



# Leading Effective Math Instruction

Marian Small  
October 2023

- 
- A large, solid yellow shape on the left side of the slide, with a wavy, organic edge that curves inward towards the text area.
- What would **you** consider to be the strongest marker of math success in a school?

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- A large, solid yellow shape on the left side of the slide, with a wavy, organic edge that curves towards the center.
- If every educator spent time on developing these ideas/markers/indicators, our schools would change significantly.

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- A large, solid yellow shape on the left side of the slide, with a wavy, organic border on its right edge.
- Here are some for me.

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- A large, solid orange shape on the left side of the slide, with a wavy, irregular right edge that curves inward.
- Math visible in the school.



# STONEY CREEK

Public School




**WHAT                  NUMBER  
COULD              THE              DOT  
                        REPRESENT**

**360**

**795**


**1335**

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Most students feeling confident  
about their engagement with  
math.

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Most students liking problems  
and challenges.

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Virtually every teacher teaching  
math being interested in  
learning more about teaching  
math.

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Not to see a drop off in confidence and interest as kids go through the grades, but, in fact, more sophisticated thinking.

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Kids asking questions,  
wondering, expressing different  
perspectives, etc.


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Better math tasks than we often  
see.


# COMPARE THESE TASKS

What is  $\frac{1}{2} + \frac{3}{4}$  ?

I added two fractions and the denominator of the sum is 12.  
What might the original fractions have been?


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Lots of instructional tasks that  
require thinking and not just  
repetition/copying.

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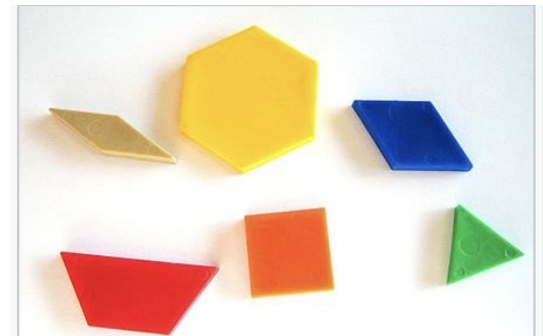
How do you know that  
 $\frac{3}{5} - \frac{1}{3} < 1 - \frac{1}{10}$

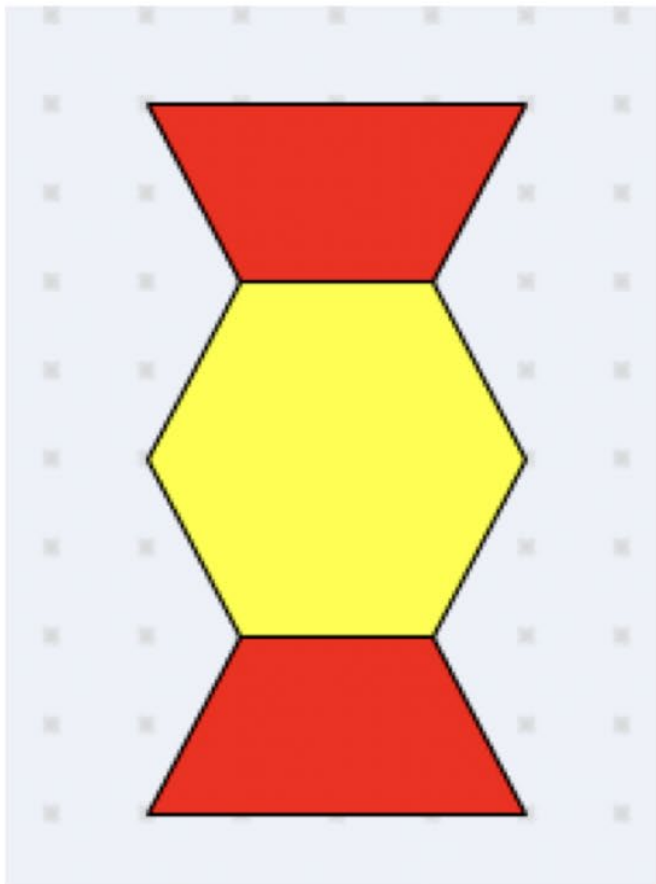
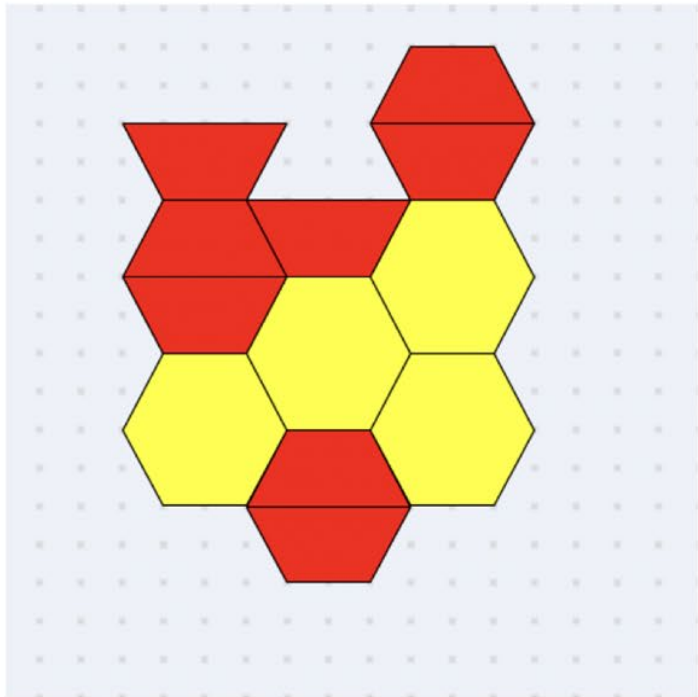
**WITHOUT FINDING THE  
ANSWER?**

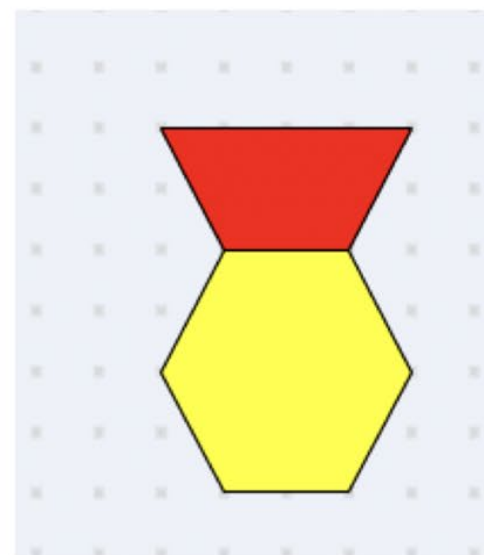
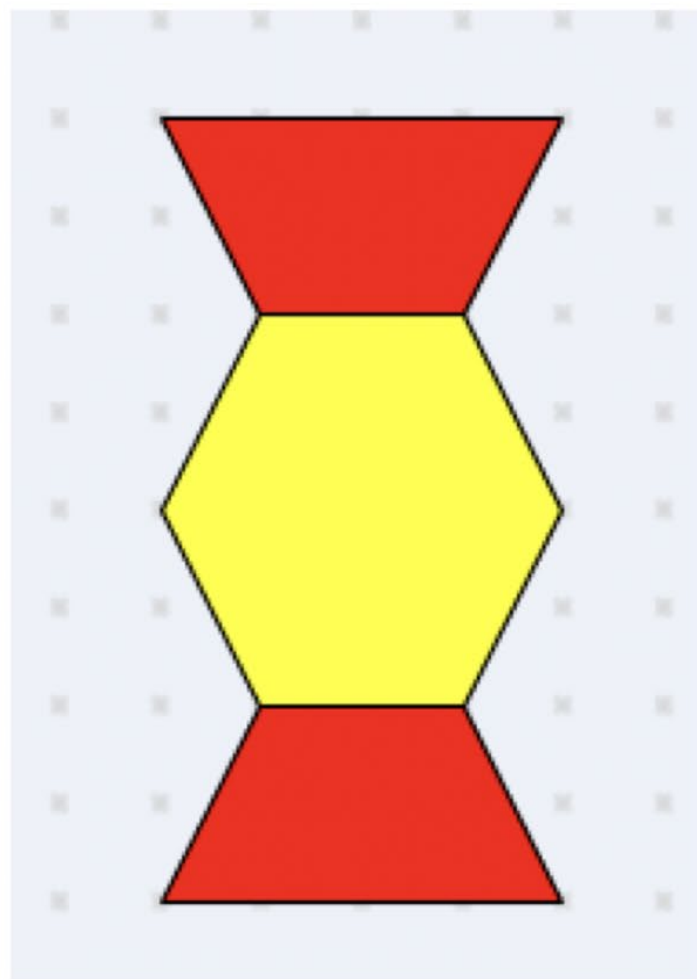
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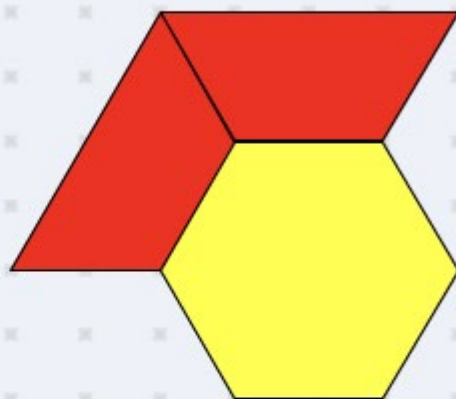
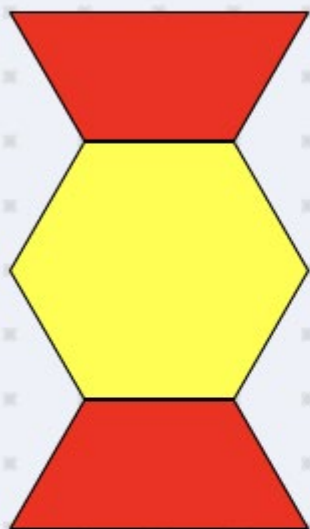
Draw a picture or make a model  
to show **WHY**  $8 + 3$  must be the  
same as  $10 + 1$ .


Use pattern blocks to make a design that is half yellow.










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You subtract two numbers and the answer is really close to what you subtracted. What could your numbers have been?

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Learning should be about  
thinking and communicating  
that thinking.

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What effect do school leaders  
have?

## **Establishing goals and expectations.**

In schools with high achievement gains, a focus on goals and expectations is talked about and is embedded in school routines, having an effect on the way teachers work.

## **Strategic resourcing**

This is both about physical resources and staffing resources.



**Planning, coordinating and evaluating teaching and the curriculum.**

This has a strong impact on student outcomes.

It includes staff discussion about pedagogy and its impact.

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It includes working with staff to develop objectives.

It includes providing feedback to teachers based on observations.

It requires systematic monitoring of student progress.

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# **Promoting and participating in teacher learning and development**

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## **Ensuring a supportive environment.**

This includes protecting teachers from undue pressure from parents.


It includes minimizing staff conflict.

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And these pressures are  
minimized when the whole  
school is on a common path.

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Valuable steps include:

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Building a school wide focus on  
problem solving.

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Building a school wide focus on  
mathematical flexibility.

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Having high expectations in  
EVERY classroom.

Expecting teachers to have clear  
and valuable learning goals and  
who teach with intention.

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What does intention look like?

Here is an example.

Try this problem:

Put the number 32 in one of the boxes. Tell what numbers make sense for the other boxes.


My intention is to focus on the relationship between the whole and parts when we add or subtract.



If 32 is on top, then the pieces below must add to 32, be less than 32 and one should be maybe 3 or 4 or 5 times the other.


32	
24	8

If 32 is bottom left, then the bottom right should be about  $\frac{1}{3}$  or  $\frac{1}{4}$  or so as much and the top should be the total.

42	
32	10

If 32 is bottom right, then the bottom left should be about 3 or 4 times as much and the top should be the total.

132	
100	32

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Each time, I am highlighting  
proportional thinking and how  
addition and subtraction relate.

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Basing decisions on data that  
matter

Using common tasks to build a  
whole-school framework

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Analyzing the data

Using the information from the  
data

# Really Knowing Your Staff

It helps to uncover your staff's true beliefs about teaching math.

One way is to use an anonymous survey.

Here are some questions you might use.

# Really Knowing Your Staff

In the end, covering curriculum/standards matters more than making the math interesting to students.

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Let's start a survey.

The currently weakest students in my class might improve, but really can't be expected to go too far.

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Let's start a survey.

I believe in about equal amounts of direct instruction, guided instruction, and exploration.

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Let's start a survey.

I believe that at least 50% of math evaluation should focus on lower level skills to ensure my students pass.

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# Let's start a survey.

Open-ended problems should be used rarely since they are too hard to give a mark or level to.

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Let's start a survey.

My main goal in math class is to get engagement.

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Let's start a survey.

I don't believe we need to worry too much about understanding the math if we are very clear and methodical about how to do it.

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Let's start a survey.

I prefer teaching more traditionally since I believe more children will benefit.

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I mentioned professional learning with staff.

Let me tell you about some work I and others have done to accomplish this.


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Sitting with staff to learn about  
a new resource/curriculum.

The admin might lead or an  
outsider might lead the session.


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Sitting with staff and an expert to help them flesh out the “big ideas” that are buried in the curriculum/standards and how to bring those out.


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Sitting with staff to look at student work, either leading or participating.

It might be work on a prepared screener or diagnostic that is similar at a number of grade levels.

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Here the goal might be to see if  
you are seeing more  
sophistication as students go up  
the grades.

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It might be to focus on student misconceptions. Again, admin can lead or participate.

Here are some examples.

- Which is more?

x    x    x

0 0 0 0 0

Many kids say the xs.

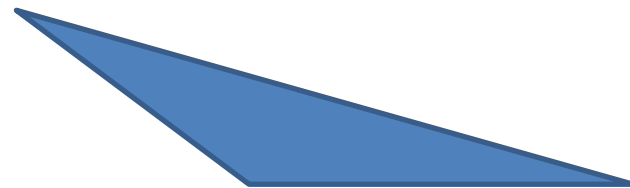
- What number is missing?

$$30 - 8 = [] - 10$$

Many kids say 22.

- $35 - 27 = 12$

- This is not a triangle



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$$50 \times 70 = 350$$

$$\frac{3}{5} = \frac{4}{6}$$

$$23 \times 45 = 815$$

Let's look at each grade band

G 3-6

Four boxes of cookies cost \$10.00. How much would 18 boxes cost?

- $\frac{3}{5} + \frac{2}{8} = \frac{5}{13}$

- A student evaluates  $3x$  when  $x = 4$  as 34.

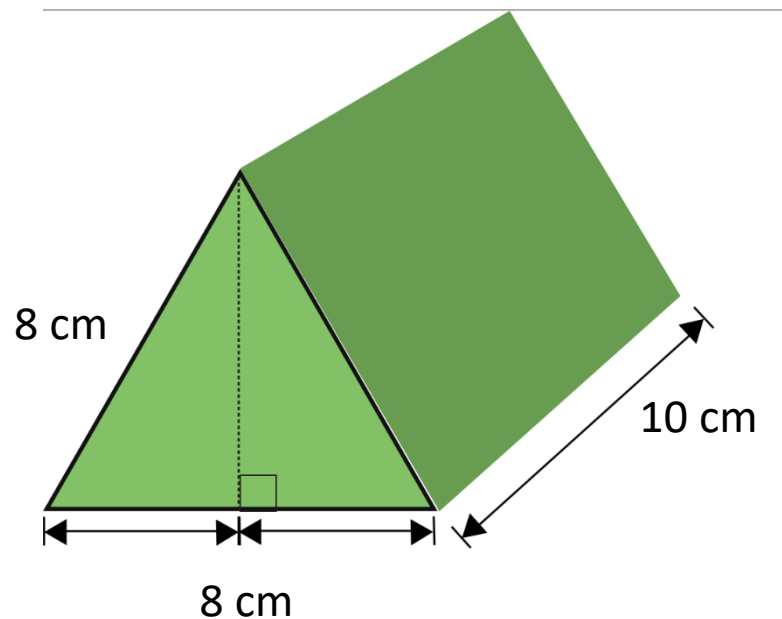
- A student calculates this area as  $70 \text{ cm}^2$ .



70 cm

1 m

- Calculates the volume of this triangular prism as  $640 \text{ cm}^3$ .



It might be valuable to  
discuss as a staff===

Student work that is not up to  
par. The focus becomes:

Why would you say to students?

What can teachers do to  
minimize how often kids get  
stuck?

Some students at Tree Glen Public School collect items for recycling.

Information about the number of items the girls and boys collect in 2 days is shown in the chart below.

Day	Number of items for the girls	Number of items for the boys
Monday	16	19
Tuesday	11	?

The girls and boys collect a total of 50 items over the 2 days.

Determine the number of items the boys collect on Tuesday.

Show your work.

$$19 + 50 = 69$$

The boys collect 69 items on Tuesday.

Packages of flags are on sale for Canada Day at two stores.

- Store A is selling a package of 5 flags for \$6.95.
- Store B is selling a package of 3 flags for \$4.80.

How much cheaper is one flag at Store A than at Store B?

Show your work.

$$\text{Store A} = \$6.95 - 5 \text{ Flags}$$

$$\text{Store B} = \$4.80 - 3 \text{ Flags}$$


$$\text{B) } 4.80 \div 3 = 1.3^{\$} \text{ at Store B 1 flag is } \$1.3,$$

$$\text{A) } 6.95 \div 5 = 1.39$$

at store A) one Flag is  $1.39^{\$}$  and at B) one Flag is 1.3 So at Store B the Flag is

Cheaper 36¢

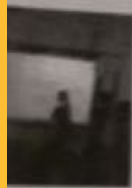
One flag at Store A is \$ 36¢ cheaper than at Store B.



It could look like this when  
everyone gets involved.

# NUMBER LINE

1. The number line is a horizontal line with arrows at both ends. It is used to represent numbers and their relative positions. The line is divided into segments by tick marks, which are labeled with numbers. The numbers are arranged in order from left to right, starting from a point called the origin.



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10. The number line is a horizontal line with arrows at both ends. It is used to represent numbers and their relative positions. The line is divided into segments by tick marks, which are labeled with numbers. The numbers are arranged in order from left to right, starting from a point called the origin.



How can you decompose to find the difference?

$62 - 27 = 35$   
 30 30 30 27  
 Nikita in Mrs. K's class  
 Kyra in Mr. Bartley's

$62 = 60 + 2$   
 $27 = 20 + 7$   
 $60 - 20 = 40$   
 $40 - 7 = 33$   
 $33 + 2 = 35$

Mathew. H  
Mrs. Burtala

Riley  
 Mr. Kar  

$$\begin{array}{r} 5 \\ 62 \\ - 27 \\ \hline 35 \end{array}$$
  
 $50 + 10 = 60$   
 $60 + 2 = 62$   
 $60 - 20 = 40$   
 $40 - 7 = 33$   
 $33 + 2 = 35$

Hailey and  
 Cori  
 $62 = 10 + 50 + 2$   
 $27 = 10 + 10 + 7$   
 $50 - 10 = 40$   
 $40 - 7 = 33$   
 $33 + 2 = 35$   
 check  

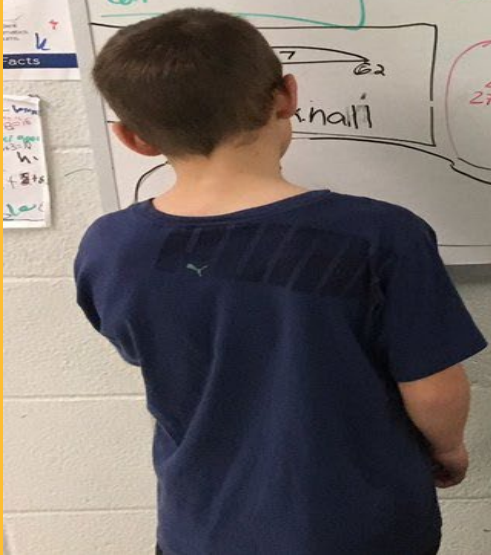
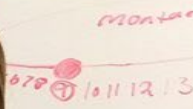
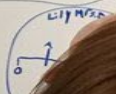
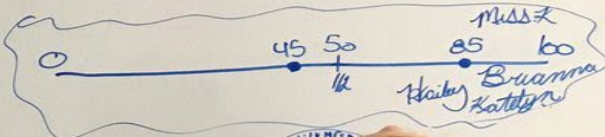
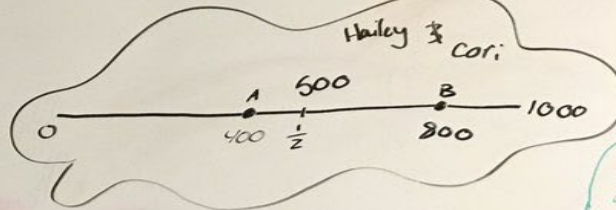
$$\begin{array}{r} 35 \\ + 27 \\ \hline 62 \end{array}$$

Sloan  
 $62 - 27 = 35$   
 $60 - 20 = 40$   
 $40 - 7 = 33$   
 $33 + 2 = 35$   
 MR. Hall

$62 - 27 = 35$   
 $60 - 20 = 40$   
 $40 - 7 = 33$   
 $33 + 2 = 35$

Ayden  
Darius in Mrs. Day

What numbers could the difference be?  
Prove your answer.



$32 \times 22 \}$ 

32	22
16	44
8	88
4	176
2	352
1	704

$(3+2) \times 20 + 2$   
 $3 \times 20 = 60$   
 $3 \times 2 = 6$   
 $2 \times 20 = 40$   
 $2 \times 2 = 4$   
 $60 + 6 + 40 + 4 = 110$

154 - 87


Ahmed - gr 6

$$\begin{array}{r} 154 \\ - 87 \\ \hline 67 \end{array}$$

4-7-5

155  
155  
155

154-8-50  
100-50000 Kyle

Trinity 

67  
The Home 19  
and picture

Mat+Ca  
14-7=7  
14-8=6

100-80-  
80  
=E

Handwritten notes on a piece of paper:

1704

32x22

30x20=600  
20x2=40  
20x2=40  
2x2=4  
add all  
up 600+40+40+4=704

600+104=704

32x22=704

X

$$\begin{array}{c}
 32 \\
 30 \quad \swarrow \quad \searrow \quad 2 \\
 22 \quad \text{[Diagram of a rectangle with dimensions 30, 2, and 22. The top side is 30, the right side is 2, and the left side is 22. The top-left corner is labeled 32.]}\quad 2
 \end{array}$$

Hayley  $32 \times 22$   
 Stewart  $= 22 \times (30 + 2)$   
 Niela  $= (22 \times 30) + (22 \times 2)$   
 $H = 720 + 44$   
 $= 564$

30  
20  
32x22  
= 22 x (30+2)  
= (22x30) + (22x2)  
= 720 + 44  
= 764  
720 Laur  
+ 44 m  
764 G

A person is writing on a whiteboard. The visible text includes:

- Top right:  $0.01$ ,  $18.7$ ,  $-8$
- Left side (being written):  $15.922$ ,  $0.01$ ,  $18.7$ ,  $-8$
- Bottom:  $15.922$ ,  $0.01$ ,  $18.7$ ,  $-8$

A close-up photograph showing the hands and forearms of two children as they write on a whiteboard. The child on the left is wearing a grey long-sleeved shirt and is writing with a black marker. The child on the right is wearing a light blue long-sleeved shirt and a purple wristband, also writing with a black marker. The whiteboard has some faint, partially visible text and lines.

200-3000  
 Trinity  
 The Actual 19  
 67  
 Blue Picture  
 yet  
 Mattica  
 $14-7=7$   
 $14-8=6$

Reema  $32 \times 22$   

$$\begin{array}{r} 32 \times 22 \\ = 2 \times 22 \\ = 22 + 22 \\ = 72 + 44 \\ = 764 \end{array}$$
  
 The answer is 764



STUDENT NUMBER PROGRESSION CHART

STUDENT NUMBER	PROGRESSION
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
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80	80
81	81
82	82
83	83
84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

STUDENT NUMBER PROGRESSION CHART

STUDENT NUMBER	PROGRESSION
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
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23	23
24	24
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84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

## VICE PRINCIPAL'S OFFICE

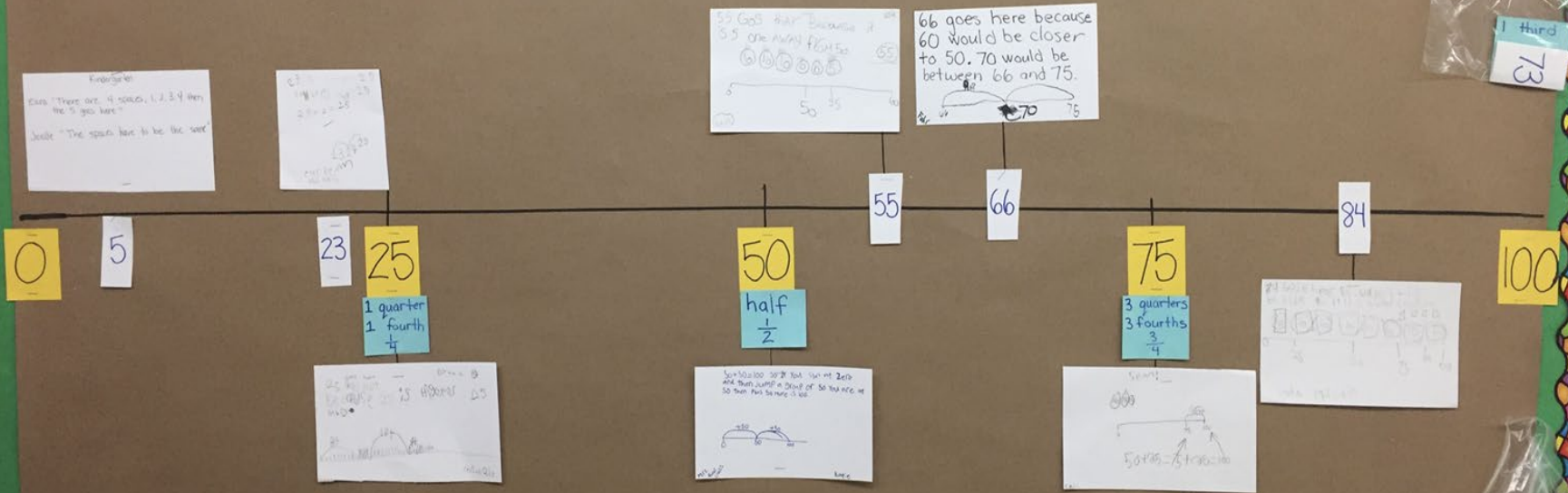
Can a fraction be greater than 1? Use a model to justify your reasoning.



# Primary Number line!

Choose a number and place where you think it goes on the number line.

Don't forget to **DEFEND** your answer!



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What path do you want to take?

Talk to your tablemates.

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What questions do you want to ask?