

Leading Effective Math Instruction

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October 2023

- What would **you** consider to be the strongest marker of math success in a school?

- If every educator spent time on developing these ideas/markers/indicators, our schools would change significantly.

- Here are some for me.

- Math visible in the school.



STONEY CREEK

Public School



WHAT NUMBER
COULD THE DOT
REPRESENT

360

795

1335

A large, solid yellow triangle is positioned on the left side of the slide, extending from the top-left corner towards the center. It has a thin white outline and a slightly irregular shape.

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.



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.



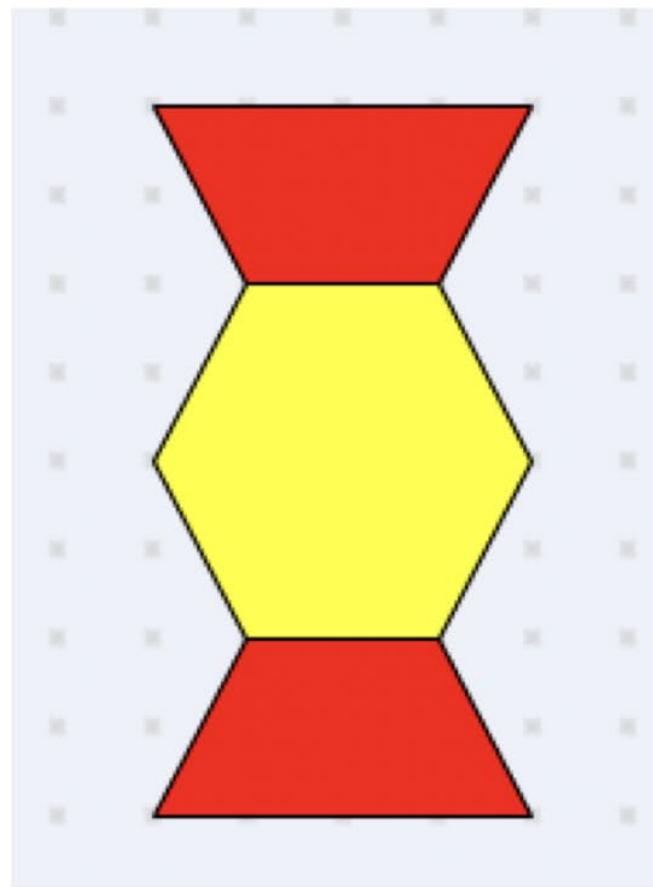
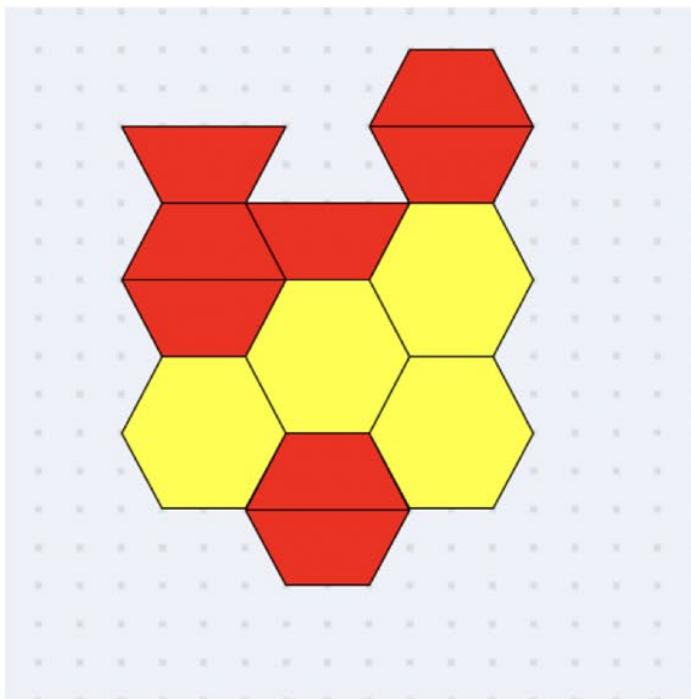
How do you know that
 $\frac{3}{5} - \frac{1}{3} < 1 - \frac{1}{10}$

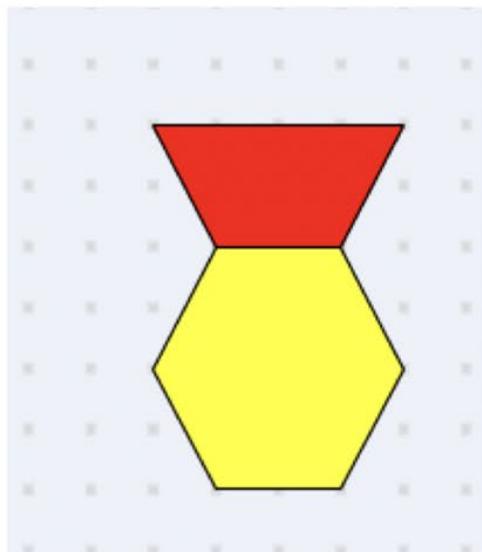
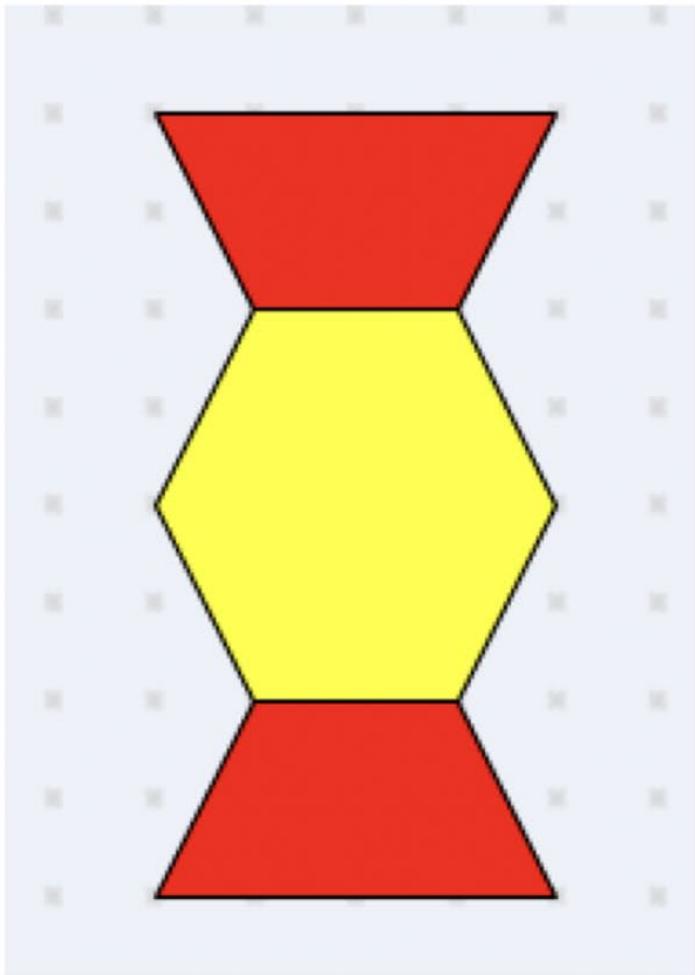
**WITHOUT FINDING THE
ANSWER?**

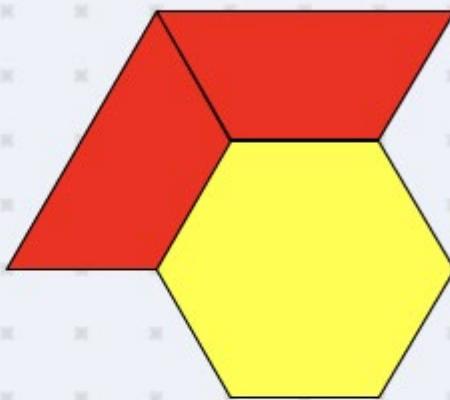
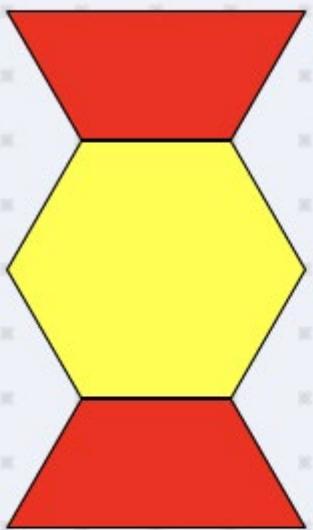
Draw a picture or make a model
to show **WHY** $8 + 3$ must be the
same as $10 + 1$.

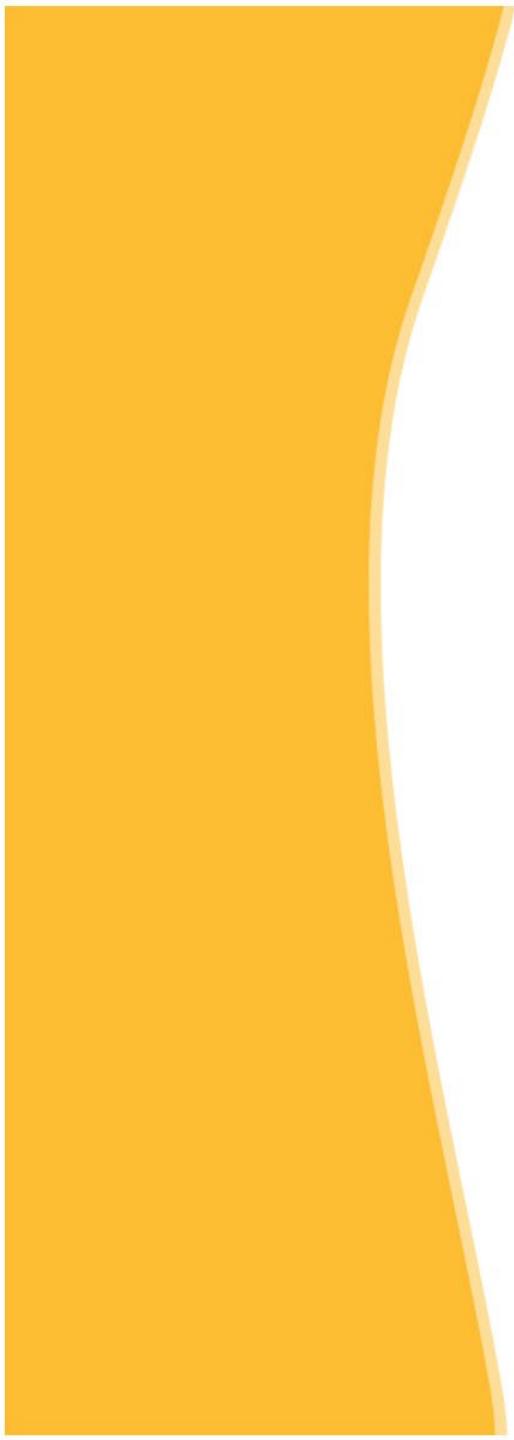
Use pattern blocks to make a design that is half yellow.



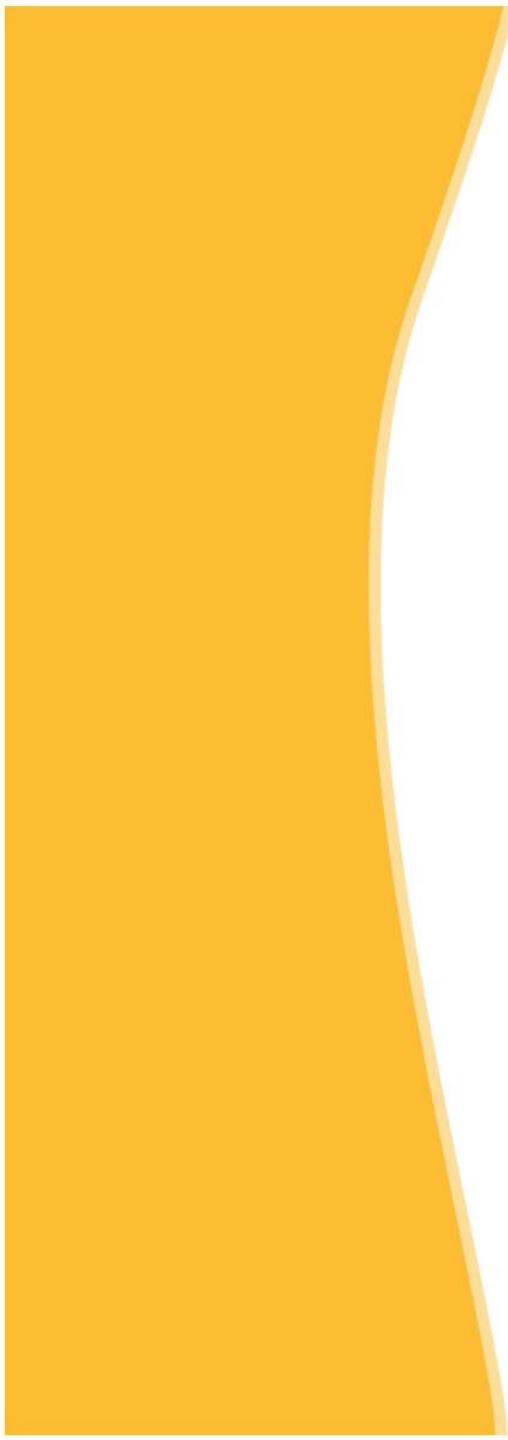






A large, solid yellow triangle is positioned on the left side of the slide, extending from the top-left corner towards the bottom-right. It has a thin white outline and a slight transparency.

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



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.



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

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.



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.



Having high expectations in
EVERY classroom.

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

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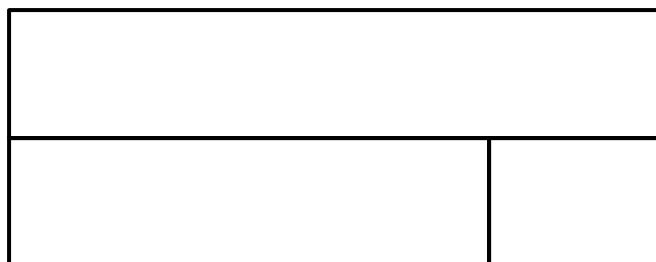
What does intention look like?

Here is an example.

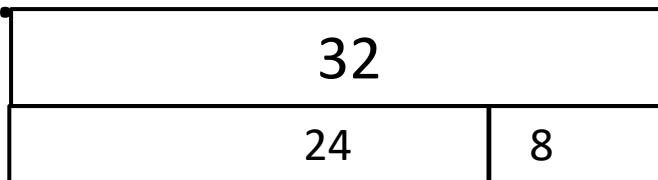
Try this problem:

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.



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

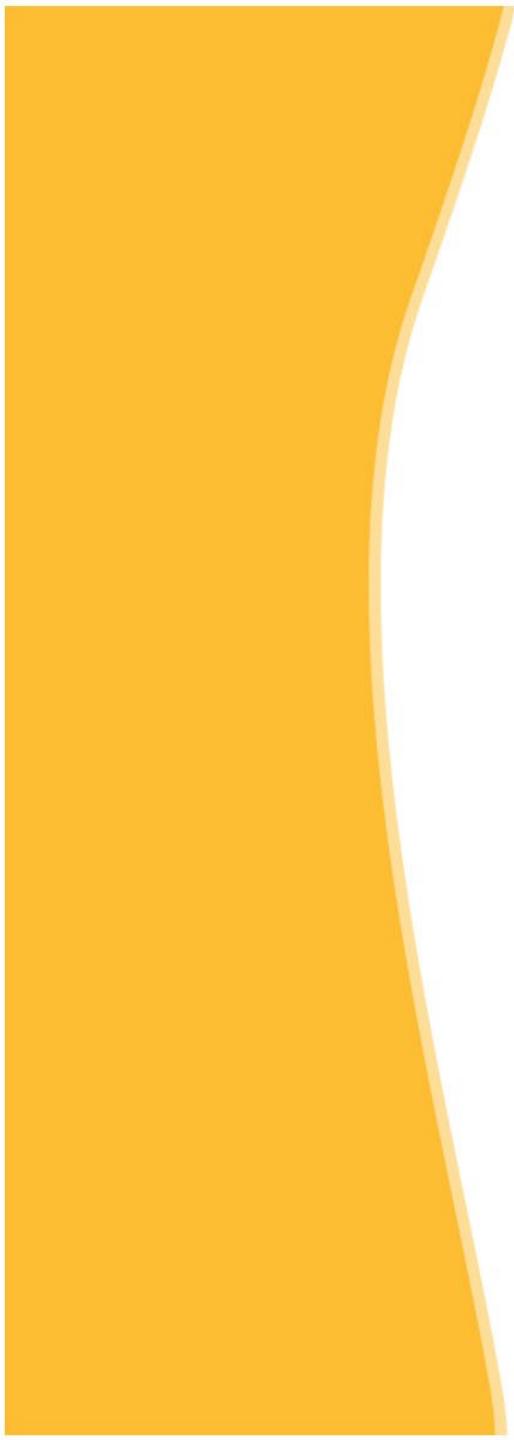
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Each time, I am highlighting
proportional thinking and how
addition and subtraction relate.

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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.

Let's start a survey.

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

Let's start a survey.

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

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.

Let's start a survey.

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

Let's start a survey.

My main goal in math class is to
get engagement.

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.

Let's start a survey.

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



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.

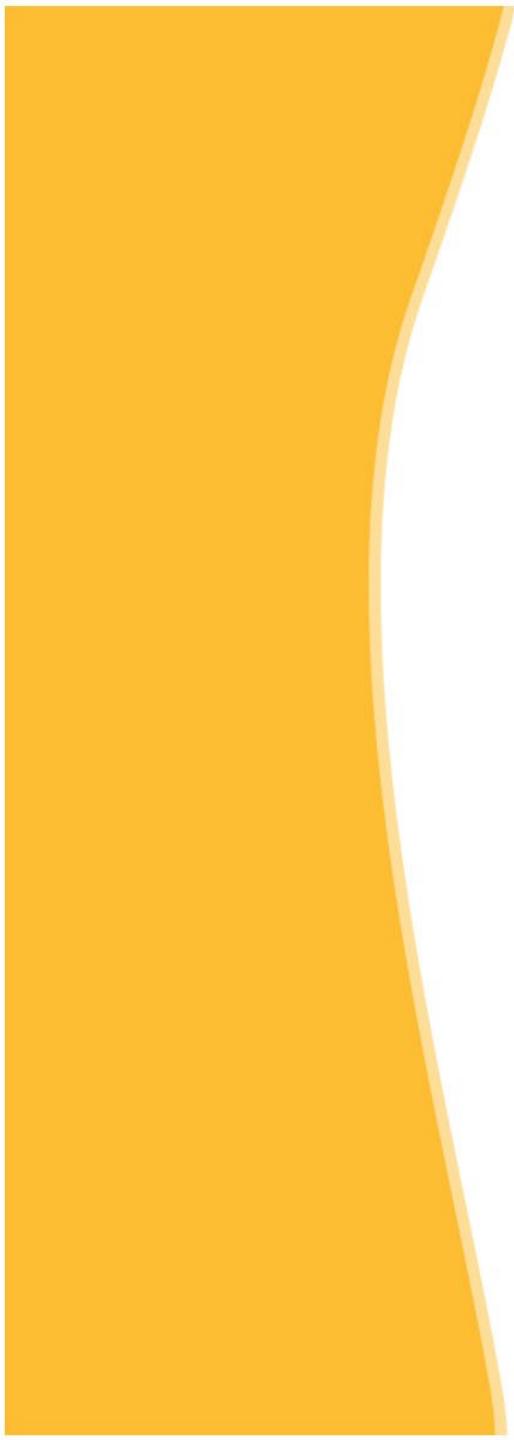


Sitting with staff and an expert to help them flesh out the “big ideas” that are buried in the curriculum/standards and how to bring those out.



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

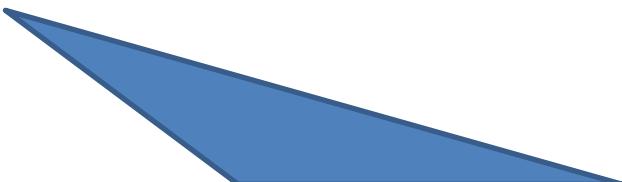
Many kids say the xs.

- What number is missing?

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

Many kids say 22.

- $35 - 27 = 12$
- This is not a triangle



$$50 \times 70 = 350$$

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

$$23 \times 45 = 815$$

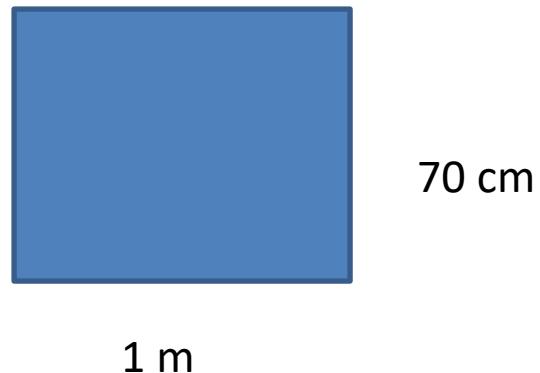
Let's look at each grade band

G 3-6

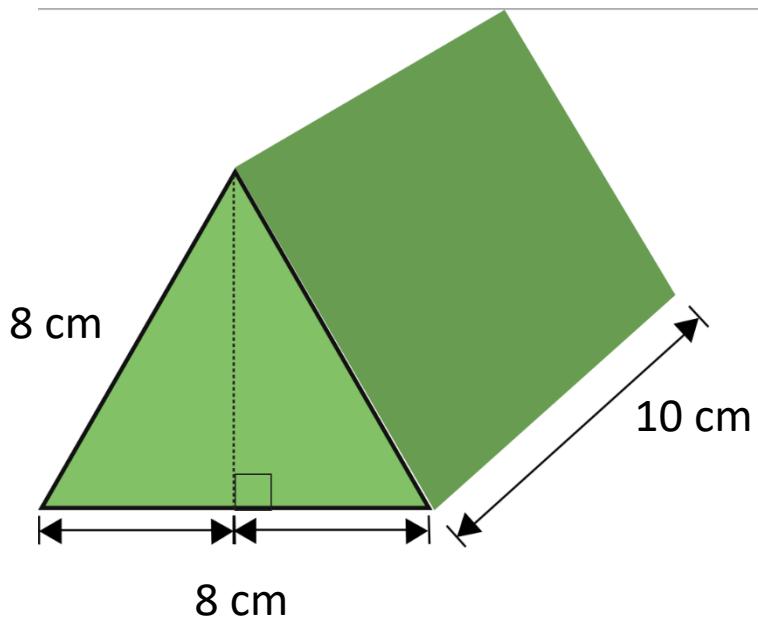
Four boxes of cookies cost \$10.00. How much would 18 boxes cost?

- $\frac{3}{5} + \frac{2}{8} = \frac{5}{13}$
- A student evaluates $3x$ when $x = 4$ as 34.

- A student calculates this area as 70 cm^2 .



- Calculates the volume of this triangular prism as 640 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?

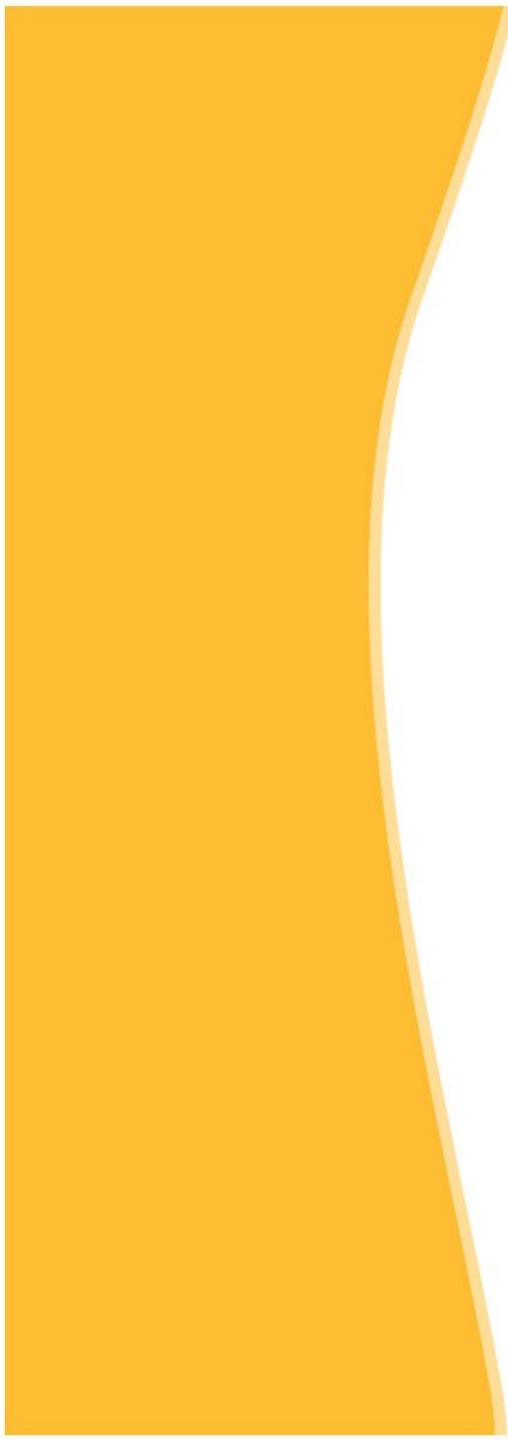
Show your work.

$$\text{Store A} = \$6.95 - 5 \text{ flags}$$
$$\text{Store B} = \$4.80 - 3 \text{ flags}$$

B) $4.80 \div 3 = \$1.3$ at Store B 1 flag is
\$1.3,

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.

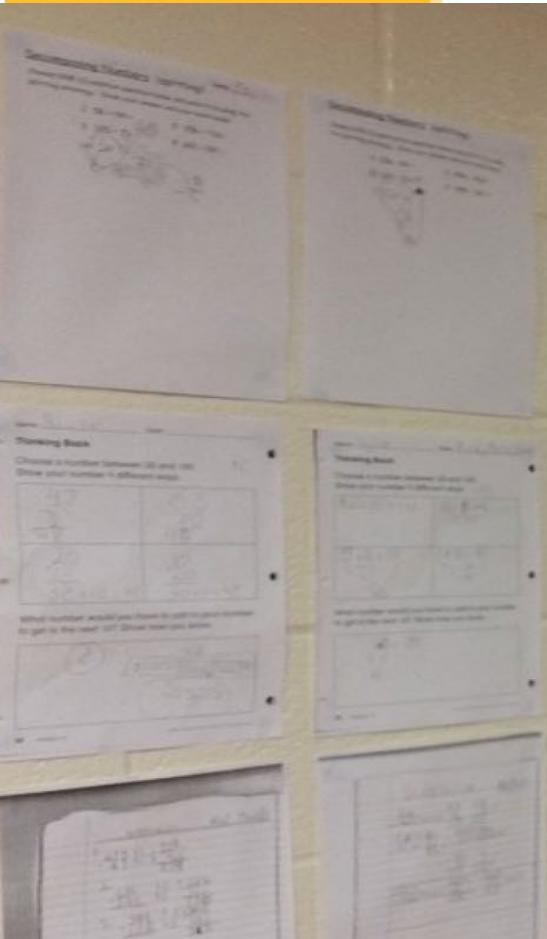


It could look like this when everyone gets involved.

NUMBER LINE

8Q10

DECOMPOSITION DR.



How can you decompose to find the difference?

$$\begin{array}{r} 62 \\ - 30 \\ \hline 32 \end{array}$$

Nikita in Mrs. K's class
Kyra in Mr. Bartlett's

Riley
Mr. Klar

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

$$\begin{array}{r} 50 \\ + 10 \\ \hline 60 \end{array}$$
$$\begin{array}{r} 60 \\ + 2 \\ \hline 62 \end{array}$$
$$\begin{array}{r} 20 \\ + 10 \\ \hline 30 \end{array}$$
$$\begin{array}{r} 20 \\ + 7 \\ \hline 27 \end{array}$$
$$\begin{array}{r} 30 \\ + 8 \\ \hline 38 \end{array}$$
$$38 - 3 = 35$$

Harley and Cori

$$\begin{array}{r} 61 \\ - 10 \\ \hline 51 \end{array}$$
$$\begin{array}{r} 50 \\ + 2 \\ \hline 52 \end{array}$$
$$\begin{array}{r} 20 \\ + 10 \\ \hline 30 \end{array}$$
$$\begin{array}{r} 30 \\ + 5 \\ \hline 35 \end{array}$$

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

$$\begin{array}{r} 62 \\ = 60 + 2 \\ 27 \\ - 28 + 1 \\ \hline 34 + 1 = 35 \end{array}$$

Mathew H
MCS.BURR/16

$$\begin{array}{r} 62 \\ - 30 \\ \hline 32 \end{array}$$

Shall

$$\begin{array}{r} 27 \\ + 10 \\ \hline 37 \end{array}$$
$$\begin{array}{r} 37 \\ + 10 \\ \hline 47 \end{array}$$
$$\begin{array}{r} 47 \\ + 5 \\ \hline 52 \end{array}$$

$10 + 10 + 5 = 35$

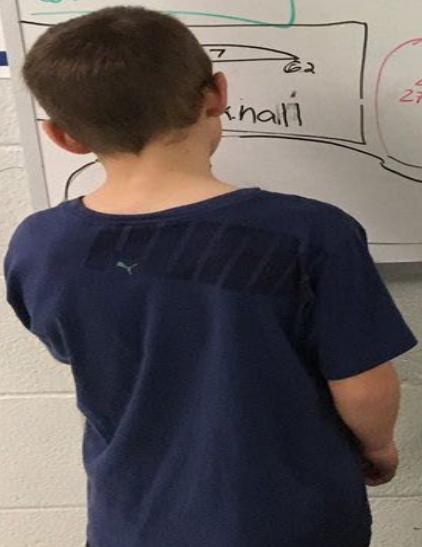
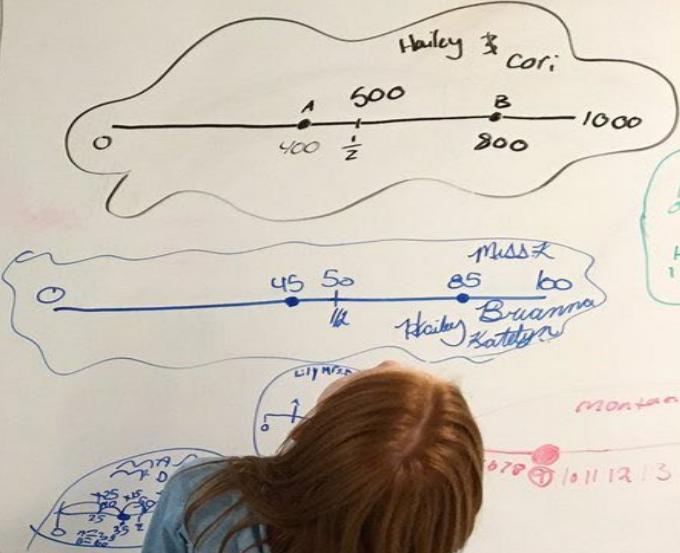
Ayden
Daniel in Mrs. K's class

Sloan

$$\begin{array}{r} 62 \\ - 27 \\ \hline 35 \end{array}$$
$$60 - 20 = 10$$
$$2 - 7 = 0$$

MR. Klar

What numbers could the do
Prove your answer.



Celebrating Student Work

$$\begin{array}{r} 32 \times 22 \\ \hline 64 \\ 120 \\ \hline 704 \end{array}$$

$$\begin{array}{r} 32 \\ 16 \\ 8 \\ 4 \\ 2 \\ 1 \\ \hline 352 \\ 704 \end{array}$$

$$(30+2) \times (20+2)$$

$30 \times 20 = 600$
 $30 \times 2 = 60$
 $2 \times 20 = 40$
 $2 \times 2 = 4$
 $600 + 60 + 40 + 4 = 704$

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

$$14 - 7 = 7$$

$$155$$

$$155$$

Kyle
TSL 155

$$\begin{array}{r} 154 - 8 = 56 \\ 100 - 56 = 44 \end{array}$$

Kyle

Trinity 11 11

The answer is
67
Piece picture
yes

Mattie
14 - 7 = 7
14 - 8 = 6
100 - 80 = 20

$$\begin{array}{r} 32 \times 22 \\ \hline 64 \\ 120 \\ 20 \\ 20 \\ \hline 704 \end{array}$$

$32 \times 2 = 64$
 $20 \times 2 = 40$
 $20 \times 2 = 40$
 $2 \times 2 = 4$
 $64 + 40 + 40 + 4 = 148$
 $600 + 148 = 748$
 $32 \times 22 = 748$

$$\begin{array}{r} 32 \times 22 \\ \hline 64 \\ 120 \\ 20 \\ 20 \\ \hline 704 \end{array}$$

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$$\begin{array}{r} 32 \times 22 \\ \hline 64 \\ 120 \\ 20 \\ 20 \\ \hline 704 \end{array}$$

$32 \times 22 = 22 \times (30+2)$
 $= 22 \times 30 + 22 \times 2$
 $= 660 + 44$
 $= 704$

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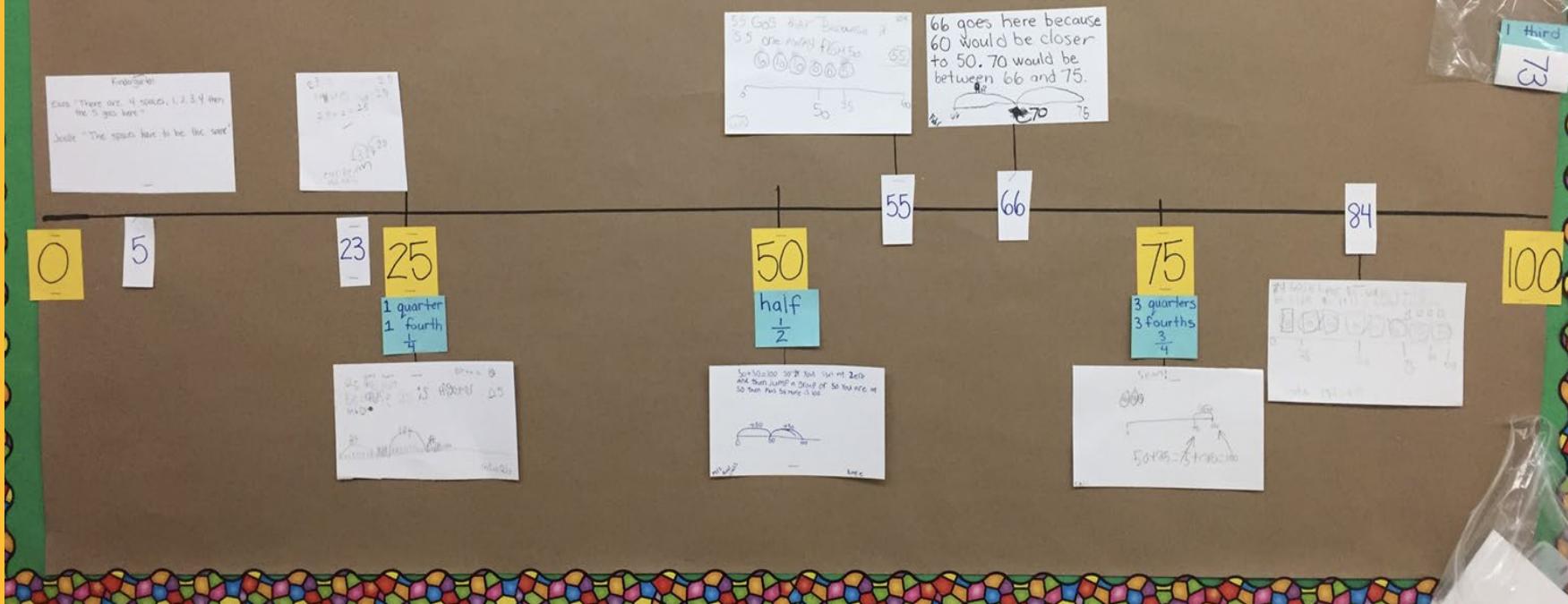
VICE PRINCIPAL's OFFICE

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!





What path do you want to take?

Talk to your tablemates.



What questions do you want to ask?