Five Components of Math Intervention

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Introduce yourself.

Describe your role as an educator.

Describe the mathematics you support.

Five Components of Math Intervention

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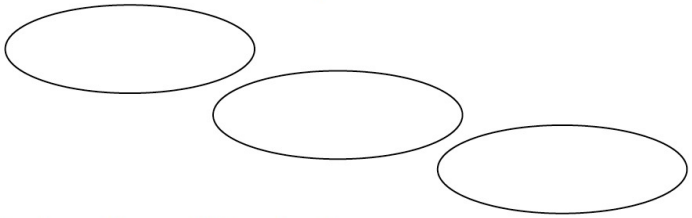
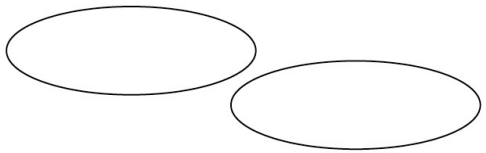
Evidence-Based Practices

Instructional Platform

Instructional Delivery



Instructional Strategies



evidence-based practice

A practice that has shown **consistent and positive** results

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

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

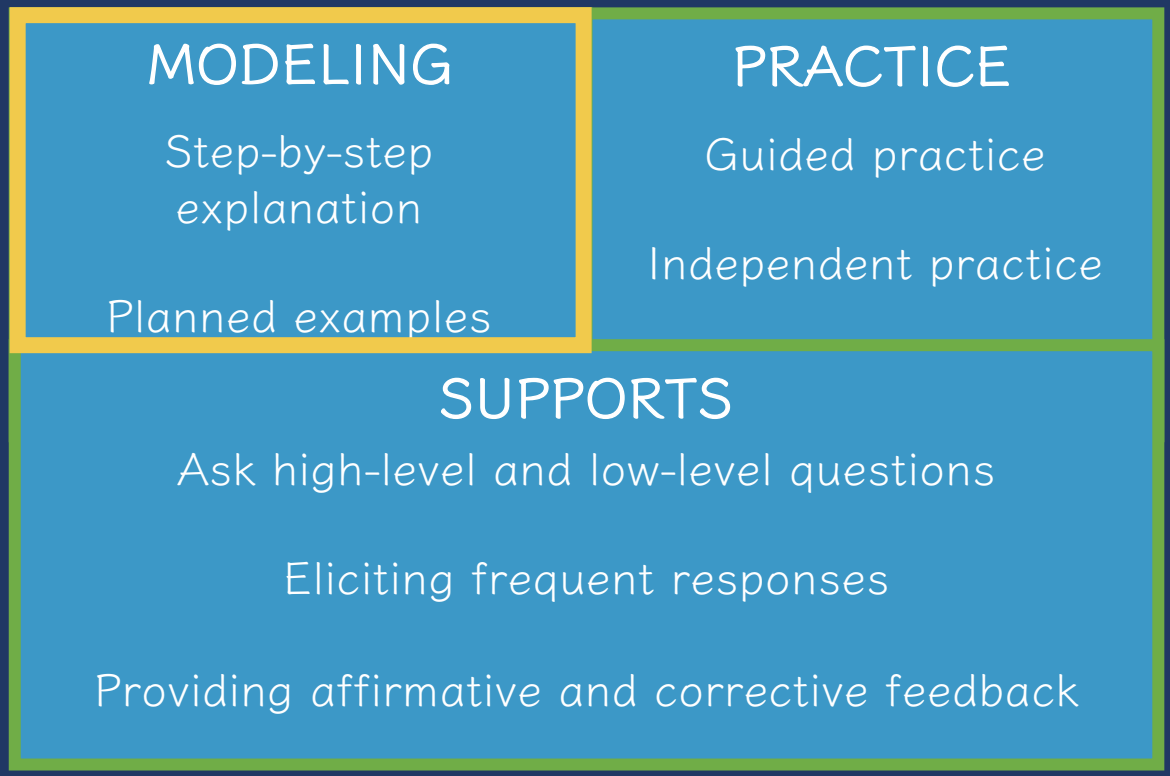
SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

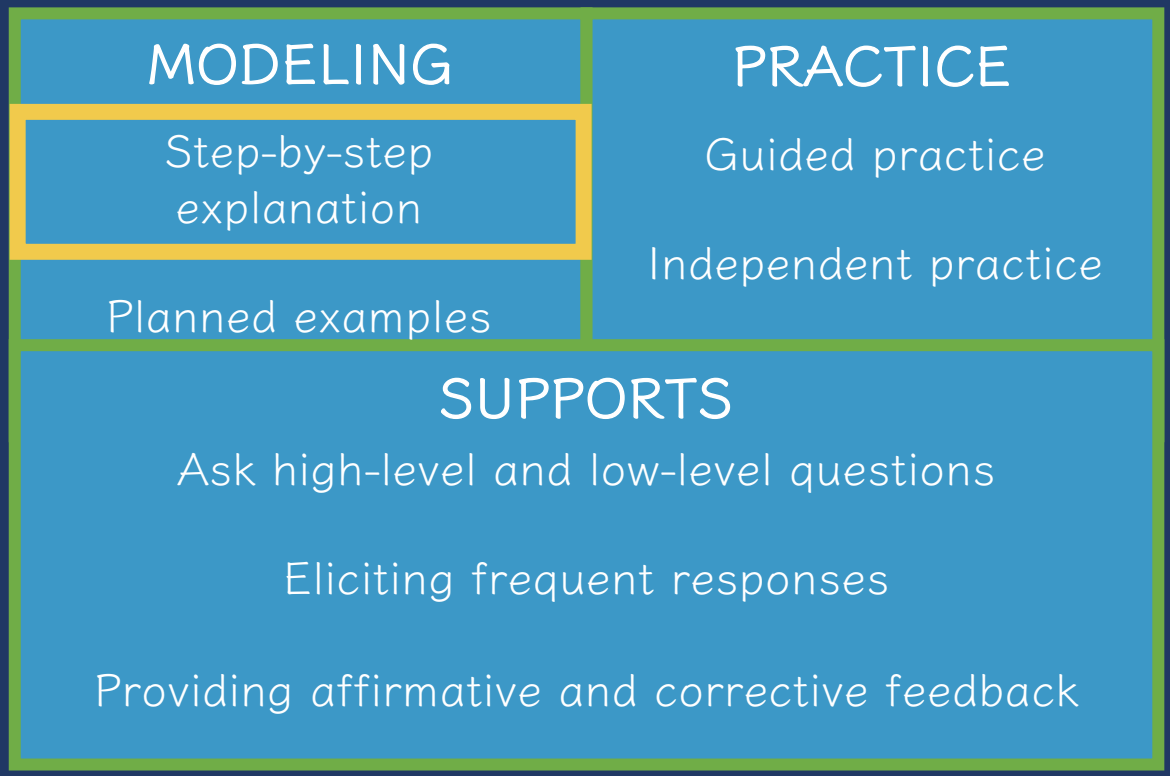
Providing affirmative and corrective feedback

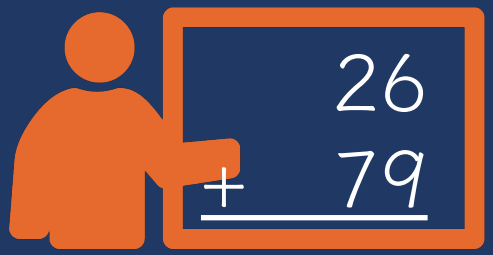
Modeling is a dialogue between the teacher and students.



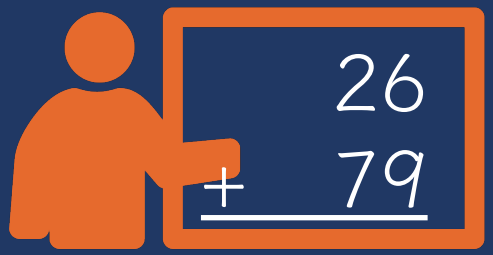
Modeling includes a step-by-step explanation of how to do a math problem.

A teacher may do 1 modeled problem or several.





"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?"

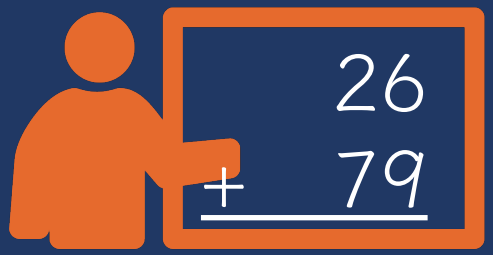
"26 plus 79."

"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?"

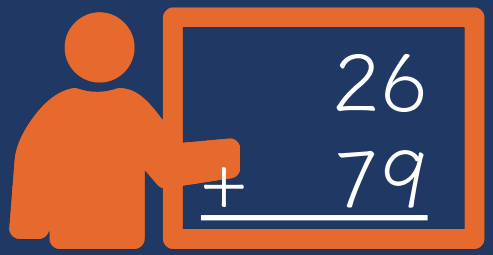
"Partial sums."

"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?"

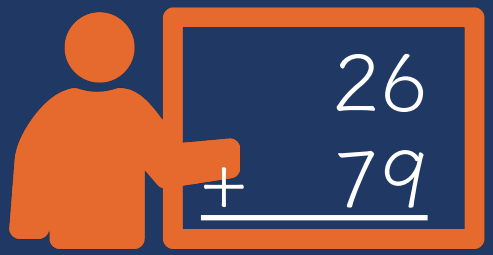
"90."

"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?"

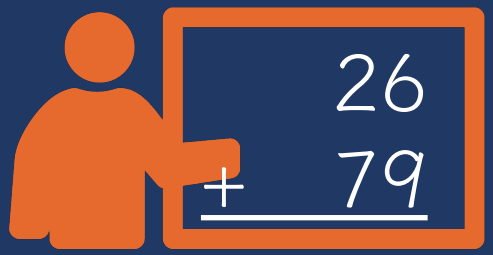
"15."

"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?"

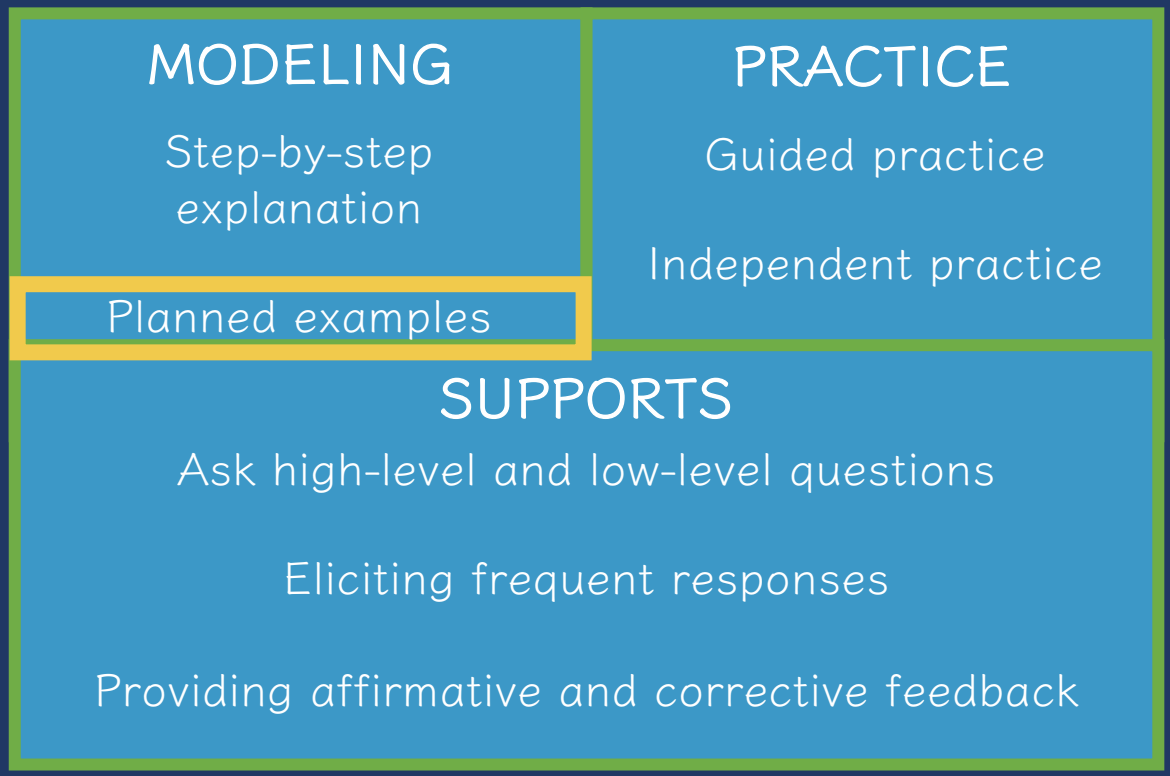
"105."

"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.

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

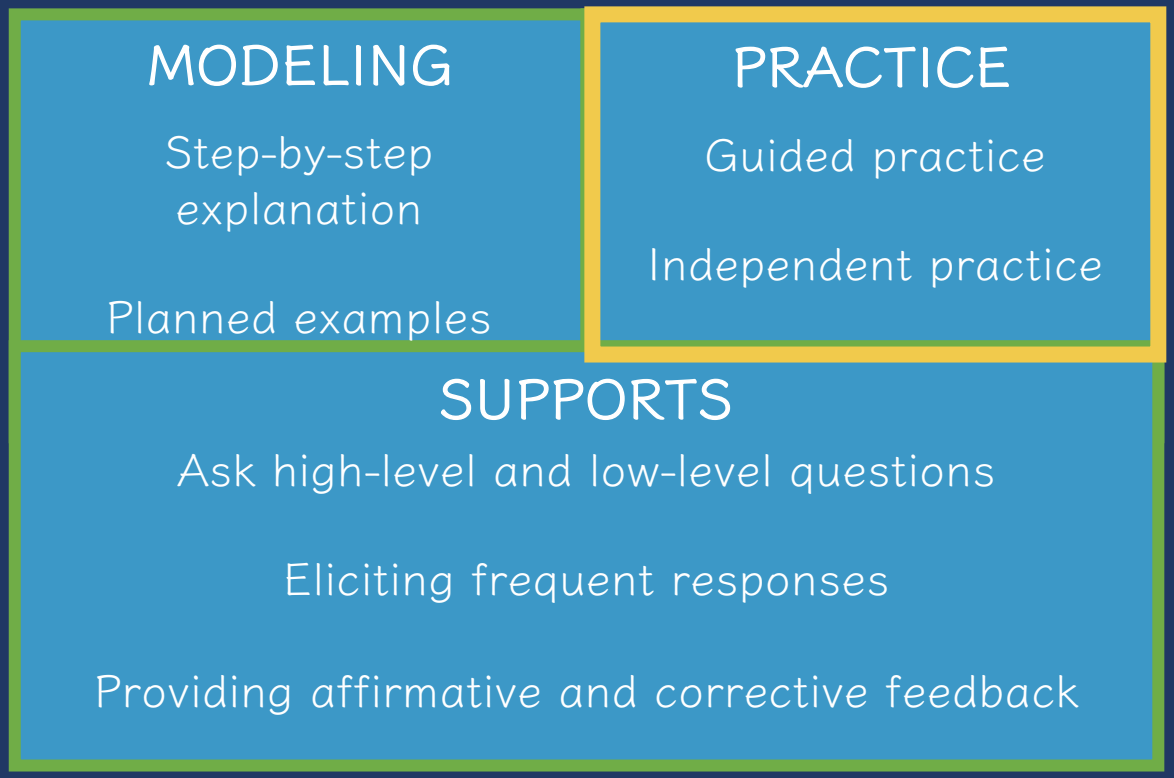
SUPPORTS

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?



Practice continues as a dialogue between the teacher and students.

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

"Let's work on a problem together."

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Ask high-level and low-level questions

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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

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PRACTICE

Guided practice

Independent practice

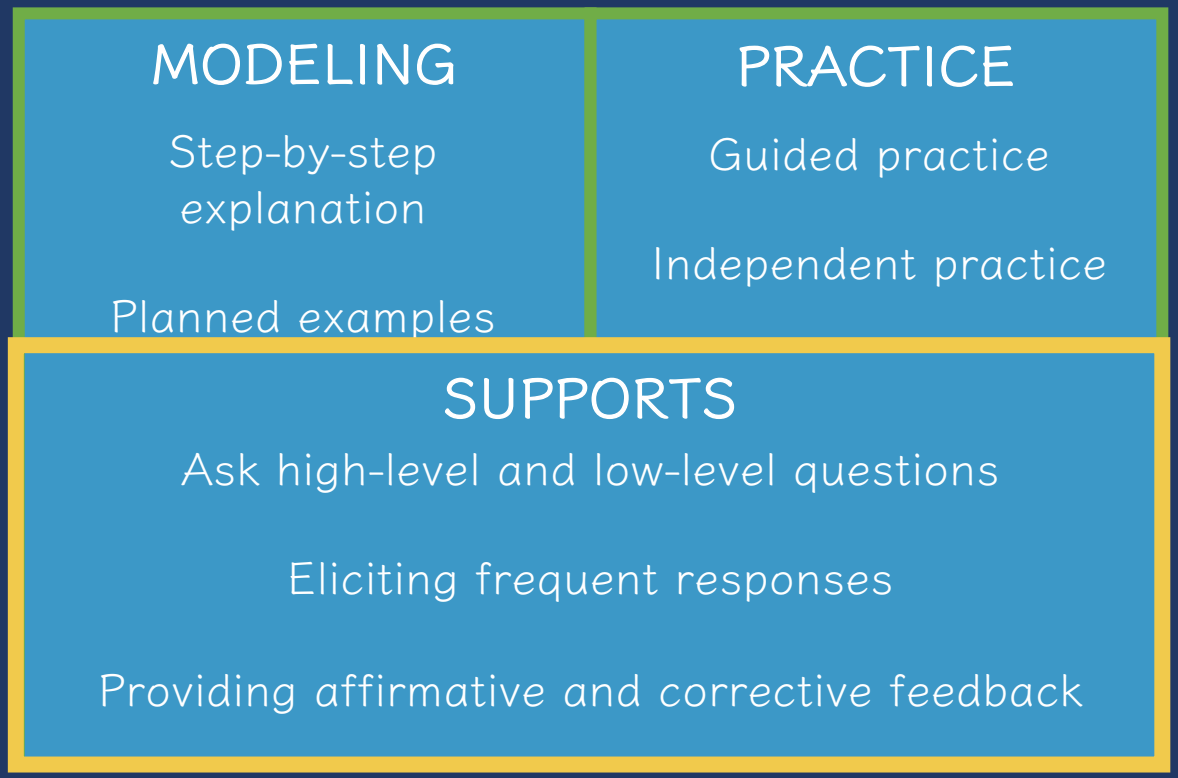
SUPPORTS

Ask high-level and low-level questions

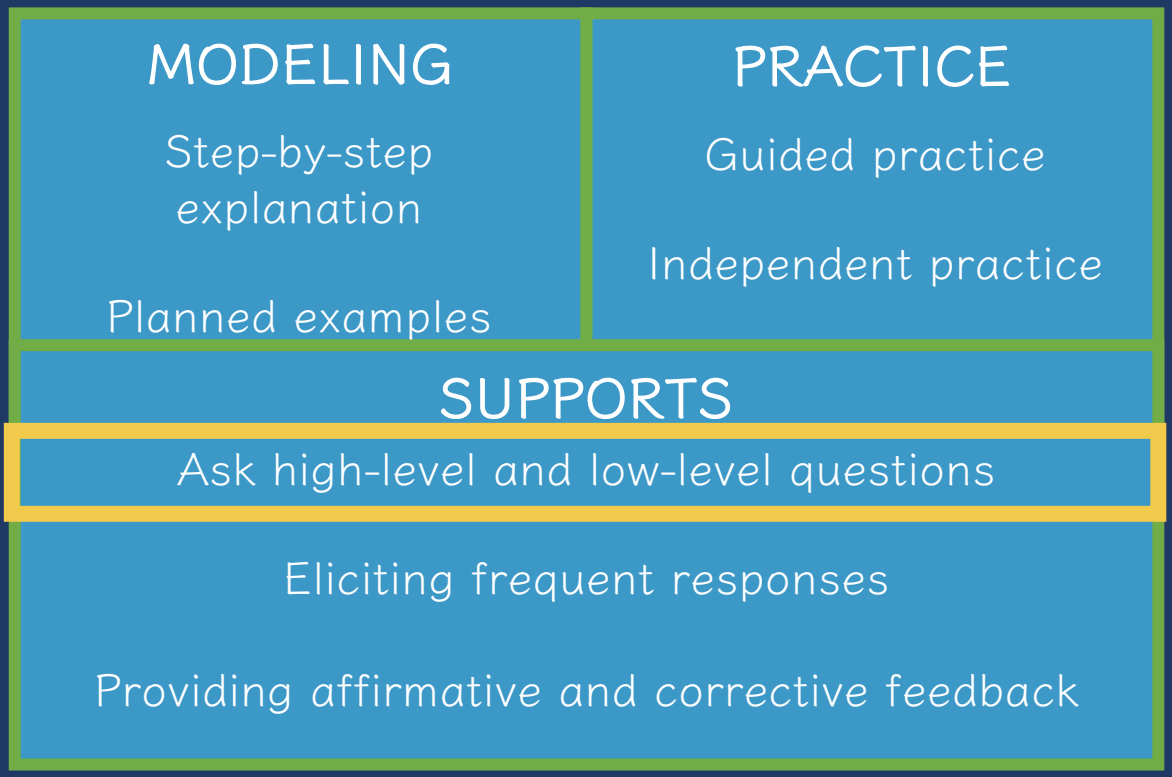
Eliciting frequent responses

Providing affirmative and corrective feedback

How do you engage students in guided practice?



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

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SUPPORTS

Ask high-level and low-level questions

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"What is 7 times 9?"

"63."

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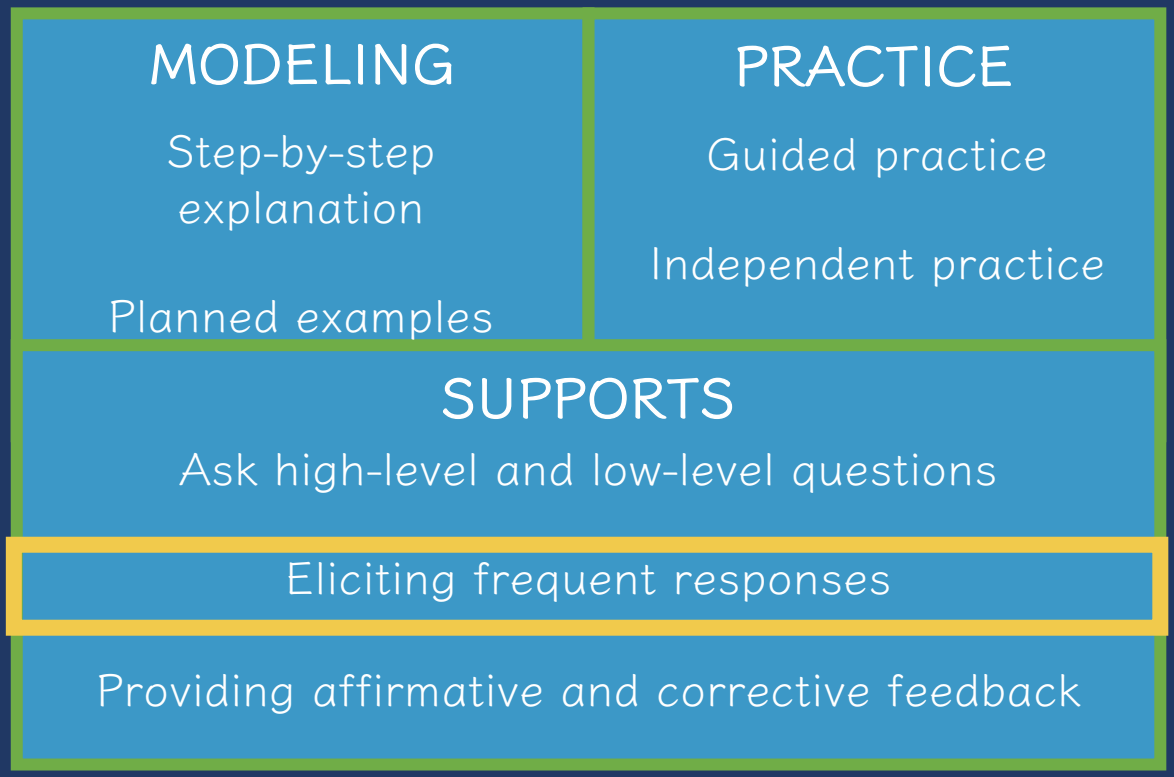
Ask high-level and low-level questions

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

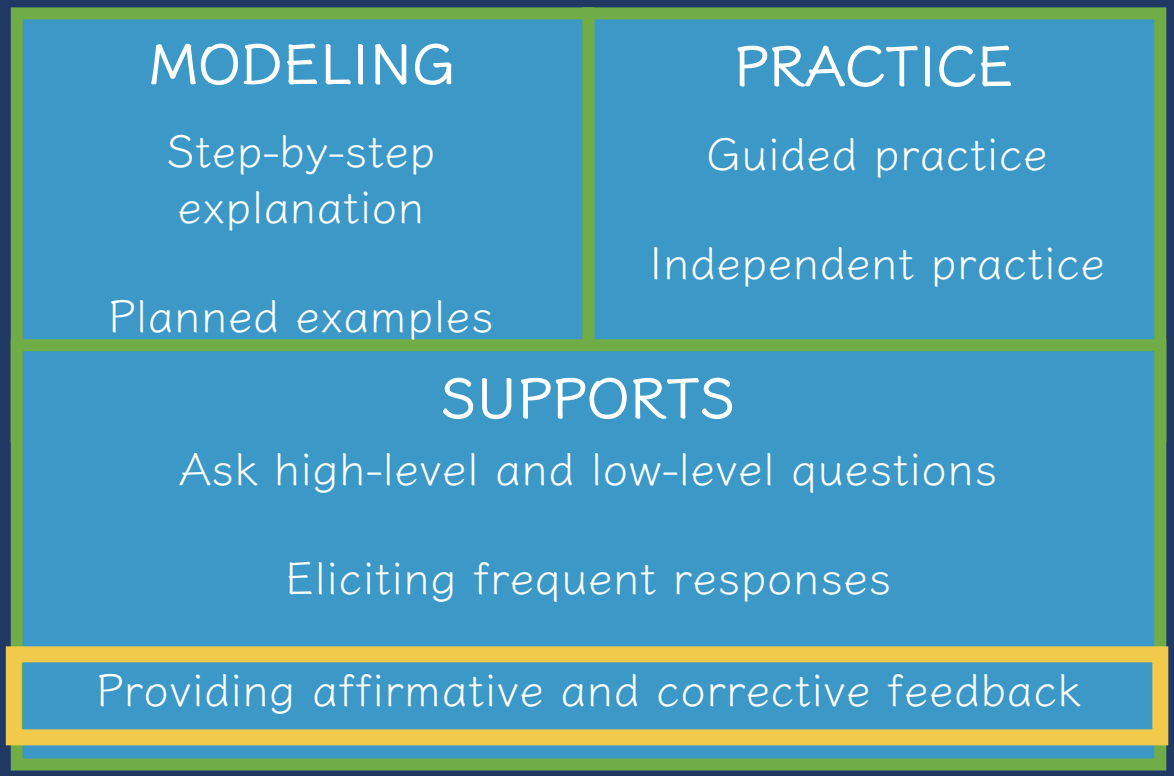
SUPPORTS

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.

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Ask high-level and low-level questions

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"Nice work using your word problem attack strategy."

MODELING

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Ask high-level and low-level questions

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"Let's look at that again. Tell me how you added in the hundreds column."

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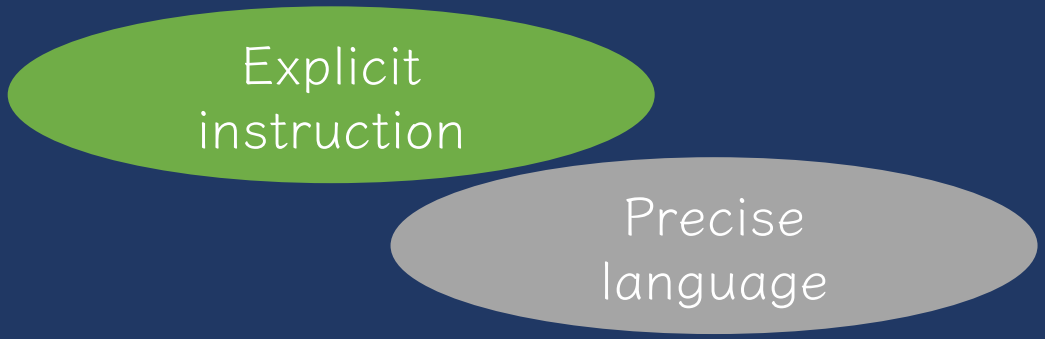
Which of these supports should you use more often?

Evidence-Based Practice: Mathematical Language

Instructional Platform

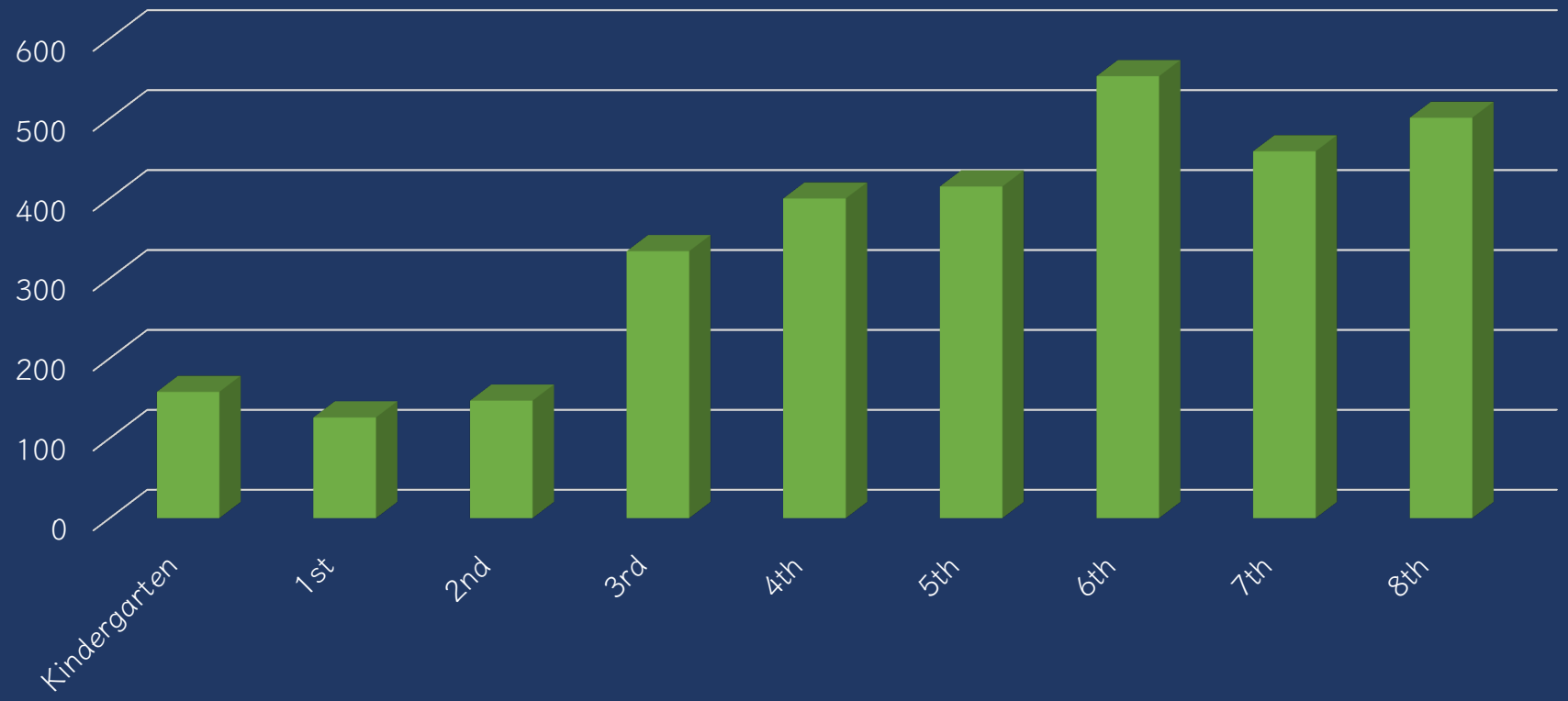
INSTRUCTIONAL DELIVERY



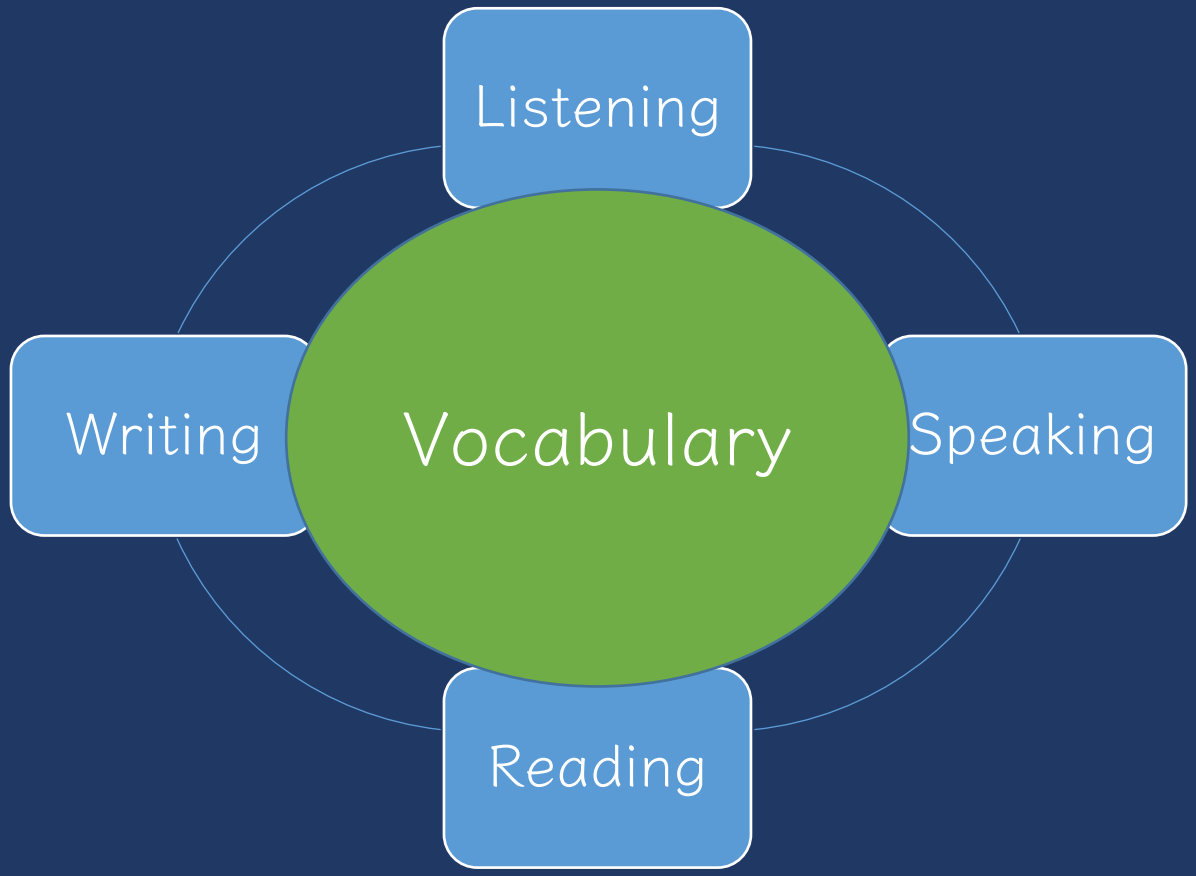
INSTRUCTIONAL STRATEGIES

Mathematical Language

Instead of that…	Say this…

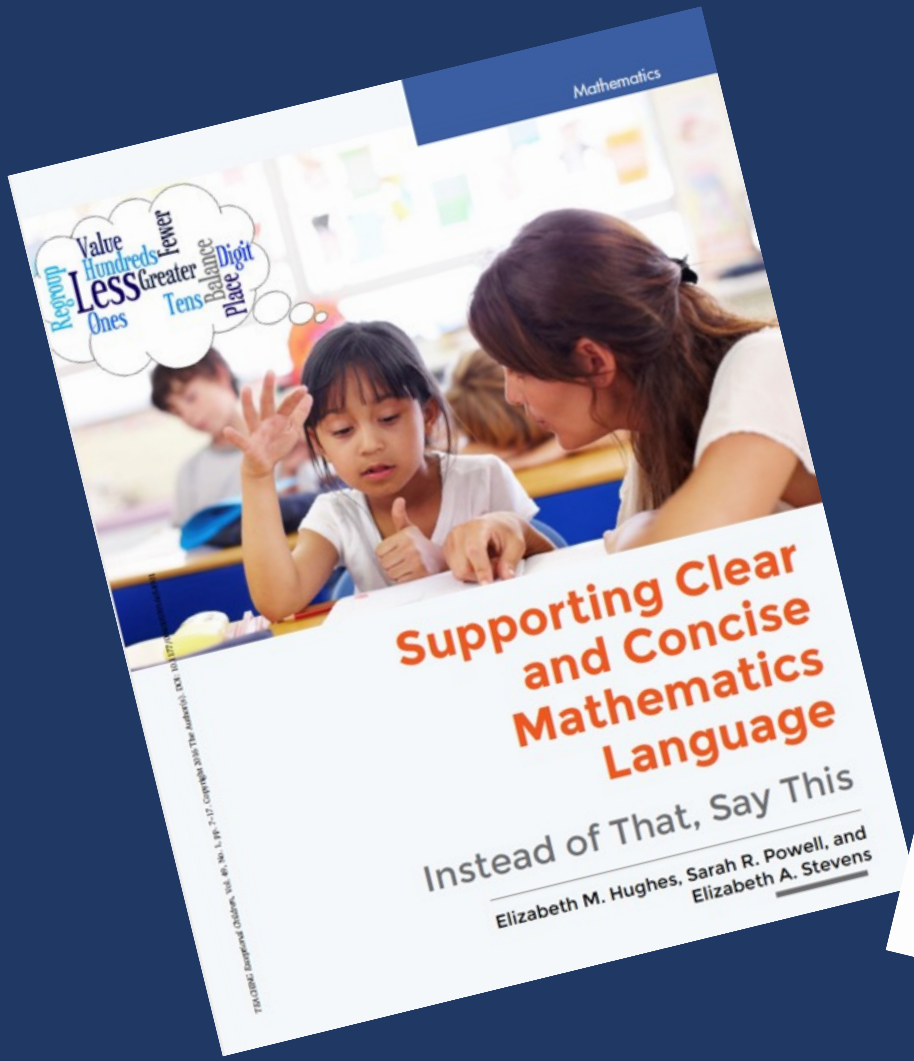


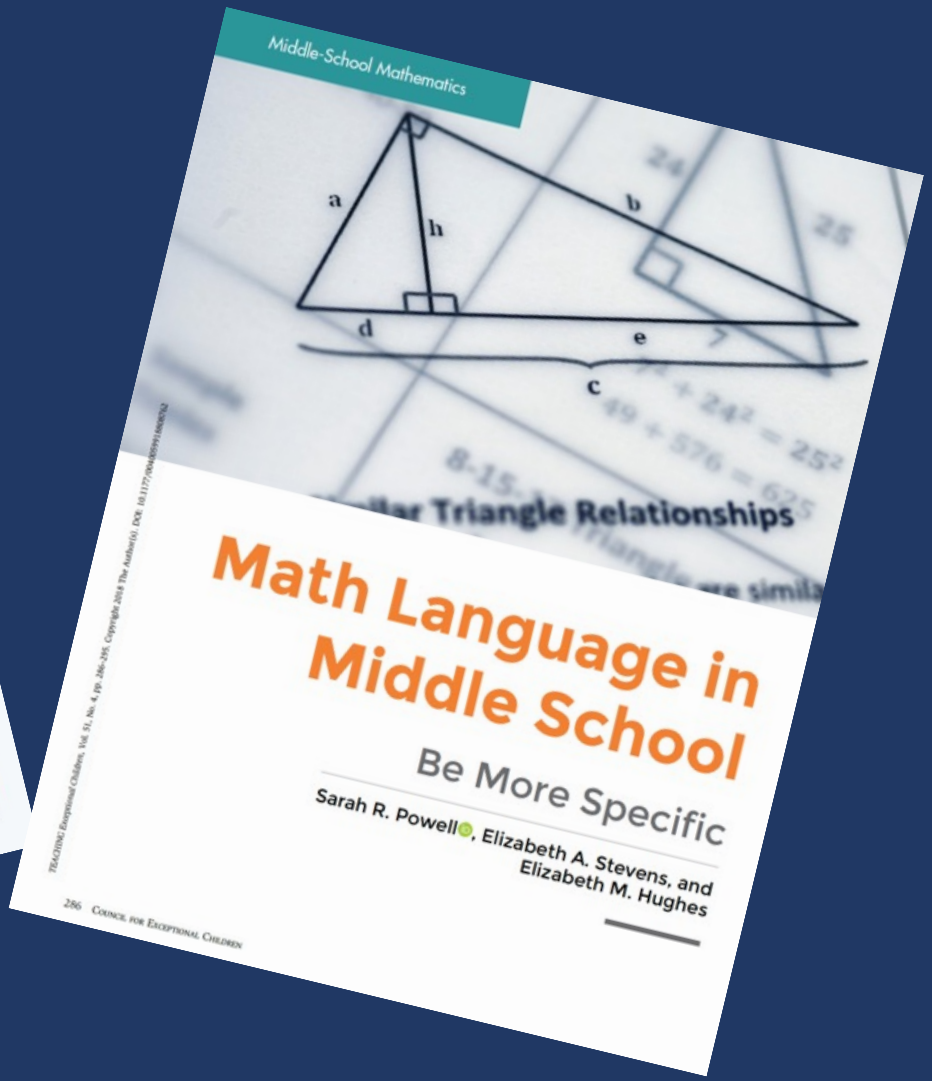
Powell, Bos, & Lin (2019)



Use formal math language

Use terms precisely





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

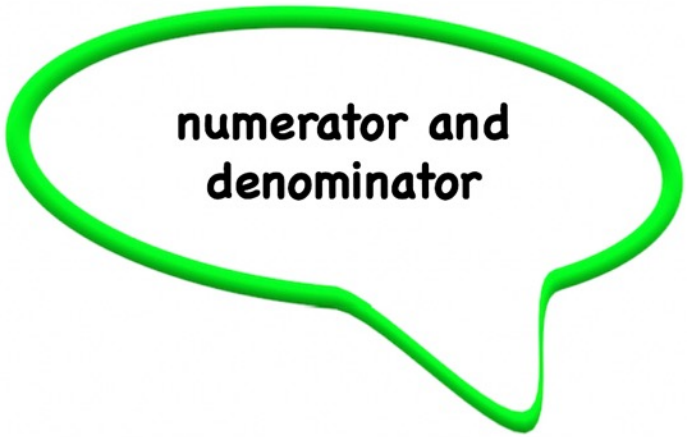
Why this is important...

- 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.

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

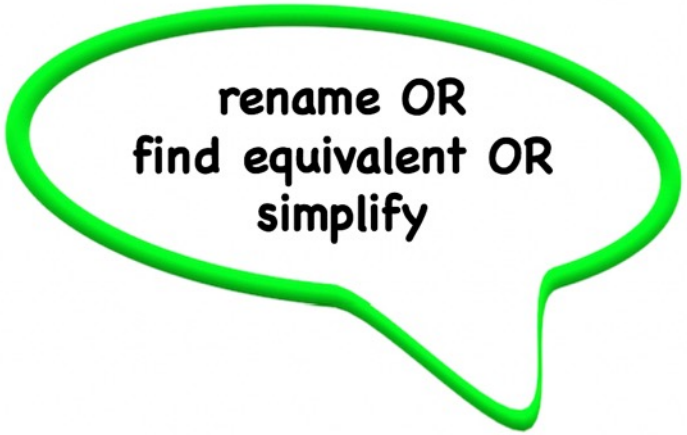
Why this is important...

- "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.



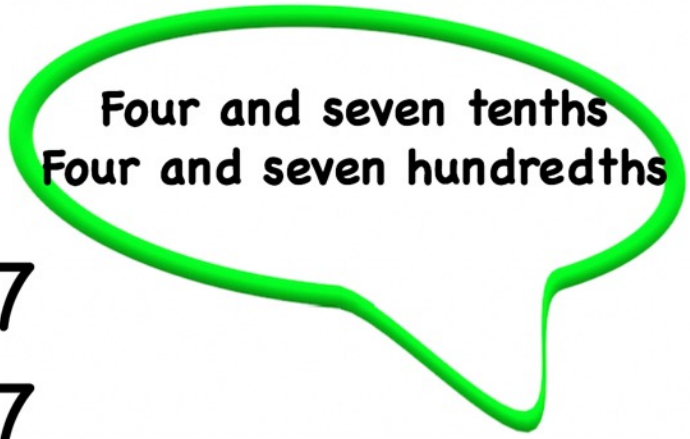
Why this is important...

- 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.



Why this is important...

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



4.7

4.07

Why this is important...

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

box OR ball

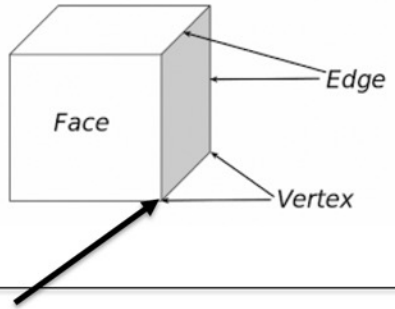
square OR circle

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

$\frac{8}{5}$

Proportion

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

Mixed number

$1\frac{3}{5}$

Ratio

4:3

Proper fraction

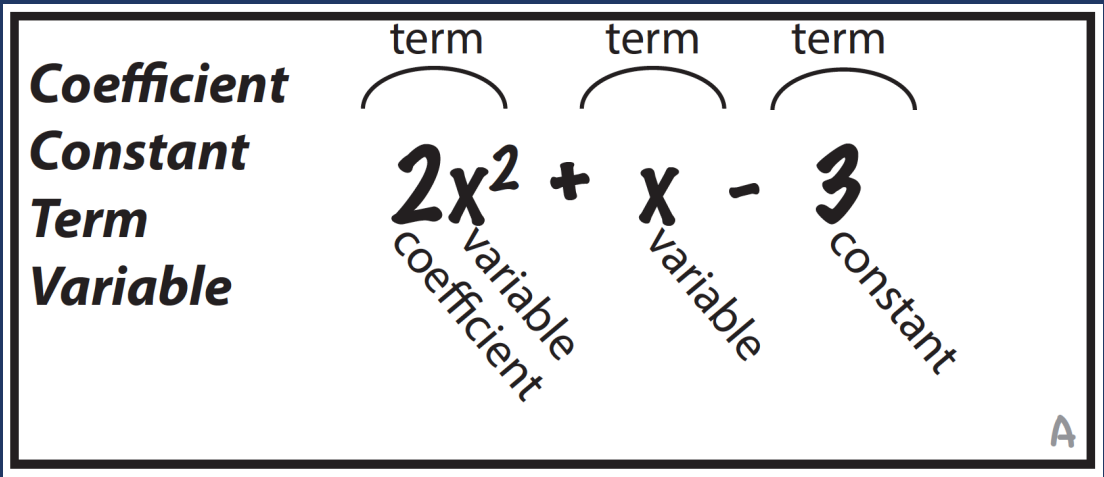
$\frac{2}{9}$

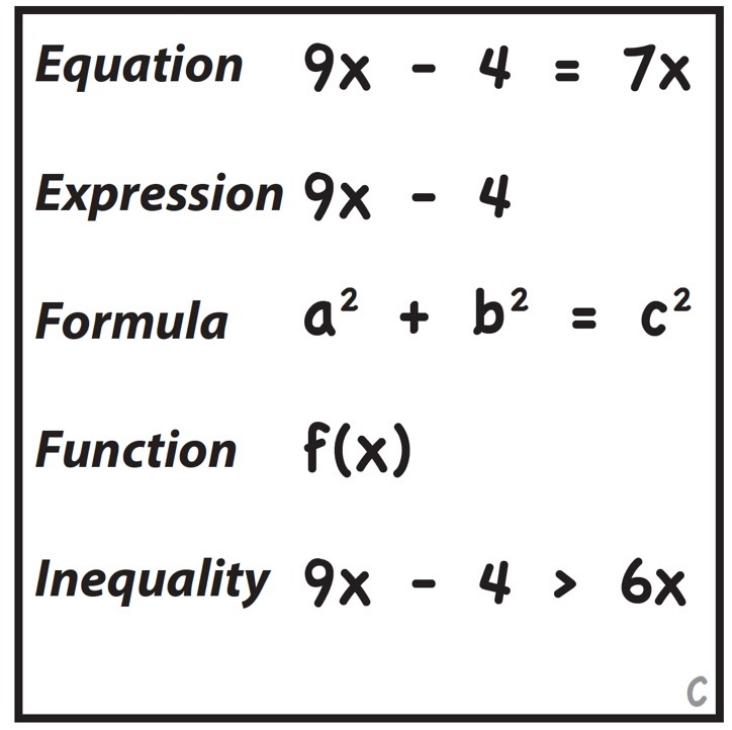
Unit fraction

$\frac{1}{6}$

D

Rubenstein & Thompson (2002)

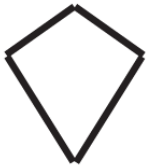




Rubenstein & Thompson (2002)

Quadrilaterals

Kite



Rhombus

Parallelogram

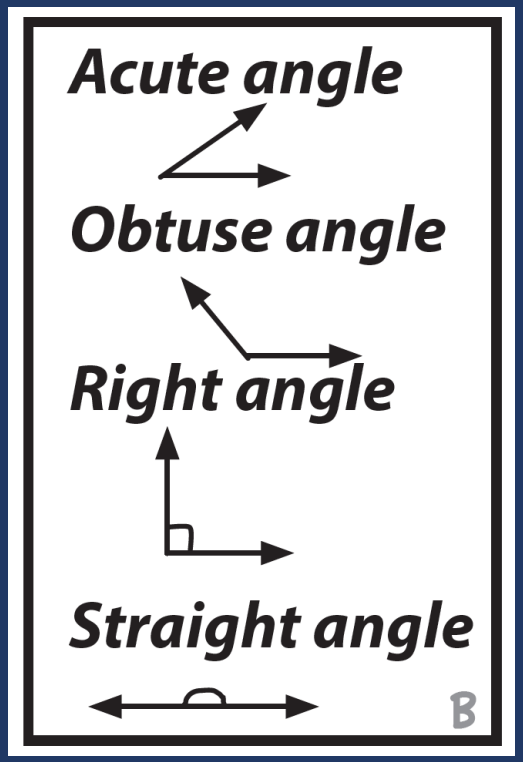
Square

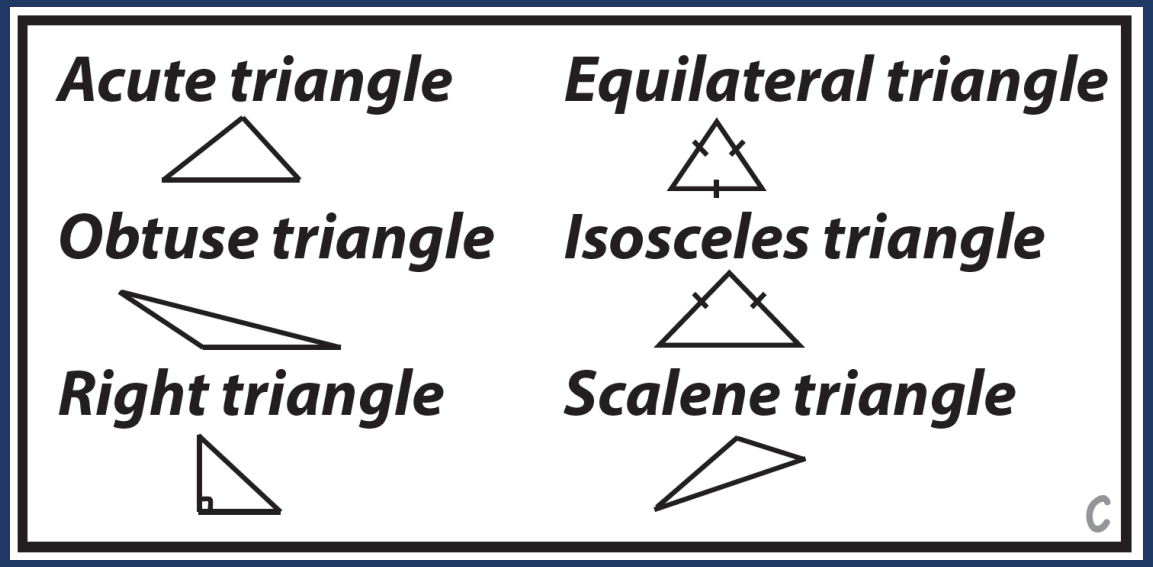
Rectangle

Trapezoid

A

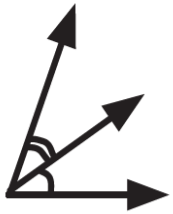
Rubenstein & Thompson (2002)



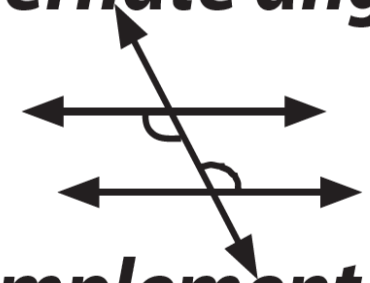


Rubenstein & Thompson (2002)

Adjacent angles

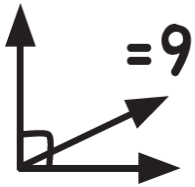


Alternate angles

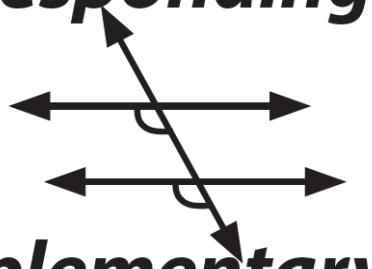


Complementary angles

=90°



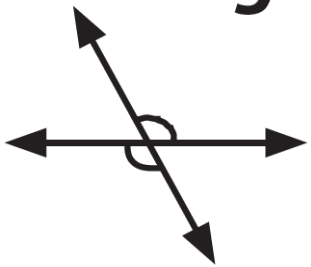
Corresponding angles



Supplementary angles

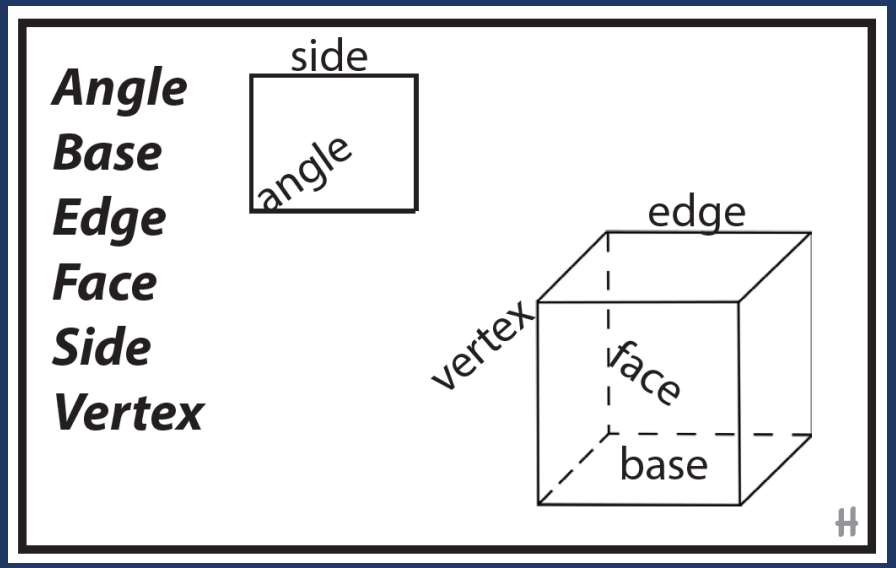
=180°

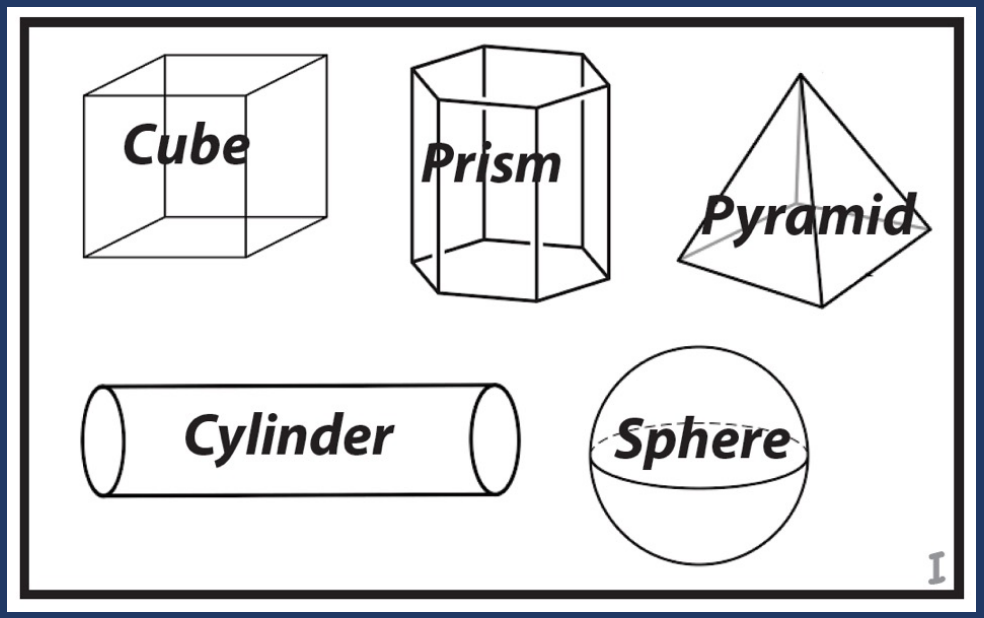
Vertical angles



D

Rubenstein & Thompson (2002)





Rubenstein & Thompson (2002)

Which terms do your students not use precisely?

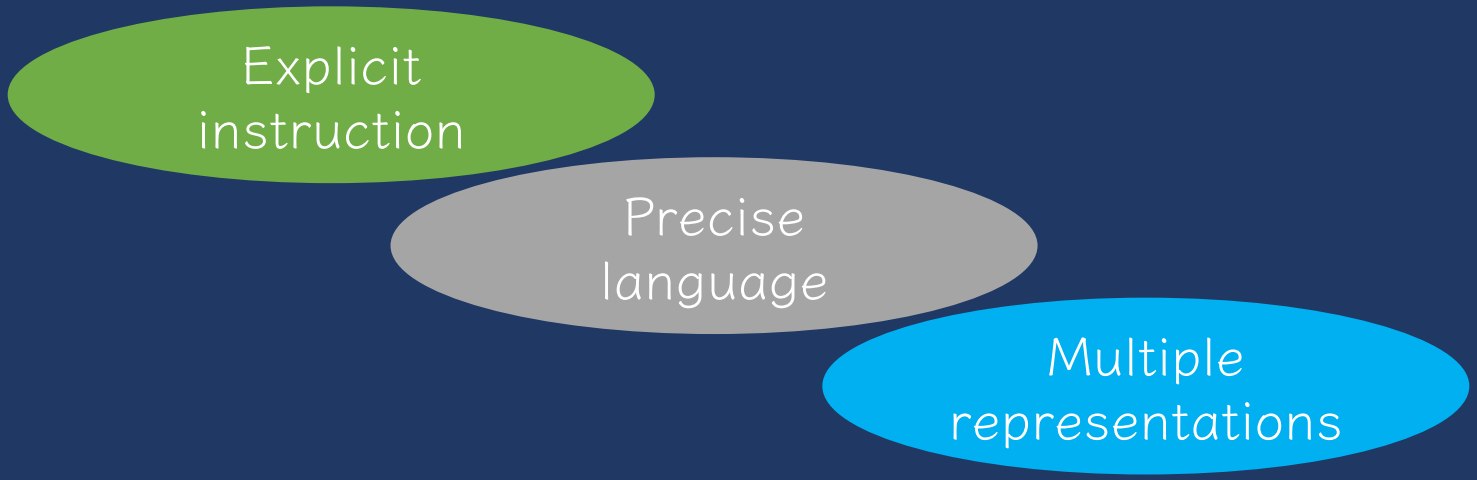
Use formal math language

Use terms precisely

Evidence-Based Practice: Multiple Representations

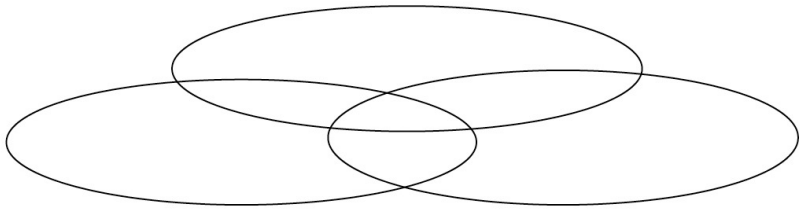
Instructional Platform

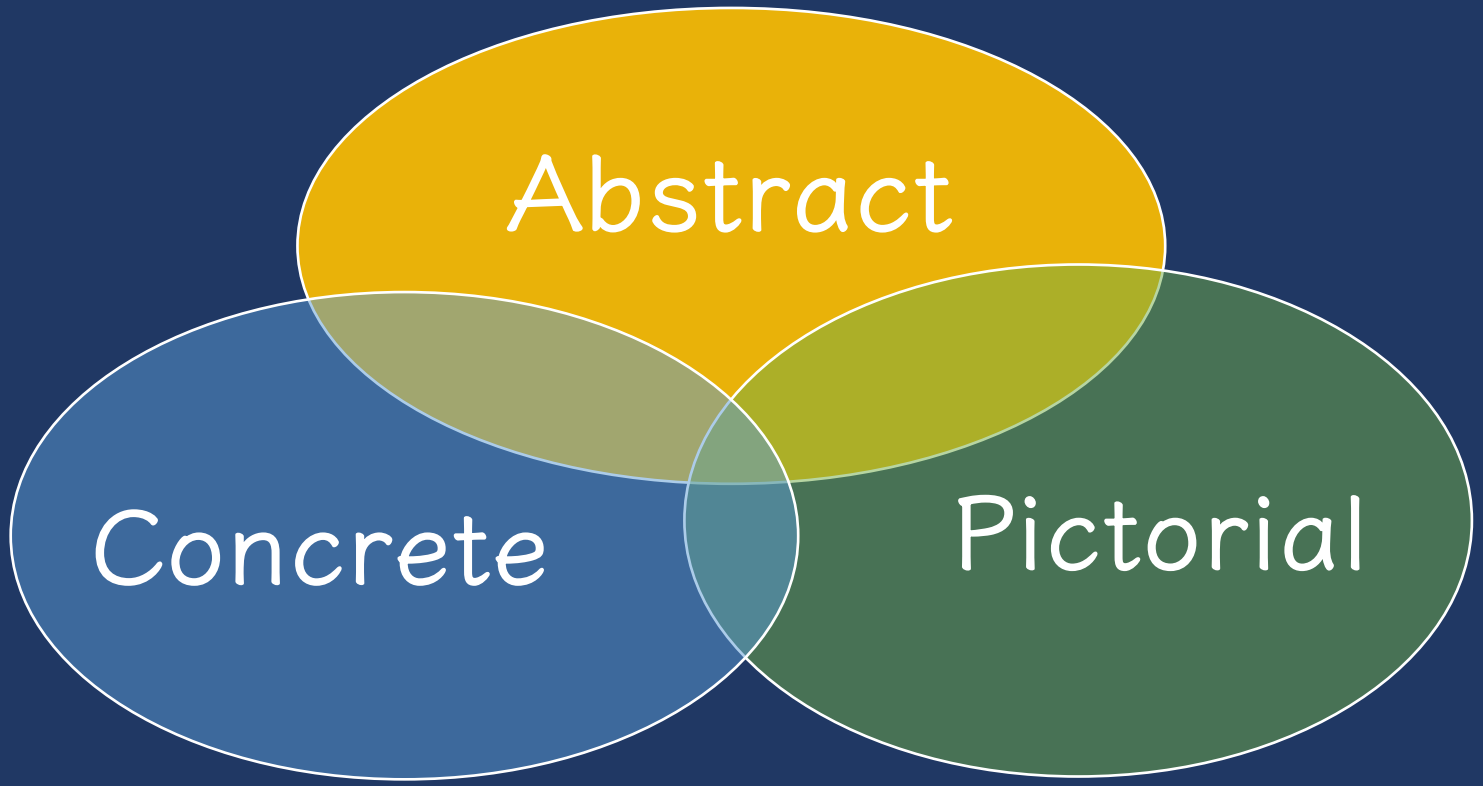
INSTRUCTIONAL DELIVERY

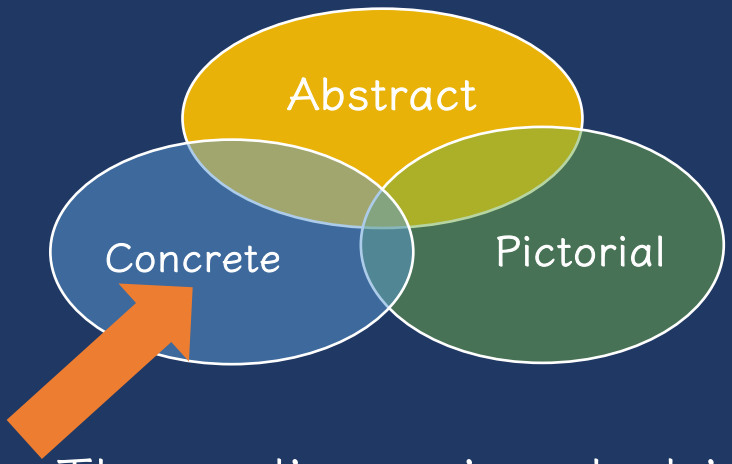


INSTRUCTIONAL STRATEGIES

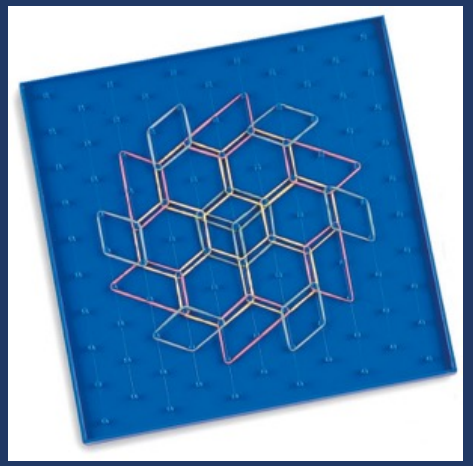
Multiple Representations

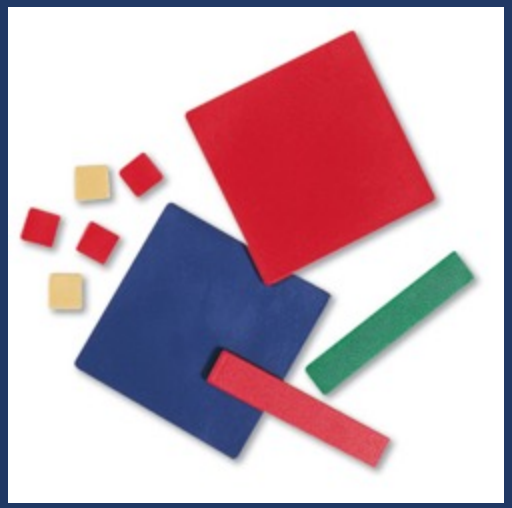


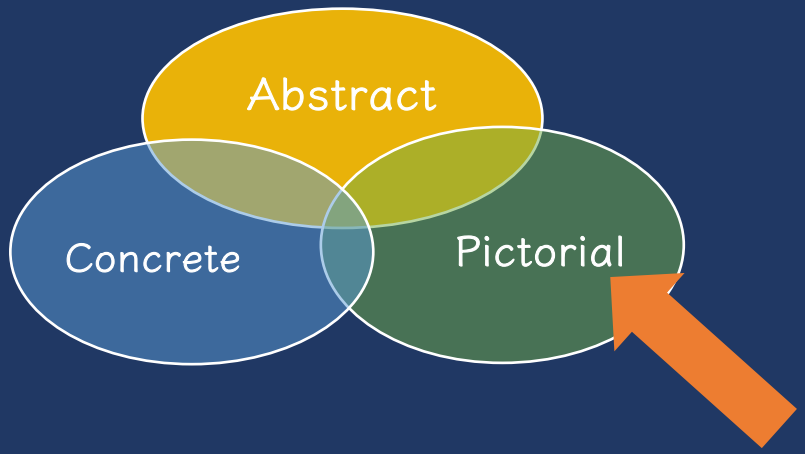




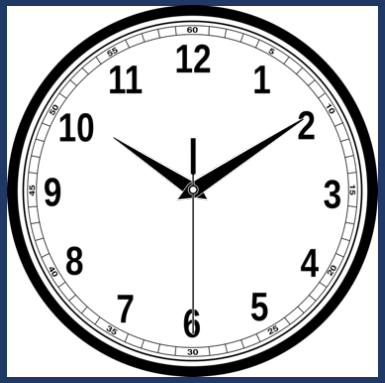
Three-dimensional objects

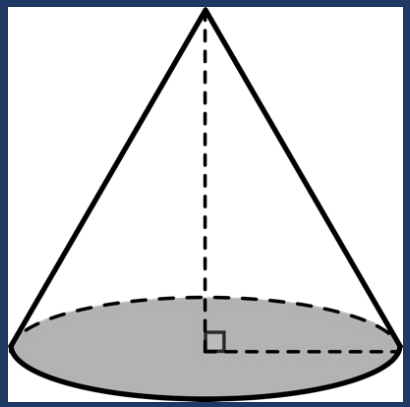


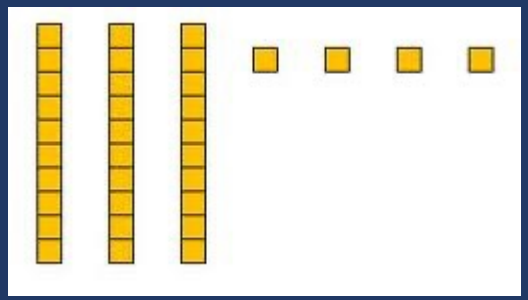


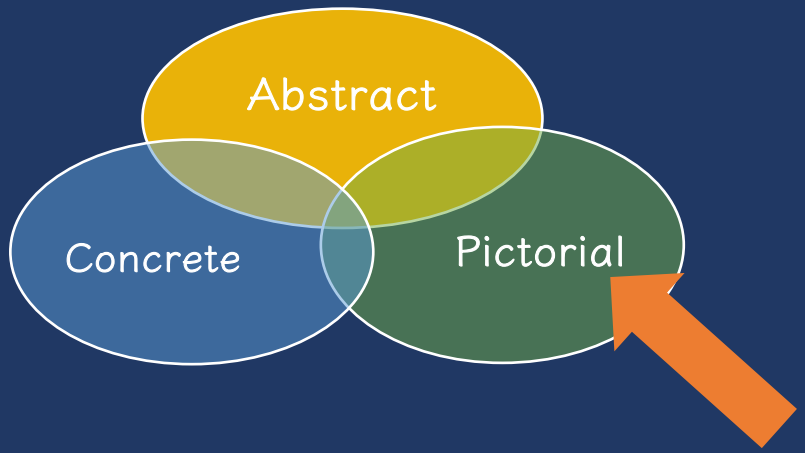


Two-dimensional images

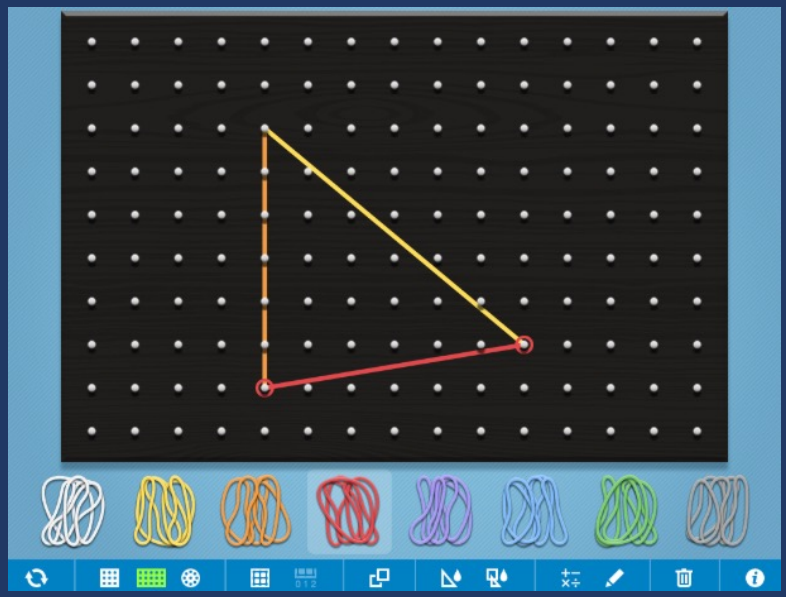


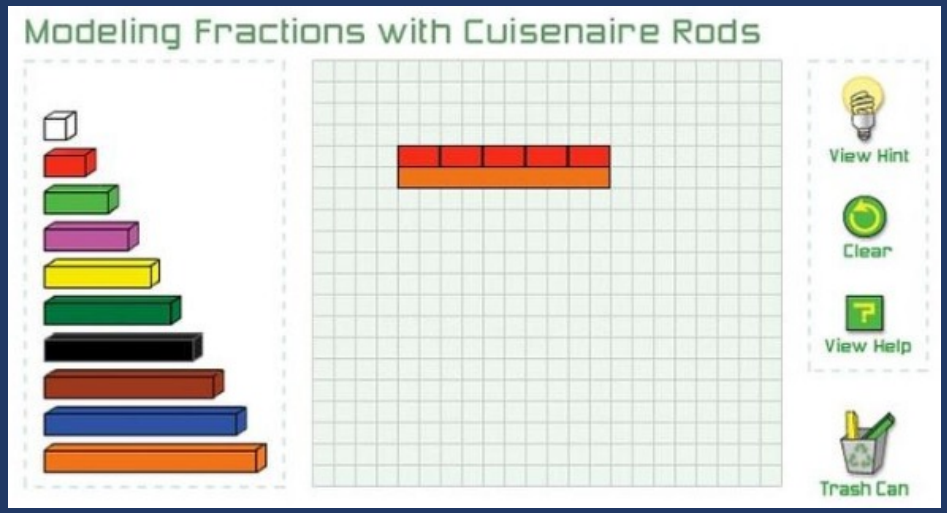


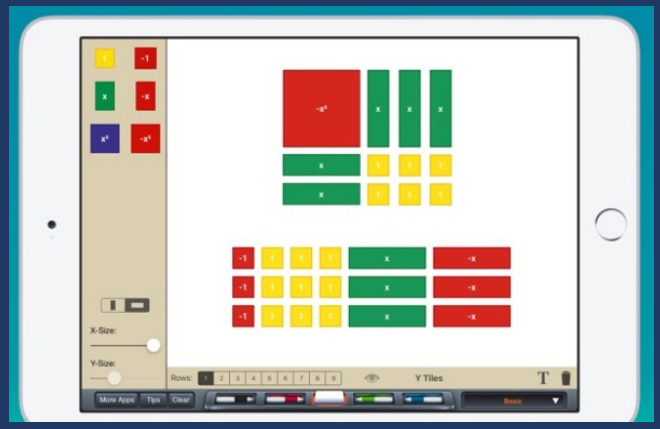


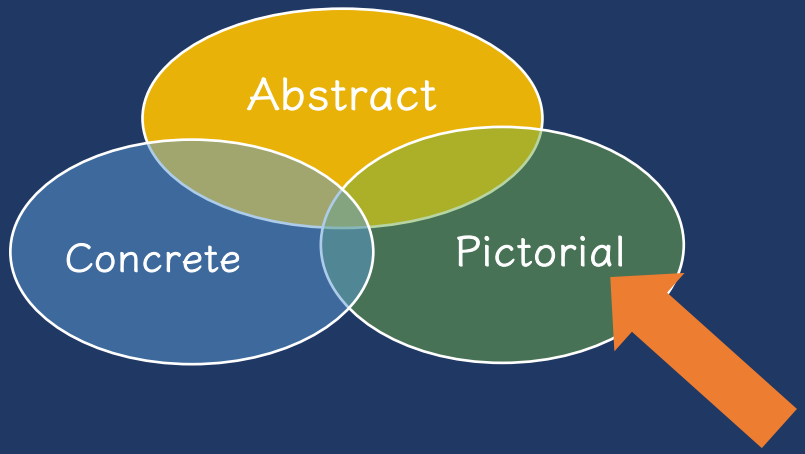


Two-dimensional images

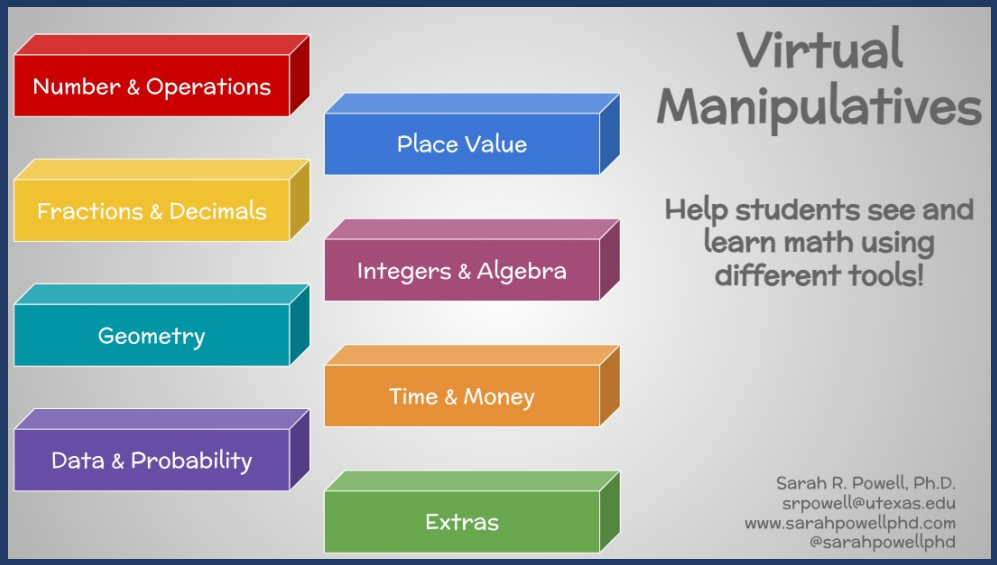




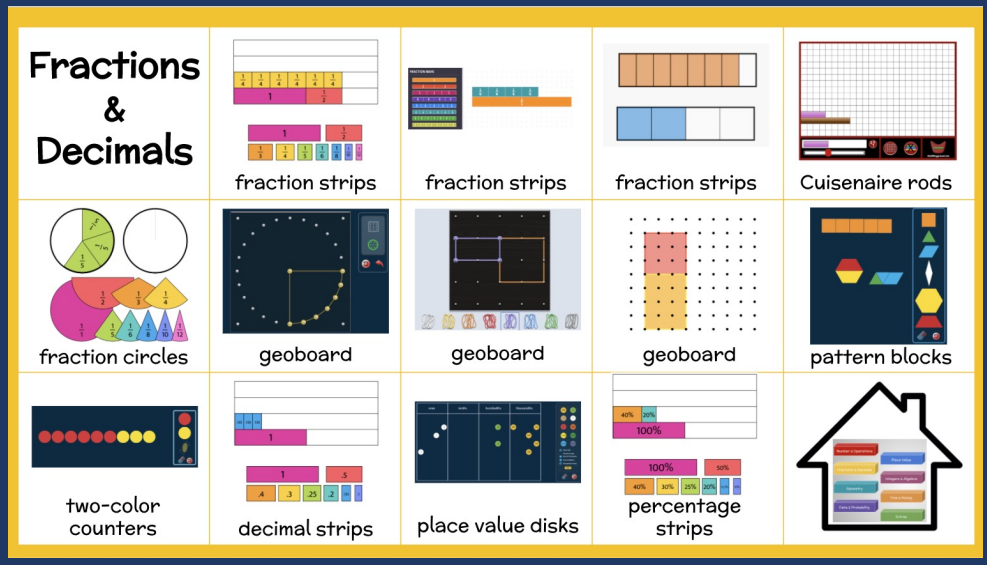


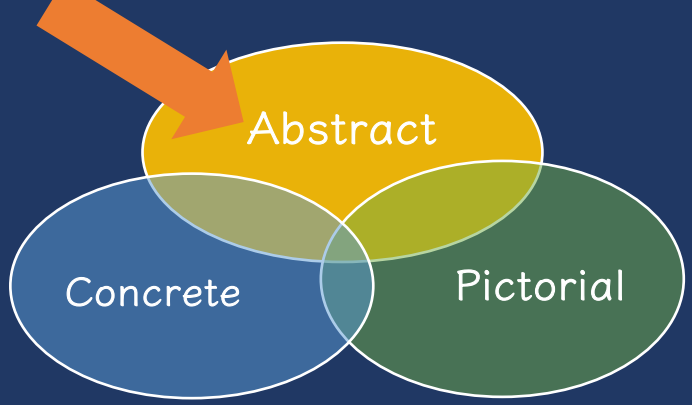


Two-dimensional images



https://bit.ly/srpowell





Numerals and symbols and words

$2 + 8 = 10$

34 = 3 tens and 4 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

Knowing multiples

Identifying shapes

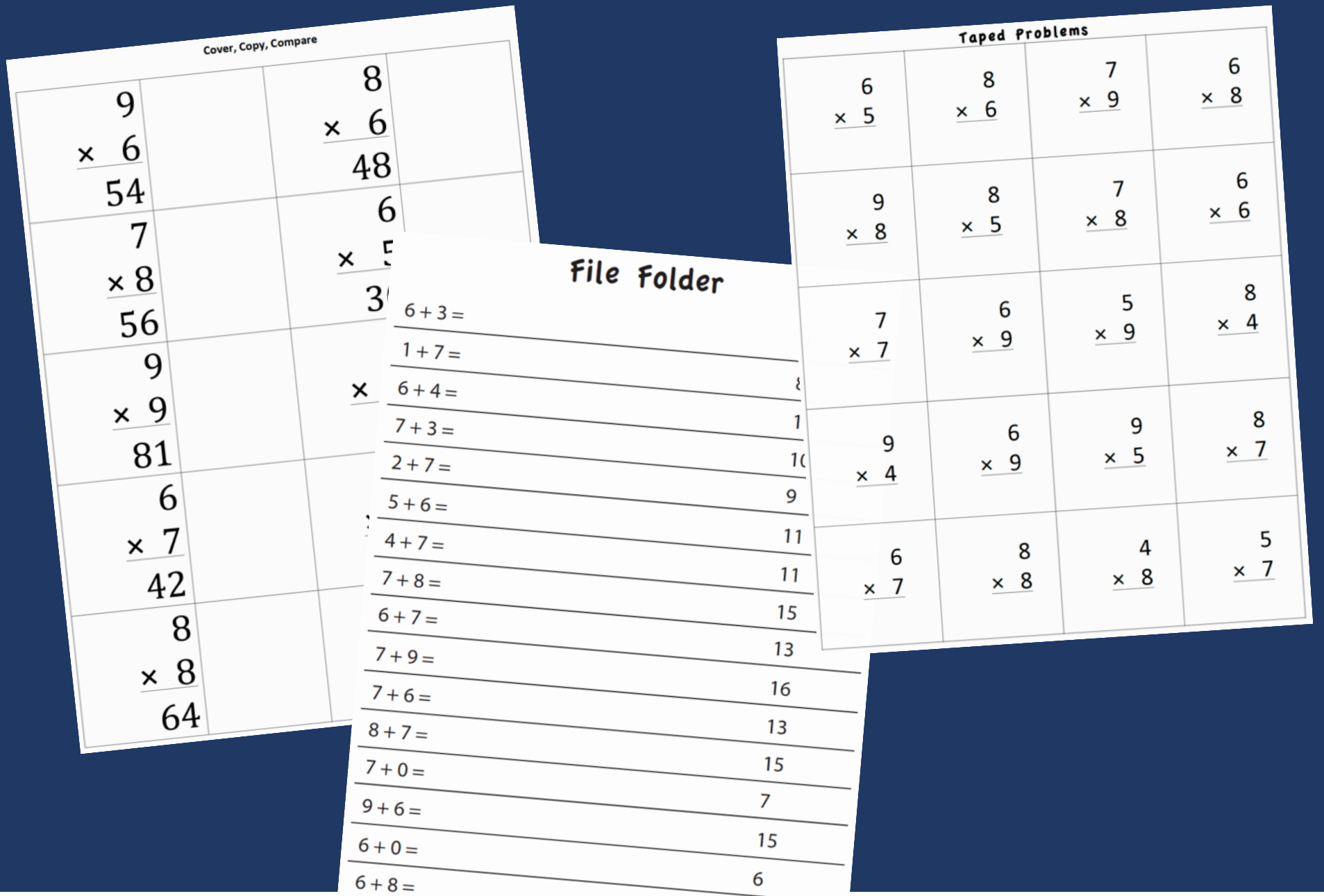
Knowing formulas

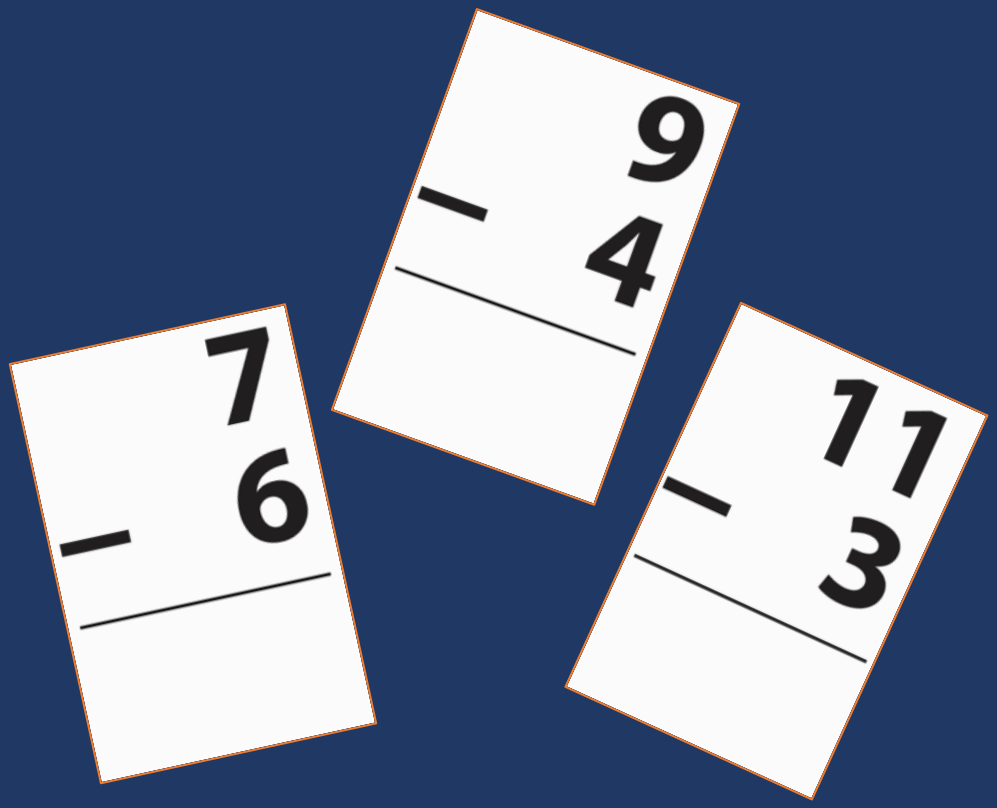
Addition	Subtraction
Multiplication	Division

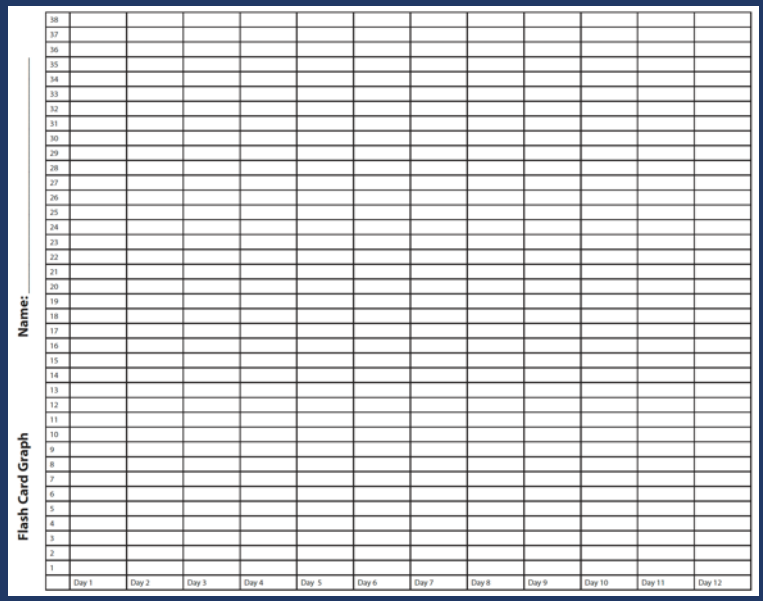
Build fluency with math facts.

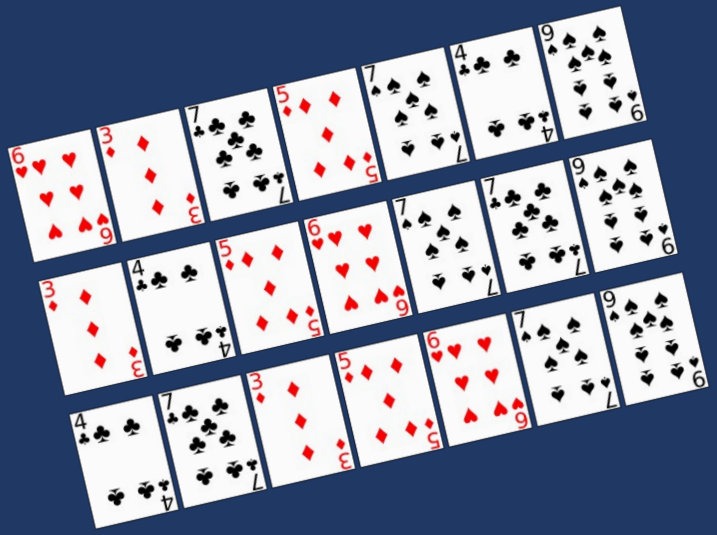
- Addition: single-digit addends
- Subtraction: single-digit subtrahend
- Multiplication: single-digit factors
- Division: single-digit divisor

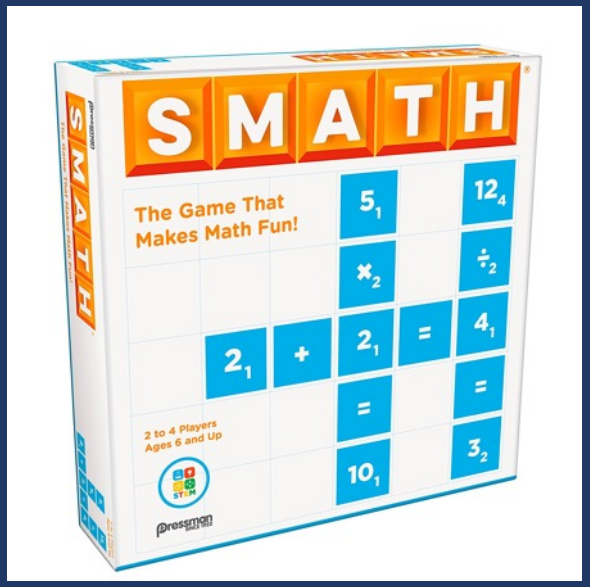
$$\begin{array}{r} 5 \\ +\ 8 \\ \hline \end{array} \qquad \begin{array}{r} 9 \\ -\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ \times\ 7 \\ \hline \end{array} \qquad \begin{array}{r} 56 \\ \div\ 8 \\ \hline \end{array}$$

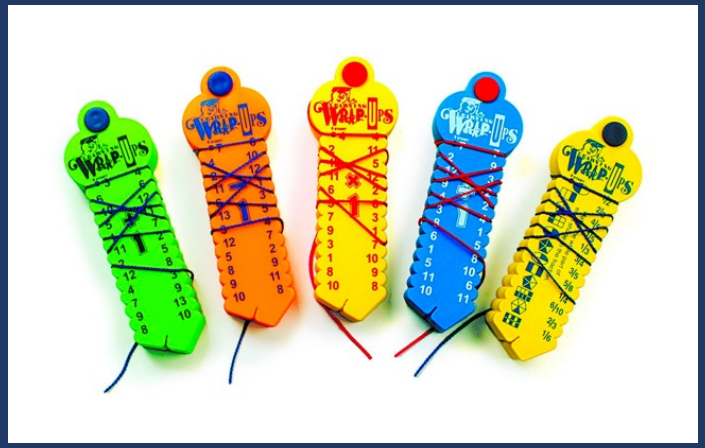


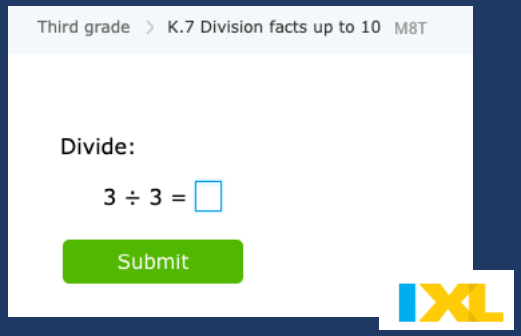


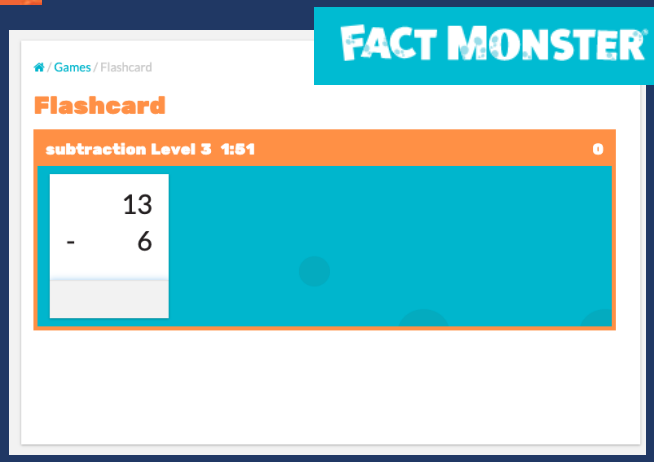












DAILY and BRIEF

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

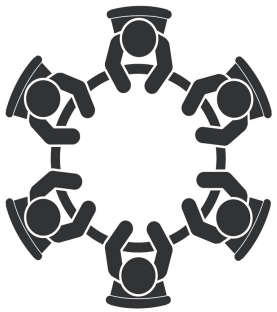
$$\begin{array}{r} 1.4 \\ +\ -3.9 \\ \hline \end{array}$$

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

$-14 - (-7) =$

$-135 \div 2 =$

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

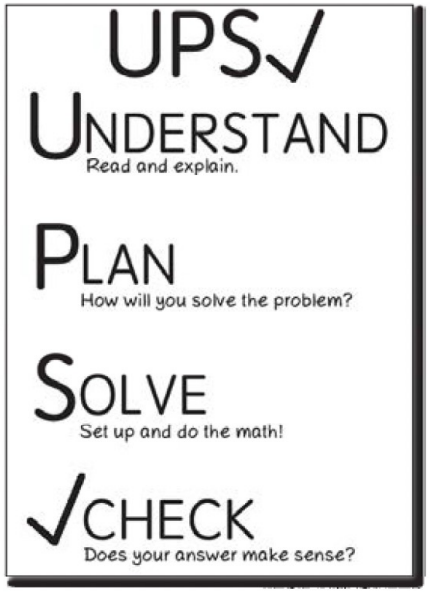
Multiple representations

INSTRUCTIONAL STRATEGIES

Fluency building

Problem solving instruction

Word-Problem Solving

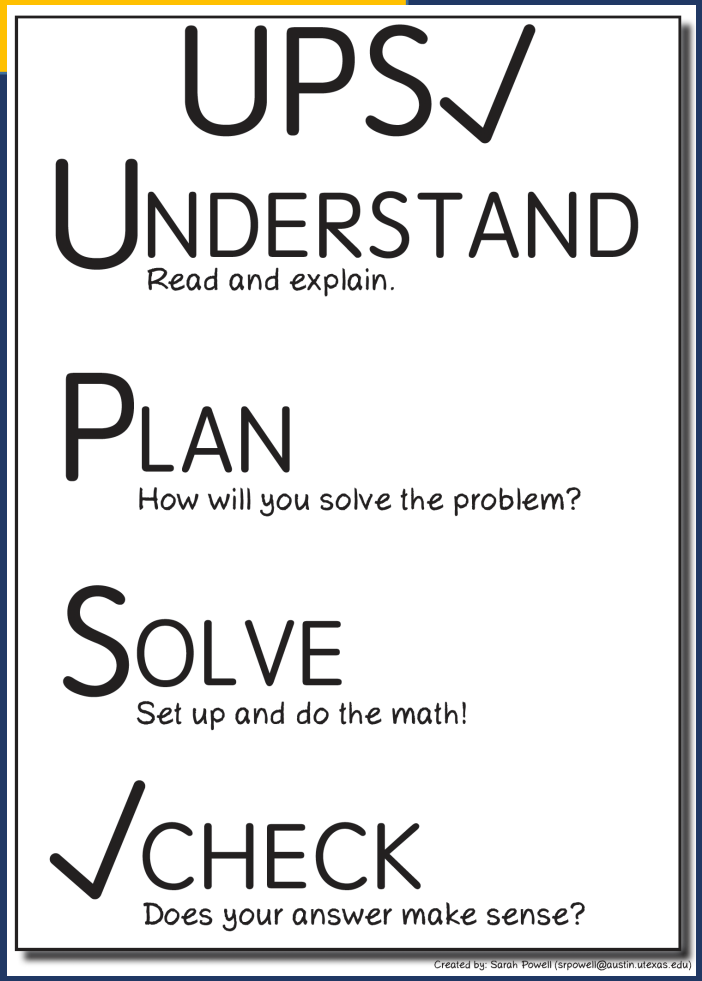


Word-Problem Schemas

Teach an attack strategy

Teach about schemas

Teach an attack strategy



Teach about schemas

- Total
- Difference
- Change
- Equal Groups
- Comparison
- Ratios/Proportions

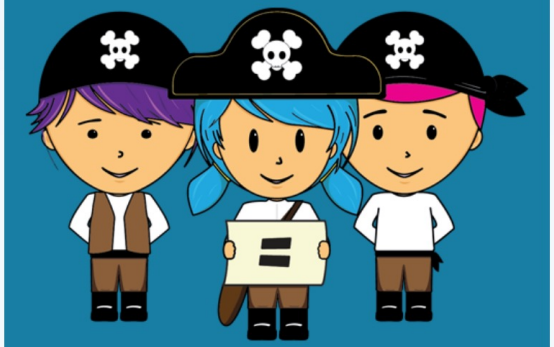
Pirate Math Equation Quest

About | Research | Individual | Small Group | STAAR | Videos

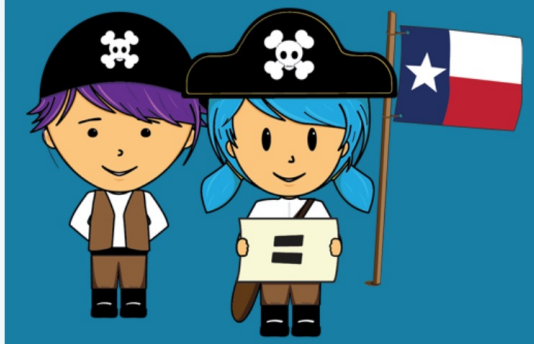
Welcome to Pirate Math Equation Quest!

Individual Word-Problem Intervention

Small-Group Word-Problem Intervention



Small-Group Word-Problem Intervention for STAAR



Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit instruction

Precise language

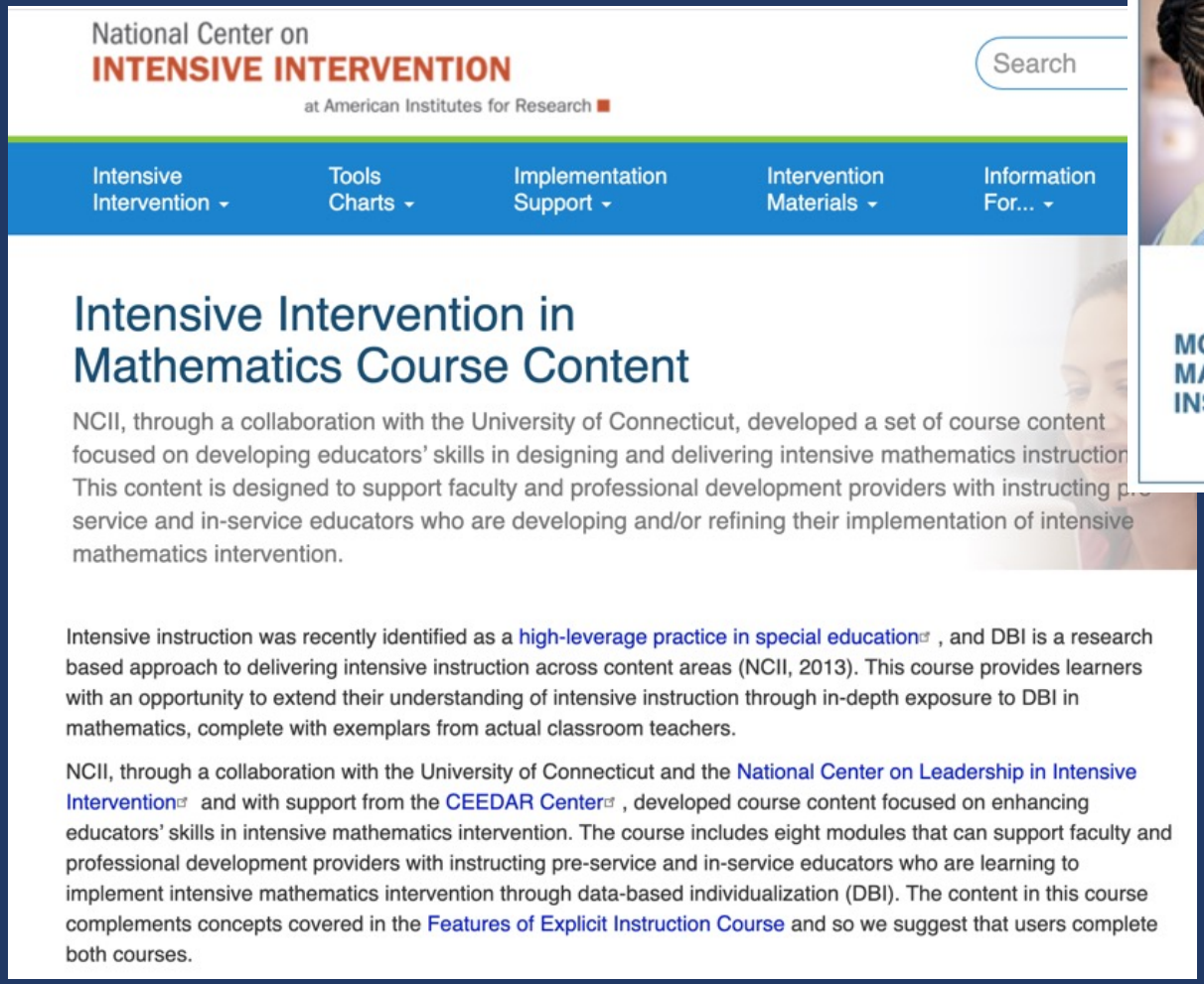
Multiple representations

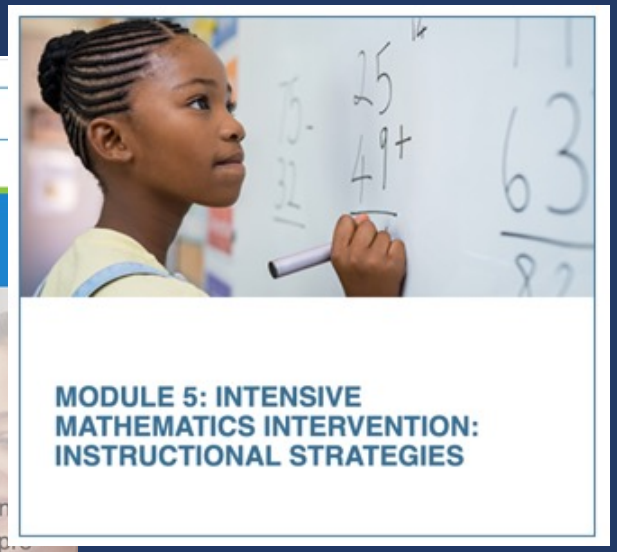
INSTRUCTIONAL STRATEGIES

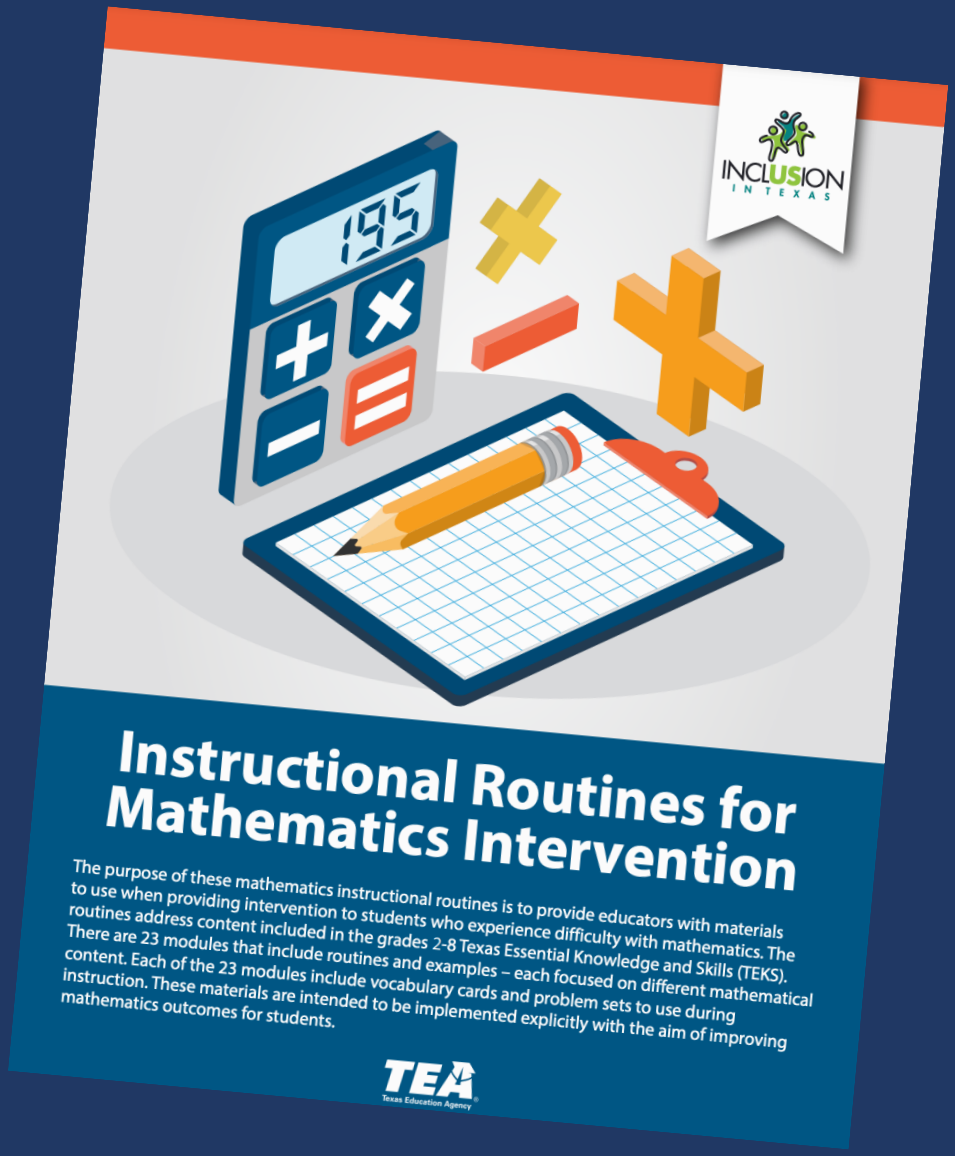
Fluency building

Problem solving instruction

https://intensiveintervention.org/intensive-intervention-math-course

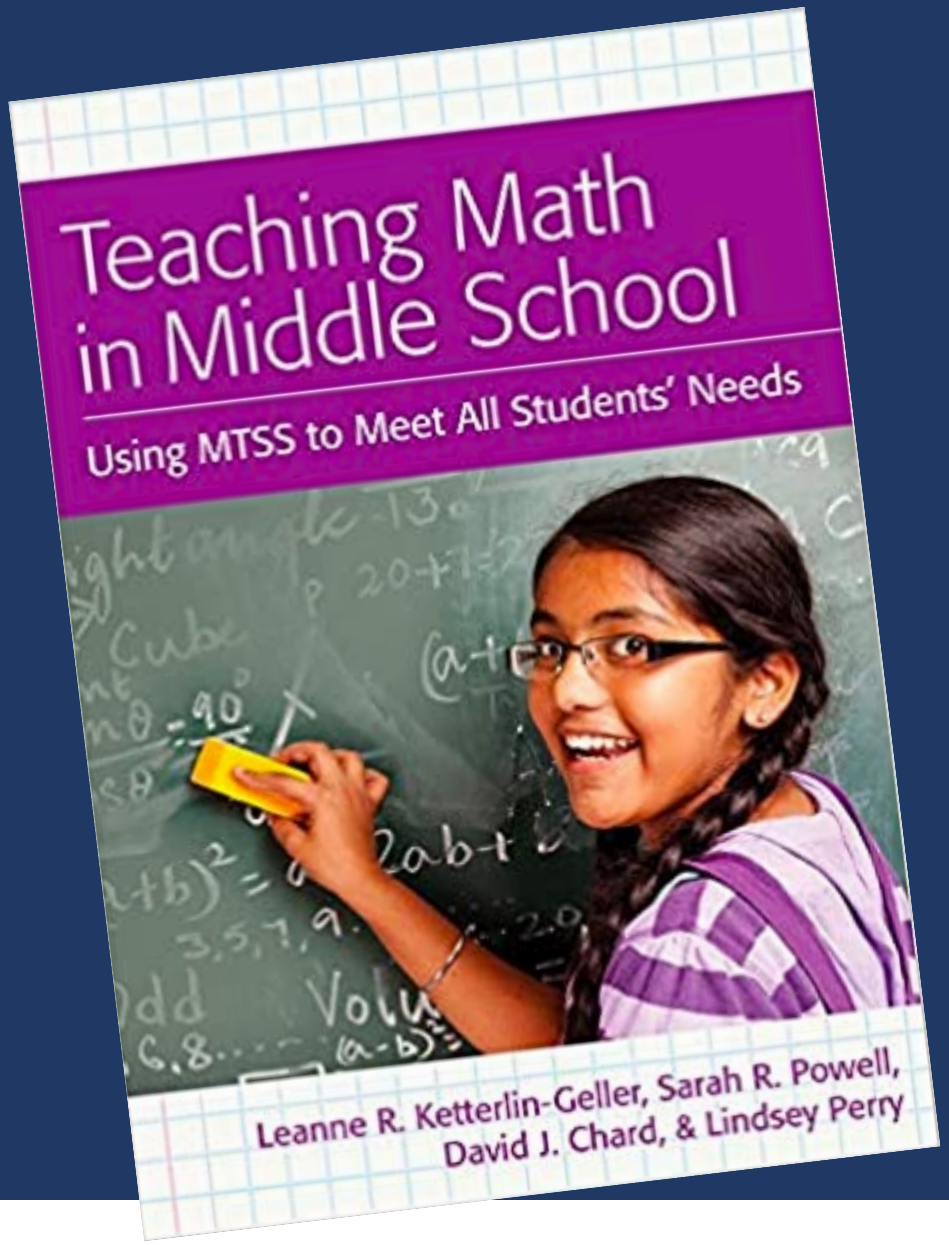


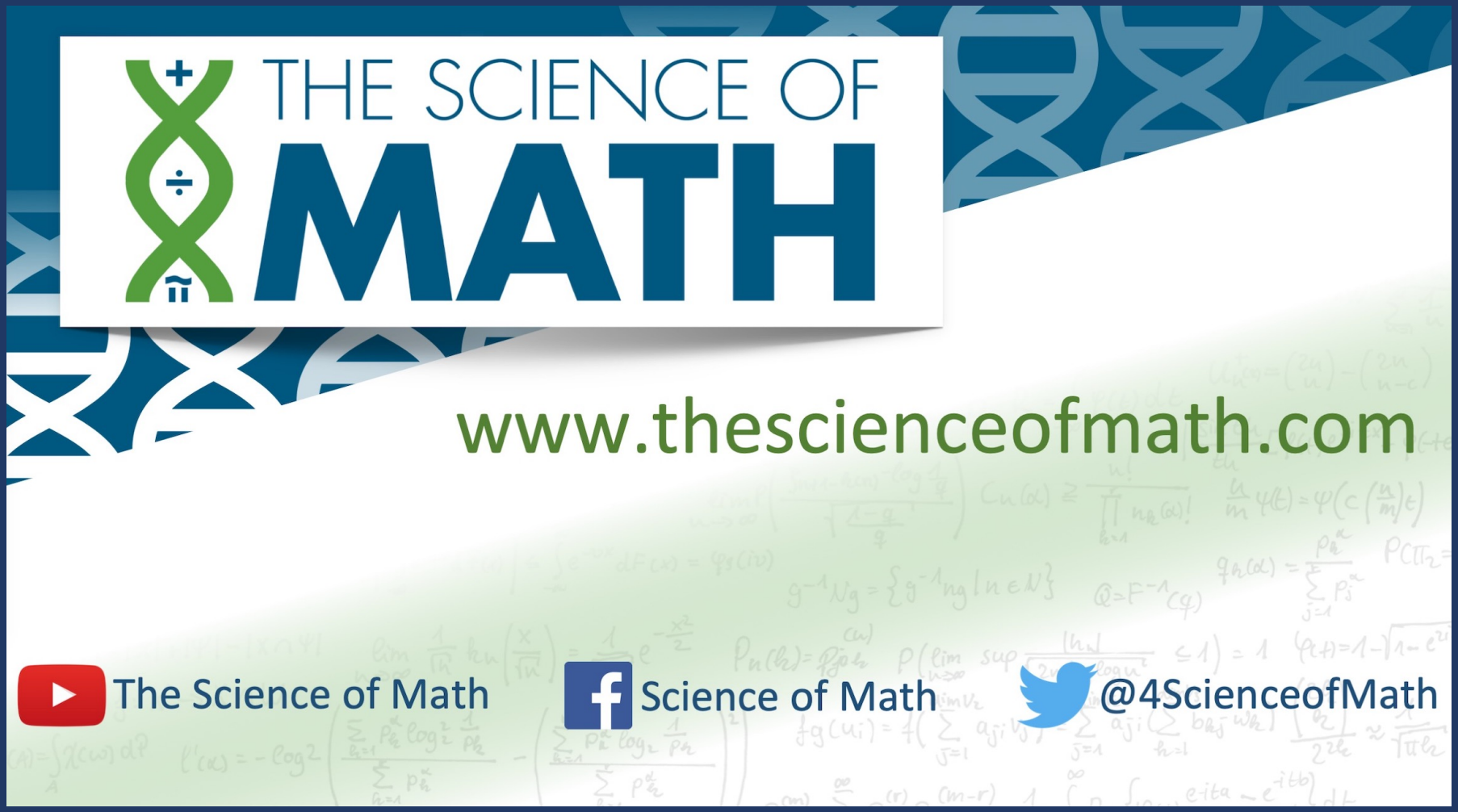




https://www.inclusionintexas.org/apps/pages/index.jsp?uREC_ID=2155039&type=d&pREC_ID=2169859

https://www.amazon.com/Teaching-Math-Middle-School-Students/dp/1598572741





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