

# Making Math Count: Closing the Achievement Gap at Greenway Elementary



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# Today's Outcomes

- ✓ Strengthen math instructional practices and structures to reflect best practices for math interventions.
- ✓ Elaborate on the role of data to drive math interventions.



# Math Problem

- How did you go about solving the task?
- What are the supports needed for students?
- What are possible interventions and extensions that go with the task?

# CCSS 4<sup>th</sup> Grade Math Problem

7



A student claims that all fractions greater than  $\frac{3}{7}$  have a denominator less than 7.

Show that the student's claim is only sometimes true.

A. Drag one number into each box to create a fraction greater than  $\frac{3}{7}$  with a denominator less than 7.

B. Drag one number into each box to create a fraction greater than  $\frac{3}{7}$  with a denominator greater than 7.

0  
1  
2  
3  
4  
5  
6  
7  
8  
9

Delete

**A. Denominator less than 7**

$$\frac{\square}{\square}$$

**B. Denominator greater than 7**

$$\frac{\square}{\square}$$

# Greenway Elementary Facts



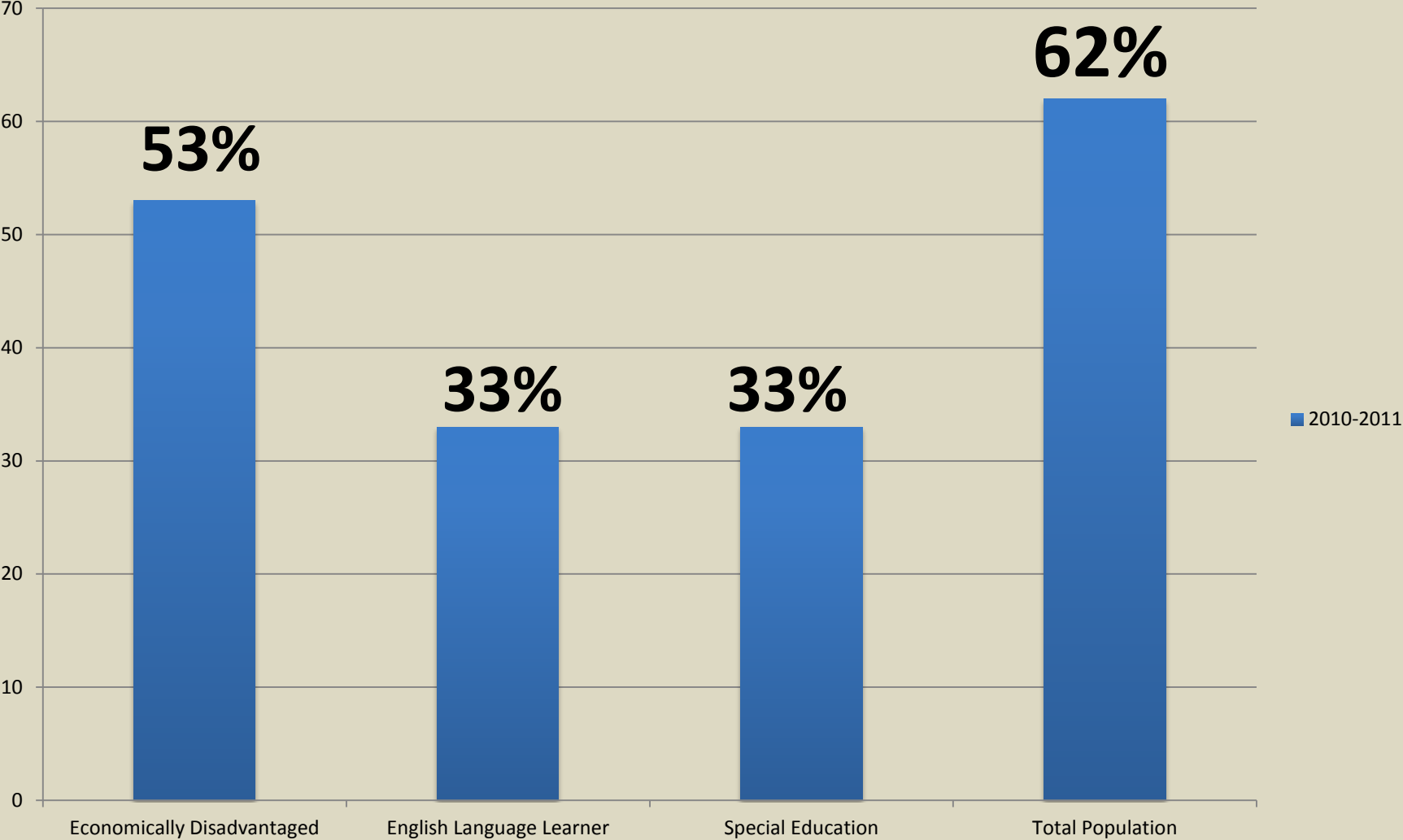
430 students, K-5

Title I School

Walking School

# Students Passing OAKS Math

2010-2011



# Ideas to Consider



Students and Staff?

Engagement?

Curriculum?

Instructional Strategies?

# Decisions, Decisions, Decisions





# Easy CBM Math

## (Curriculum Based Measurement)

11.

Batting Averages

Name	Average
Lefty Louis	.236
Slugger Sue	.309
Billy Bunter	.217
Henry Homer	.368

Whose averages are closest?

- A. Slugger Sue and Henry Homer
- B. Lefty Louis and Slugger Sue
- C. Lefty Louis and Billy Bunter

12.

$$\frac{1}{4} = \underline{\quad}$$

- A. 0.50
- B. 0.33
- C. 0.25

# Easy CBM Math Data

	45			Low
	43			Low
	41			Low
	41			Low
	40			Low
	40			Low
	40			Low
	39			Low
	33			Some
	21			High

# The Hook



# NCTM

## 3 Most Effective Instructional Strategies

❖ Visual & Graphic Descriptions of the Problems

❖ Systematic & Explicit Instruction

❖ Student Think-Alouds



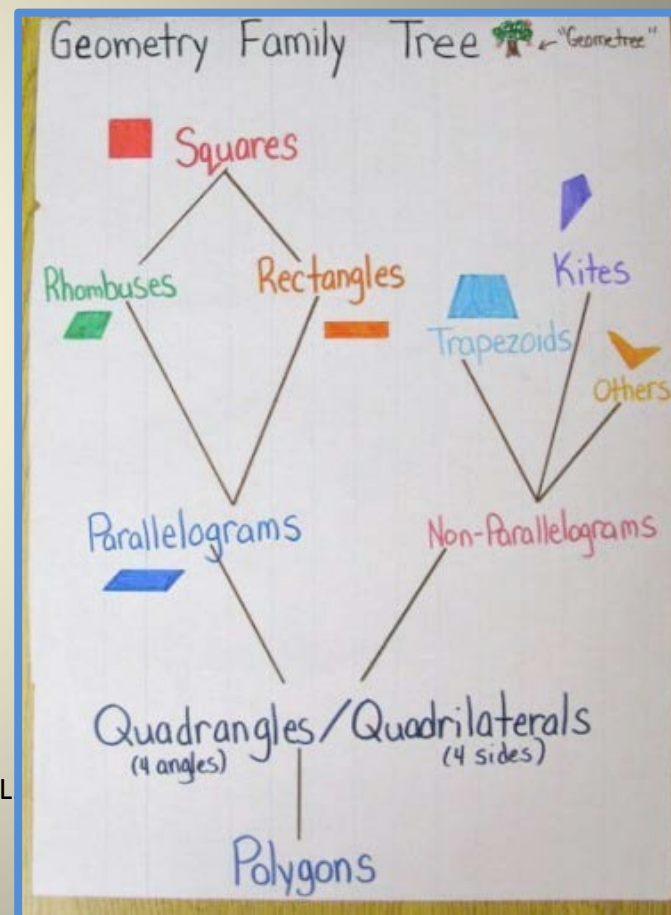
# More Math Minutes

Year 1, 2011-2012: 4 days x 1 hour x 6 weeks



“Mathematics truly is a **foreign language** for most students: it is **learned** almost entirely **at school** and is not spoken at home. Mathematics is not a “first” language; that is, it does not originate as a spoken language, except for the naming of small whole numbers.”

(Usiskin, 1996). **Literacy Strategies for Improving Mathematics Instruction**  
by Joan M. Kenney, Euthecia Hancewicz, Loretta Heuer, Diana Metsisto and Cynthia L



# Which words would be spoken in homes of your students?

Addition		Subtraction		Multiplication	
+	Increased by	-	minus	X	factor
add	more than	left	greater than	product	product
together	combined	less than	less than	times	*
total	together	total	more than	multiply	Multiplied by
In all	total of	In all	how many less	Division	
altogether	added to	altogether	decreased by	÷	out of
all	sum	reduced by	difference	quotient	ratio of
Equal		from	fewer than	per	percent
=	same			Divide equally	divide
same as	the same as				
Is equal to	equals				

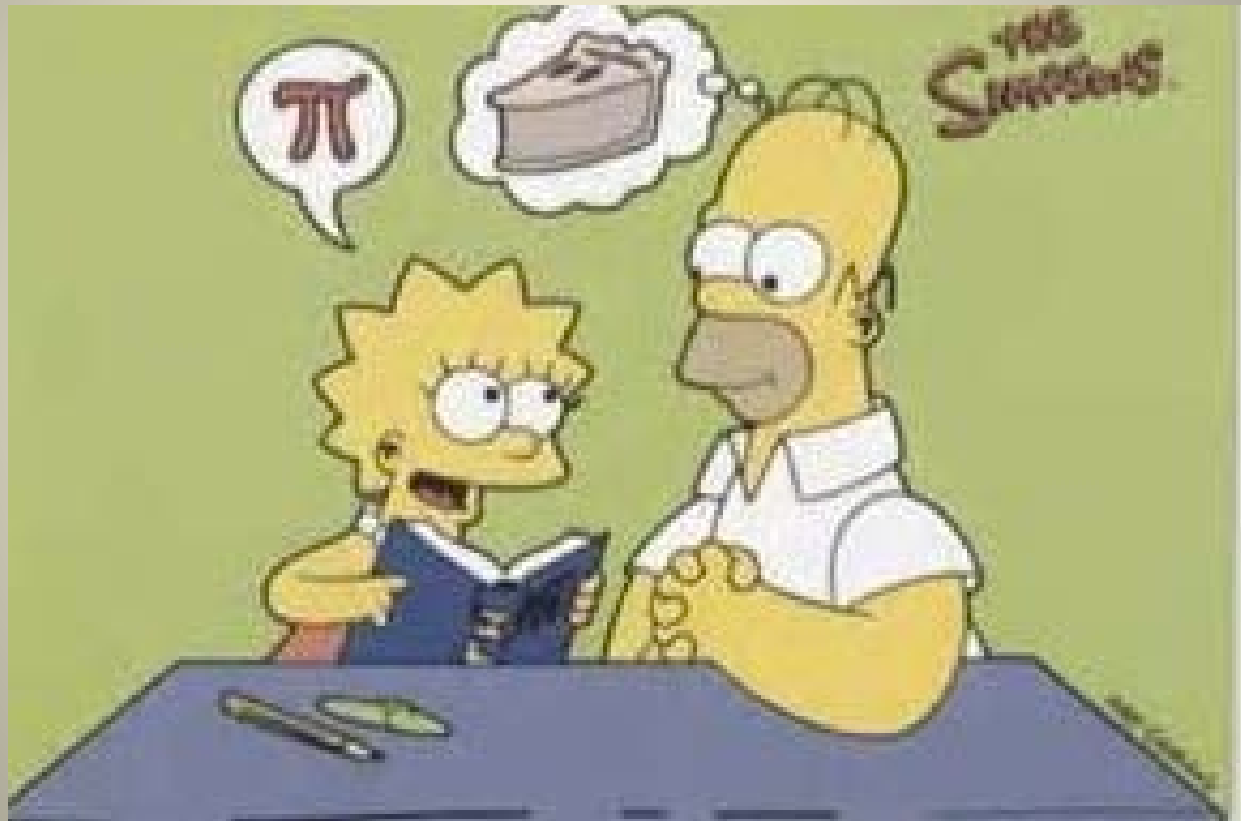
“In reading mathematics text one must **decode** and **comprehend** not only words, but also **signs** and **symbols**, which involve different skills...

Consequently, students need to learn the **meaning of each symbol** much like they learn “sight” words in the English language. In addition they need to connect each symbol, the idea it represents, and the written or spoken term that corresponds to the idea.”





# Math Misunderstanding



# Math Concept Disconnect

- Video

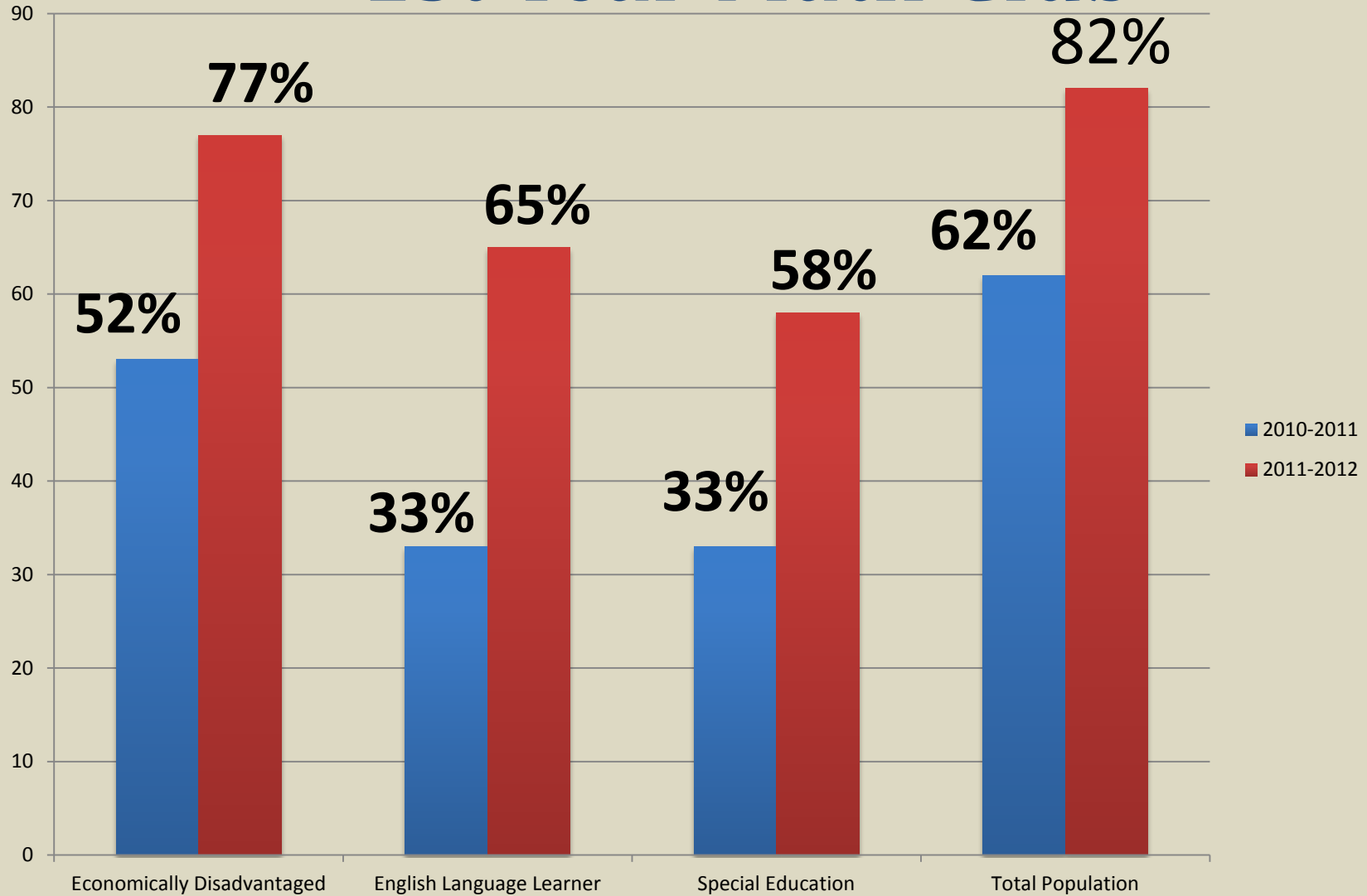
# 4<sup>th</sup> Grade Math CCSS

**Number and Operations – Fractions** - Note: Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, & 100.

**Extend understanding of fraction equivalence and ordering.**

- 4.NF.1: Explain why a fraction  $a/b$  is equivalent to a fraction  $(n \times a)/(n \times b)$  by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
- 4.NF.2: Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as  $1/2$ . Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols  $>$ ,  $=$ , or  $<$ , and justify the conclusions, e.g., by using a visual fraction model.

# 1st Year Math Club



Blue is prior to After-School Club.  
Red is with After-School Club support.

Annals

NATIONAL TITLE I  
**DISTINGUISHED  
SCHOOL**



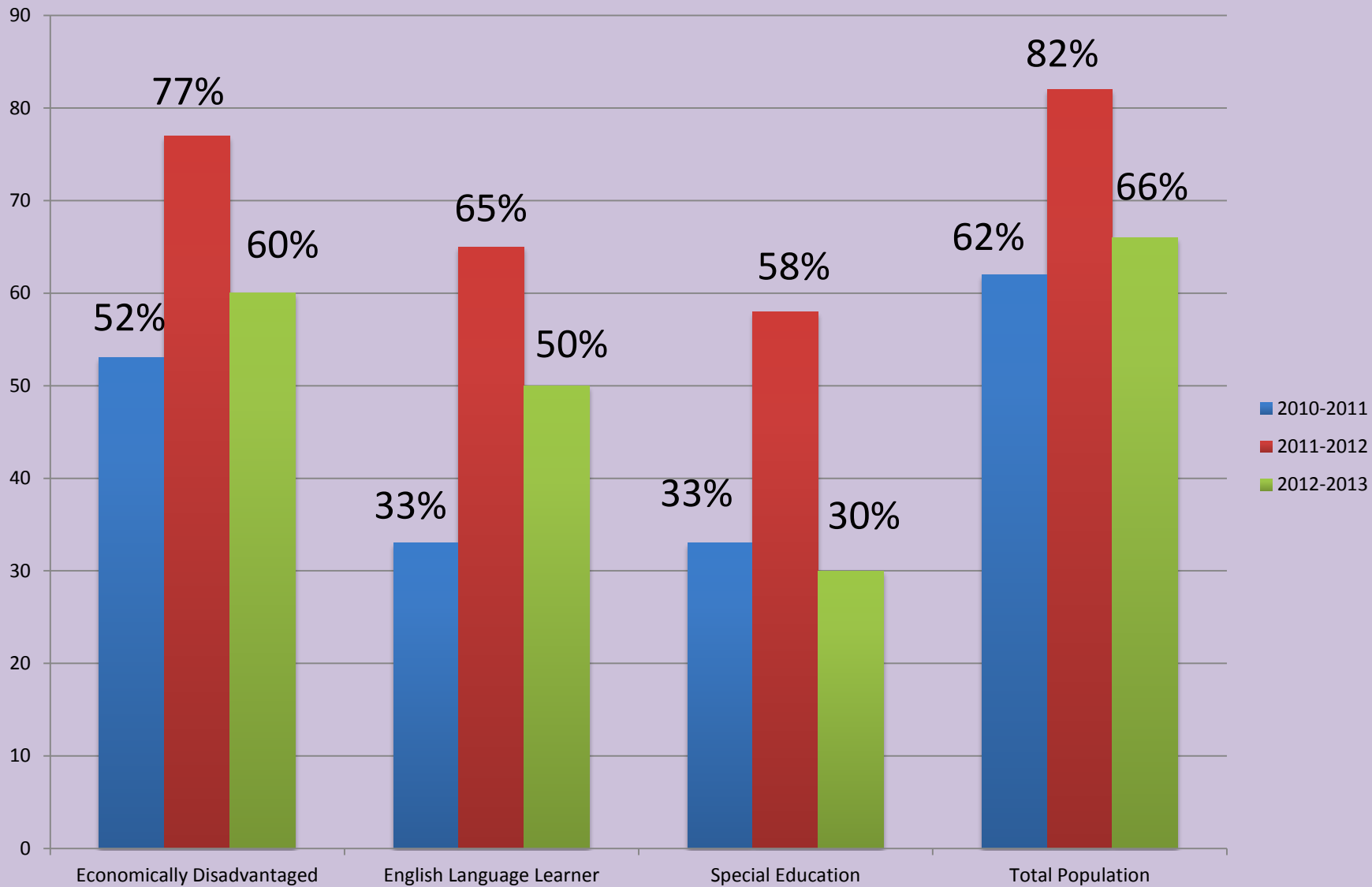
NATIONAL TITLE I  
ASSOCIATION

# More Math Minutes

- Year 1, 2011-12: 4 days x 1 hour x 6 weeks
- Year 2, 2012-13: 3 days x 1 hour x 6 weeks



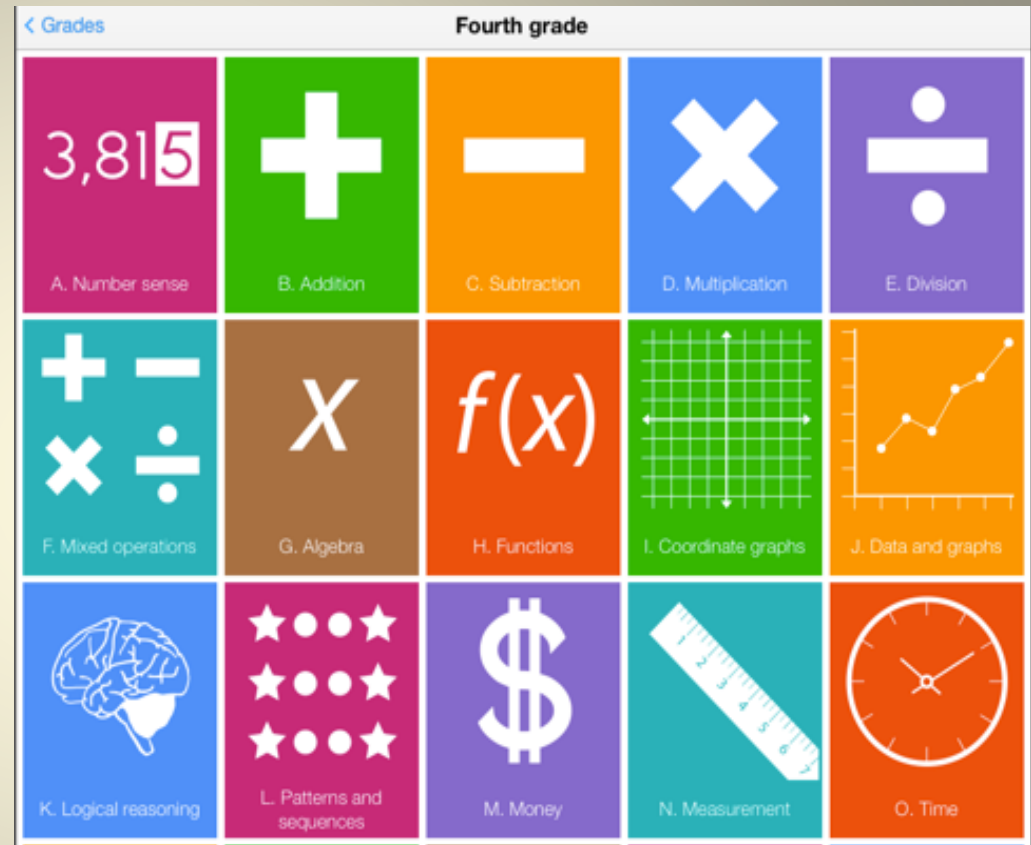
# 2<sup>nd</sup> Year Oaks Math Club



# iPads

“Use multimedia and other technologies in lessons. In doing so, they not only provide more visual support, but also model the use of technology.”

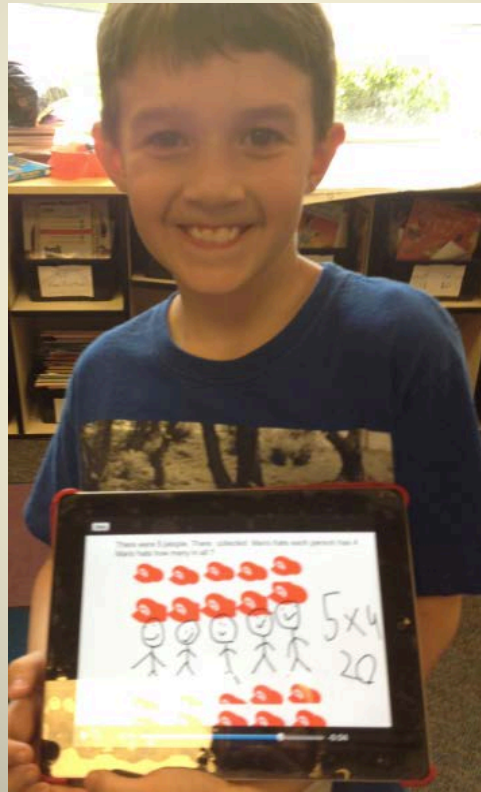
Echevarria, Short, Peterson. *Using The SIOP MODEL with Pre-K and Kindergarten English Language Learners*



IXL.COM



# Engaging Ipads



# Research Based Strategies

- ❖ National Council of Teachers of Mathematics (NCTM) *Effective Strategies for Teaching Students with Difficulties in Mathematics*
- ❖ Sheltered Instruction Observation Protocol (SIOP)



# Visual & Graphic Representations

- ❖ At least 1-2 days
- ❖ Concrete
- ❖ Framework for working memory



# *Systematic and Explicit Instruction*

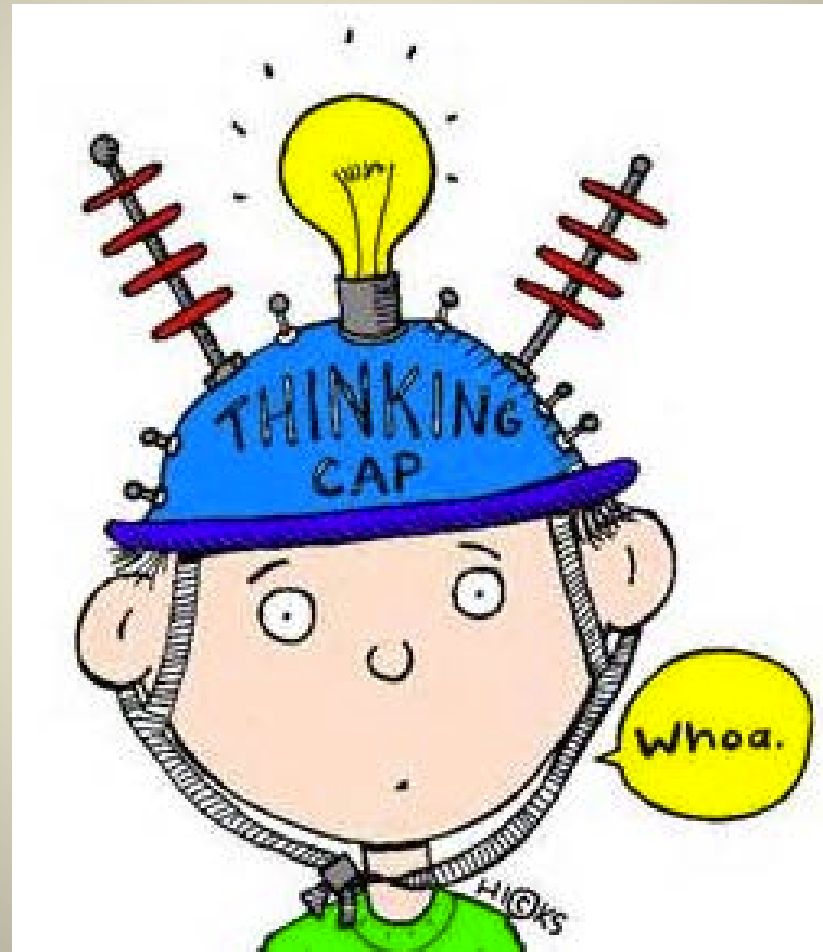
Me,  
we,  
you



# Verizon Math



# Student Think Alouds



# Lesson Preparation

Does the lesson have objectives that are posted and discussed with students?

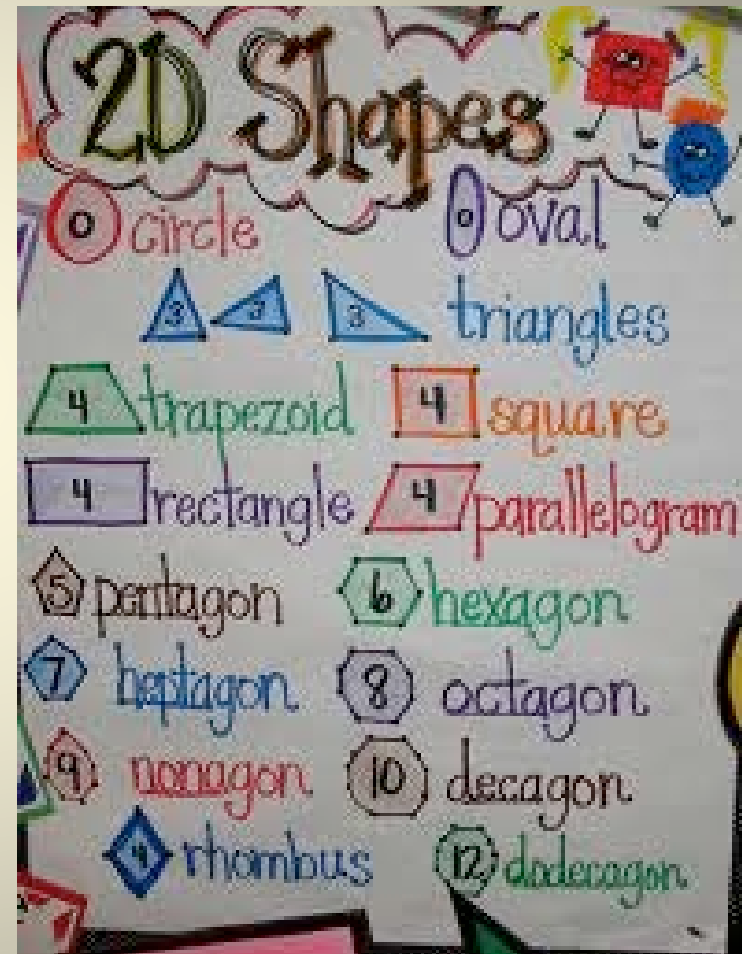
*I can find the **area** of an object.*

*I can find the **area** of an object using the **equation**.*

***Length x Width***

*I can compare the area of two rectangles.*

Does the lesson include meaningful activities that integrate concepts with language practice?



# Building Background

Do teachers make connections between new concepts and students' personal experiences?



Are the teachers explicitly teaching key academic vocabulary & providing multiple opportunities to use it in meaningful ways?



# Comprehensible Input

Do teachers

- ...modulate their rate of speech, choice of words, and complexity of sentence structure?
- ...explain academic tasks clearly, both orally and in writing, providing models and examples?
- ...make content accessible to students through multiple ways: visuals, demonstrations, graphic organizers or cooperative learning?





- Video

# Outcome Sentence Frames

“I could use \_\_\_\_\_ in my school  
when I \_\_\_\_\_.”

“One benefit I could see for my students if I  
implement \_\_\_\_\_  
might be \_\_\_\_\_.”



# Today's Outcomes

- ✓ Strengthen math instructional practices and structures to reflect best practices for math interventions.
- ✓ Elaborate on the role of data to drive math interventions.

# Believe

- Video

# Summary of Standards for Mathematical Practice

Summary of Standards for Mathematical Practice	Questions to Develop Mathematical Thinking
<p><b>1. Make sense of problems and persevere in solving them.</b></p> <ul style="list-style-type: none"> <li>Interpret and make meaning of the problem to find a starting point. Analyze what is given in order to explain to themselves the meaning of the problem.</li> <li>Plan a solution pathway instead of jumping to a solution.</li> <li>Monitor their progress and change the approach if necessary.</li> <li>See relationships between various representations.</li> <li>Relate current situations to concepts or skills previously learned and connect mathematical ideas to one another.</li> <li>Continually ask themselves, "Does this make sense?" Can understand various approaches to solutions.</li> </ul>	<p>How would you describe the problem in your own words?            How would you describe what you are trying to find?            What do you notice about...?            What information is given in the problem?            Describe the relationship between the quantities.            Describe what you have already tried. What might you change?  <b>Talk me through the steps you've used to this point.</b>            What steps in the process are you most confident about?            What are some other strategies you might try?            What are some other problems that are similar to this one?            How might you use one of your previous problems to help you begin?            How else might you organize...represent... show...?</p>
<p><b>2. Reason abstractly and quantitatively.</b></p> <ul style="list-style-type: none"> <li>Make sense of quantities and their relationships.</li> <li>Decontextualize (represent a situation symbolically and manipulate the symbols) and contextualize (make meaning of the symbols in a problem) quantitative relationships.</li> <li>Understand the meaning of quantities and are flexible in the use of operations and their properties.</li> <li>Create a logical representation of the problem.</li> <li>Attends to the meaning of quantities, not just how to compute them.</li> </ul>	<p>What do the numbers used in the problem represent?            What is the relationship of the quantities?            How is _____ related to _____?            What is the relationship between _____ and _____?            What does _____ mean to you? (e.g. symbol, quantity, diagram)            What properties might we use to find a solution?            How did you decide in this task that you needed to use...?            Could we have used another operation or property to solve this task? Why or why not?</p>
<p><b>3. Construct viable arguments and critique the reasoning of others.</b></p> <ul style="list-style-type: none"> <li>Analyze problems and use stated mathematical assumptions, definitions, and established results in constructing arguments.</li> <li>Justify conclusions with mathematical ideas.</li> <li>Listen to the arguments of others and ask useful questions to determine if an argument makes sense.</li> <li>Ask clarifying questions or suggest ideas to improve/revise the argument.</li> <li>Compare two arguments and determine correct or flawed logic.</li> </ul>	<p>What mathematical evidence would support your solution?            How can we be sure that...? / How could you prove that...?            Will it still work if...?            What were you considering when...?            How did you decide to try that strategy?            How did you test whether your approach worked?            How did you decide what the problem was asking you to find? (What was unknown?)            Did you try a method that did not work? Why didn't it work? Would it ever work? Why or why not?            What is the same and what is different about...?            How could you demonstrate a counter-example?</p>
<p><b>4. Model with mathematics.</b></p> <ul style="list-style-type: none"> <li>Understand this is a way to reason quantitatively and abstractly (able to decontextualize and contextualize).</li> <li>Apply the mathematics they know to solve everyday problems.</li> <li>Are able to simplify a complex problem and identify important quantities to look at relationships.</li> <li>Represent mathematics to describe a situation either with an equation or a diagram and interpret the results of a mathematical situation.</li> <li>Reflect on whether the results make sense, possibly improving/revising the model.</li> <li>Ask themselves, "How can I represent this mathematically?"</li> </ul>	<p>What number model could you construct to represent the problem?            What are some ways to represent the quantities?  <b>What is an equation</b> or expression that matches the diagram, number line., chart..., table..?            Where did you see one of the quantities in the task in your equation or expression?            How would it help to create a diagram, graph, table...?            What are some ways to visually represent...?            What formula might apply in this situation?</p>

# Summary of Standards for Mathematical Practice

Summary of Standards for Mathematical Practice	Questions to Develop Mathematical Thinking
<p><b>5. Use appropriate tools strategically.</b></p> <ul style="list-style-type: none"> <li>Use available tools recognizing the strengths and limitations of each.</li> <li>Use estimation and other mathematical knowledge to detect possible errors.</li> <li>Identify relevant external mathematical resources to pose and solve problems.</li> <li>Use technological tools to deepen their understanding of mathematics.</li> </ul>	<p>What mathematical tools could we use to visualize and represent the situation?            What information do you have?            What do you know that is not stated in the problem?            What approach are you considering trying first?            What estimate did you make for the solution?            In this situation would it be helpful to use...a graph..., number line..., ruler..., diagram..., calculator..., manipulative?            Why was it helpful to use...?            What can using a _____ show us that _____ may not?            In what situations might it be more informative or helpful to use...?</p>
<p><b>6. Attend to precision.</b></p> <ul style="list-style-type: none"> <li>Communicate precisely with others and try to use clear mathematical language when discussing their reasoning.</li> <li>Understand the meanings of symbols used in mathematics and can label quantities appropriately.</li> <li>Express numerical answers with a degree of precision appropriate for the problem context.</li> <li>Calculate efficiently and accurately.</li> </ul>	<p>What mathematical terms apply in this situation?            How did you know your solution was reasonable?            Explain how you might show that your solution answers the problem.            What would be a more efficient strategy?            How are you showing the meaning of the quantities?            What symbols or mathematical notations are important in this problem?            What mathematical language..., definitions..., properties can you use to explain...?            How could you test your solution to see if it answers the problem?</p>
<p><b>7. Look for and make use of structure.</b></p> <ul style="list-style-type: none"> <li>Apply general mathematical rules to specific situations.</li> <li>Look for the overall structure and patterns in mathematics.</li> <li>See complicated things as single objects or as being composed of several objects.</li> </ul>	<p>What observations do you make about...?            What do you notice when...?            What parts of the problem might you eliminate..., simplify...?            What patterns do you find in...?            How do you know if something is a pattern?            What ideas that we have learned before were useful in solving this problem?            What are some other problems that are similar to this one?            How does this relate to...?            In what ways does this problem connect to other mathematical concepts?</p>
<p><b>8. Look for and express regularity in repeated reasoning.</b></p> <ul style="list-style-type: none"> <li>See repeated calculations and look for generalizations and shortcuts.</li> <li>See the overall process of the problem and still attend to the details.</li> <li>Understand the broader application of patterns and see the structure in similar situations.</li> <li>Continually evaluate the reasonableness of their intermediate results</li> </ul>	<p>Explain how this strategy work in other situations?            Is this always true, sometimes true or never true?            How would we prove that...?            What do you notice about...?            What is happening in this situation?            What would happen if...?            Is there a mathematical rule for...?            What predictions or generalizations can this pattern support?            What mathematical consistencies do you notice ?</p>

# Making Math Count: Closing the Achievement Gap Questions

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