



# **Primary Math Classroom Practices to Support Coherent Understanding and Application of New Learning**

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*Why is precision important in supporting cohesive and coherent learning across the grades?*

With this question in mind, share your responses to these questions with a table or elbow partner:

1. How would guide students in finding a solution to the following subtraction problem:  $200-38$ ?
2. What does “=” represent?

*Why is precision important in supporting cohesive and coherent learning across the grades?*

With this question in mind, share your responses to these questions with a table or elbow partner:

3. If 3 and 5 are shown on a number line, how would you guide students on what to put in the blank?

3    \_    5?

What if the number line is presented like this:

3    \_    5?

Or like this:

3    \_    5?

4. Which is the bigger number?    2    or    7

# Standards of Mathematical Practice (SMP)

SMP 1: Make sense of problems and persevere in solving them.	SMP 2: Reason abstractly and quantitatively.	SMP 3: Construct viable arguments and critique the reasoning of others.	SMP 4: Model with mathematics (apply the math you know to solve problems).
SMP 5: Use appropriate tools strategically.	<b><i>SMP 6: Attend to precision.</i></b>	SMP 7: Look for and make use of structure. (patterns, properties, attributes, overview and shift perspective).	SMP 8: Look for and express regularity in repeated reasoning. (general methods, more efficient, abstract equations, general formulas, maintain oversight of the process while attending to details, evaluate the reasonableness of their intermediate results).

# Mathematical Practice 6: Attend to Precision

Mathematically proficient students try to communicate precisely to others.

They try to use clear definitions in discussion with others and in their own reasoning.

They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately.

They are careful about specifying units of measure,

and labeling axes to clarify the correspondence with quantities in a problem.

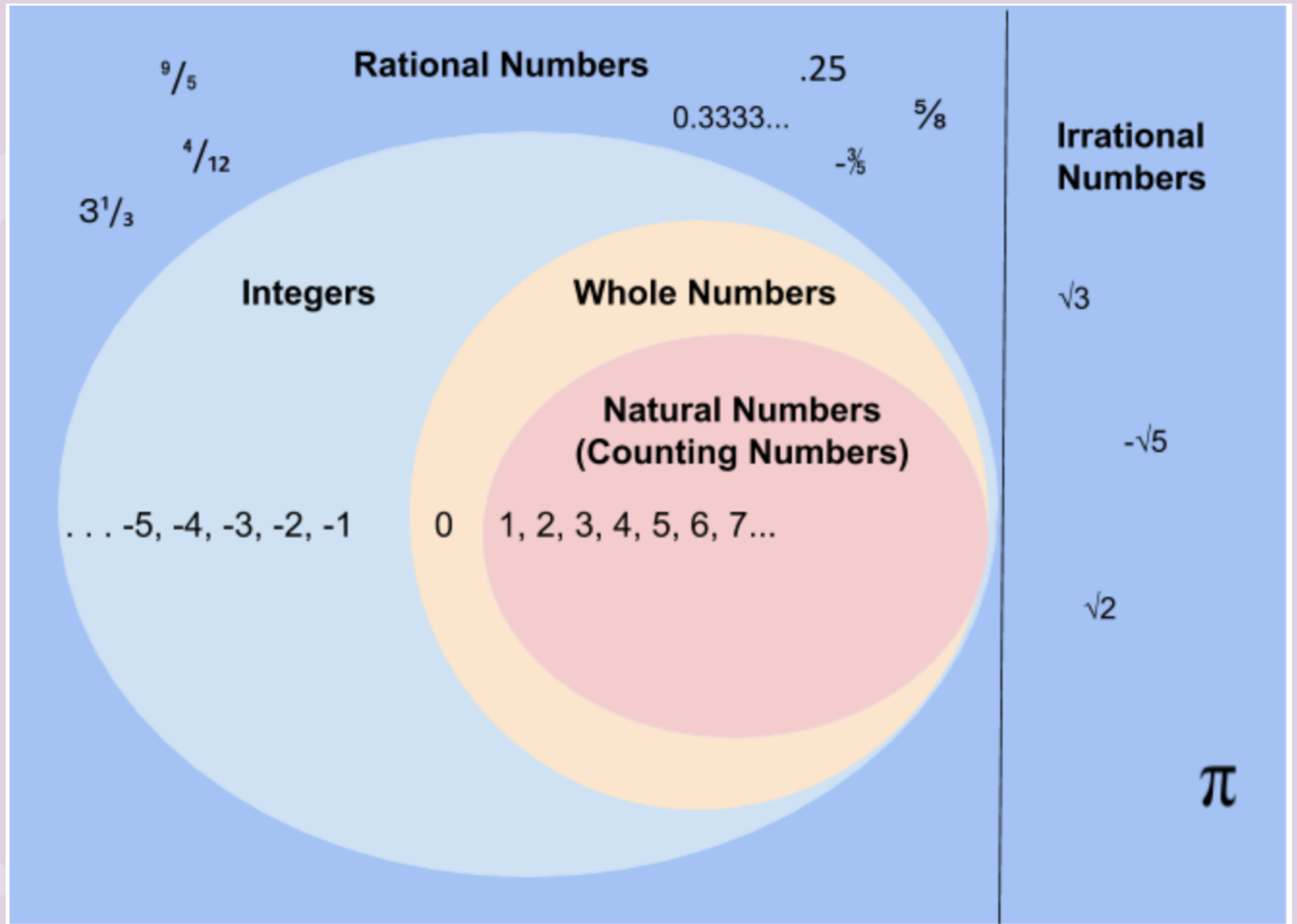
They calculate accurately and efficiently, expressing numerical answers with a degree of precision appropriate for the problem context.

In the elementary grades, students give carefully formulated explanations to each other.

By the time they reach high school they have learned to examine claims and make explicit use of definitions.

# The Real Number System

What are the implications of this chart in developing number sense?



# Building Appropriate and Coherent Understanding of Basic Mathematical Principles: “=”

How did you respond to “What does “=” represent?”

Does it ALWAYS mean the “answer” to the calculation follows?

# Building Appropriate and Coherent Understanding of Basic Mathematical Principles: “=”

2. What does “=” represent?

## SPECTRUM OF UNDERSTANDING



### Level 4: Comparative Relational

- Consistently have a relational view of the equals sign
- See equivalence through relationships rather than calculations

$$15 + 7 = 14 + 8$$

### Level 3: Basic Relational

- Begin to have relational view of the equals sign
- Can see equations with operations on both sides of the equals sign as true, but generally carries out computation to determine equivalence

$$4 + 2 = 3 + 3$$

### Level 2: Flexible Operational

- Begin to accept atypical equations with operations on the right side of the equals sign or with no operations

$$5 = 3 + 2$$
$$4 = 4$$

### Level 1: Rigid Operational

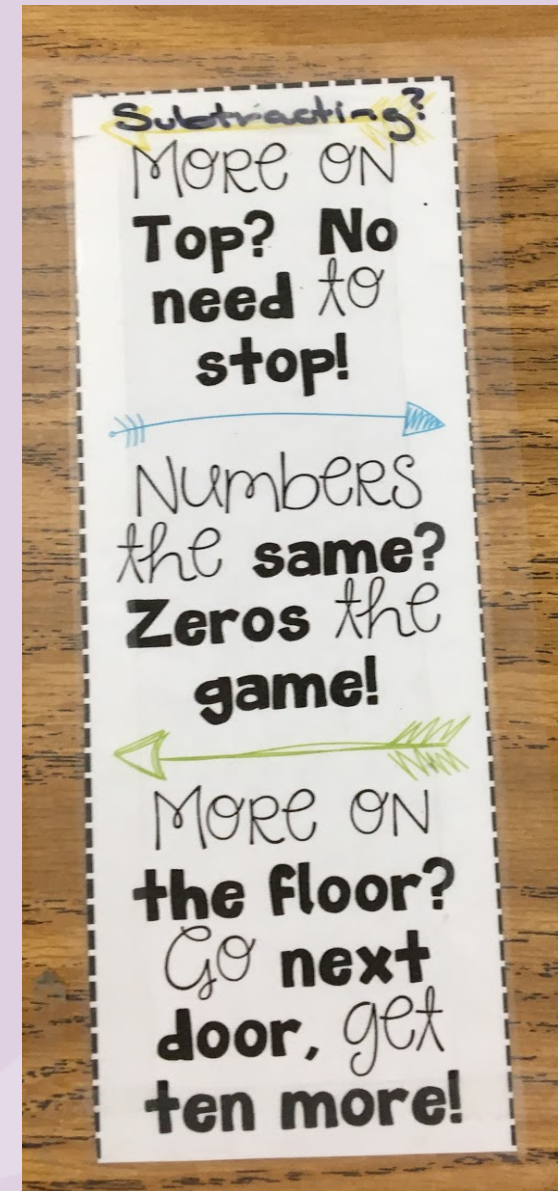
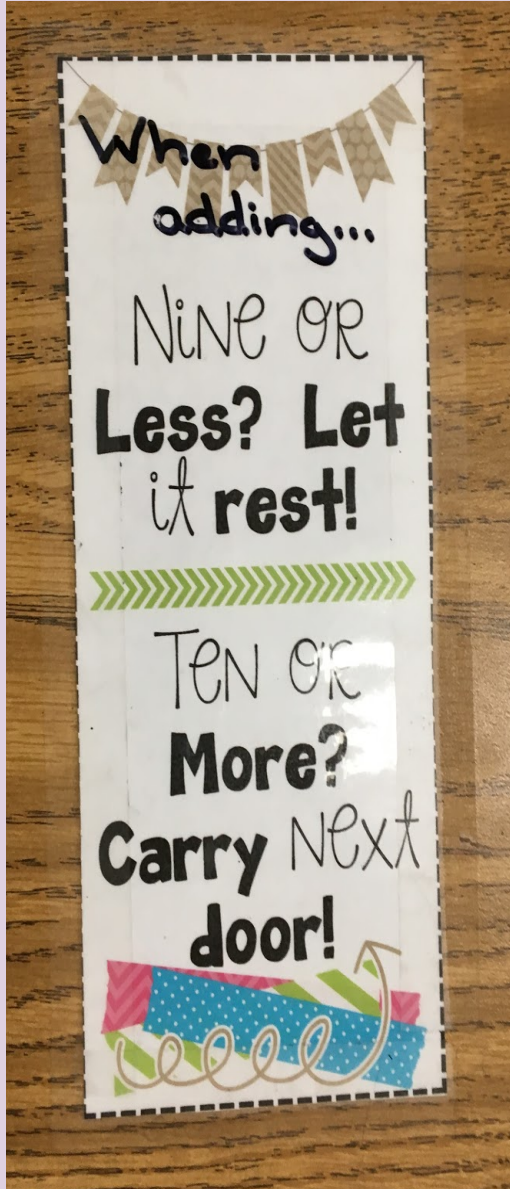
- Are only successful on typical equation structures

$$3 + 4 = \underline{\quad}$$
$$3 + \underline{\quad} = 7$$



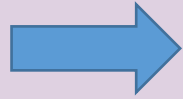
# Building Appropriate and Coherent Understanding of Basic Mathematical Principles: “-” (subtraction); “+” (addition)

What are the implications for place value and operations understanding with these “math rhymes”



# Building Appropriate and Coherent Understanding of Basic Mathematical Principles: “+” (addition)

What are the implications for place value understanding and operation of adding with this “shortcuts”?



**“When you *add* a 0 to a number it gets larger.”**  
**This is modeled by writing a 3 then “adding” a 0 to the right of it to get 30:**

3

30

**BUT** what happens here?

$$3 + 0 = 3$$

$$0 + 3 = 3$$

3.0 (0 to right of decimal point)

0.3 (0 to left of decimal point)

0.30

# Building Appropriate and Coherent Understanding of Basic Mathematical Principles: “-” (subtraction)

How do we describe the “-” to students?

Does it always indicate an operation or action?

Does it always result in a “bigger number?”

What does it represent?

# Sense-making in Context: Multiple Meaning Keyword :Clues”

Example	Context meaning
7=2 <b>and</b> 5	adding together
2½	Two <b>and</b> one-half (whole number and a fractional part)
2.5	Two <b>and</b> 5 tenths (whole number and a decimal fractional part)
\$2.05	Two dollars <b>and</b> 5 cents (two whole dollars and a fraction of another dollar)
Chances of rolling both a 5 <b>and</b> a 3 on dice	Two events that <b>both</b> happen
Sue <b>and</b> Jorge went for a walk	Multiple individuals doing the same activity together
Peanut butter <b>and</b> jelly	One sandwich with two separate ingredients
What is the difference between 6 <b>and</b> 4?	Do we add or subtract to find response?

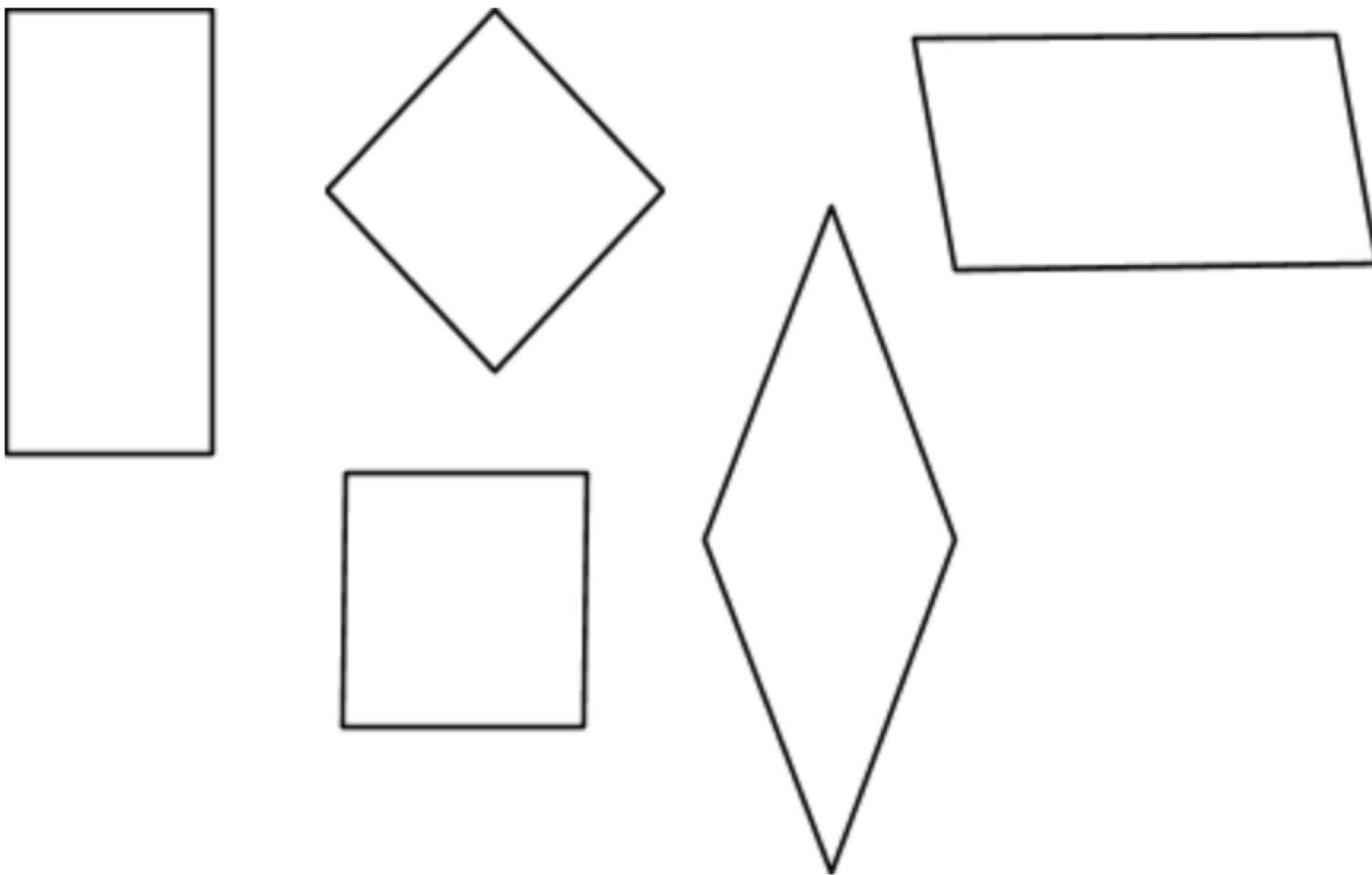
## Sense-making in Context: Multiple Meaning Keyword :Clues”

Example	How do we find the solution?
Alice had 5 books. Jill had 9 books. How many <b>more</b> books did Jill have than Alice?	
Alice had 5 books. Jill had 4 <b>more</b> books than Alice. How many books did they have altogether?	
Alice had 5 books. Jill had 4 times as many (or <b>more</b> ) books as Alice. How many books did Jill have?	
Alice had 5 books. She wanted 9 books. How many <b>more</b> books did she need to get?	

# Sense-making in Context: Multiple Meaning Keyword :Clues”

Words with multiple meanings in everyday English	<p>The floor is <u>even</u>.</p> <p>The picture is <u>even</u> with the window.</p> <p>Breathing develops an <u>even</u> rhythm during sleep.</p> <p>The dog has an <u>even</u> temperament.</p> <p>I looked sick and felt <u>even</u> worse.</p> <p><u>Even</u> a three-year-old child knows the answer.</p>
Words with multiple meanings in academic English	<p>Number: <u>Even</u> numbers (e.g., 2, 4, 6, and so on)</p> <p>Number: <u>Even</u> amounts (e.g., even amounts of sugar and flour)</p> <p>Measurement: An <u>even</u> pound (i.e., an exact amount)</p>

# Geometry: Attribute Precision



Is a square a rectangle? Is a rectangle a square? Or are they two entirely different shapes? What is a diamond? How important is shape orientation?



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***Thank you!***

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