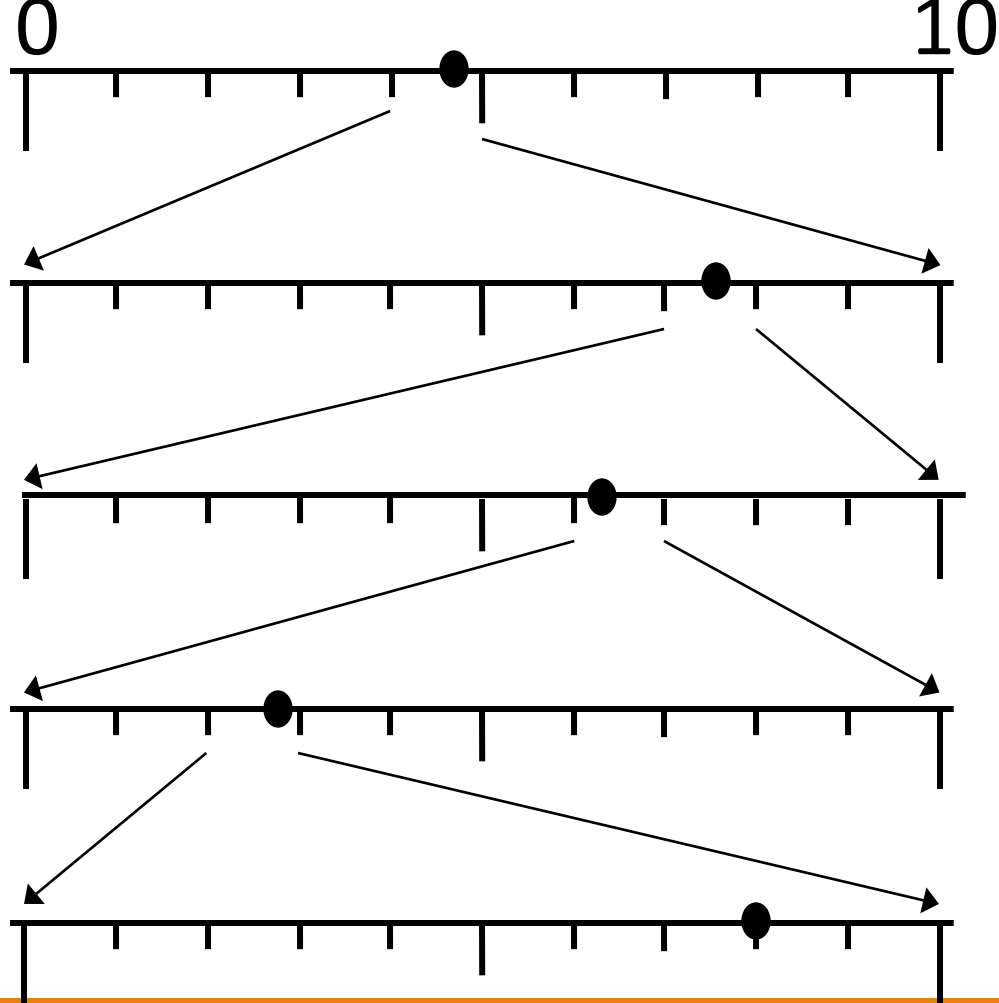


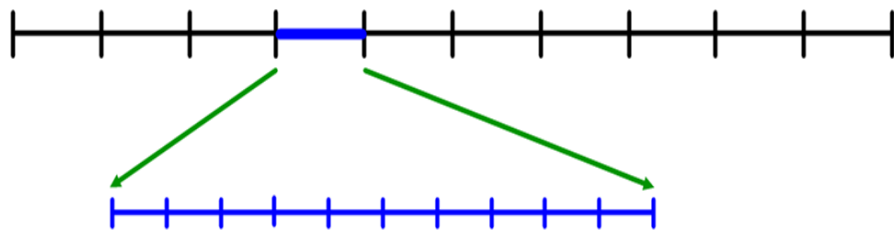


Tell me about these images.



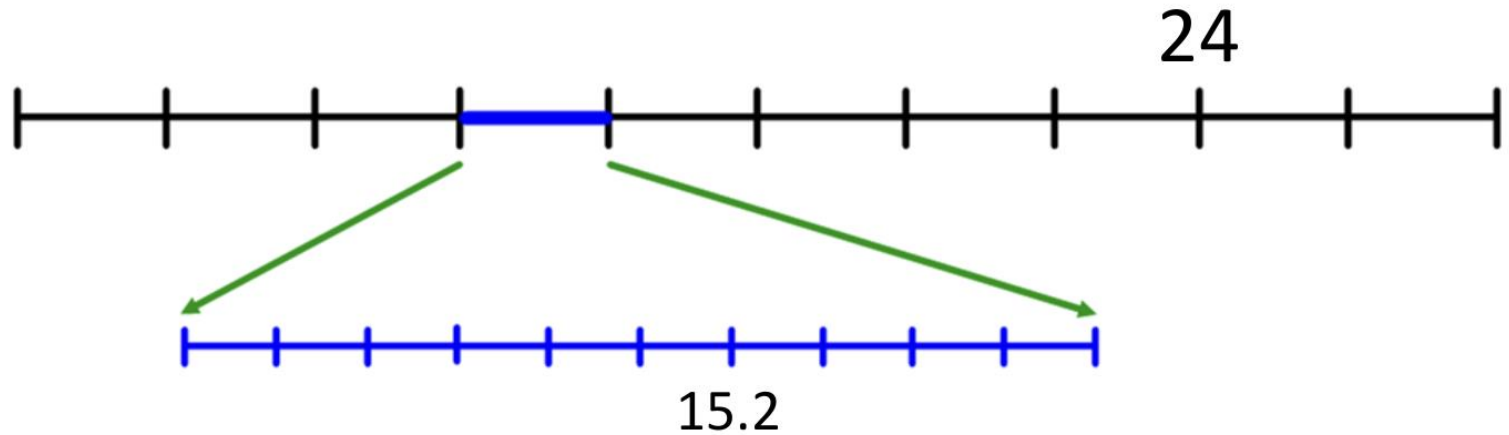
What number
does this
represent?





Interval on the top number line Decimals	
Start number	End number
1.1	1.2
11.2	12.2
3.24	3.25
2.4	2.6
4.02	4.06
Make up one of your own.	

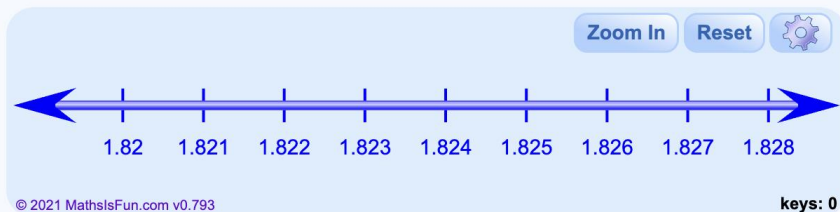
Find the missing numbers.



Zoomable Number Line

Zoomable Number Line

Click on number line to zoom in, **shift-click** to zoom out.
Click at left or right to scroll.



Which Number am I?

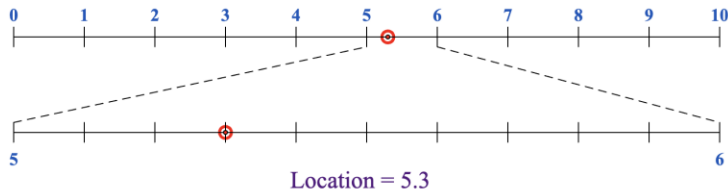
What is the location of the red point?
Make a prediction. Zoom in to check.

Prediction =

Zoom

Actual Location =

Check



New Problem



Reset < 1 >

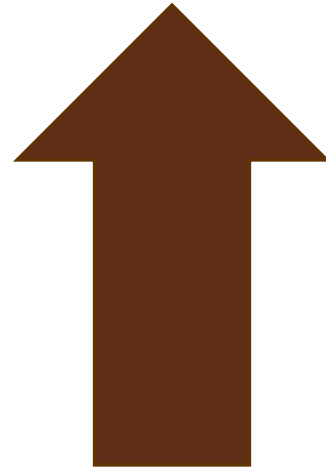
To understand operations and estimation with fractions, student must first understand *fractions*.


- Hope Phillips

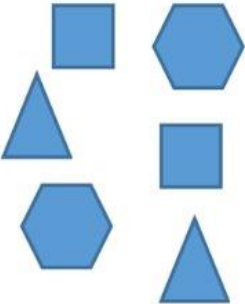
What are the Actions of the Numerator & Denominator?


counts

splits




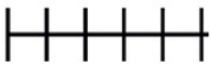
1. If  = $\frac{1}{3}$ draw a picture of "1."

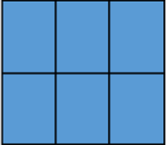
2. If  = $\frac{2}{3}$ draw a picture of "1."


3. If  = $\frac{2}{7}$ draw a picture of "1."

4. If  = $\frac{2}{5}$ draw a picture of "1."

5. If  = $\frac{3}{2}$ draw a picture of "1."

6. If  = $\frac{5}{3}$ draw a picture of "1".

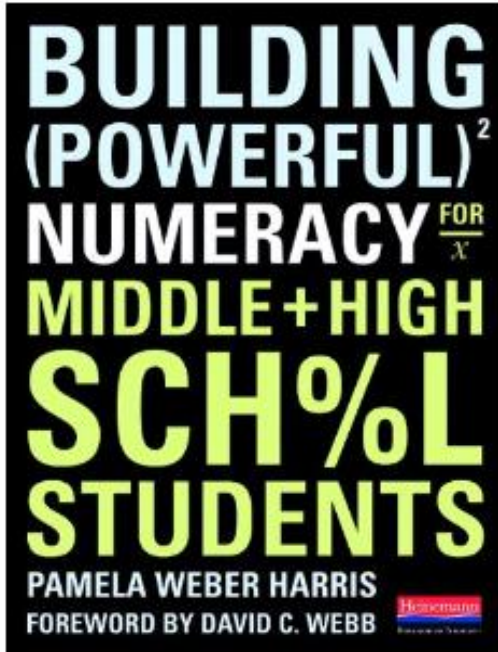
7. If  = $\frac{3}{4}$ draw a picture of "1."

8. If  = $\frac{1}{2}$ draw a picture of "1."

Building
(from)
Numerical Relationships



Pamela Weber Harris



[Walmart Pre-Owned Copy](#)

[AbeBooks Pre-Owned Copy](#)

[Amazon New Copy and Pre-Owned](#)

[Pam Harris' Podcast Math is Figure-Out-Able!](#)

Packs of gum	Sticks of gum
1	15
2	
4	
10	
12	
20	
5	
15	
	289

The order is the order. Do not change it.



Time in Car (hours)	Distance Traveled (miles)
$\frac{3}{4}$	36
$1\frac{1}{2}$	
3	
$4\frac{1}{2}$	
1	
5	
12	
	108
	225

Number Lines:

A Focus On Relative Magnitude



What number is the arrow pointing to?

How do you know?

- Accessible entry point
- Focus on *distance*



Gut
answer first!

Estimate by partitioning length
(visually; then, on paper)

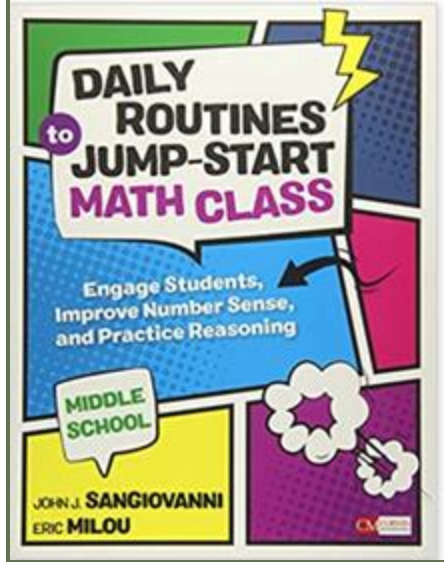
Where would you put 5,000?





Use decimals, fractions (in a variety of forms), and percent





[Amazon Link to Daily Routines Jump-Start Resource](#)

[Link to San Diego City Schools Resource](#)

San Diego City Schools
Middle Level
Mathematics Routine Bank
Free!

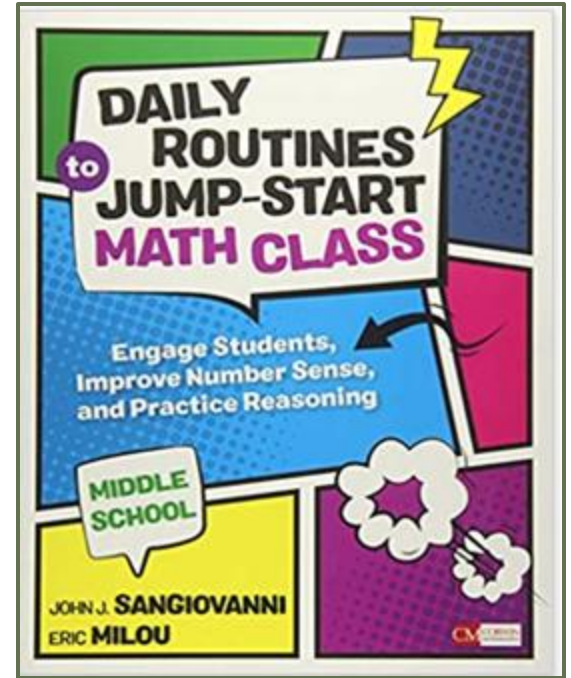
Daily Routines Jump-Start
Math Class
By: SanGiovanni & Milou

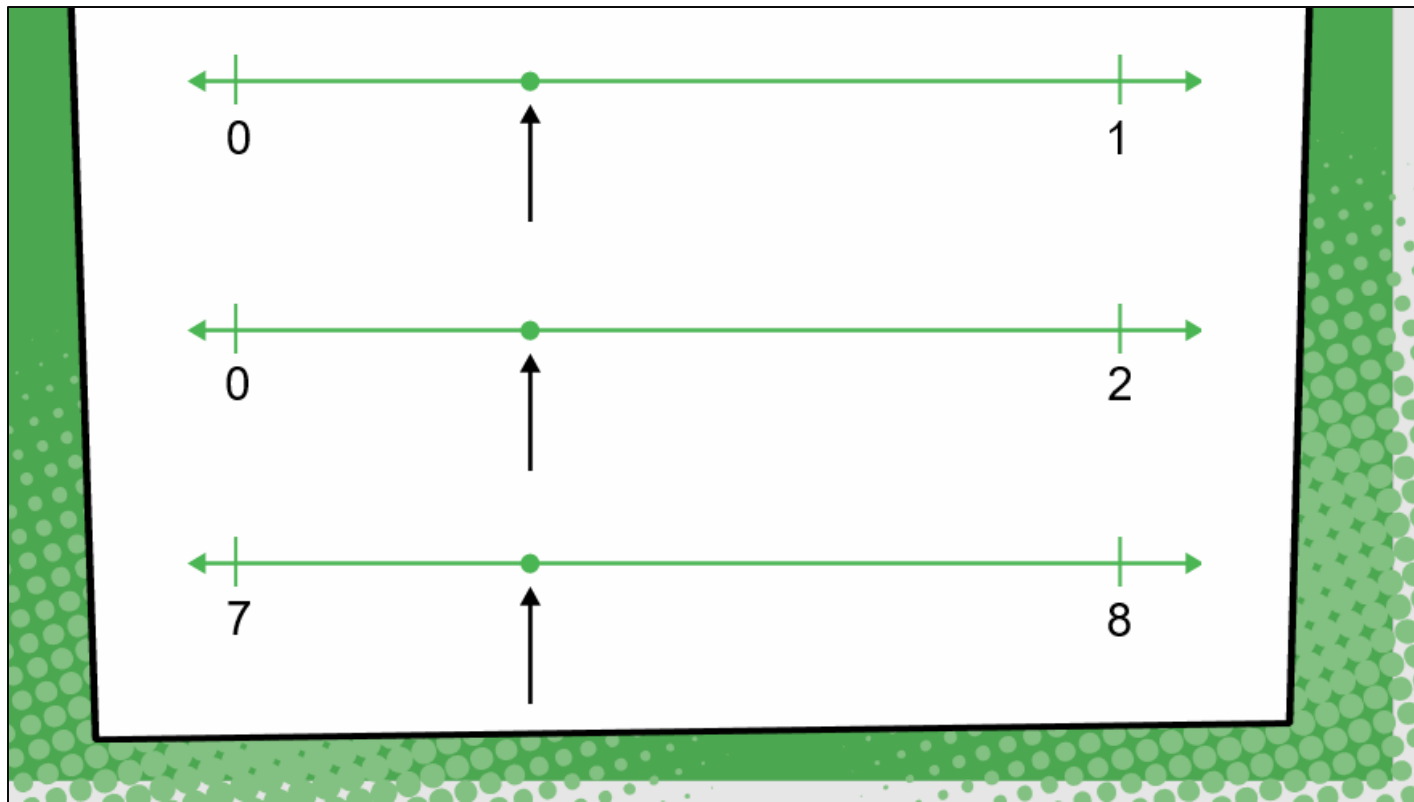


Where's the Point?

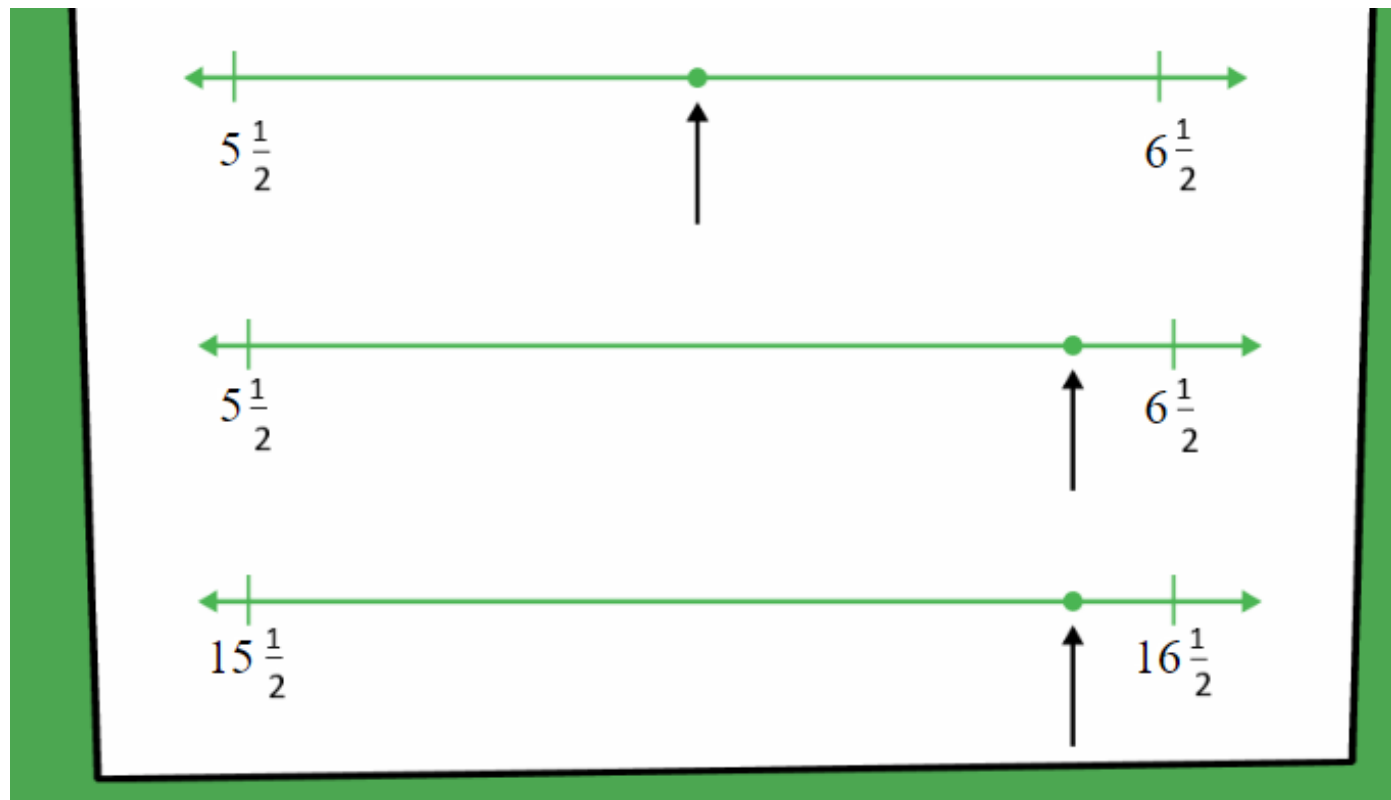
Daily Routines Jump-Start
Math Class

By: John J. SanGiovanni
& Eric Milou

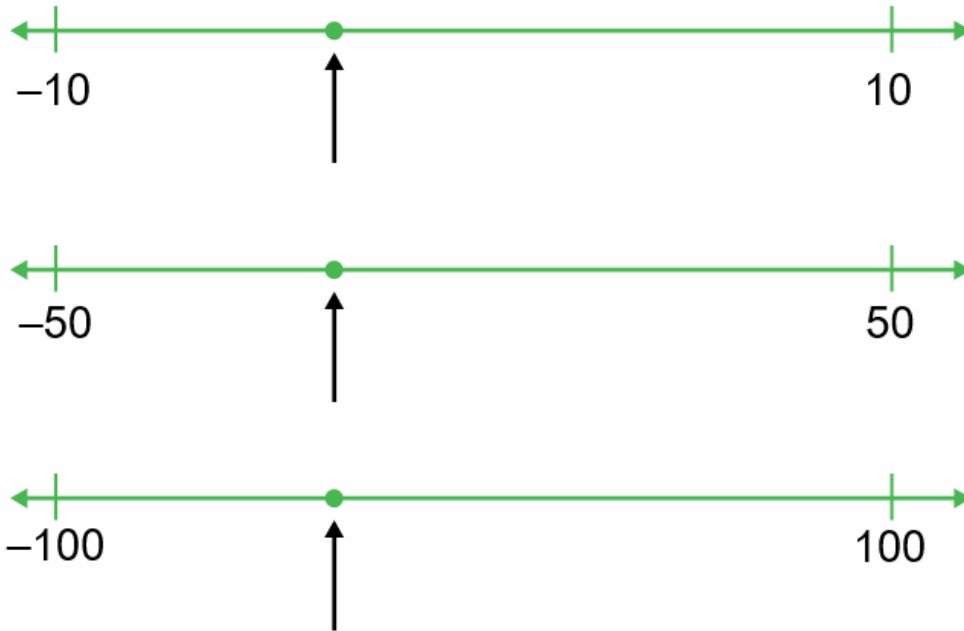






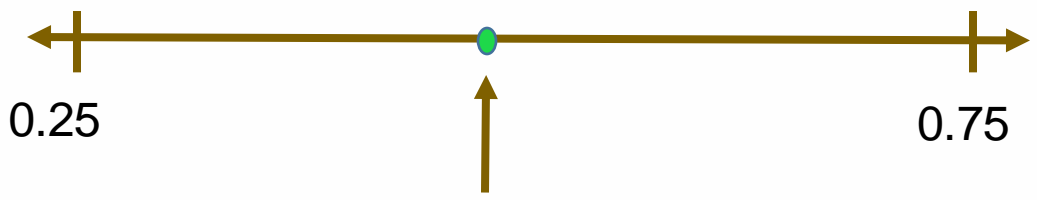




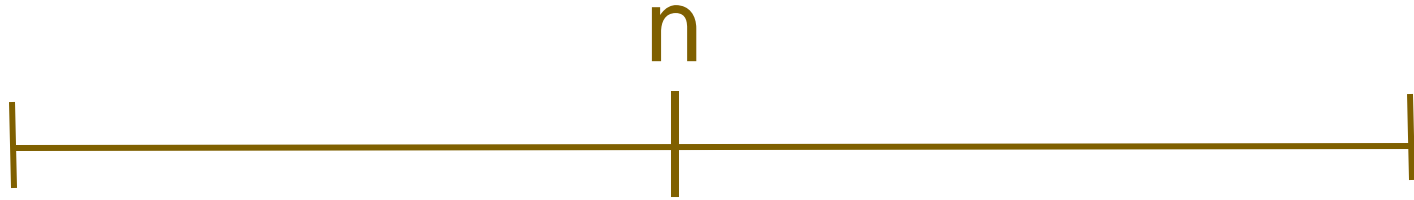


Notice
anything
different
here?

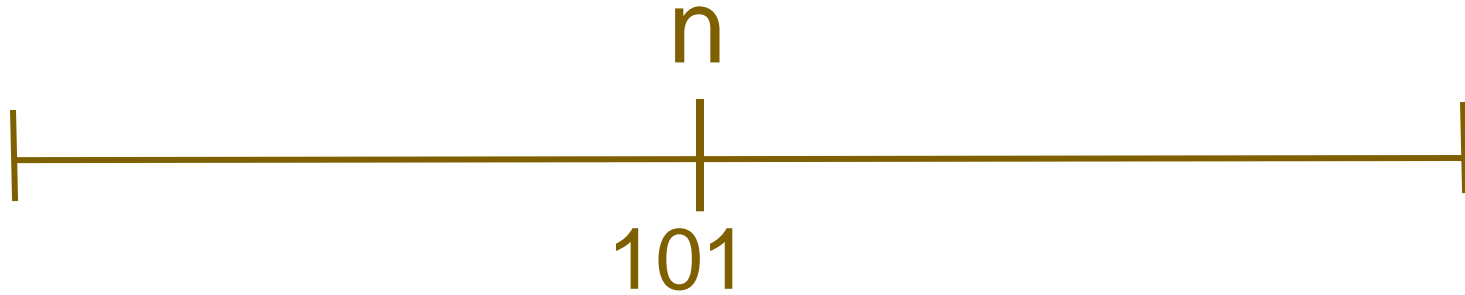
Multiplicative
Reasoning



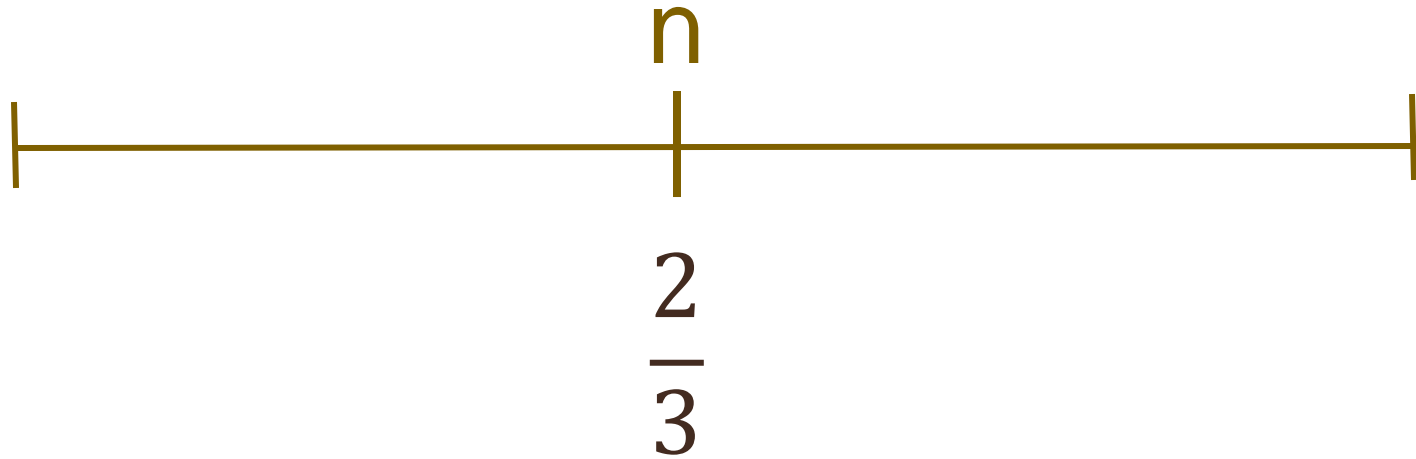
What Could the Ends Be?



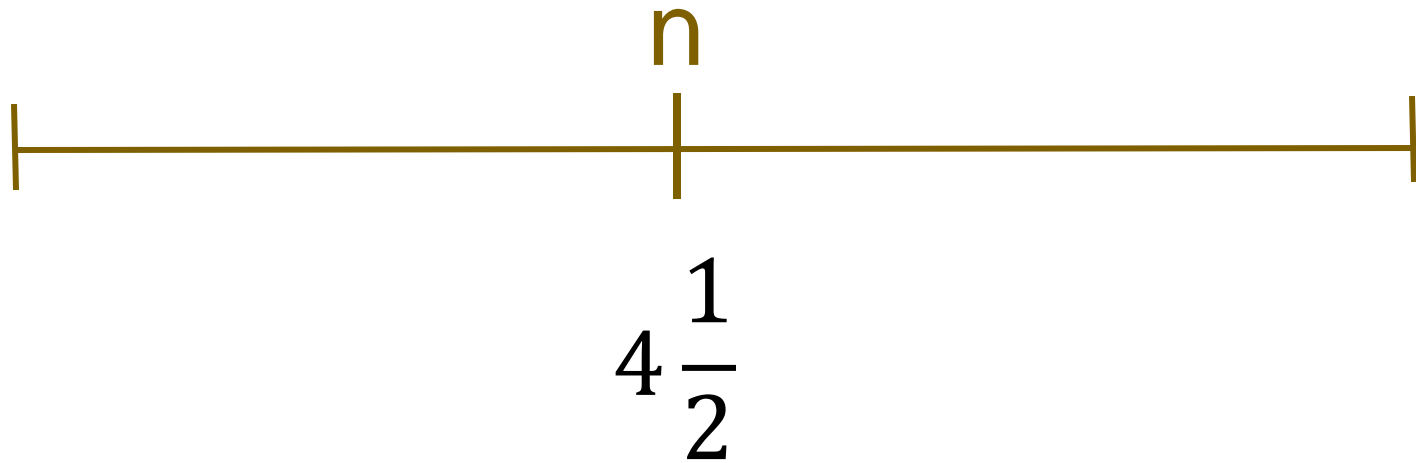
What numbers could be the ends?



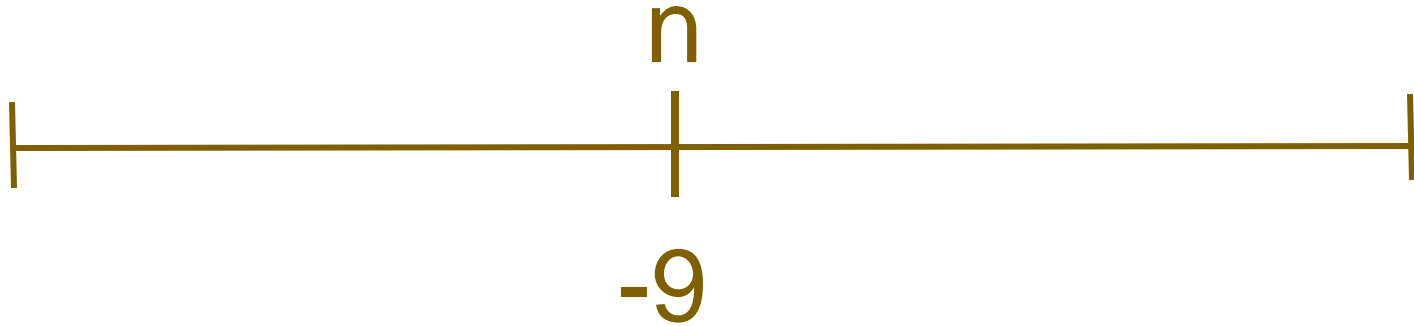
What numbers could be the ends?



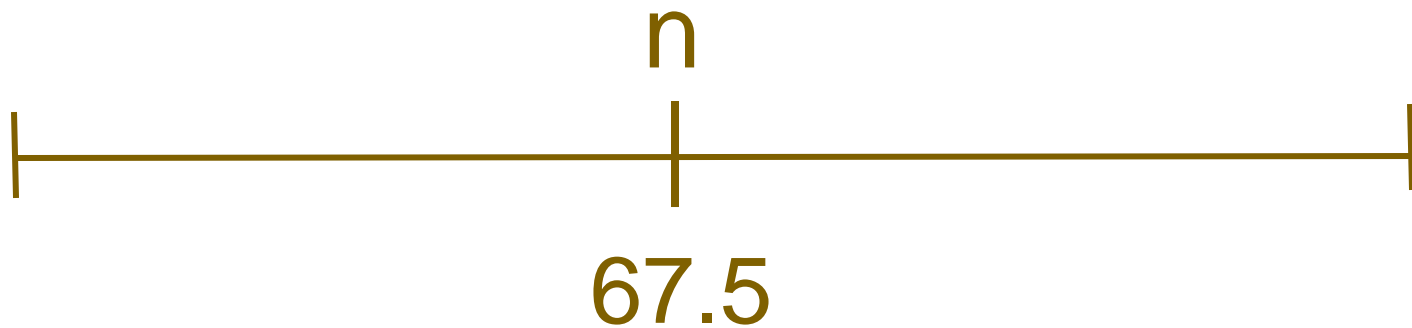
What numbers could be the ends?



What numbers could be the ends?

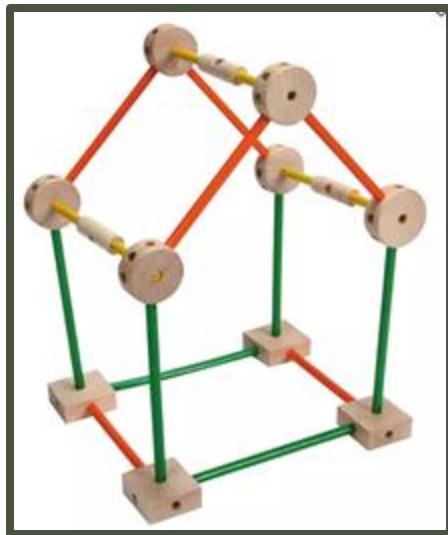


What numbers could be the ends?

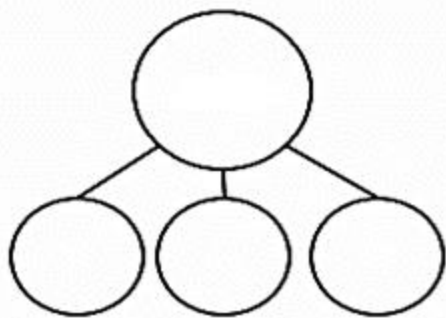
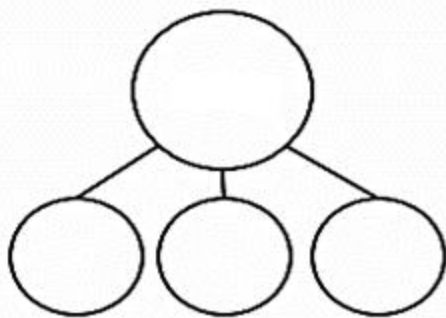
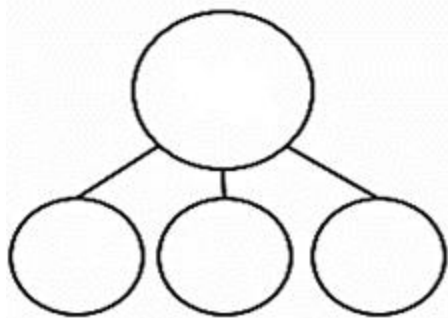
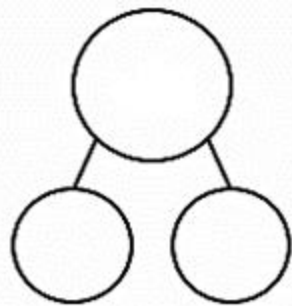
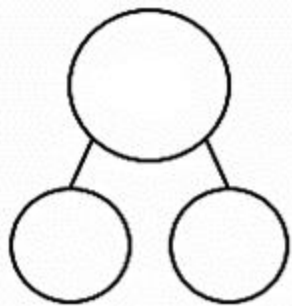
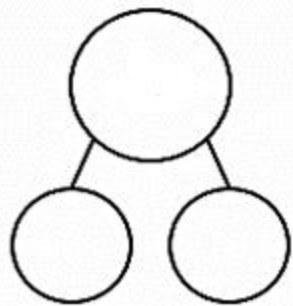


Broken Numbers

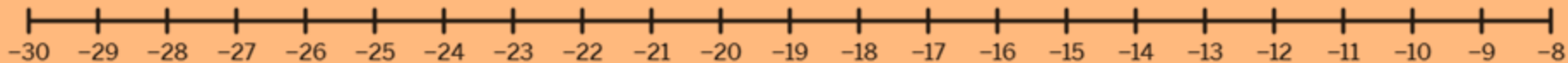
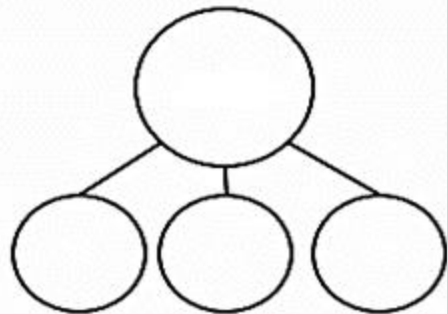
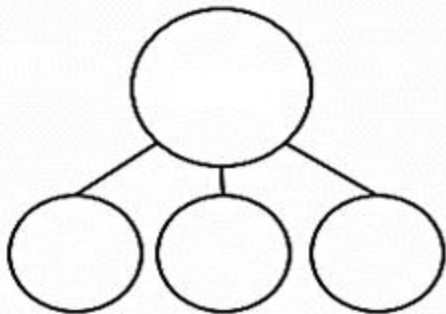
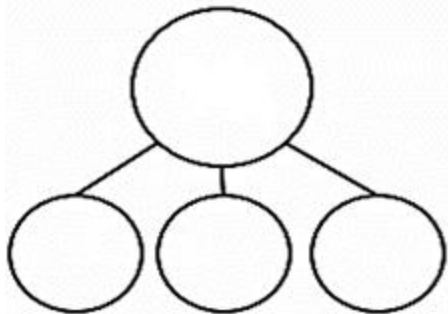
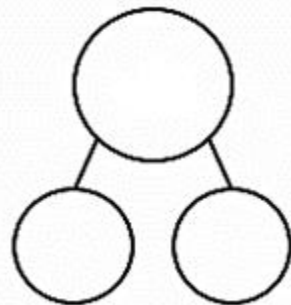
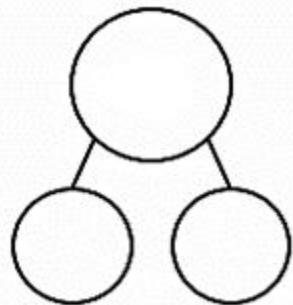
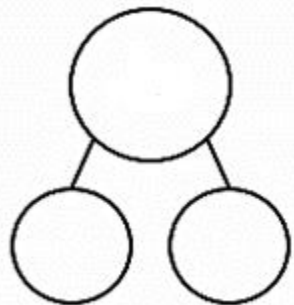
(A.K.A. -- Decomposed Numbers)



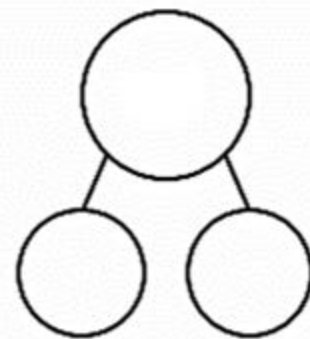
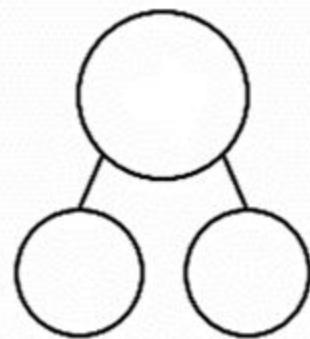
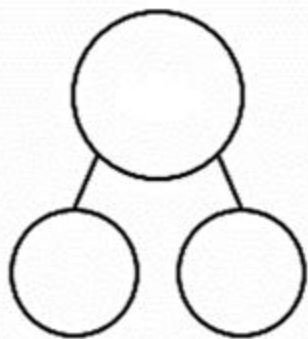
$$\frac{13}{5}$$

 $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$

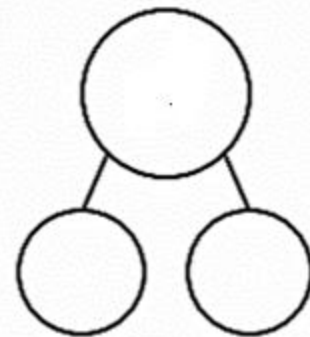
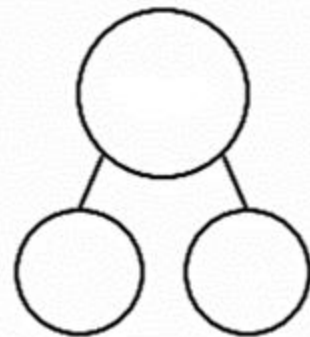
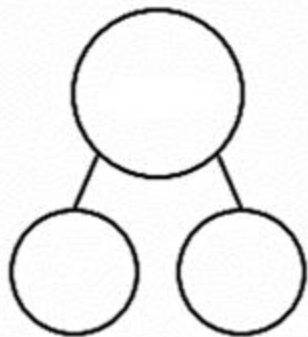
-27



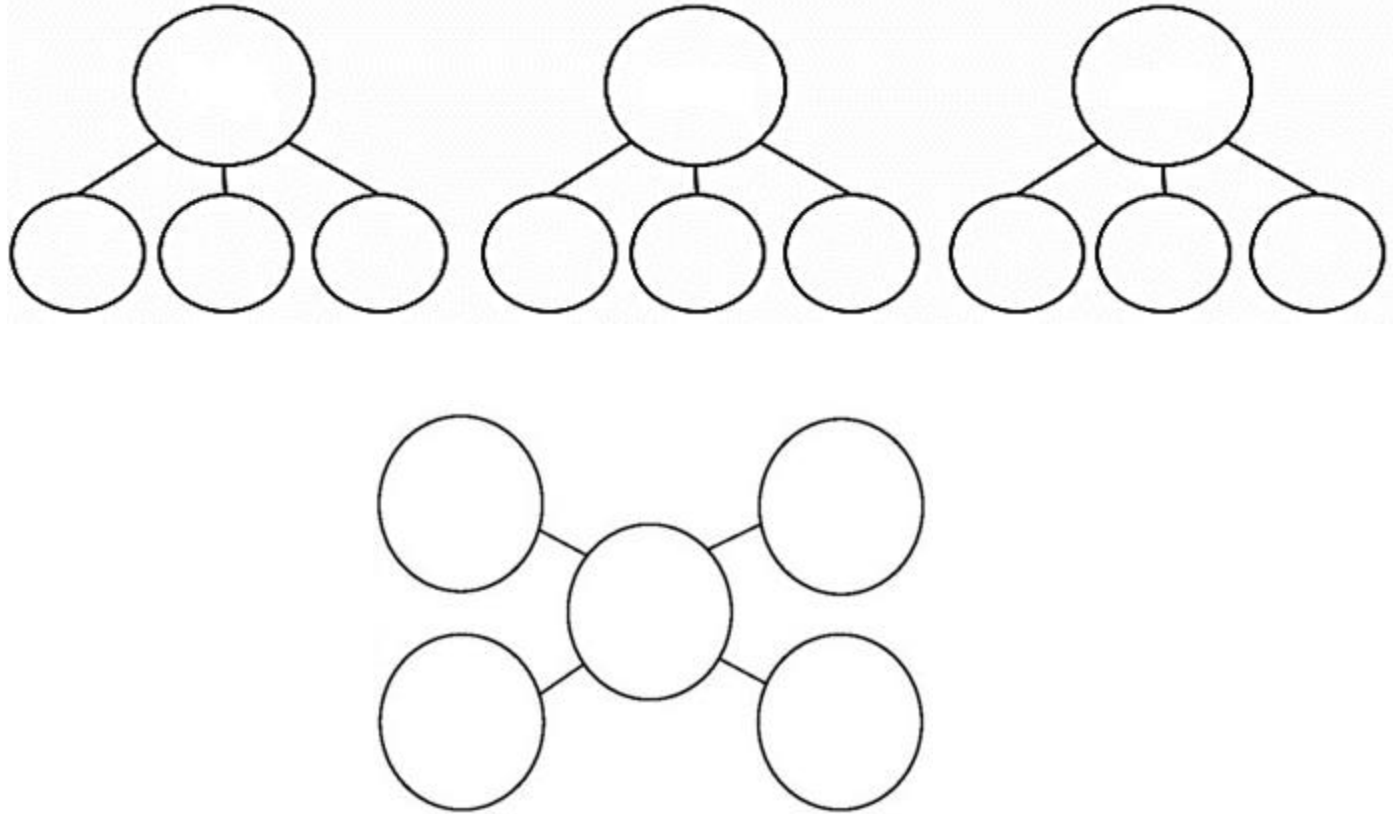
103.7



253.7



$$4x + 6$$



Break down the given number into three parts that add up to its original value.

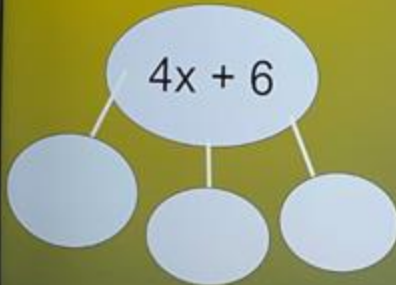
97



-27



$4x + 6$



BROKEN NUMBERS

0 1 2 3 4 5 6

7 8 9 10 11 12

0 1 2 3 4 5 6

7 8 9 10 11 12



Helpful Hints from Berkeley Everett

BERKELEY EVERETT

I help you teach **MATH** that **MAKES SENSE** to **HUMANS**

Seven
takeaways from
years of using
number sense
routines...

I used to think kids had to “get it” before a routine was over. It was hard to keep it short, *and* I was more likely to share *my* thinking rather than listen to kids’ thinking. Deep and meaningful learning takes time and routines are meant to build number sense over the course of the year. So, sit back and relax and don’t try to accomplish anything. You can always come back to the same prompt tomorrow and **continue the conversation.**

Conference Evaluation Forms

Complete the survey at

<https://bit.ly/2024GMCgrowth>

Scan the QR code



Session Evaluation Forms

Complete the survey at

<http://bit.ly/2024GMCsessions>

Scan the QR code



Thank
You

Three stylized leaves in orange, yellow, and red are positioned around the text 'Thank You'.



KEEP IN TOUCH!

[www.https://www.columbusstate.edu/crmc/](https://www.columbusstate.edu/crmc/)

TEACHER NEEDS
SURVEY:



FOLLOW US ON SOCIAL MEDIA:



PRESENTATION LINK

phillips_hope@columbusstate.edu