Breaking Down the Gatekeepers

Models and Visual Strategies for Integers, Fractions and Decimals

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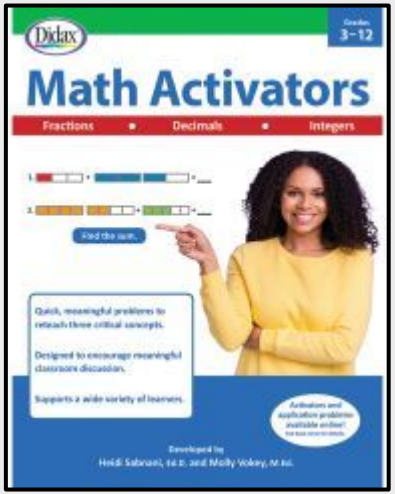

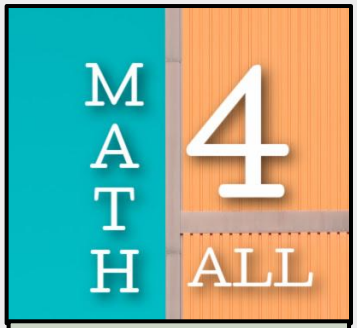

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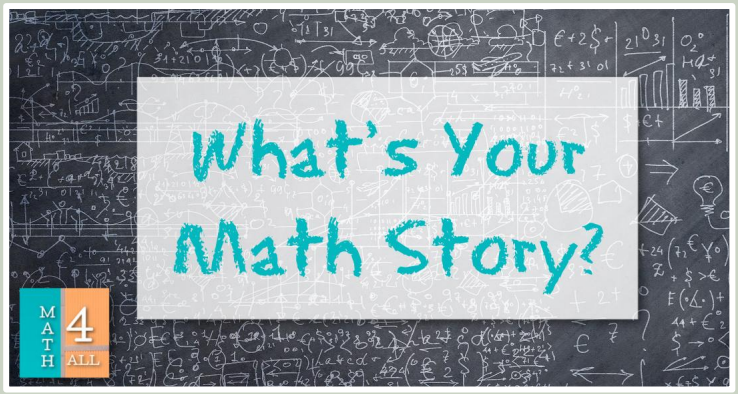


MATH 4 ALL

Gatekeepers

Fractions, decimals, and integers are areas that are consistently hard for kids. High school teachers ask for materials to help students with these areas.

In order to get into higher levels of math these areas must be solid or the math becomes too clunky.

Centering Student Thinking

These activators can be used at the beginning of instruction or as an intervention. In small groups, concepts can be explored more deeply.

The goal is to represent student thinking in order to make connections for all students.

Centering Student Thinking

Consider how we VISUALLY represent student's thoughts and make connections explicit between these representations.

Consider these problems

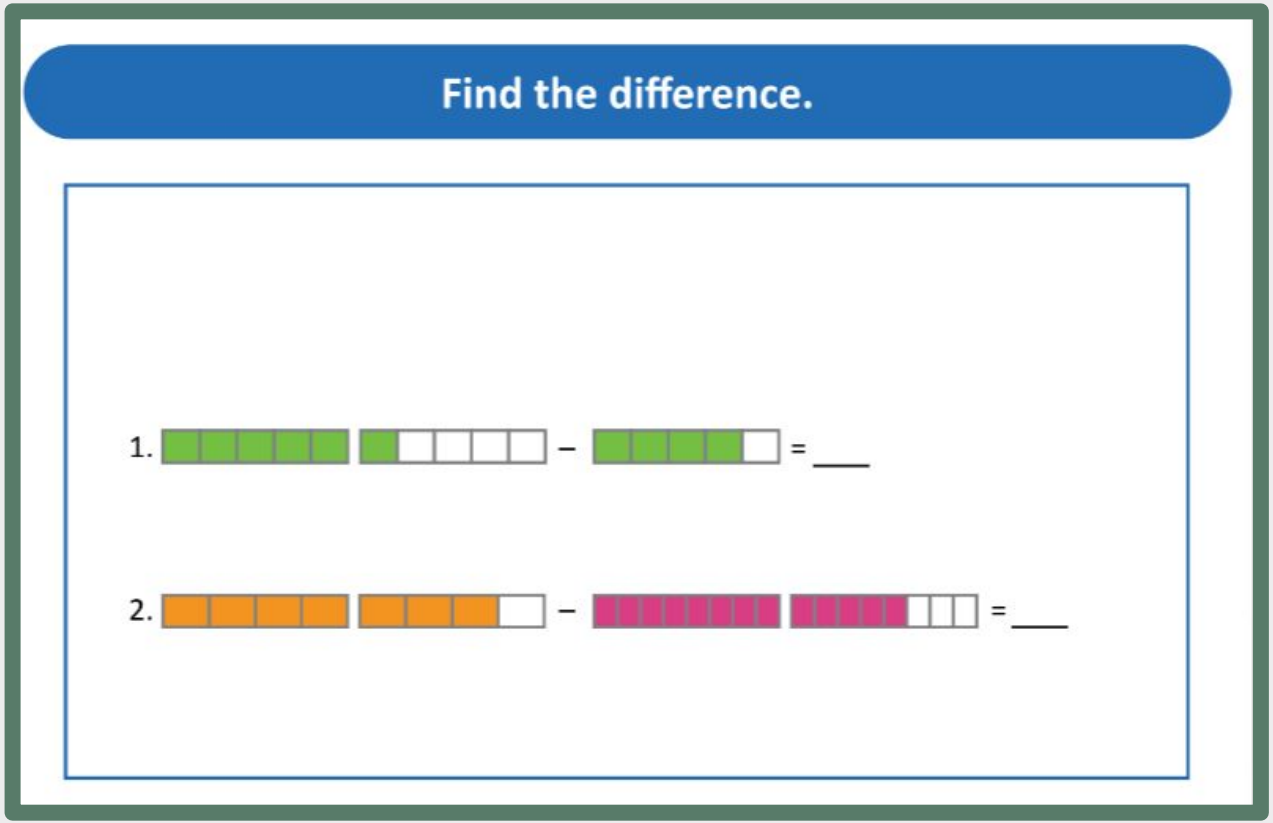
$$1\ \tfrac{1}{5} - \tfrac{4}{5} =$$

$$1\ \tfrac{3}{4} - 1\ \tfrac{5}{8} =$$

Pictorial Representations make difficult concepts accessible

$1\frac{1}{5} - \frac{4}{5} =$

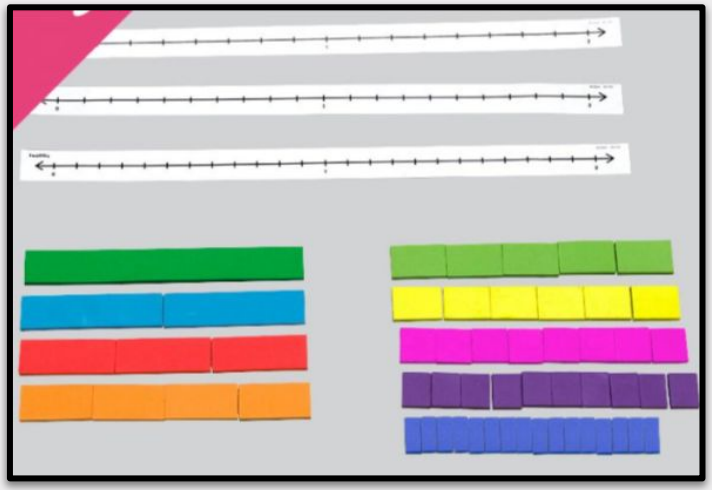
$1\frac{3}{4} - 1\frac{5}{8} =$



Manipulatives

$1\frac{1}{5} - \frac{4}{5} =$

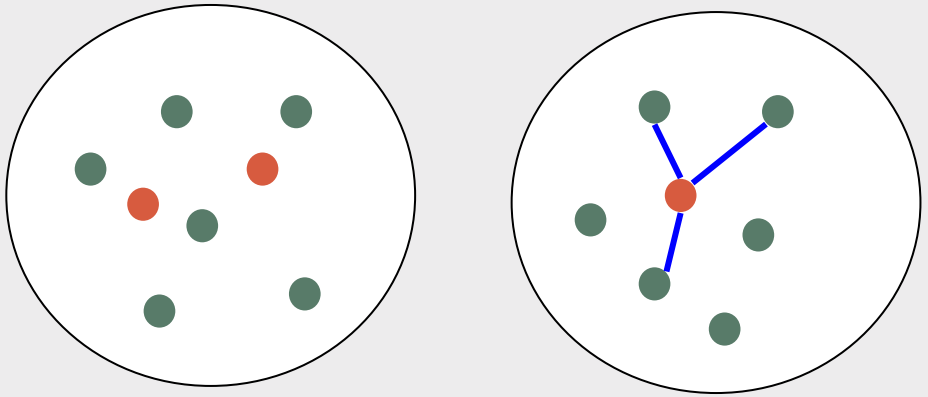
$1\frac{3}{4} - 1\frac{5}{8} =$



Discuss with your table.

How do the pictorial representations and the manipulatives help to better assess and understand student thinking?

Building Connections



Dr. Karen Karp

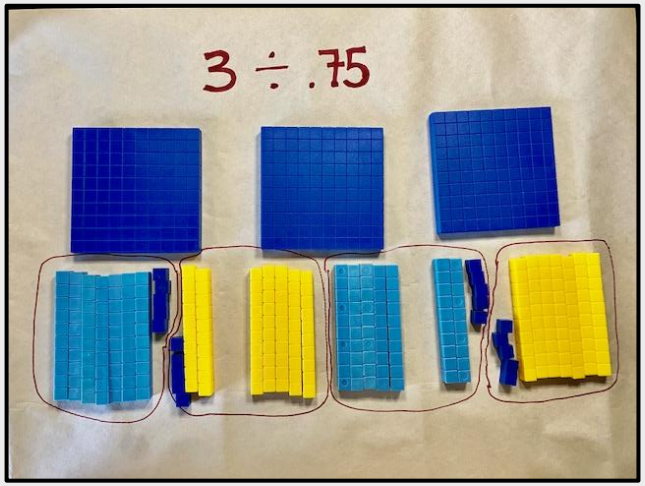
Graphic recreated from Kate Fanelli who is the math accessibility specialist for Michigan's Integrated Mathematics Initiative

Most Important Job of the teacher is:

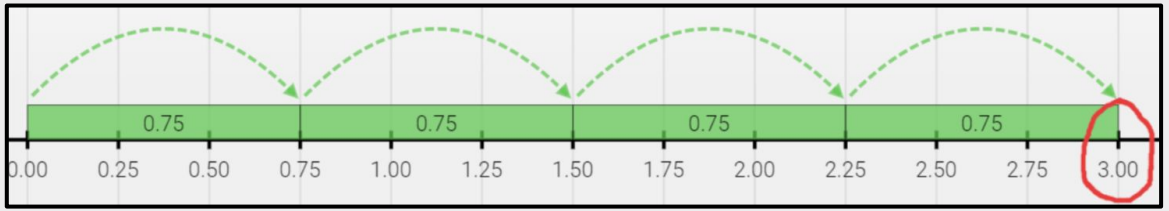
- Provide a problem that allows students to connect what they know to representations that further learning.
- Time for student thinking (for solving and sharing with a partner)
- Scribe Student thinking (visually)
- Allow for student talk
- Make Connections Explicit

Concurrent Representations Make Connections

Physical actions, drawings or diagrams, symbolic representations.



3 x 100 = 300 Multiply the dividend by 100
.75 x 100 = 75 Multiply the divisor by 100
300 ÷ 75 = 4 Divide



“Using multiple representations creates a mental residue” –

Karp 2022

$4\frac{1}{3} - 2\frac{2}{3}$

$4\frac{1}{3}$ $2\frac{2}{3}$

2 $2\frac{1}{3}$ $2\frac{2}{3}$ $\frac{1}{3}$

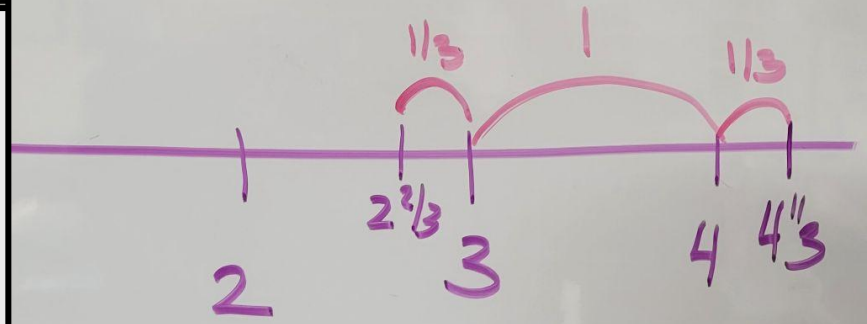
$2\frac{1}{3} - 2\frac{1}{3} = 0$

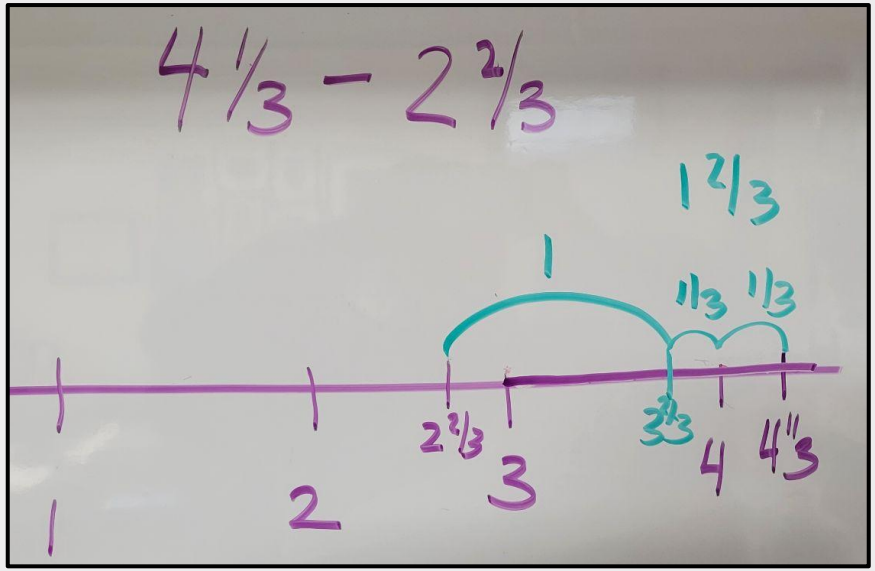
$2 - \frac{1}{3} = 1\frac{2}{3}$

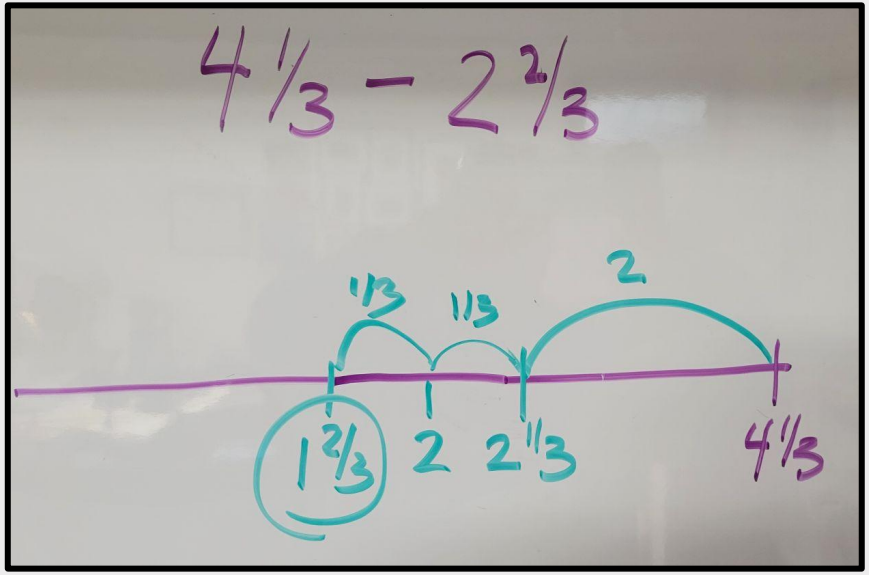
$4\frac{1}{3} - 2\frac{1}{3} = 2$

$2 - \frac{1}{3} = 1\frac{2}{3}$

$4\frac{1}{3} - 2\frac{2}{3}$




4 1/3 - 2 2/3
1 2/3
1
1/3 1/3
2 2/3
3
3 1/3
4
4 1/3
1
2


4 1/3 - 2 2/3
1/3 1/3
2
1 2/3
2
2 1/3
4 1/3

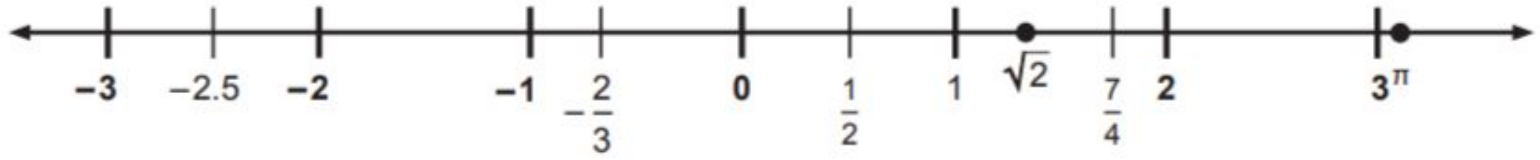
“Diagram literacy is the ability to “read” a diagram. ***Students who can create diagrams to express their thinking, and interpret diagrams to receive new information, are working at a conceptual, representational level to make connections****, look for and make use of structures (Common Core Standard of Mathematical Practice #7), and model mathematically (Standard of Mathematical Practice #4).”*

Kate Fanelli

Number Lines

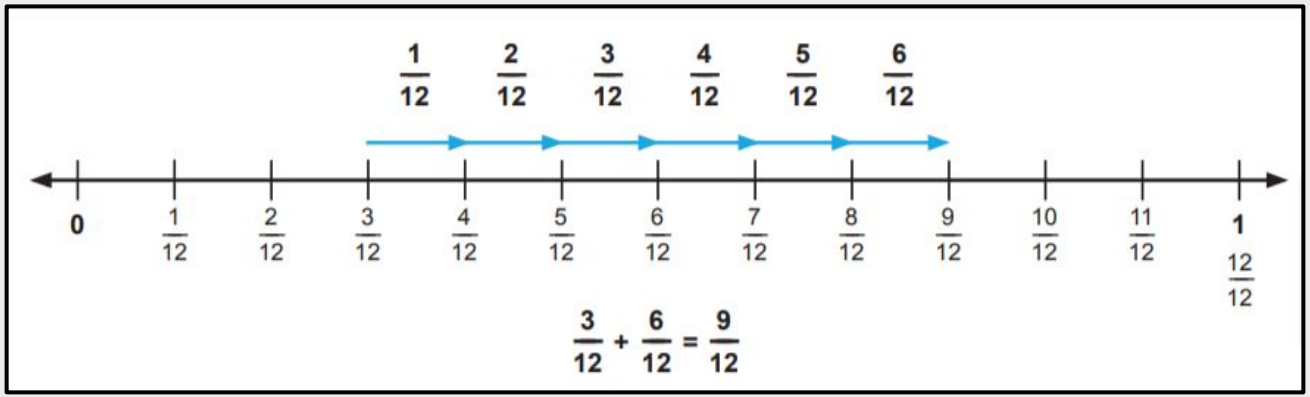
Help students build understanding that fractions are numbers with magnitude
(Fuchs et al., 2013; Siegler et al., 2010)

Example 4.1. Number line representing magnitudes of whole, positive, negative, rational, and irrational numbers.



Number Lines

An intervention program that strongly emphasized the number line representation for fractions found larger gains for at-risk learners than a program that focused primarily on the part-whole approach. (Fuchs et al., 2013; Siegler et al., 2010)



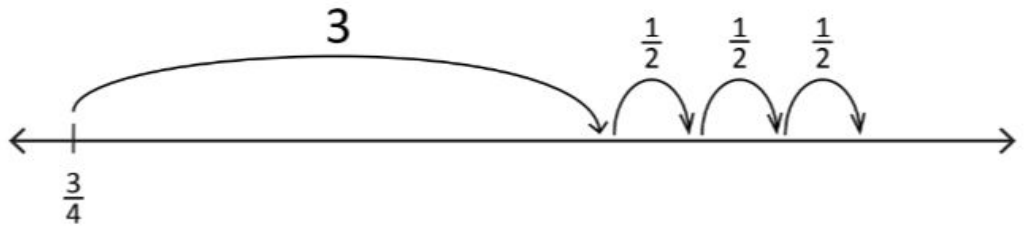
Protocol For Math Activators

1. The teacher shows the slide.
2. The students solve the problem.
3. The teacher asks for answers and scribes all the answers that students provide.
4. The students turn and talk.
5. The teacher asks for students to share their answers.
6. Teacher conducts a conversation connecting strategies and representations.

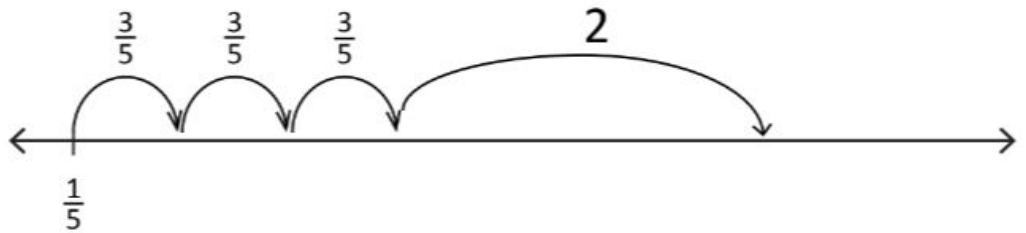
Adding Fractions 1.14

What is the end point?

1.



2.



What equations show the value of the integer chips?

1. 

2. 

Practice

1

Choose an activator

From your table

2

Choose a person to be the facilitator

Take turns

3

Students solve then scribe student thoughts

Discuss how to scribe thinking for maximum student understanding

What is the missing number?

A hexagon represents one whole.

Synthesis/Closing up

1. Focus on student thinking
2. Use visuals to represent thinking
3. Make connections explicit

THIS TAKES PRACTICE