

# Five Components of Math Intervention

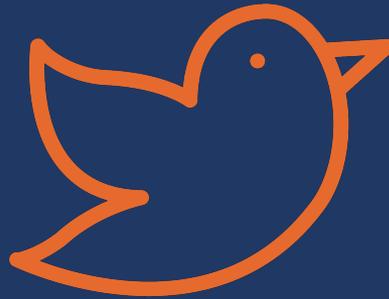


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[@sarahpowellphd](https://twitter.com/sarahpowellphd)





Introduce yourself.

Describe your role as an educator.

Describe the mathematics you support.



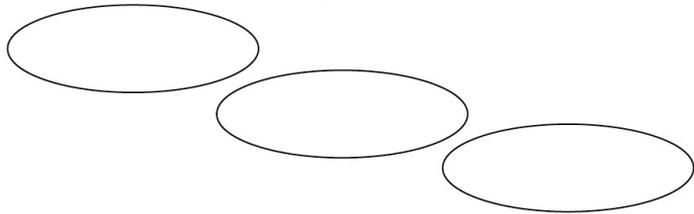
# Five Components of Math Intervention

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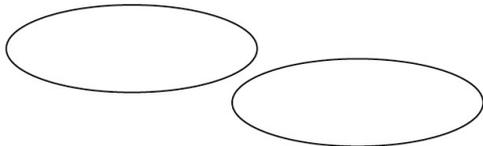
Evidence-Based Practices

Instructional Platform

Instructional Delivery



Instructional Strategies



evidence-based practice

A practice that  
has shown  
consistent and  
positive results



evidence-based practice



evidence-based intervention

An intervention (i.e., packaged program) that has shown consistent and positive results



evidence-based practice



evidence-based intervention

evidence-based strategy

A method or strategy that has shown consistent and positive results



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

Precise  
language

Multiple  
representations

## INSTRUCTIONAL STRATEGIES

Fluency building

Problem solving  
instruction



# Evidence-Based Practice: Explicit Instruction



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

## INSTRUCTIONAL STRATEGIES



## Explicit Instruction

MODELING

PRACTICE

SUPPORTS



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

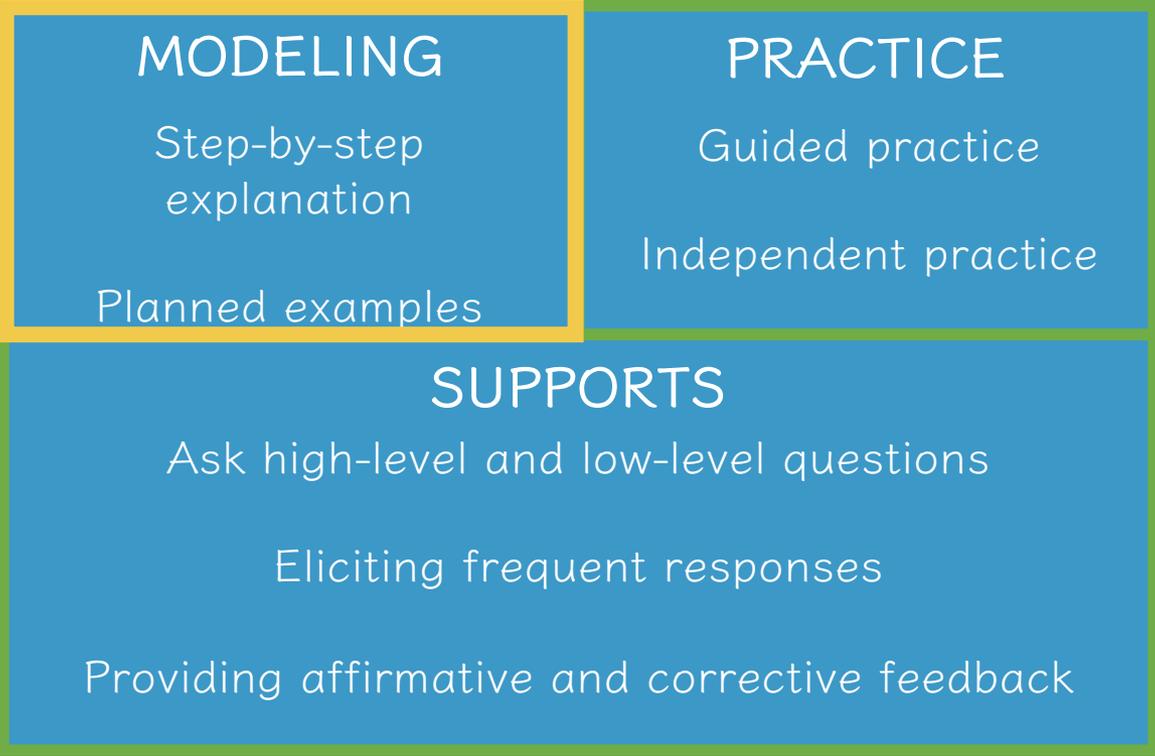
Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



Modeling is a dialogue between the teacher and students.



Modeling includes a step-by-step explanation of how to do a math problem.

A teacher may do 1 modeled problem or several.

## MODELING

Step-by-step explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

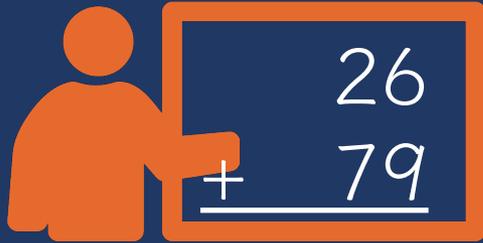
## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

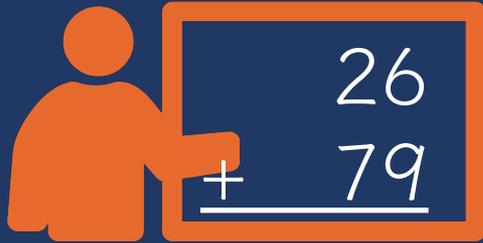
Providing affirmative and corrective feedback





“Today, we are learning about addition. This is important because sometimes you have different amounts – like money – and you want to know how much money you have altogether.”





“Let’s solve this problem. What’s the problem?”

“26 plus 79.”



“To solve 26 plus 79, first decide about the operation. Should we add, subtract, multiply, or divide?”

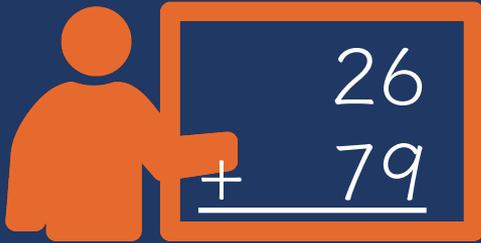
“Add.”



“How did you know we want to add?”

“There’s a plus sign.”





“The plus sign tells us we want to add. To add, let’s use the partial sums strategy. What strategy?”

“Partial sums.”



“With the partial sums strategy, we start adding in the greatest place value. What’s the greatest place value in this problem?”

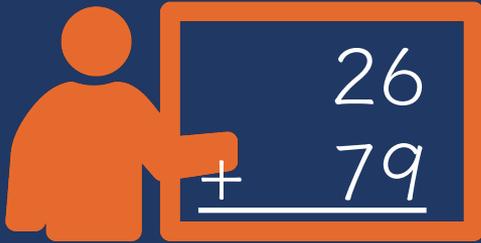
“The tens.”



“So, let’s add the tens. What’s 20 plus 70?”

“90.”





“20 plus 70 equals 90. Let’s write 90 right here below the equal line. What will we write?”

“90.” 

“90 is the partial sum when you add the tens. What does 90 represent?”

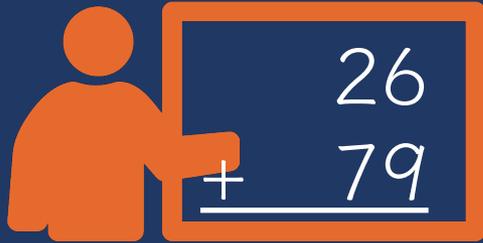
“It’s the partial sum of adding 20 plus 70.”



“Now, let’s add the ones. What should we add?”

“6 plus 9.” 





“6 plus 9 equals what?”

“15.” 

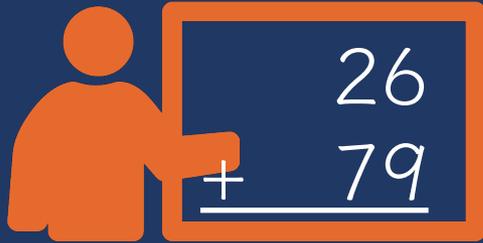
“Let’s write 15 below the 90.  
Where do we write the 15?”

“Below the 90.” 

“15 is the partial sum when you add the ones.  
Now, let’s add the partial sums together. What will we add?”

“90 plus 15.” 





“What’s 90 plus 15?”

“How did you add those numbers?”

“So, when you add 26 plus 79, the sum is 105. Who can share how we solved this problem?”

“105.”



“I added 90 plus 10 then added 5 more.”



“We used the partial sums strategy. We added the tens then added the ones. Then we added the partial sums.”



Modeling needs to include planned examples.

## MODELING

Step-by-step explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

These examples should be sequenced so easier skills lead to more difficult skills.



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

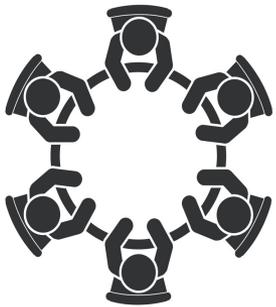
Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



What's the math that you  
model with your students?



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

Practice continues as a dialogue between the teacher and students.

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



## MODELING

Step-by-step explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

Guided practice is practice in which the teacher and students practice problems together.



“Let’s work on a problem together.”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

Independent practice is practice in which the students practice independently with teacher support.



“Now, you’ll practice a problem on your own. Use your attack strategy!”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

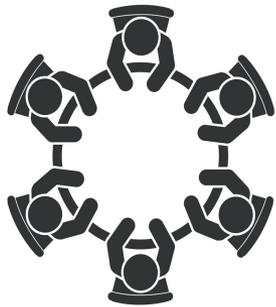
Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



How do you engage students  
in guided practice?



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

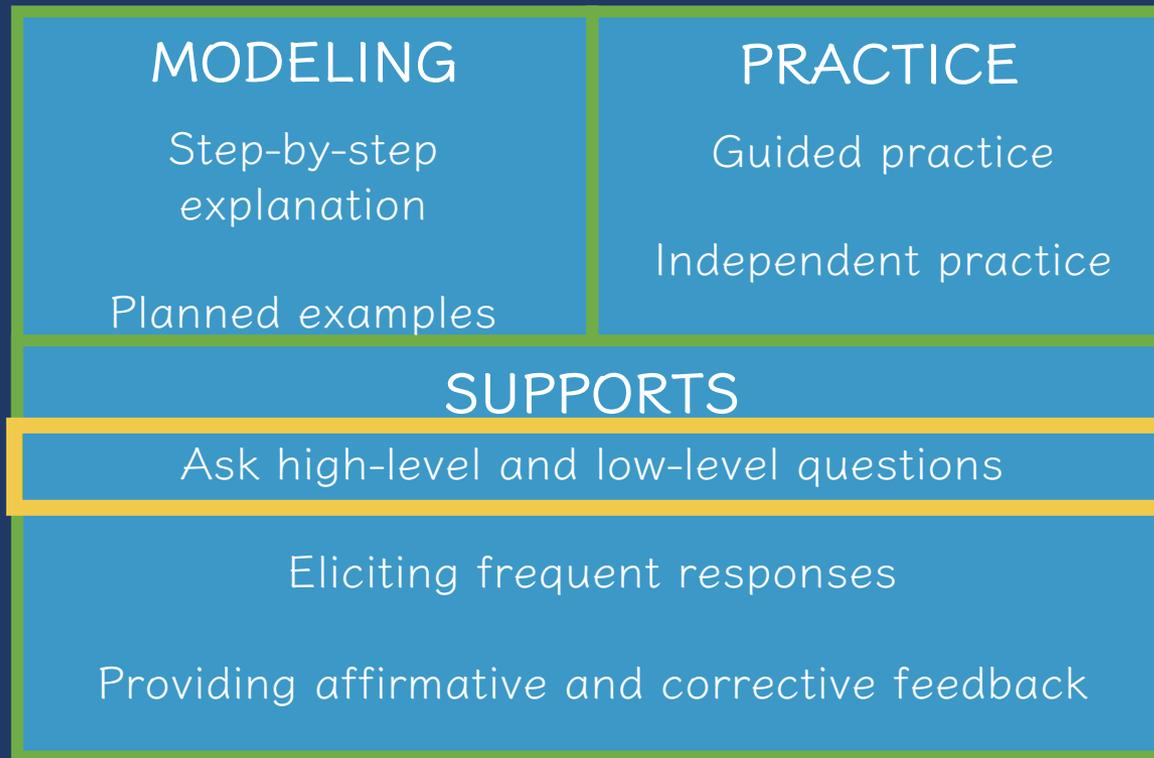
Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

These **Supports** should be used in  
both **Modeling** and **Practice**.





During **Modeling** and **Practice**, it is essential to engage students and check for understanding.



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



“What is 7 times 9?”

“63.”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

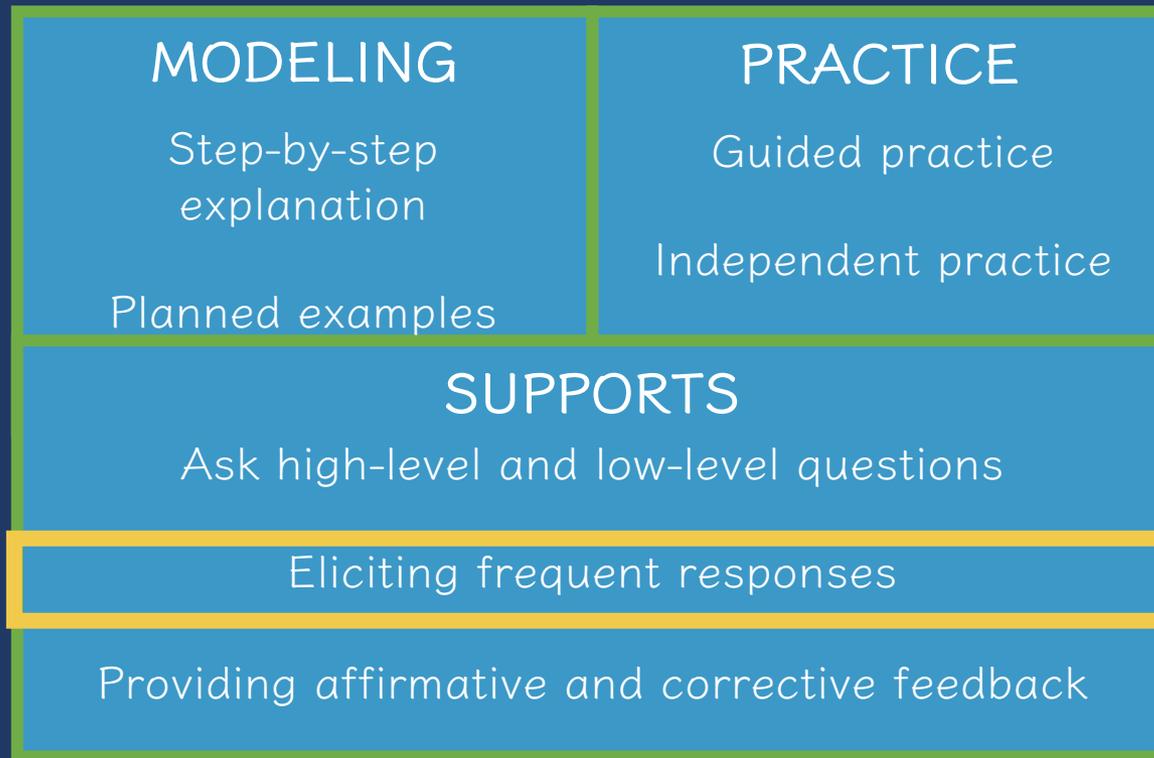
Providing affirmative and corrective feedback



“Why do you use  
zero pairs?”

“Because a positive 1  
and a negative 1 equal  
0. I use the zero pair  
to help me subtract.”





During **Modeling** and **Practice**, students should frequently respond. The frequent responses keeps student attention and keeps student learning active.



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

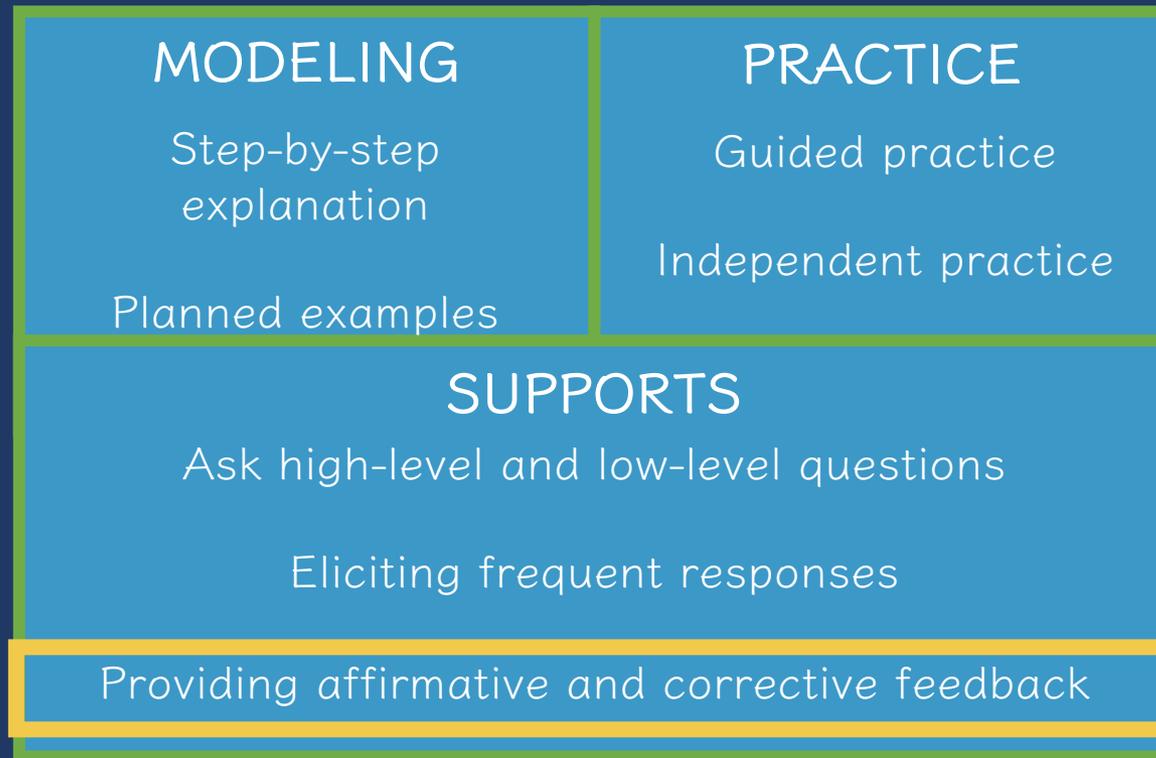
Eliciting frequent responses

Providing affirmative and corrective feedback



- Oral
- Written
- With manipulatives
- With drawings
- With gestures





During **Modeling** and **Practice**, students should receive immediate feedback on their responses.



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



“Nice work using your  
word problem attack  
strategy.”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



“Let’s look at that again. Tell me how you added in the hundreds column.”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

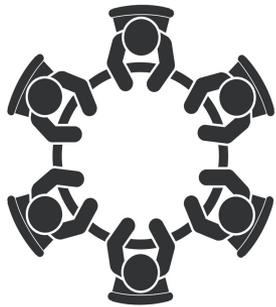
Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



Which of these supports  
should you use more often?



# Evidence-Based Practice: Mathematical Language



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

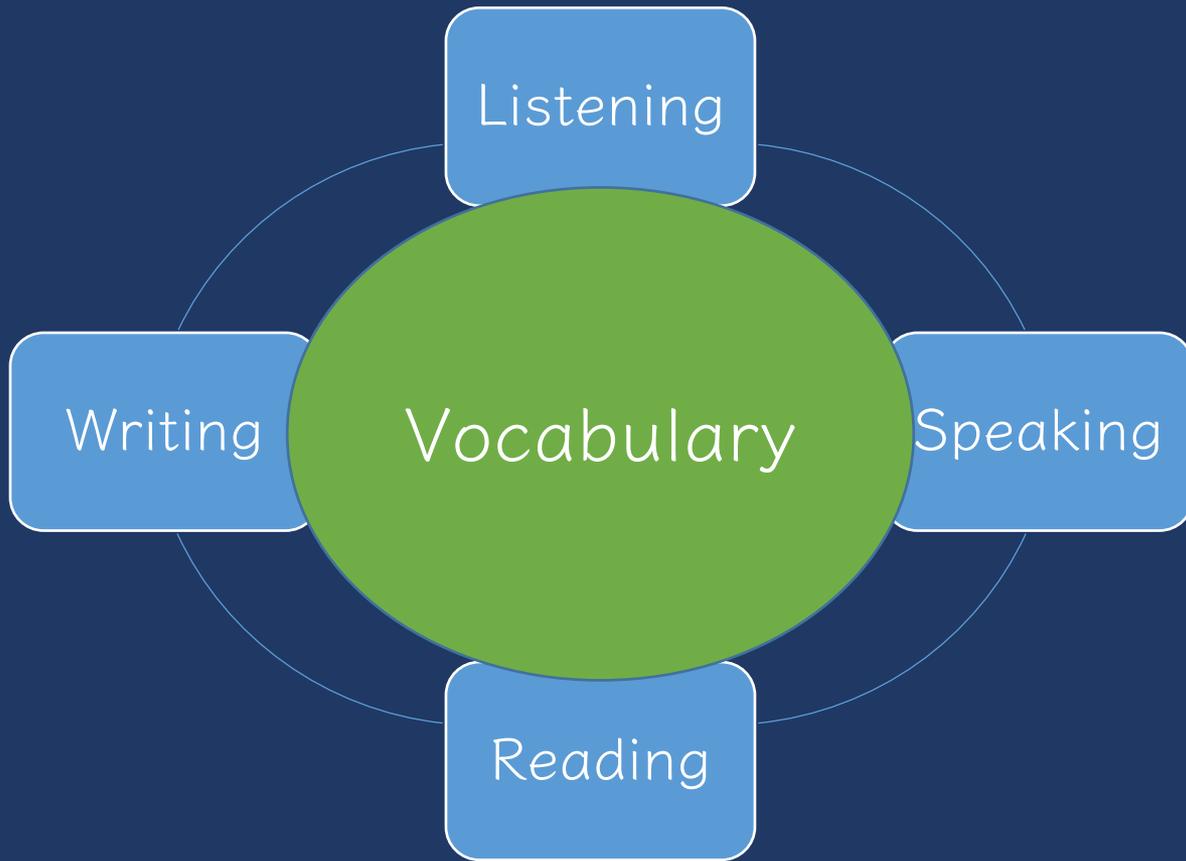
Precise  
language

## INSTRUCTIONAL STRATEGIES









Use formal math language

Use terms precisely



Mathematics

Regroup  
Value  
Hundreds  
Less  
Ones  
Fewer  
Greater  
Tens  
Balance  
Digit  
Place



# Supporting Clear and Concise Mathematics Language

Instead of That, Say This

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

TEACHING Exceptional Children, Vol. 46, No. 1, pp. 2-12, Copyright 2018 The Authors. DOI: 10.1177/0048794618788292

Middle-School Mathematics



# Math Language in Middle School

Be More Specific

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

TEACHING Exceptional Children, Vol. 51, No. 4, pp. 286-295, Copyright 2018 The Authors. DOI: 10.1177/0048794618788292

286 COUNCIL FOR EXCEPTIONAL CHILDREN





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.





The alligator eats the  
bigger number



is less than  
OR  
is greater than

**Why this is important...**

- 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.





carry OR borrow



regroup OR  
trade OR  
exchange

$$\begin{array}{r} 167 \\ + 294 \\ \hline \end{array}$$

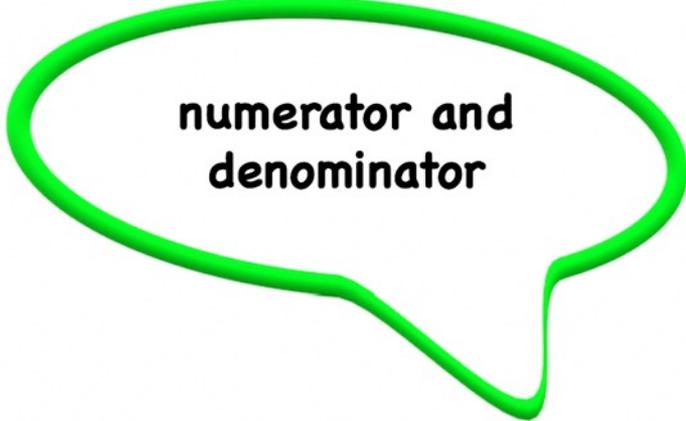
**Why this is important...**

- “Carry” or “borrow” is procedural.
- The other terms reinforce the conceptual understanding or regrouping ones into tens, tens into hundreds, and so on (i.e., the total amount does not change) *or* ungrouping hundreds into tens, tens into ones, and so on.





top number and  
bottom number



numerator and  
denominator

**Why this is important...**

- Identifying that there are two separate (whole) numbers suggests that whole number properties can be applied to fractions.
- Emphasizing that a fraction is ONE number with ONE magnitude on a number line that is communicated with a numerator and denominator is important.





reduce the fraction



rename OR  
find equivalent OR  
simplify

**Why this is important...**

- Reducing suggests that the quantity or magnitude of the new number will be less than the original number.





Four point seven  
Four point oh seven



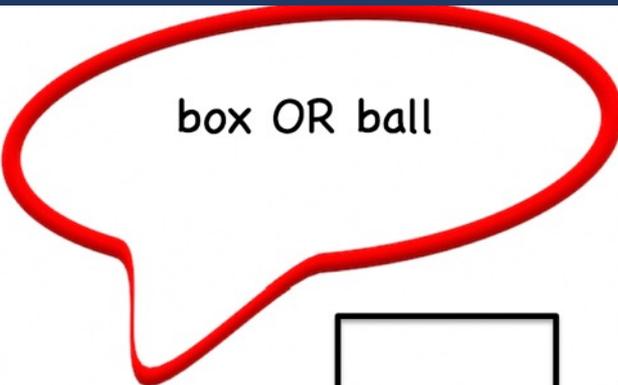
Four and seven tenths  
Four and seven hundredths

4.7  
4.07

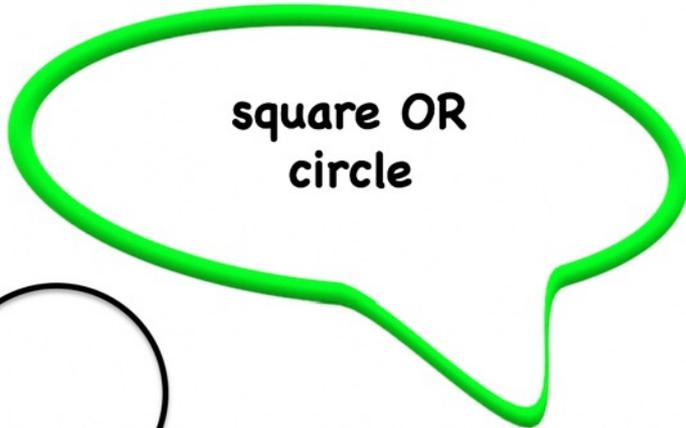
**Why this is important...**

- Accurately shares the magnitude of the decimal.
- Emphasizes place value.

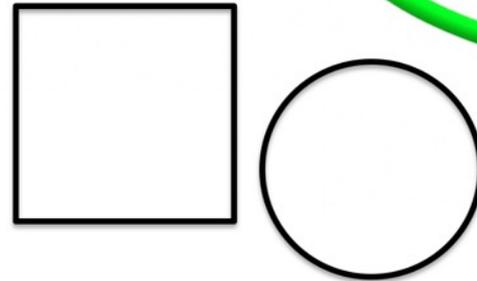




box OR ball



square OR  
circle

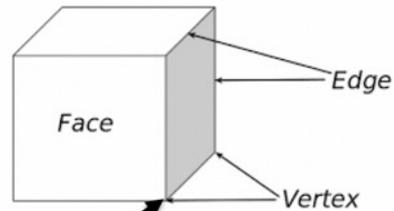


**Why this is important...**

- Use the formal language of shapes to confirm informal language.

point

vertex



**Why this is important...**

- This is the endpoint where two or more line segments or rays meet.



What are examples of,  
“Instead of \_\_\_\_, Say \_\_\_\_?”



Use formal math language

Use terms precisely



## **Factor**

$$1 \times 8 = 8$$

$$2 \times 4 = 8$$

factor factor

## **Multiple**

$$8 \times 1 = 8$$

$$8 \times 2 = 16$$

multiples of 8

E

## **Improper fraction**

$$\frac{8}{5}$$

## **Mixed number**

$$1\frac{3}{5}$$

## **Proper fraction**

$$\frac{2}{9}$$

## **Proportion**

$$\frac{2}{5} = \frac{8}{20}$$

## **Ratio**

$$4:3$$

## **Unit fraction**

$$\frac{1}{6}$$

D

<b>Coefficient</b>	term	term	term
<b>Constant</b>			
<b>Term</b>			
<b>Variable</b>			

$2x^2 + x - 3$   
 coefficient variable    variable    constant

A

**Equation**  $9x - 4 = 7x$

**Expression**  $9x - 4$

**Formula**  $a^2 + b^2 = c^2$

**Function**  $f(x)$

**Inequality**  $9x - 4 > 6x$

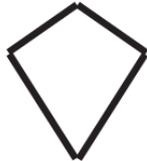
C

Rubenstein & Thompson (2002)



# Quadrilaterals

***Kite***



***Rhombus***



***Parallelogram***



***Square***



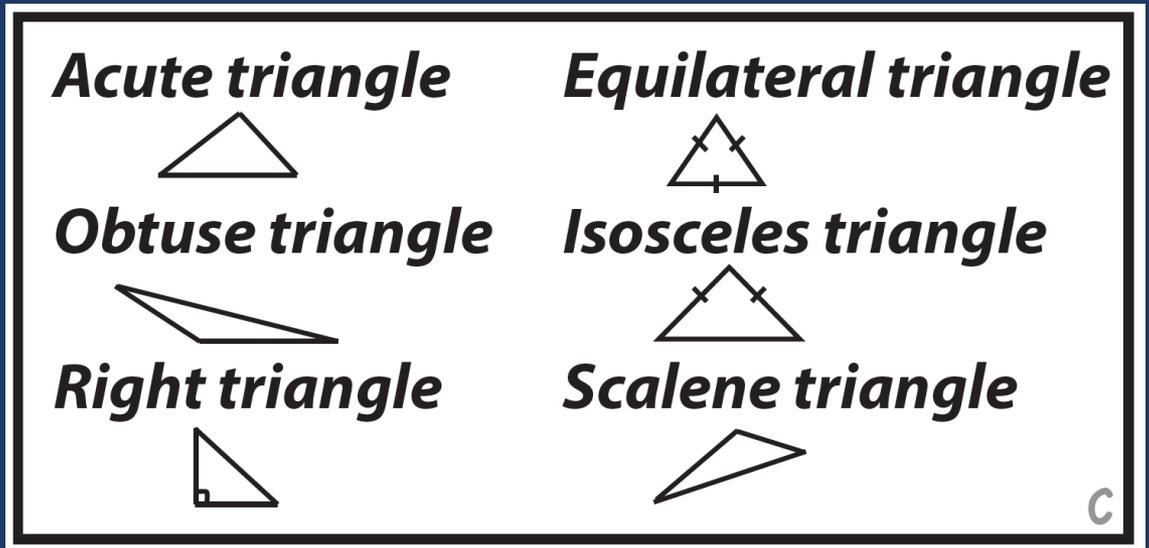
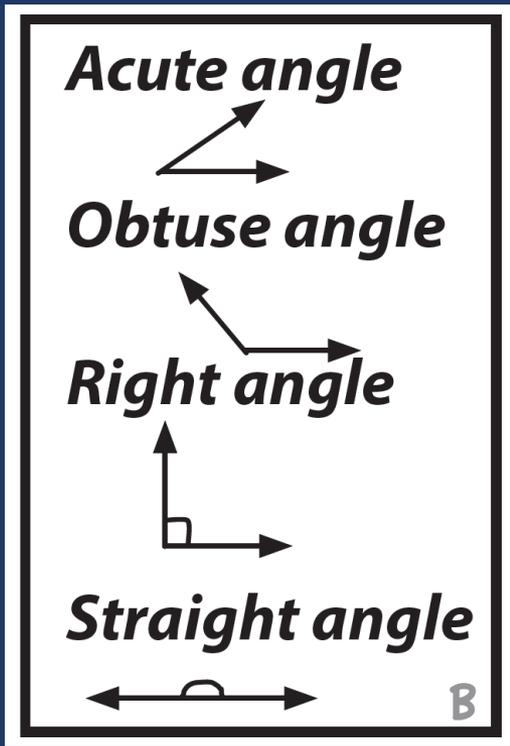
***Rectangle***



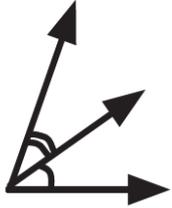
***Trapezoid***



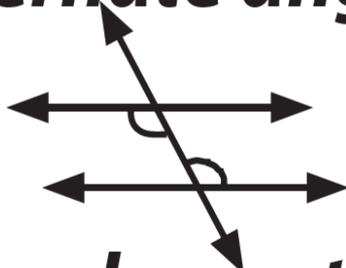
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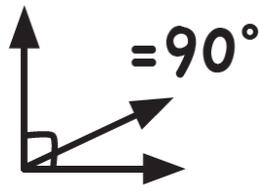
## **Adjacent angles**



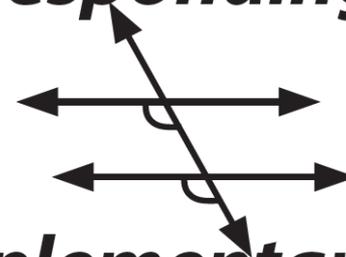
## **Alternate angles**



## **Complementary angles**



## **Corresponding angles**

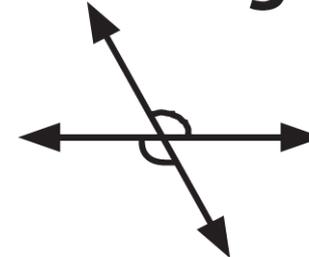


## **Supplementary angles**

= 180°

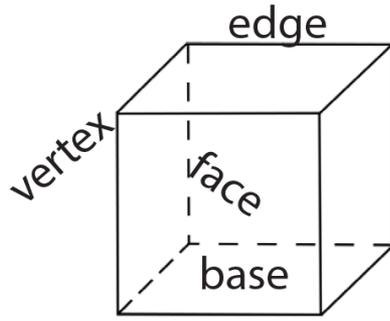
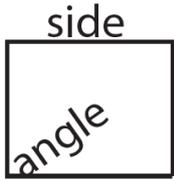


## **Vertical angles**

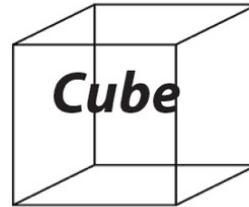


D

**Angle**  
**Base**  
**Edge**  
**Face**  
**Side**  
**Vertex**



#



I

Rubenstein & Thompson (2002)





Which terms do your students not use precisely?



Use formal math language

Use terms precisely



# Evidence-Based Practice: Multiple Representations



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

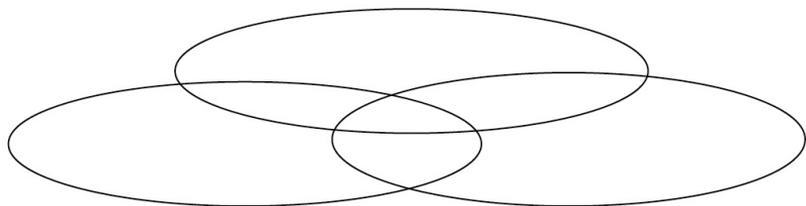
Precise  
language

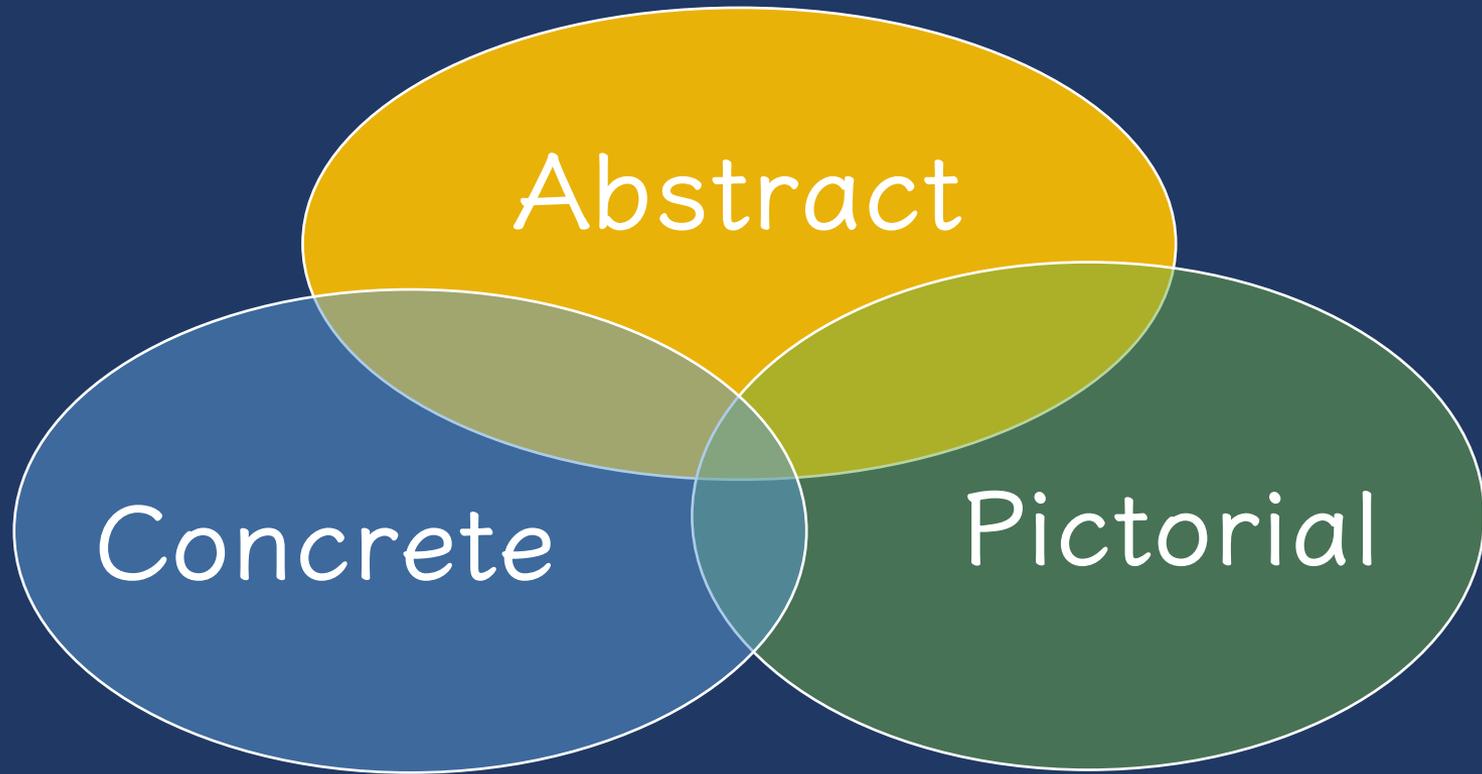
Multiple  
representations

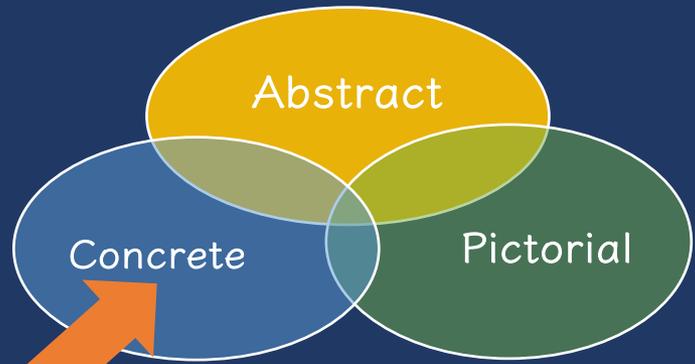
## INSTRUCTIONAL STRATEGIES



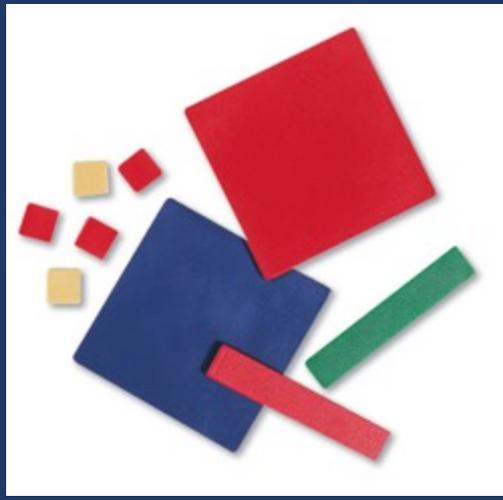
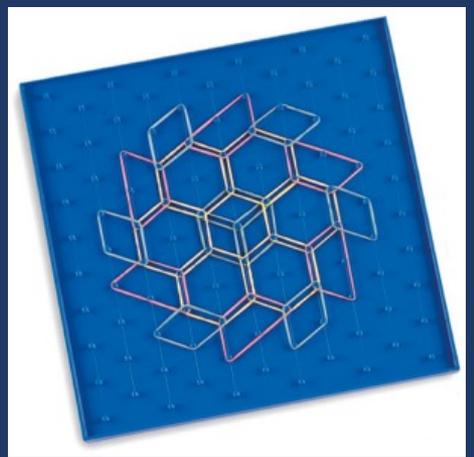
## Multiple Representations

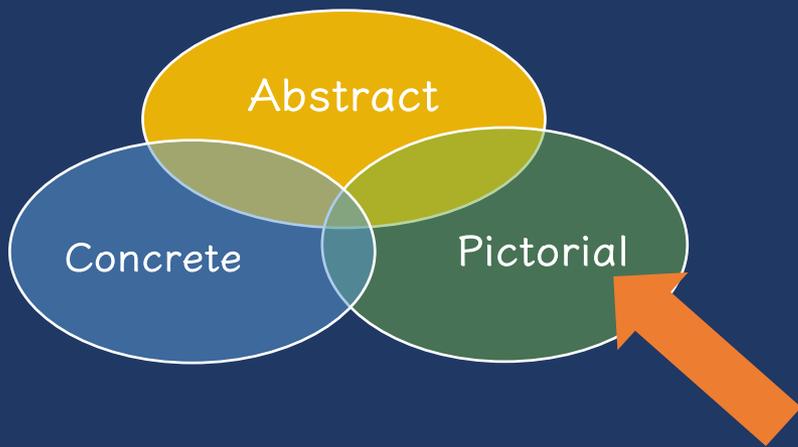




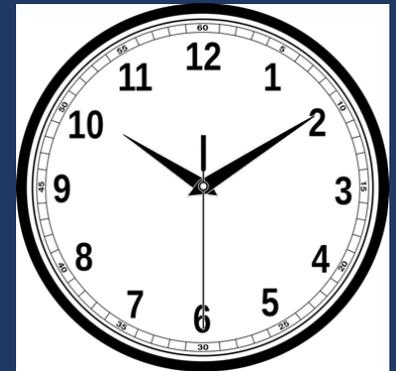
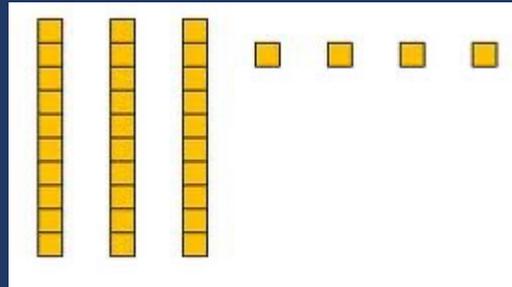
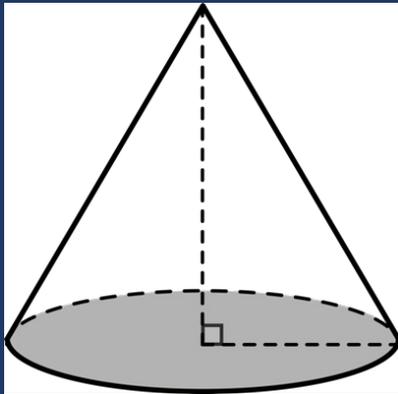


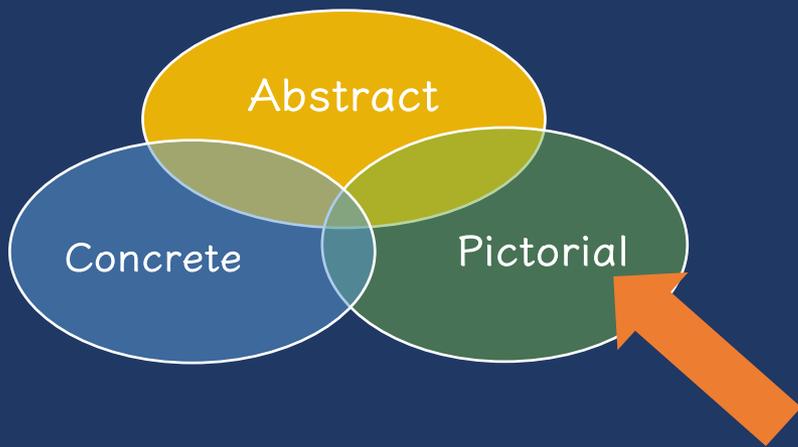
Three-dimensional objects



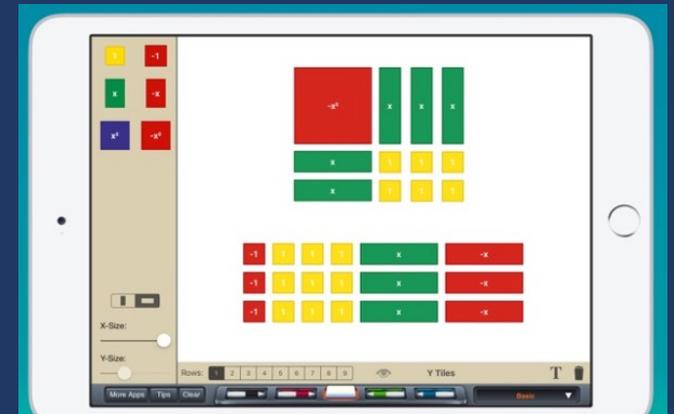
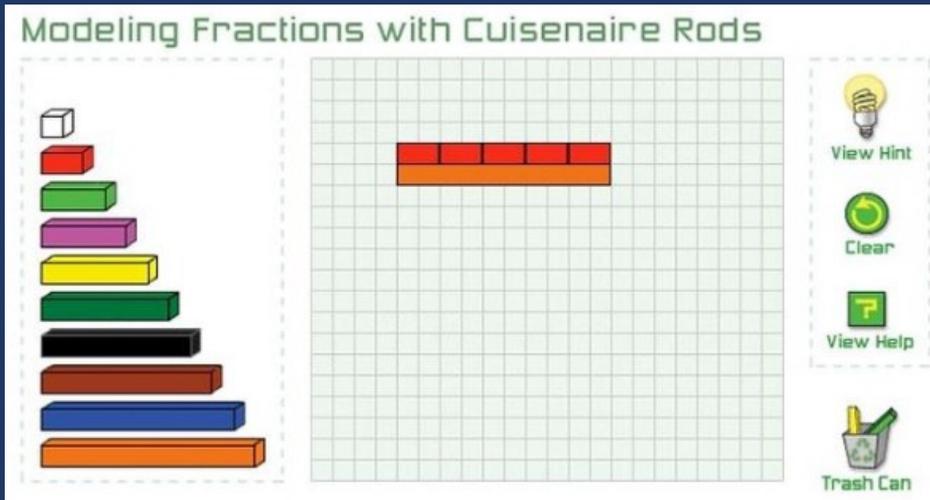
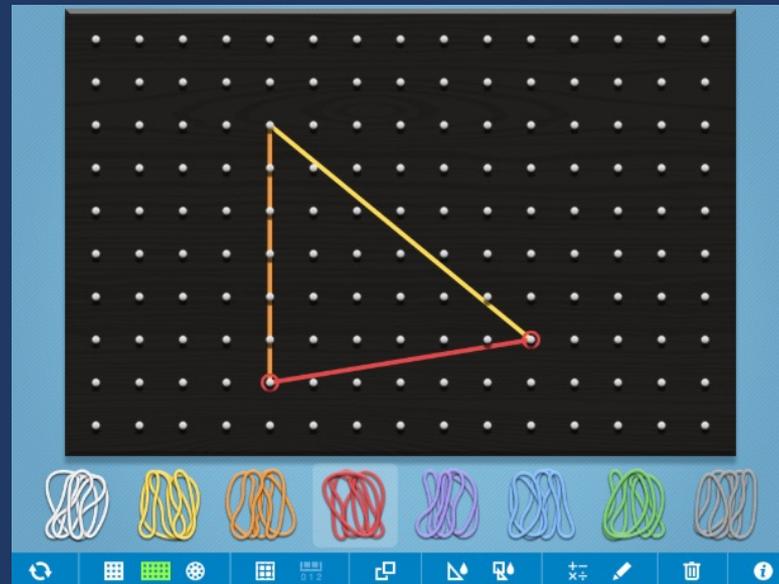


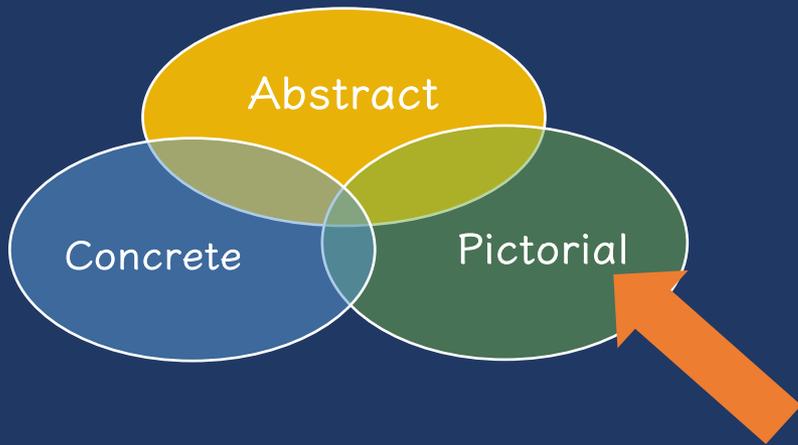
## Two-dimensional images





Two-dimensional images





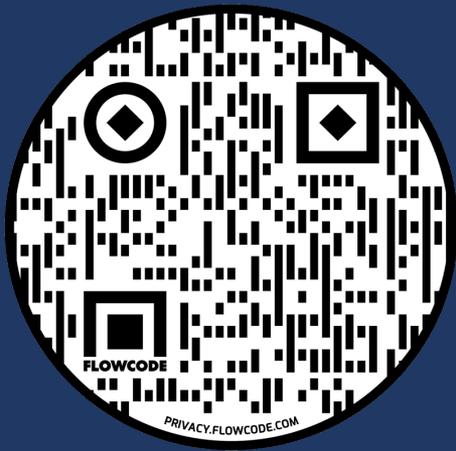
Two-dimensional images

## Virtual Manipulatives

Help students see and learn math using different tools!

Number & Operations	Place Value
Fractions & Decimals	Integers & Algebra
Geometry	Time & Money
Data & Probability	Extras

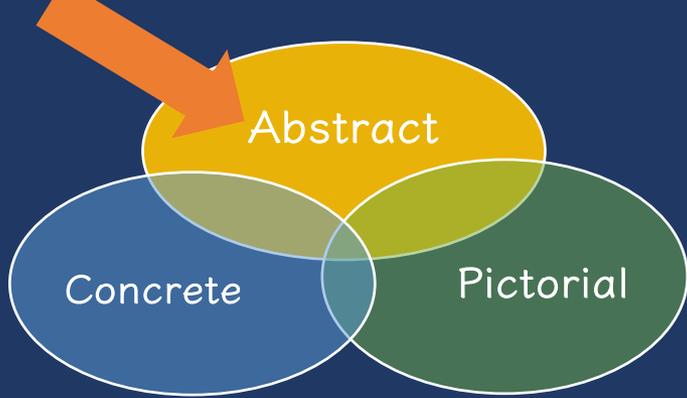
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<https://bit.ly/srpowell>

<b>Fractions &amp; Decimals</b>	fraction strips	fraction strips	fraction strips	Cuisenaire rods
	fraction circles	geoboard	geoboard	geoboard
	two-color counters	decimal strips	place value disks	percentage strips
				pattern blocks





Numerals and symbols and words

$$2 + 8 = 10$$

$$34 = 3 \text{ tens and } 4 \text{ ones}$$

$$x - 6 = 8$$

$$\begin{array}{r} 4,179 \\ + \quad 569 \\ \hline \end{array}$$





If you are left handed:  
What's one of your favorite  
hands-on manipulatives?

If you are right handed:  
What's one of your favorite  
virtual manipulatives?



# Evidence-Based Practice: Fluency Building



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

Precise  
language

Multiple  
representations

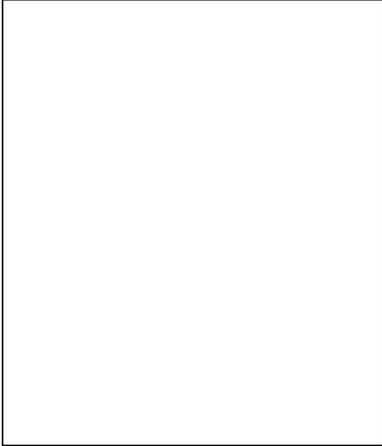
## INSTRUCTIONAL STRATEGIES

Fluency building

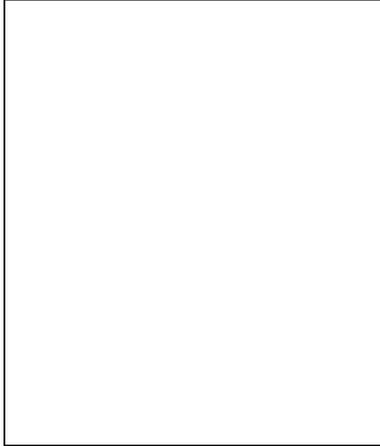


## Fluency

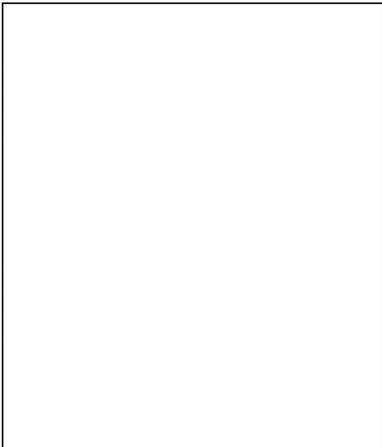
Addition



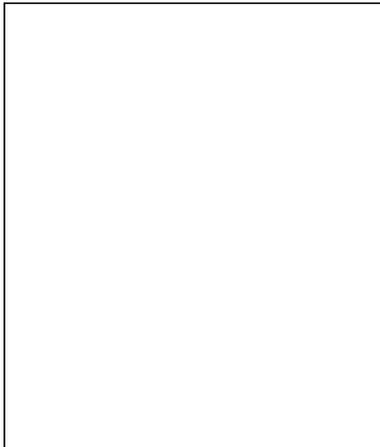
Subtraction



Multiplication



Division



# Building Fluency

Fluency is doing mathematics easily and accurately.

Fluency in mathematics makes mathematics easier.

Fluency provides less stress on working memory.

Fluency helps students build confidence with mathematics.

With fluency, it is important to emphasize both conceptual learning and procedural learning.



Addition	Subtraction
Multiplication	Division

Counting

Comparing numbers

Counting coins

Telling time

Identifying equivalent fractions

Identifying shapes

Knowing multiples

Knowing formulas



Addition	Subtraction
Multiplication	Division

Build fluency with math facts.

- Addition: single-digit addends
- Subtraction: single-digit subtrahend
- Multiplication: single-digit factors
- Division: single-digit divisor

$$\begin{array}{r} 5 \\ + 8 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ - 4 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times 7 \\ \hline \end{array}$$

$$\begin{array}{r} 56 \\ \div 8 \\ \hline \end{array}$$



Cover, Copy, Compare

$\begin{array}{r} 9 \\ \times 6 \\ \hline 54 \end{array}$	$\begin{array}{r} 8 \\ \times 6 \\ \hline 48 \end{array}$
$\begin{array}{r} 7 \\ \times 8 \\ \hline 56 \end{array}$	$\begin{array}{r} 6 \\ \times 5 \\ \hline 30 \end{array}$
$\begin{array}{r} 9 \\ \times 9 \\ \hline 81 \end{array}$	
$\begin{array}{r} 6 \\ \times 7 \\ \hline 42 \end{array}$	
$\begin{array}{r} 8 \\ \times 8 \\ \hline 64 \end{array}$	

File Folder

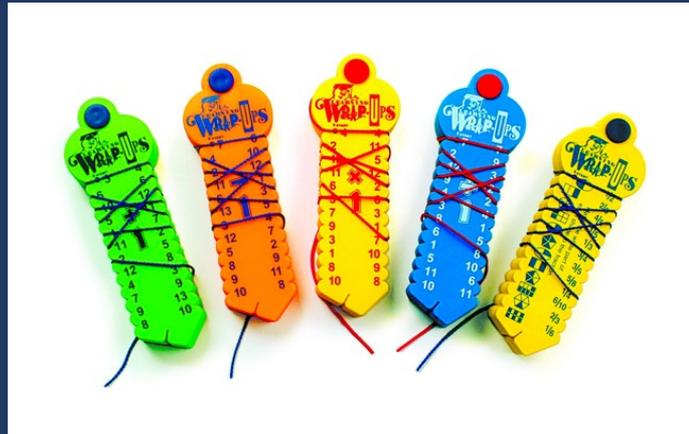
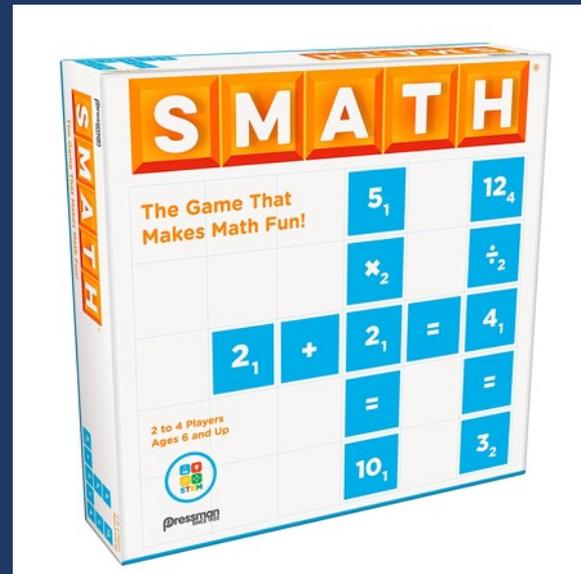
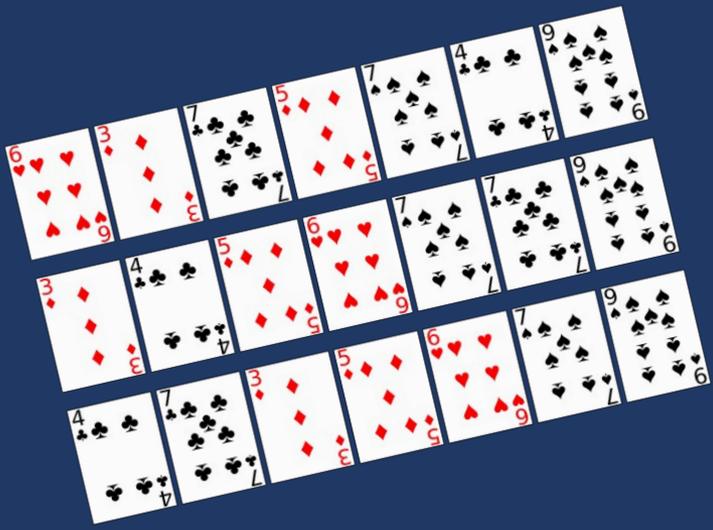
$6+3=$	9
$1+7=$	8
$6+4=$	10
$7+3=$	10
$2+7=$	9
$5+6=$	11
$4+7=$	11
$7+8=$	15
$6+7=$	13
$7+9=$	16
$7+6=$	13
$8+7=$	15
$7+0=$	7
$9+6=$	15
$6+0=$	6
$6+8=$	14

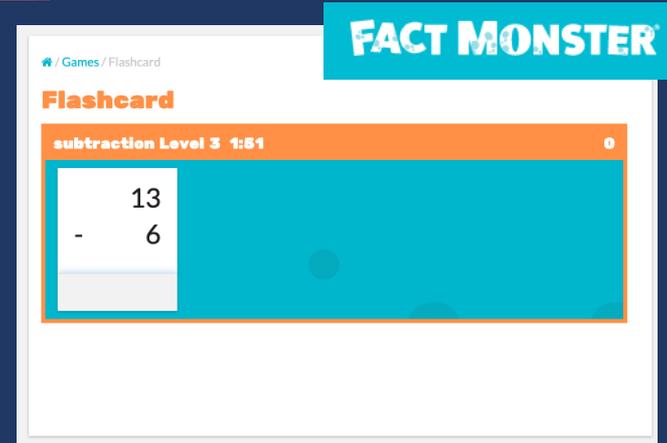
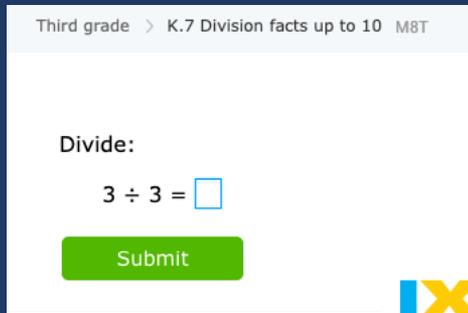
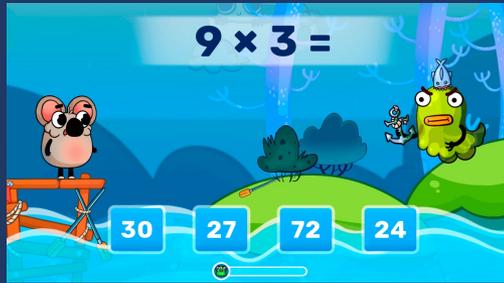
Taped Problems

$\begin{array}{r} 6 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 8 \\ \hline \end{array}$
$\begin{array}{r} 9 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 6 \\ \hline \end{array}$
$\begin{array}{r} 7 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times 4 \\ \hline \end{array}$
$\begin{array}{r} 9 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times 7 \\ \hline \end{array}$
$\begin{array}{r} 6 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ \times 7 \\ \hline \end{array}$









Reflex

Get your free 30-day trial

Help your students attain math fact fluency success whether in-person, remote, or through hybrid learning

*Game-based system to improve math fact fluency for grades 2-6 in less than 30 days!*

DAILY and BRIEF



Addition	Subtraction
Multiplication	Division

Build fluency with whole-number computation

$$\begin{array}{r} 15 \\ + 28 \\ \hline \end{array}$$

$$\begin{array}{r} 23 \\ \times 9 \\ \hline \end{array}$$

$$\begin{array}{r} 1009 \\ - 724 \\ \hline \end{array}$$

$$\begin{array}{r} 7250 \\ \div 15 \\ \hline \end{array}$$



Addition	Subtraction
Multiplication	Division

Build fluency with rational-number computation

$$\begin{array}{r} 1.4 \\ + 3.9 \\ \hline \end{array}$$

$$\frac{2}{3} \times \frac{3}{4}$$

$$\frac{9}{4} - \frac{3}{8}$$

$$\begin{array}{r} 7.892 \\ \div 0.14 \\ \hline \end{array}$$



Addition	Subtraction
Multiplication	Division

Build fluency with integer computation

$$\begin{array}{r} 1.4 \\ + -3.9 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times -12 \\ \hline \end{array}$$

$$-14 - (-7) =$$

$$-135 \div 2 =$$



Addition	Subtraction
Multiplication	Division



What are five ways you help students build fact fluency?



# Evidence-Based Practice: Word-Problem Solving



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

Precise  
language

Multiple  
representations

## INSTRUCTIONAL STRATEGIES

Fluency building

Problem solving  
instruction



Word-Problem Solving

**UPS** ✓  
**U**NDERSTAND  
Read and explain.

**P**LAN  
How will you solve the problem?

**S**OLVE  
Set up and do the math!

✓**C**HECK  
Does your answer make sense?

Word-Problem Schemas



Teach an attack strategy

Teach about schemas



# Teach an attack strategy

**UPS** ✓

**UNDERSTAND**  
Read and explain.

**PLAN**  
How will you solve the problem?

**SOLVE**  
Set up and do the math!

✓ **CHECK**  
Does your answer make sense?

Created by: Sarah Powell (spowell@austin.utexas.edu)



# Teach about schemas

Total

Difference

Change

Equal Groups

Comparison

Ratios/Proportions





# Pirate Math Equation Quest

About

Research

Individual

Small Group

STAAR

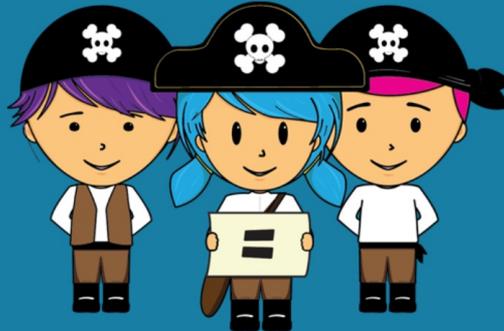
Videos

## Welcome to Pirate Math Equation Quest!

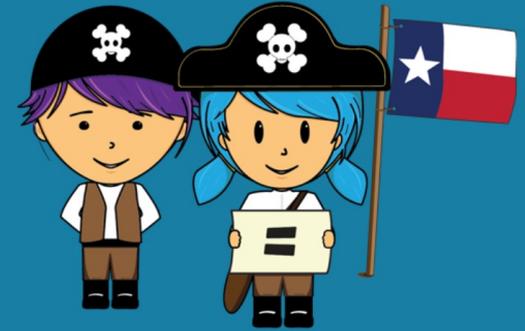
### Individual Word-Problem Intervention



### Small-Group Word-Problem Intervention



### Small-Group Word-Problem Intervention for STAAR



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# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

Precise  
language

Multiple  
representations

## INSTRUCTIONAL STRATEGIES

Fluency building

Problem solving  
instruction



## Intensive Intervention in Mathematics Course Content

NCII, through a collaboration with the University of Connecticut, developed a set of course content focused on developing educators' skills in designing and delivering intensive mathematics instruction. This content is designed to support faculty and professional development providers with instructing pre-service and in-service educators who are developing and/or refining their implementation of intensive mathematics intervention.

Intensive instruction was recently identified as a [high-leverage practice in special education](#), and DBI is a research based approach to delivering intensive instruction across content areas (NCII, 2013). This course provides learners with an opportunity to extend their understanding of intensive instruction through in-depth exposure to DBI in mathematics, complete with exemplars from actual classroom teachers.

NCII, through a collaboration with the University of Connecticut and the [National Center on Leadership in Intensive Intervention](#) and with support from the [CEEDAR Center](#), developed course content focused on enhancing educators' skills in intensive mathematics intervention. The course includes eight modules that can support faculty and professional development providers with instructing pre-service and in-service educators who are learning to implement intensive mathematics intervention through data-based individualization (DBI). The content in this course complements concepts covered in the [Features of Explicit Instruction Course](#) and so we suggest that users complete both courses.



### MODULE 5: INTENSIVE MATHEMATICS INTERVENTION: INSTRUCTIONAL STRATEGIES



The cover features a central illustration of a blue calculator with a digital display showing '195', several colorful plus signs, a pencil, and a pair of scissors on a blue grid notepad. In the top right corner, there is a logo for 'INCLUSION IN TEXAS' with a green icon of three people. The bottom section of the cover is a dark blue banner containing the title and a descriptive paragraph.

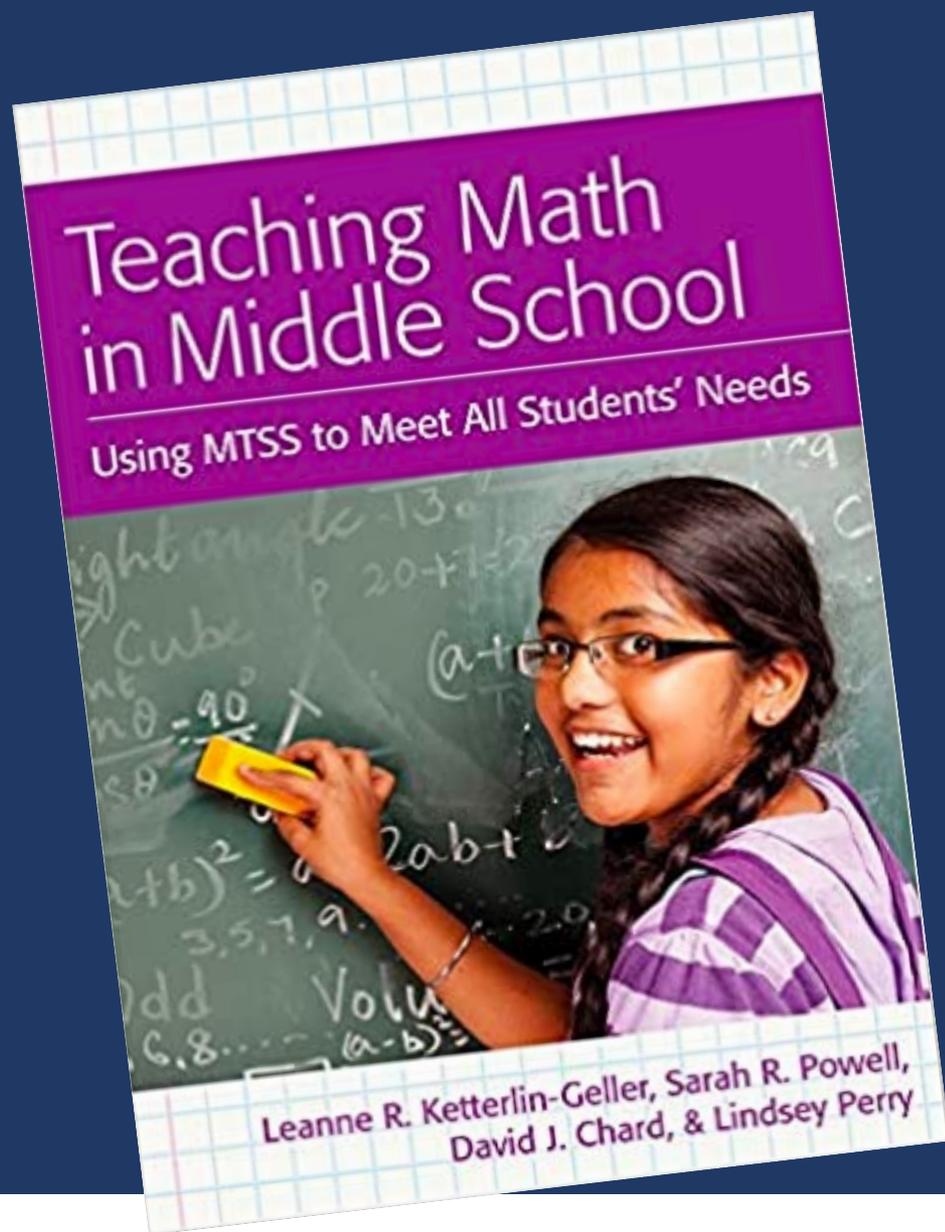
**Instructional Routines for Mathematics Intervention**

The purpose of these mathematics instructional routines is to provide educators with materials to use when providing intervention to students who experience difficulty with mathematics. The routines address content included in the grades 2-8 Texas Essential Knowledge and Skills (TEKS). There are 23 modules that include routines and examples – each focused on different mathematical content. Each of the 23 modules include vocabulary cards and problem sets to use during instruction. These materials are intended to be implemented explicitly with the aim of improving mathematics outcomes for students.

**TEA**  
Texas Education Agency

[https://www.inclusionintexas.org/apps/pages/index.jsp?uREC\\_ID=2155039&type=d&pREC\\_ID=2169859](https://www.inclusionintexas.org/apps/pages/index.jsp?uREC_ID=2155039&type=d&pREC_ID=2169859)







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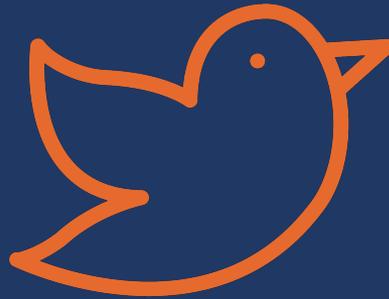


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