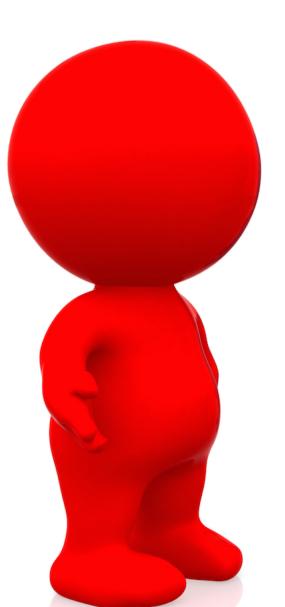
#### **INSTEAD OF THAT... SAY THIS!**



Be Precise With Math Language



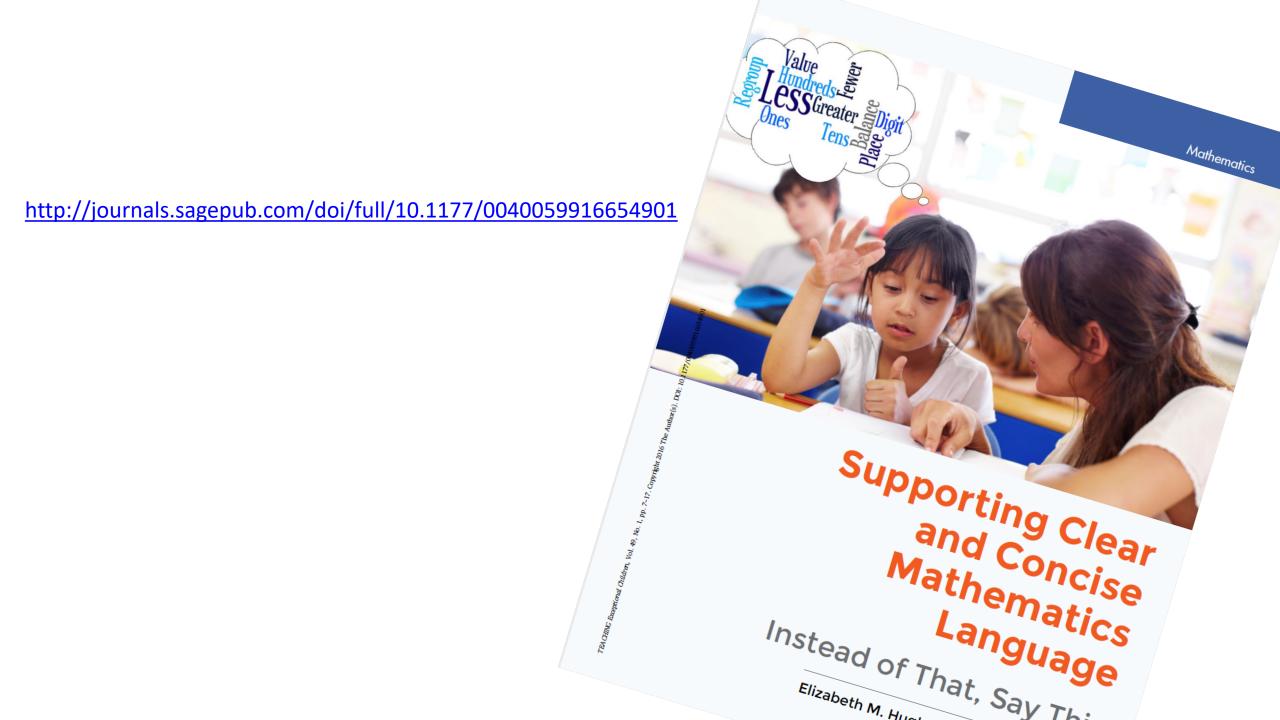


#### **Presenters**



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Join at slido.com #V968





### The Language of Mathematics



Listening

Speaking

Reading

Writing

#### Mathematics Requires That We Read...

Words add, *x*-axis

Letters X, Y, A

Left to Right  $2 \times 4 = 8$ 

Symbols + / %

**Numbers** 4, 8, 97



Right to Left + 2 = 6 + 4

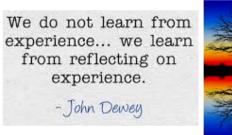
Top to Bottom



#### Language of Mathematics



- Mathematics shares many words with the English language
  - Different meanings





- Comparable meanings with math specificity

area

Specific math terms

quotient

isosceles

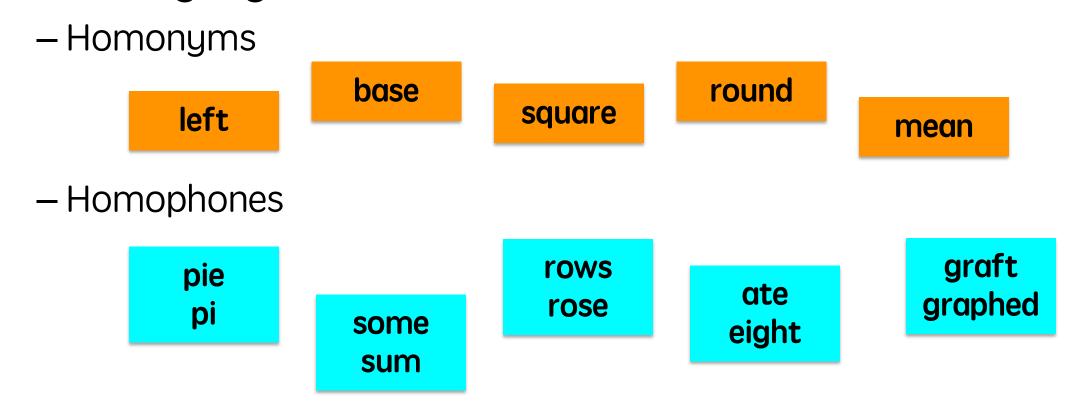
quadrilateral



#### Language of Mathematics



Mathematics language requires students to be flexible with language





#### Language of Mathematics



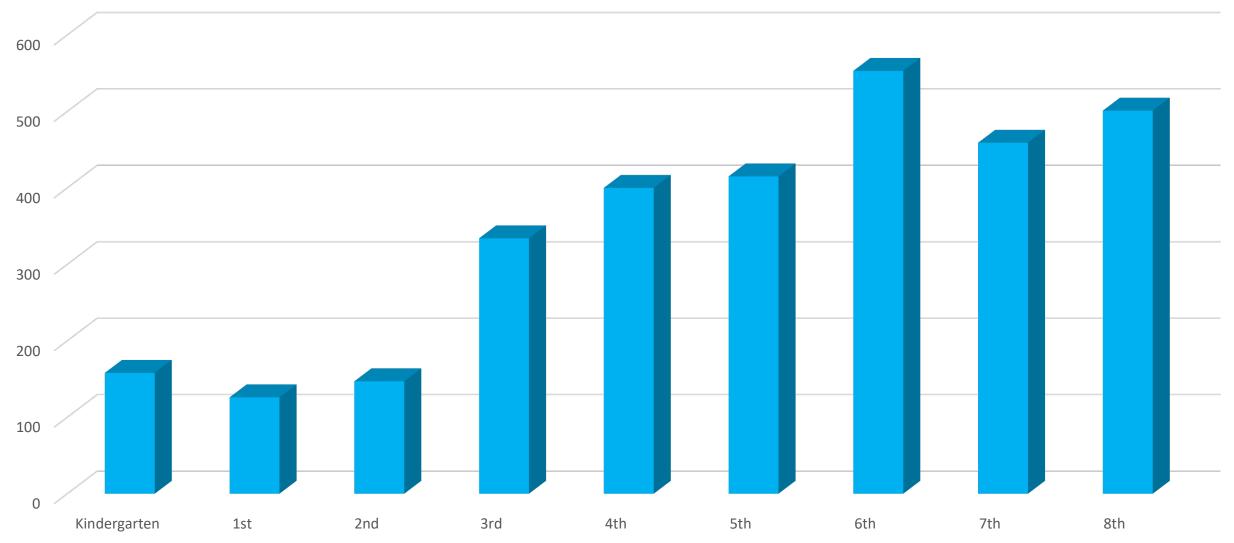
- Mathematics language also requires students to understand
  - Technical terms

	trapezoid		rhombus		numerator		addend		subtract		
– Subtechnical terms											
	base		degrees		cube		plane		arc		
– Symbolic terms											
	plus		zero		twelve		dollars		and		
– General terms											
	above		measure		answer		longest		outside		



## **Vocabulary Across Grades**







# Language Impacts Mathematics Learning Across Grades

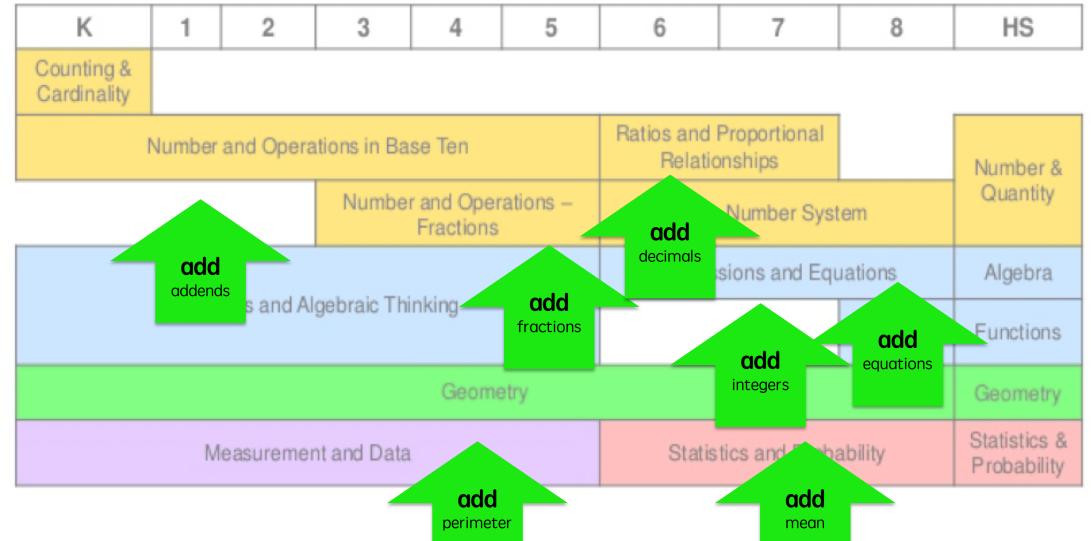


К	1	2	3	4	5	6	7	8	HS		
Counting & Cardinality											
1	Number	and Opera	tions in Ba	Ratios and Relation	Number & Quantity						
			Numbe	The							
Expressions and Equations									Algebra		
	Operati	ons and Al	gebraic Thi			Functions	Functions				
Geometry									Geometry		
Measurement and Data Statistics and Probability											



### Language Impacts Mathematics Learning Across Grades







#### Difficulty or Disability



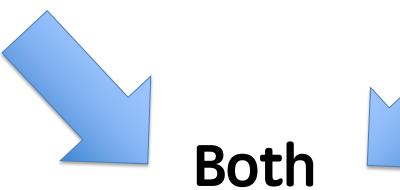
- May be difficult to distinguish
- Different legal obligations
- Different underlying processing
- Require attention to instruction and impact of instruction on learning outcomes

A *specific learning disability* is... a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in the *imperfect ability* to listen, think, speak, read, write, spell, or do mathematical calculations. Such term includes such conditions as dyslexia, dysgraphia, dyscalculia.



# For students with learning difficulties or disabilities, they may experiences challenges with











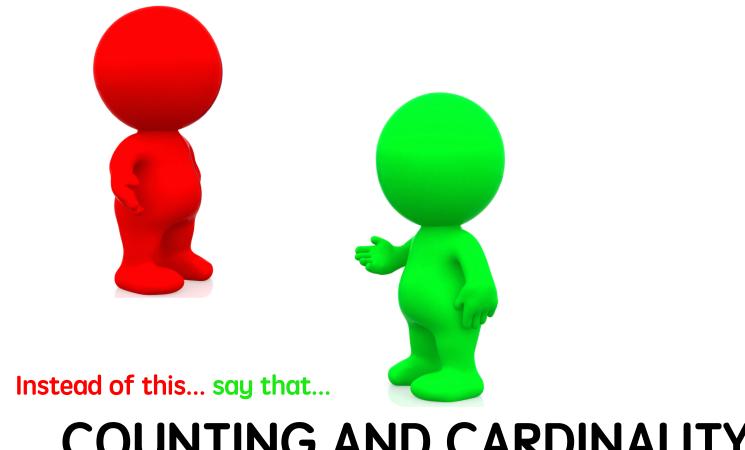
Instead of That, Say This

Elizabeth M. Hughes, Sarah R. Powell, and Elizabeth A. Stevens

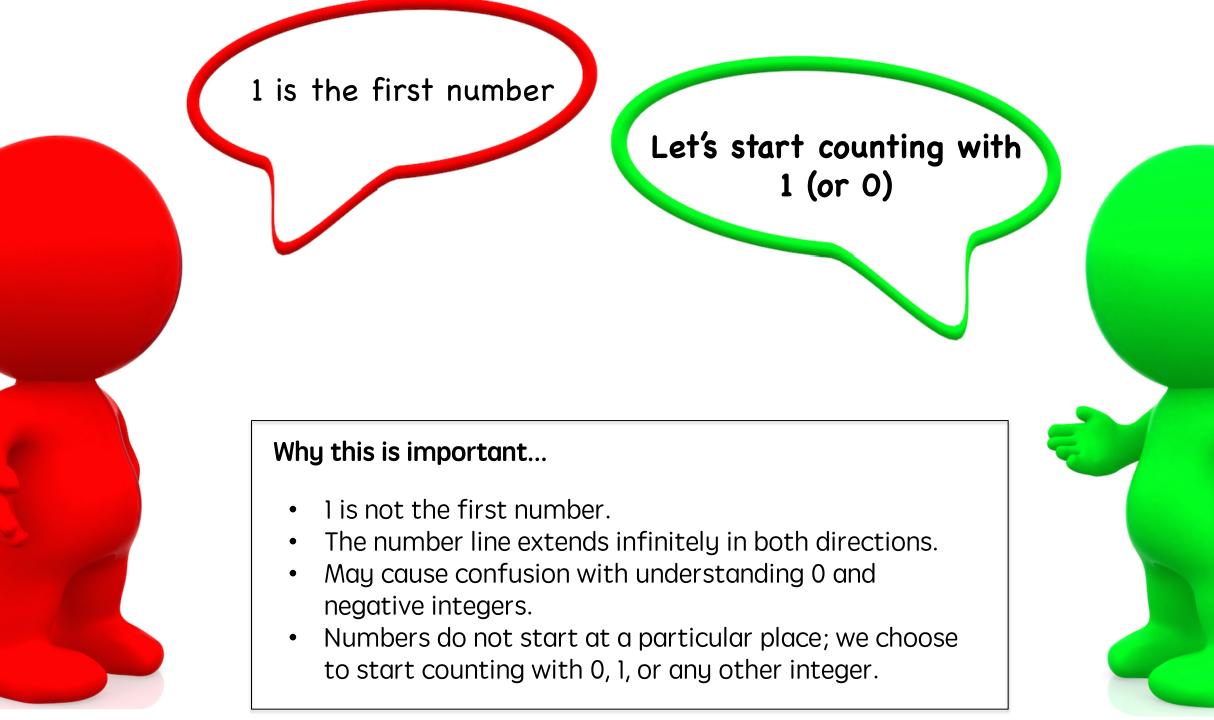


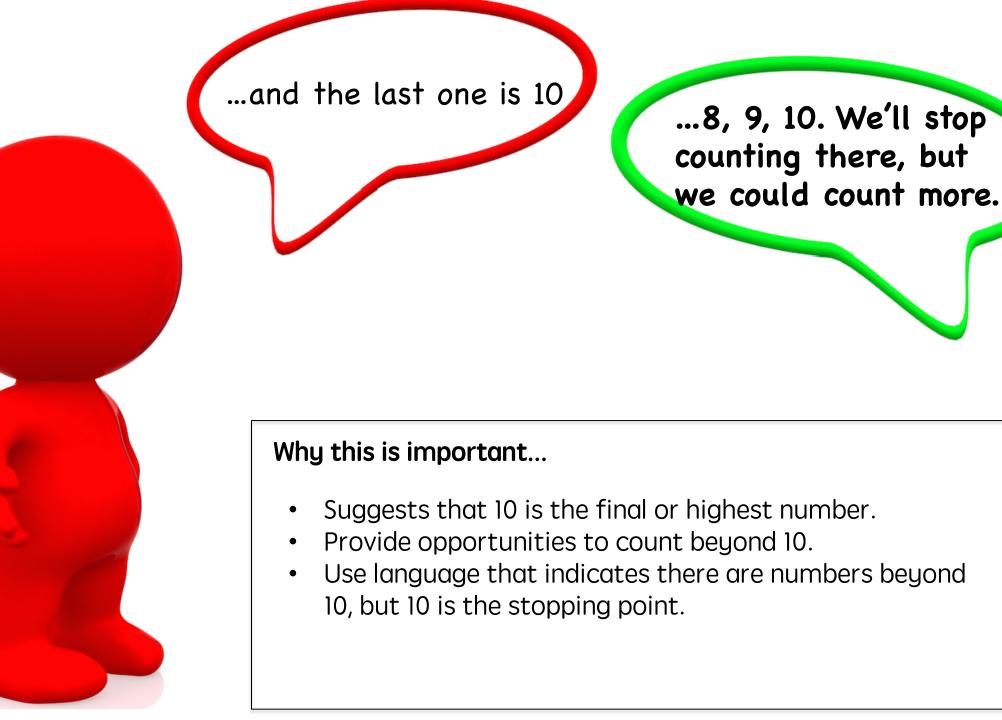


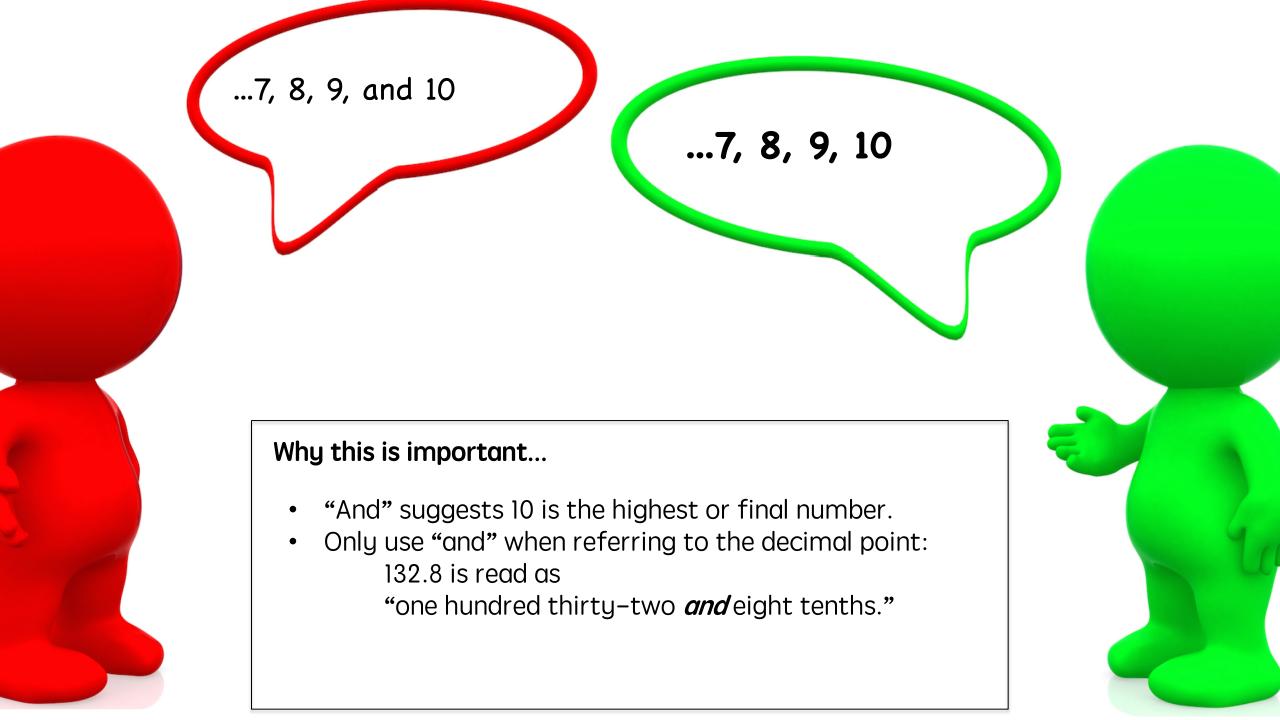




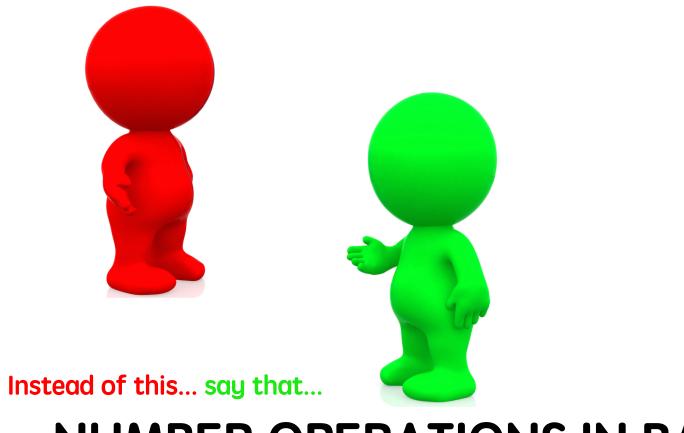
**COUNTING AND CARDINALITY** 











#### **NUMBER OPERATIONS IN BASE 10**

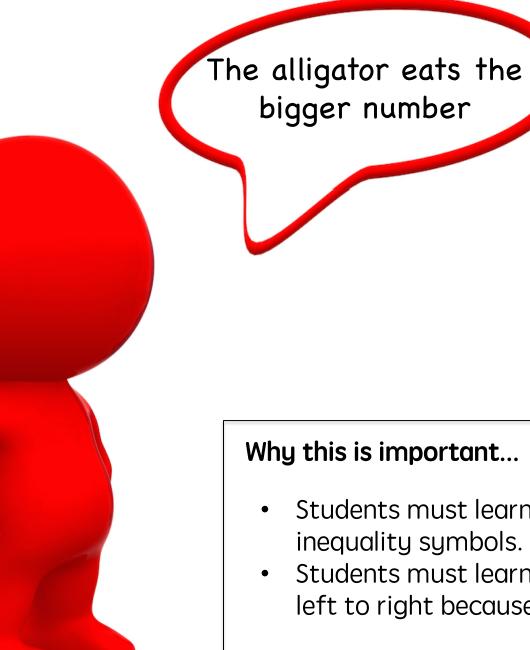
What number is in the tens place?

What digit is in the tens place? What is the value of the digit in the tens place?

135

#### Why this is important...

- A number refers to the entire amount.
- The 3 in the tens place value is not a number, but rather a digit in the number 135.
- Reinforces conceptual understanding of place value.
- Emphasizes that 3 is part of the number 135 with a value of 30.



is less than
OR
is greater than

- Students must learn how to read and write the inequality symbols.
- Students must learn to read equations correctly from left to right because < and > are two distinct symbols.

bigger number and smaller number number that is greater OR number that is less Why this is important... This is not mathematical language. "Bigger" and "smaller" do not transfer to working with negative integers.

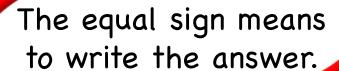
When adding, your answer is always bigger.
When subtracting, your answer is always smaller.

(Ask students to predict and reason.)

#### Why this is important...

- These are rules that expire in later grade levels.
- Leads to erroneous understanding of addition and subtraction.

$$-7 + 8 = 1$$

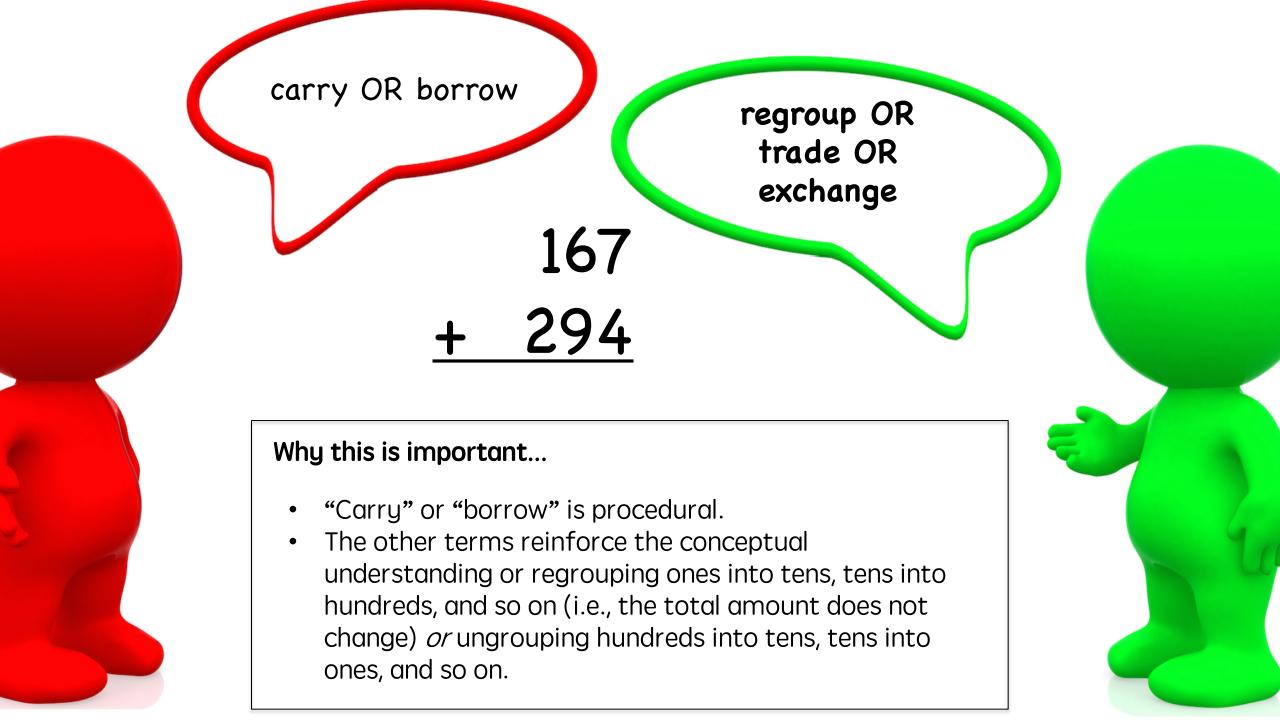


The equal sign means the same as.

$$5 + 3 = 8$$

#### Why this is important...

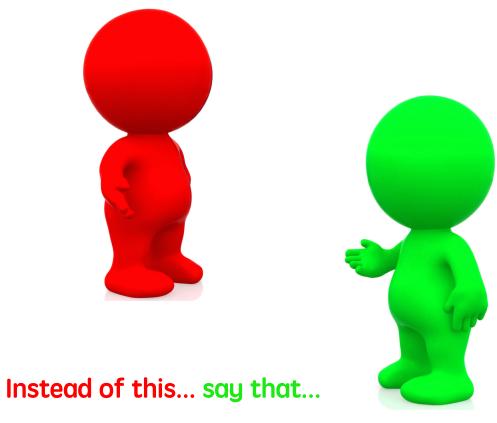
- Students may develop a habit (or a misunderstanding) that the equal sign means they should write an answer or compute.
- Using "the same as" reinforces the understanding that the quantities on both sides of the equal sign need to be the same.



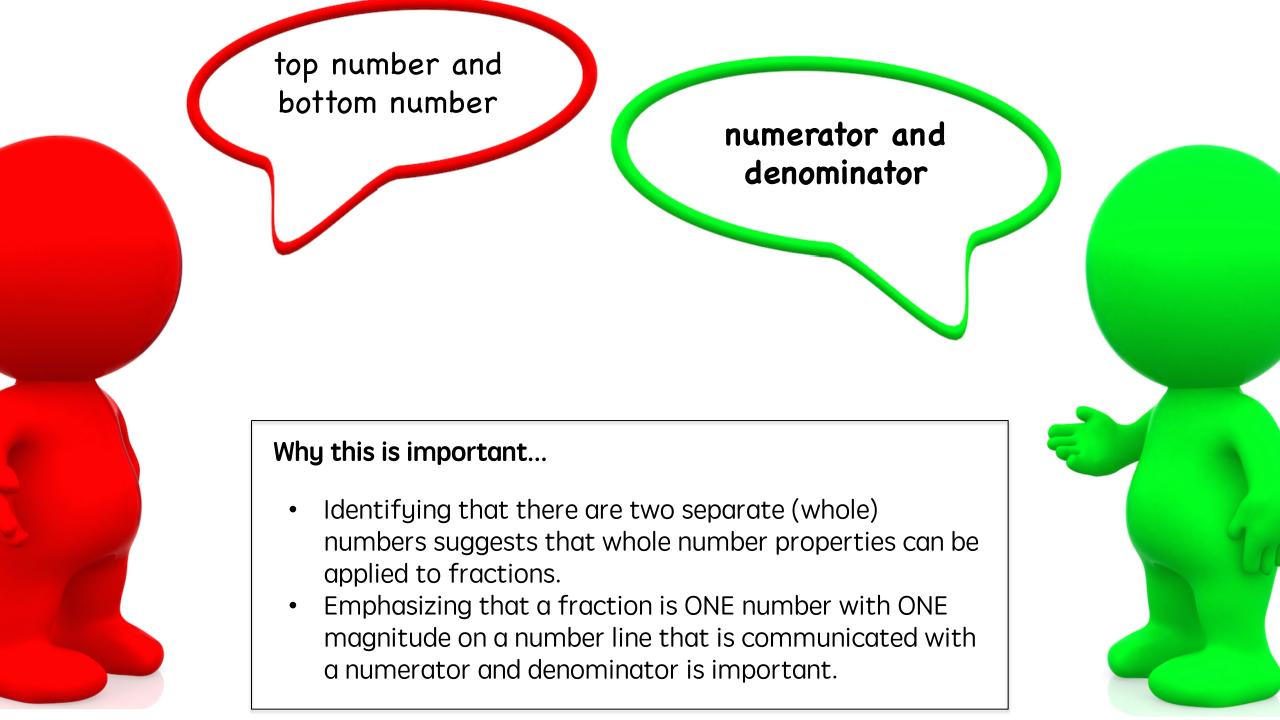


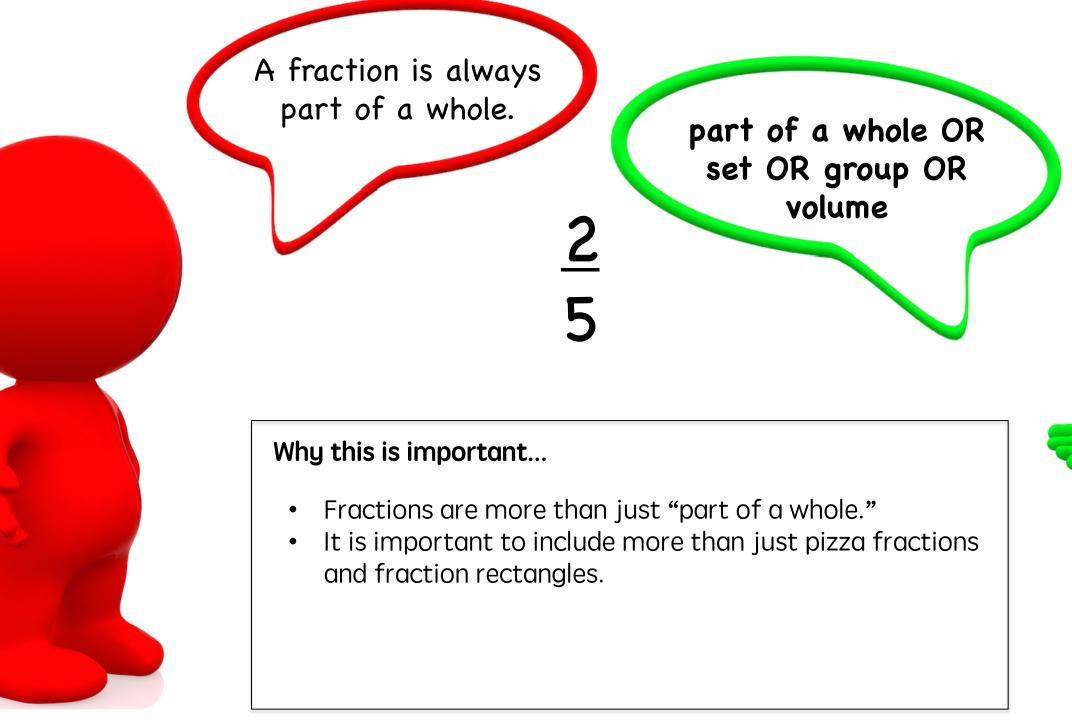


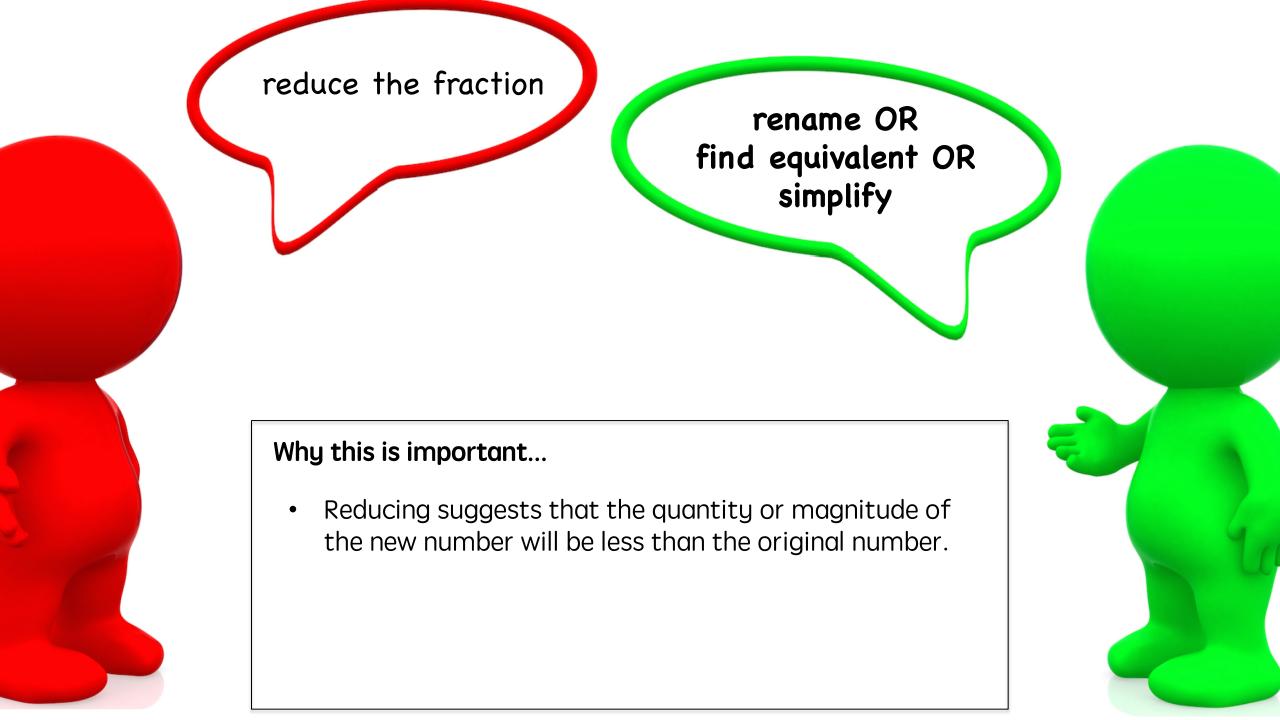
"That's right, I've decided to give myself zero pay raise this year."



# NUMBERS AND OPERATIONS WITH RATIONAL NUMBERS







Four point seven Four point oh seven Four and seven tenths Four and seven hundredths 4.74.07 Why this is important... Accurately shares the magnitude of the decimal. Emphasizes place value.

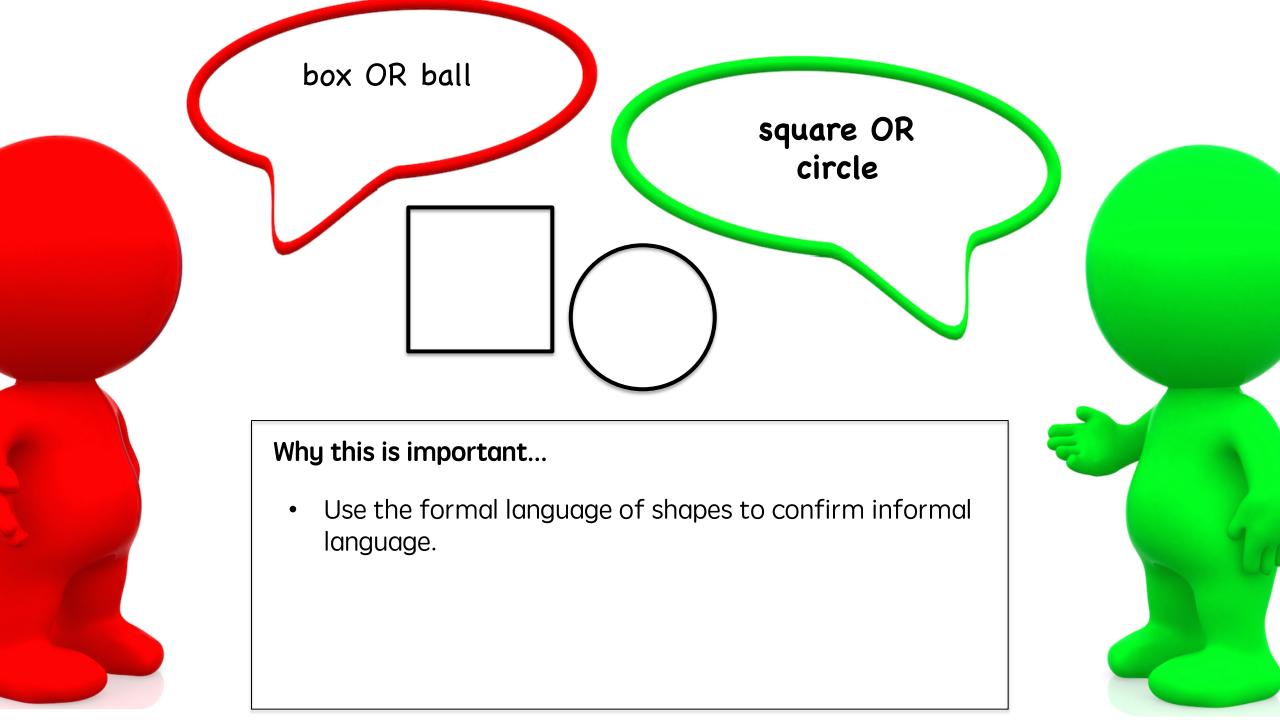


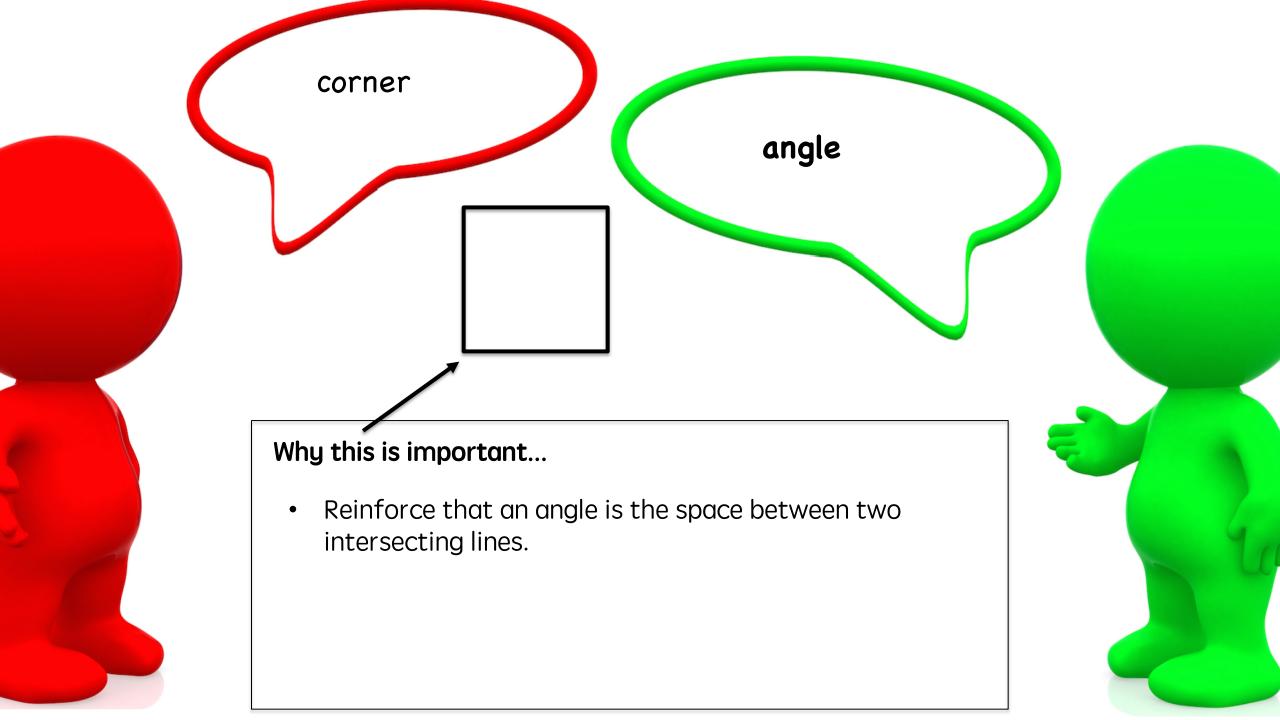


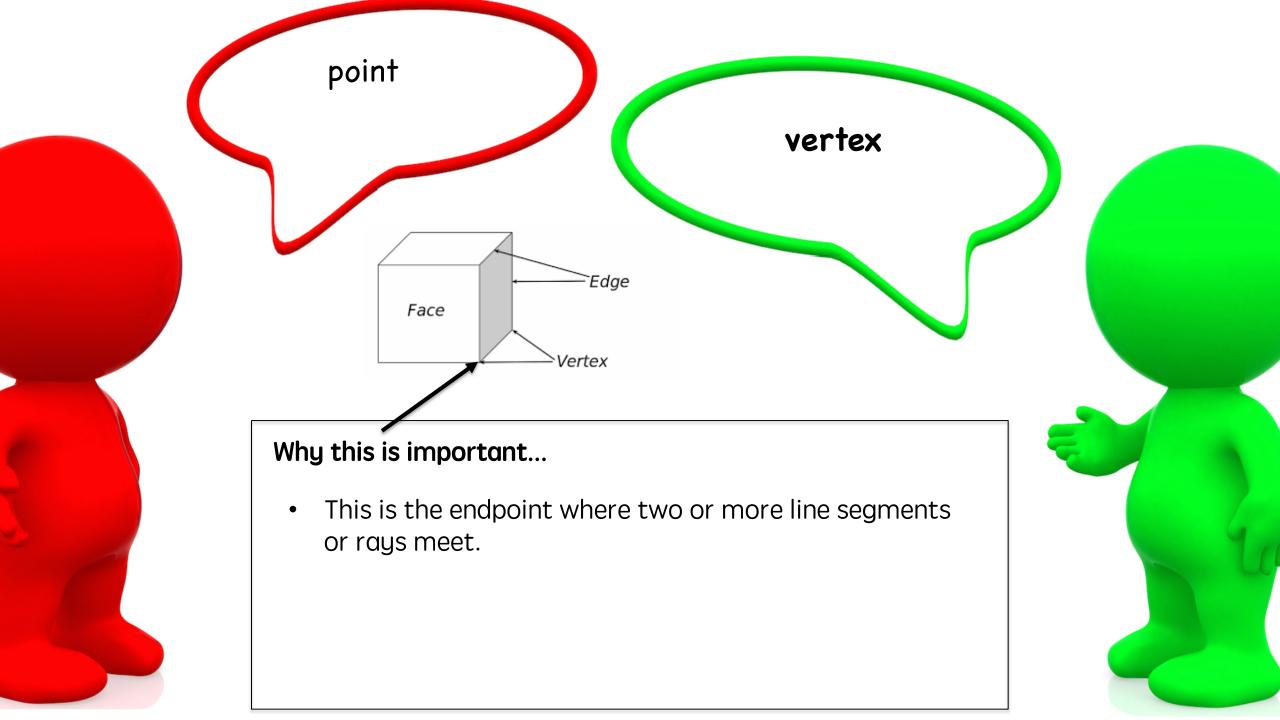


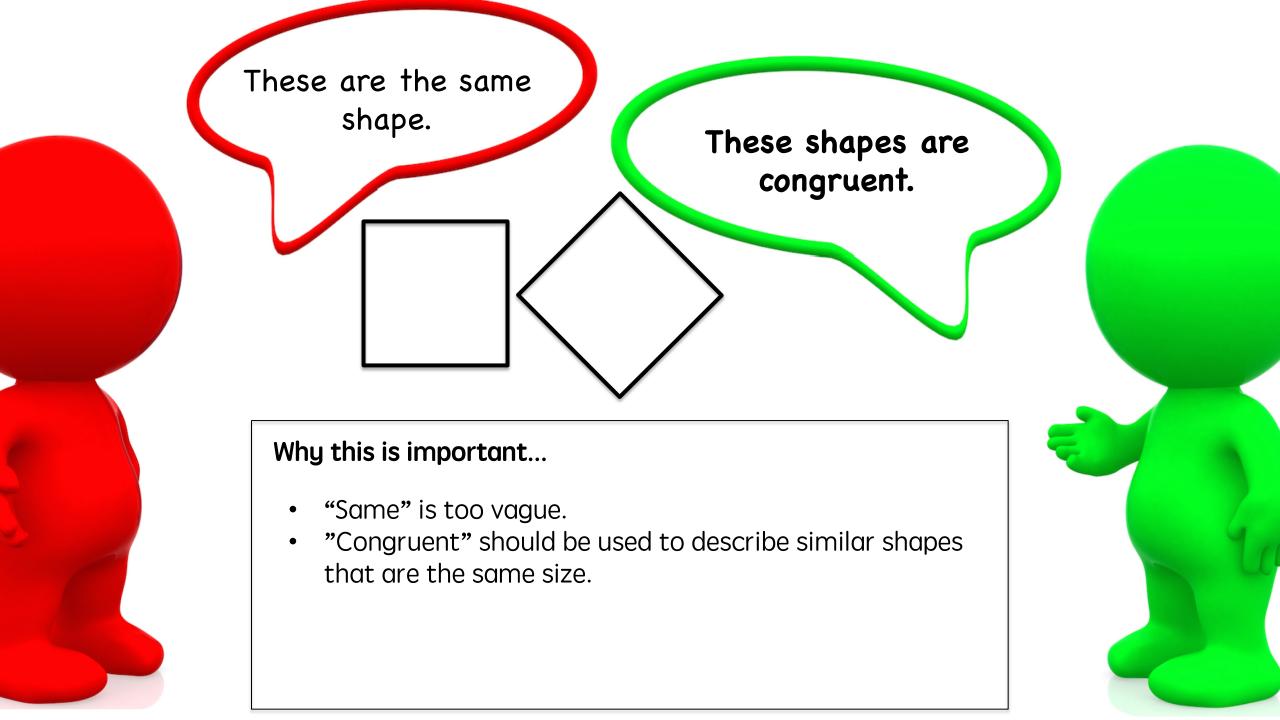
Instead of this... say that...

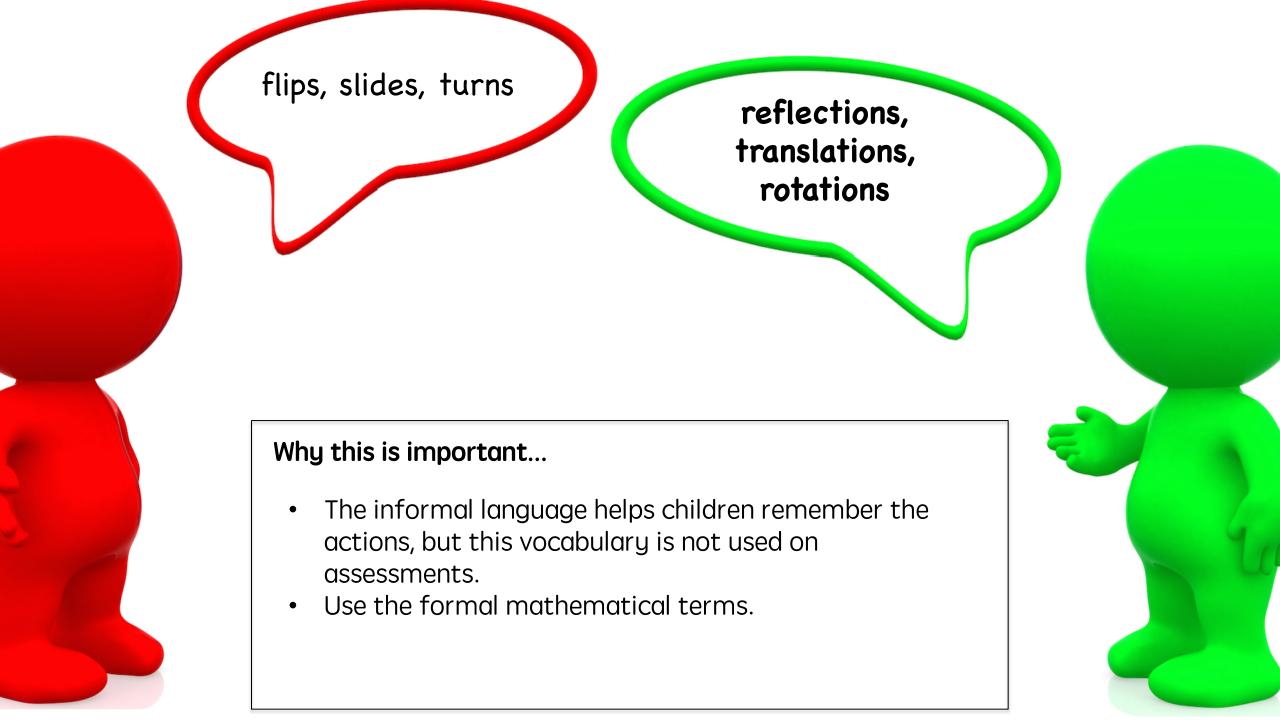
**GEOMETRY** 



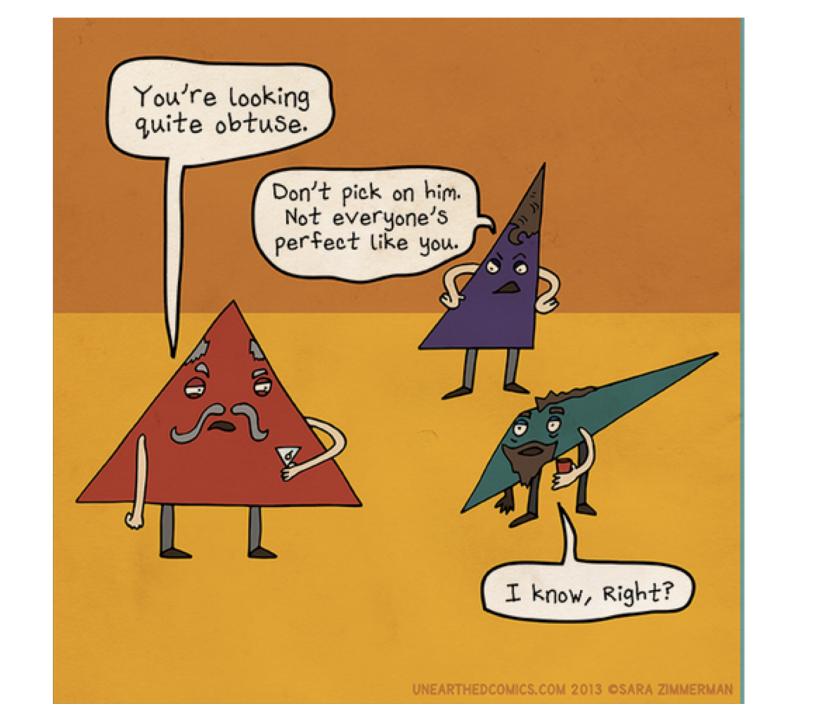


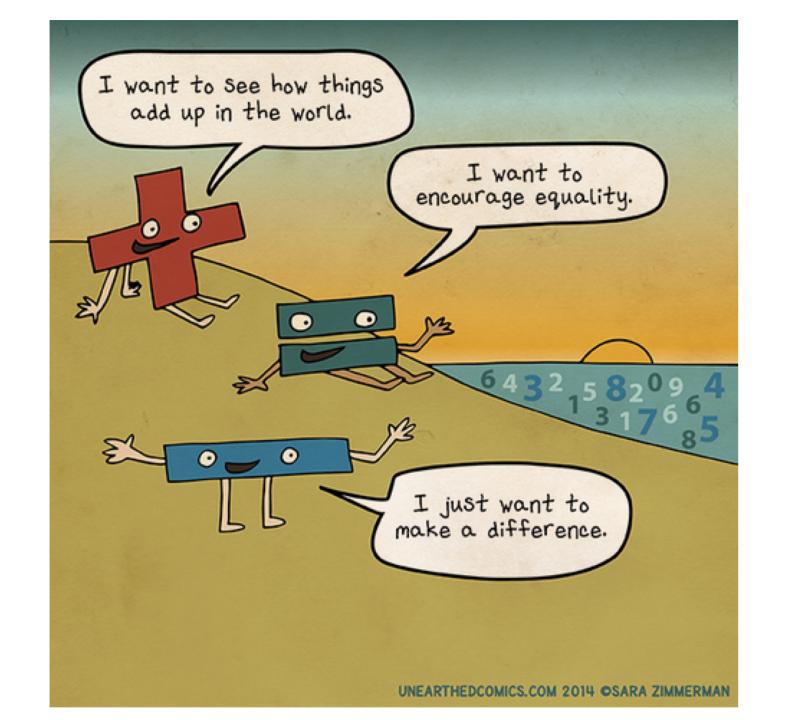


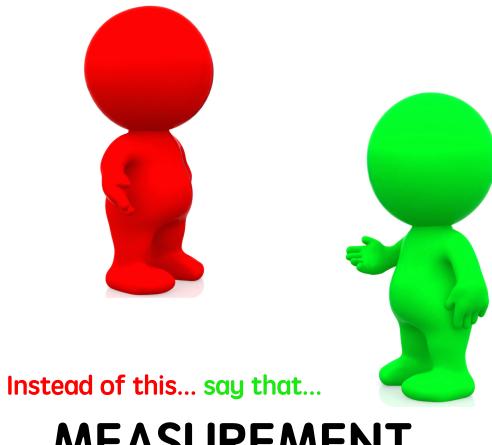




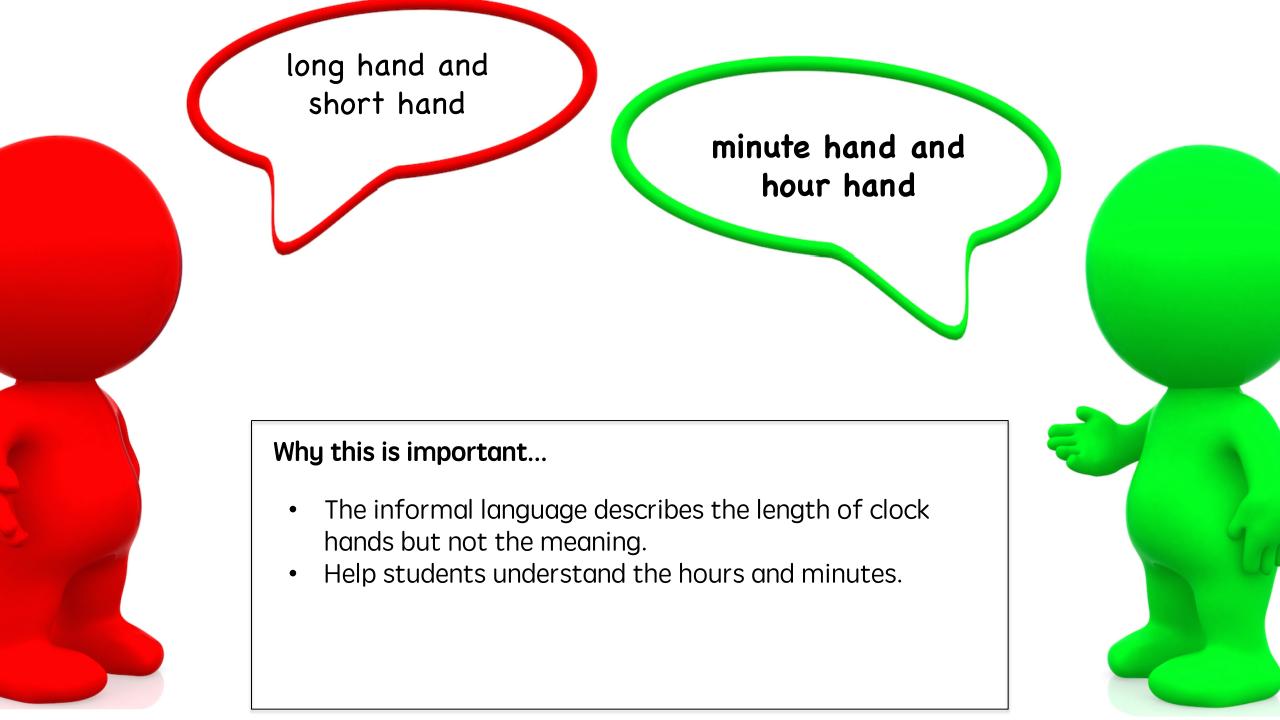


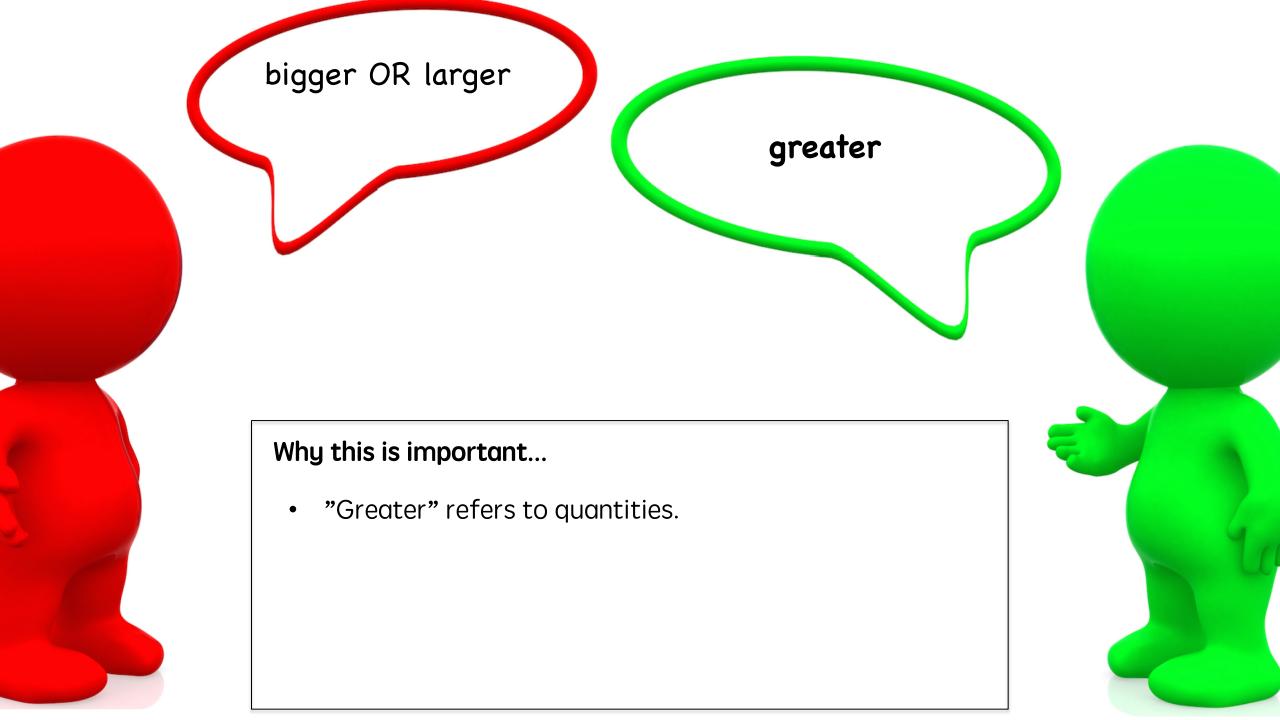


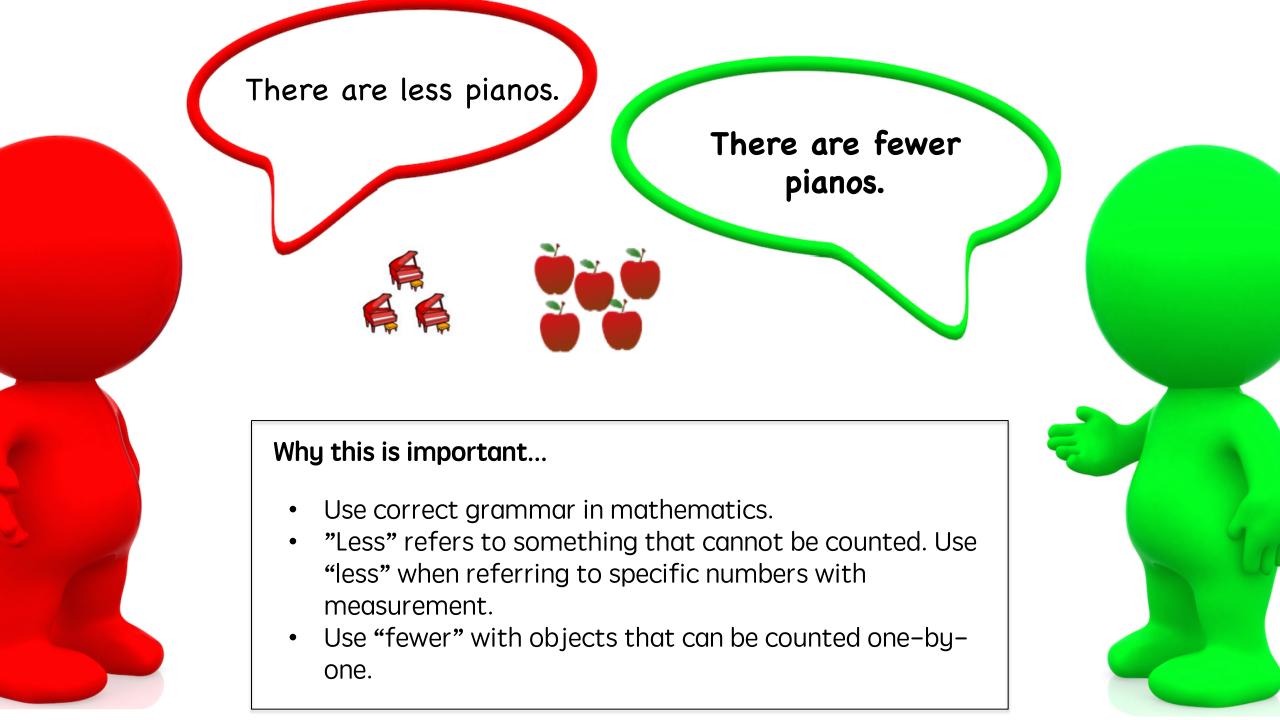


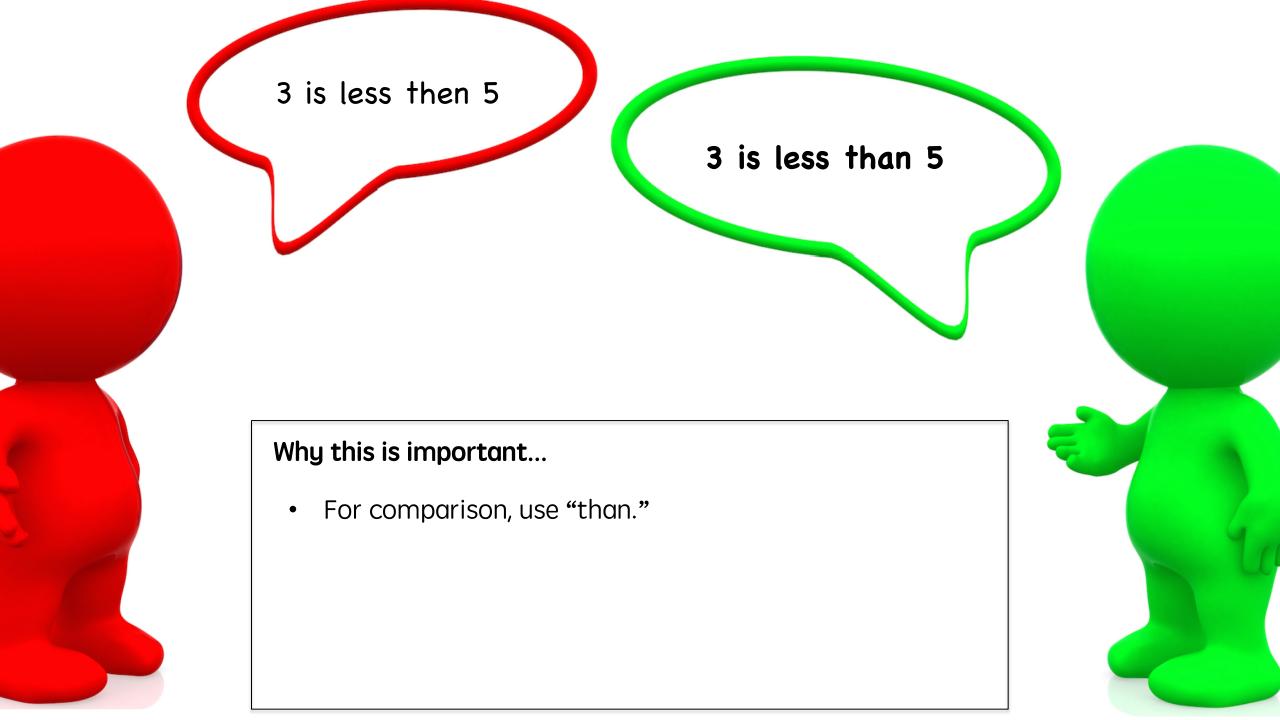


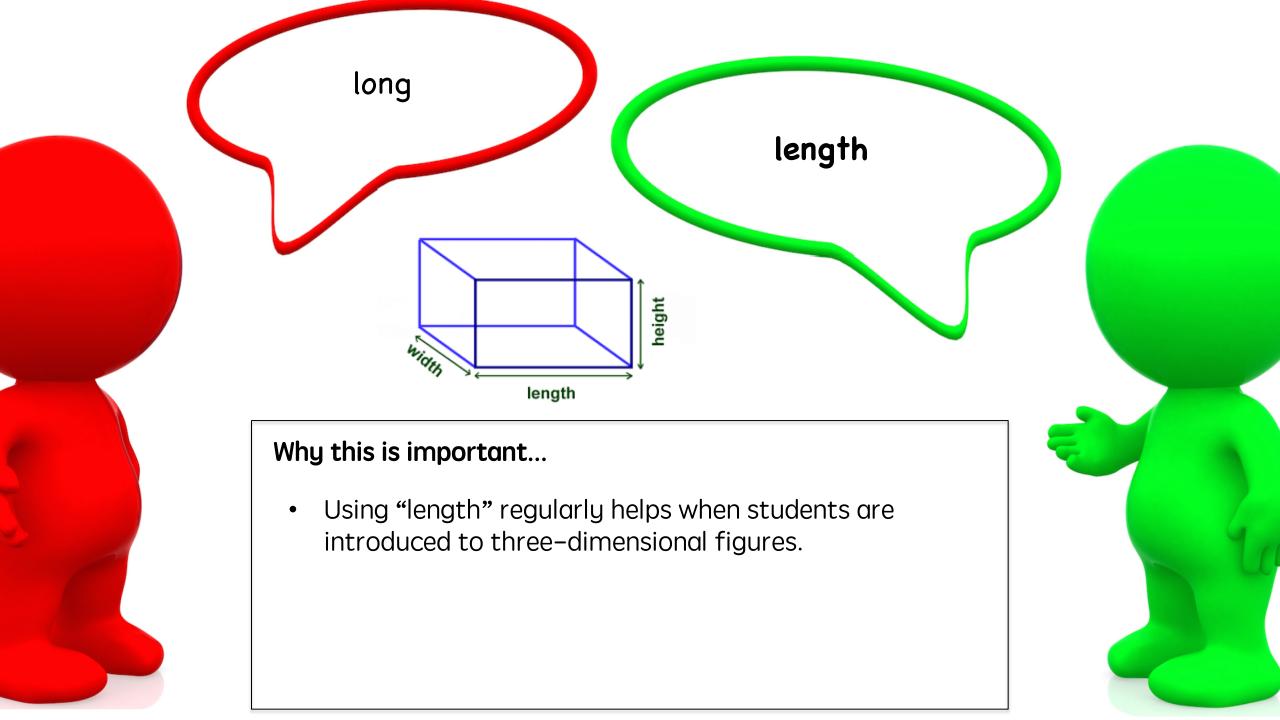
**MEASUREMENT** 



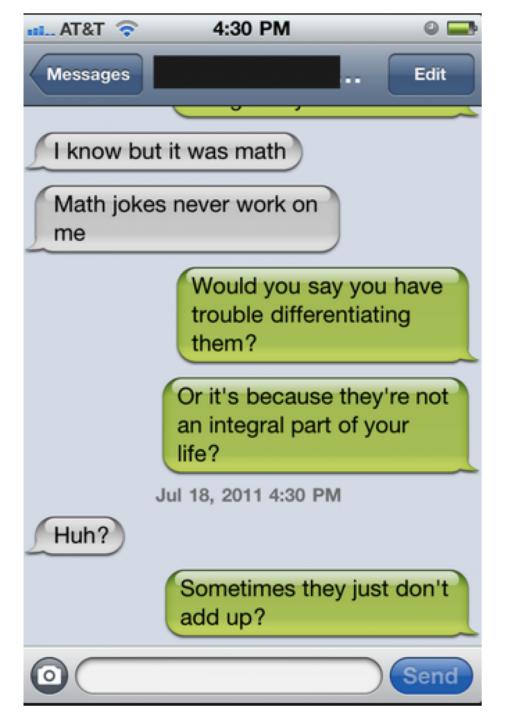


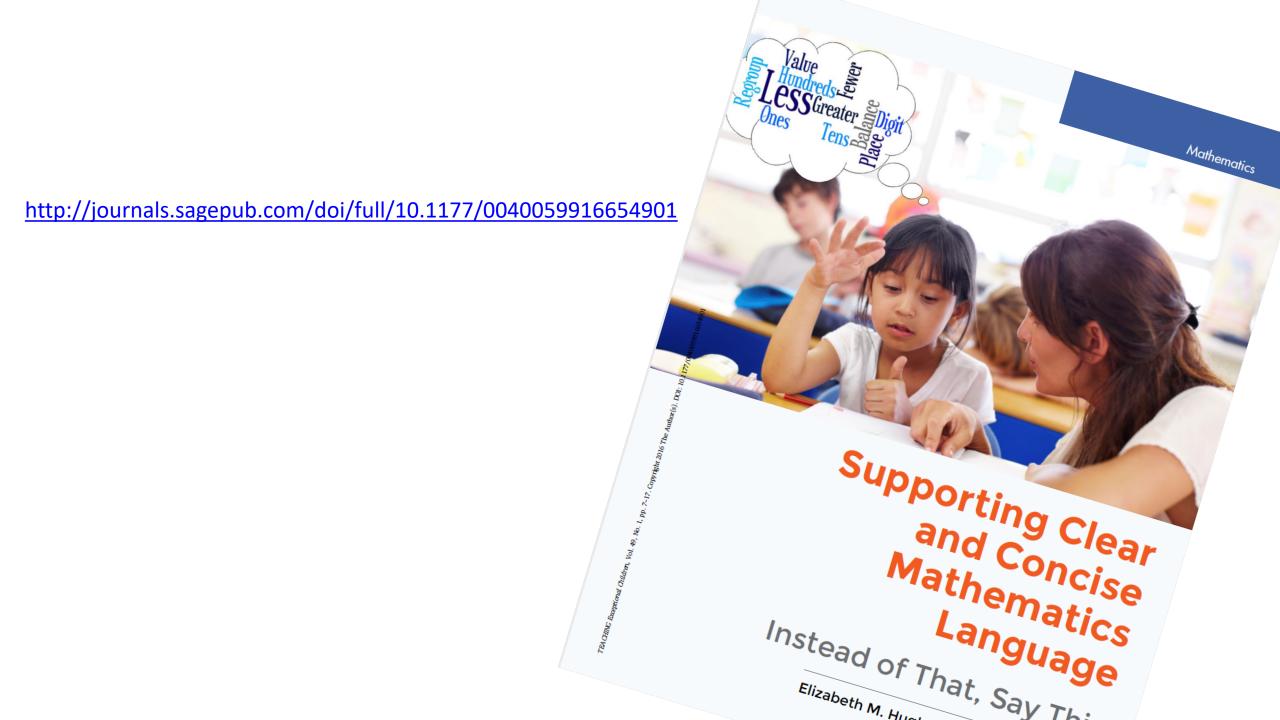














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## **Tomorrow at NCTM**

## Facilitating Proficient Mathematical Discourse through Language and Vocabulary Development

Fri, 4/27: 1:30 PM - 2:30 PM

426

Session

60 Minutes

Walter E. Washington Convention Center

Room: 147 B

## Description

The language of mathematics is an essential aspect of sophisticated mathematical discourse, yet students with learning difficulties or English learners may encounter language barriers to engaging in mathematics discourse. This session will focus on useful and practical techniques to support the development of mathematical language.