Marian Small Feb 2018

Becoming the Math Teacher K-6 Students Need!

What really matters ?

A positive classroom environment

A positive classroom environment

A positive classroom environment

Building curiosity

What would you call a giant beanstalk?

Building curiosity

How many inches long is “long” hair?

Building curiosity

About how much pizza do you think all the kids in Edmonton eat in one week?

Building curiosity

Or even more "mathy", e.g.

2 truths and a lie

- 68 can be represented with 32 base ten blocks.
- 148 can be represented with 43 base ten blocks.
- 502 can be represented with 142 base ten blocks.

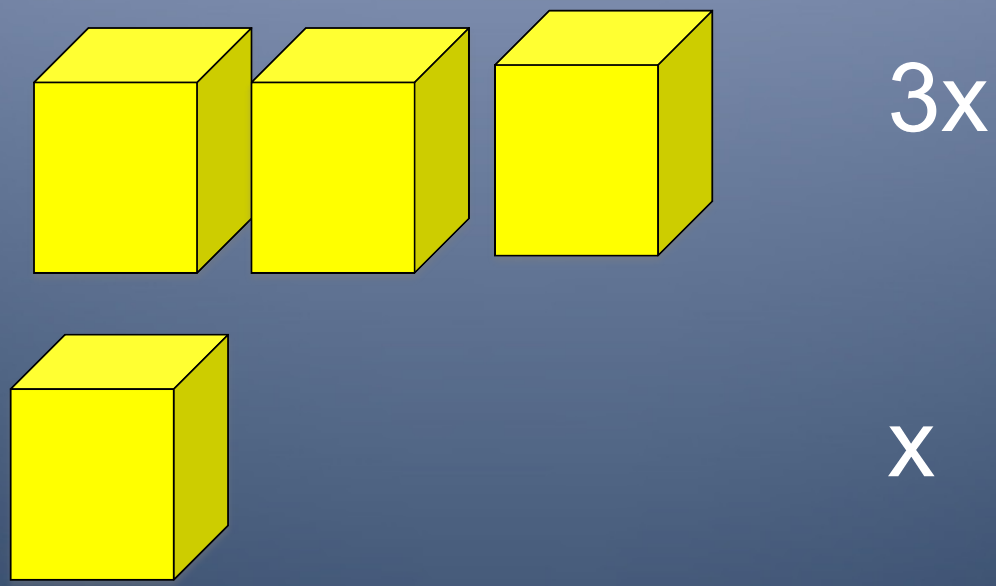
X	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

Or

Choose two numbers so that if you add them, the sum is double their difference.

What has to be true about those numbers? Why?

Or



Avoiding an over-focus on the answer

Instead

Ask questions about the ideas encountered.

For example

Task: Make a rectangle out of square tiles.
Cut it in half.
What fraction of the old perimeter is the new perimeter?

So then ask….

Could the new perimeter be greater than the old one? Explain.

Could it be half of the old one? Explain.

So then ask….

Suppose the new perimeter is ¾ of the old one.

What could the original rectangle have looked like?

Could the fraction be really close to 1? When?

A focus on thinking and understanding

Rather than on just knowledge and application.

For example

Instead of : How much more is 20 – 3 than 17 – 5?

I ask:

Without getting answers, how much more is 20 – 3 than 20 –13?

For example

Instead of : Write three equivalent fractions for 6/10.

I ask:

Draw a picture to show why 6/10 = 3/5.

For example

Instead of : What is the tens digit in 418?

I ask:

Why might some people say there is 1 ten in 418 but some people say 41?

Being intentional

Use tasks not just because they are engaging but on the right topic, but to lead to important ideas for kids to learn.

For example

You want kids to realize that if you subtract 2-digit numbers, the result can be 1-digit or 2-digits, but never 3 digits.

So you set a task:

You subtract two 2-digit numbers.

How many digits could the result have?

Is there a number of digits the result could not be?

Or

You want kids to know the difference between the role of the numerator and denominator in a fraction.

So you set a task

Choose a number between 3 and 8.

Use a picture to show a fraction where that number is the numerator.

Use a picture to show a fraction where that number is the denominator.

So you set a task

Get another kid to look at both pictures and guess what your number must have been.

Scaffold less

Scaffold when kids need help, but not automatically.

Tolerance for misinterpretation of the task

You ask students to determine the dimensions of a rectangle where the perimeter is 3 times the length.

Several of them assume the length is 3 times the width, instead.

What do you do?

Differentiated instruction

An open-ended enough task or varied enough task that is suitable to every student to whom you are assigning it.

For example….

A third shape is more like shape A than shape B.
What might it look like?

For example....

A fraction is just a LITTLE more than 1/2. What could it be?

For example….

You buy an item and give the clerk one bill. Your change is one bill and 6 coins.

What might the price have been?

Maybe

You gave $20 and got back $10 and 6 quarters--- $8.50

You gave $10 and got back $5 and 6 pennies--- $4.94.

You gave $20 and got back $5 and 3 dimes and 3 nickels-- $14.55.

For example…

You add two numbers and the digit in the tens place is 1.

What could the numbers have been?

Maybe

30 + 84

201 + 113

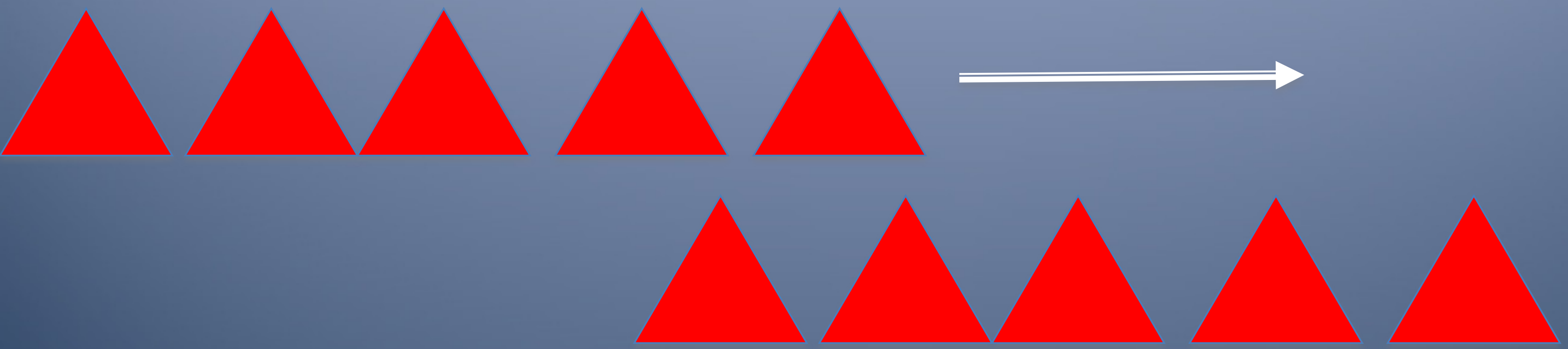
10 + 9

For example…

The tenth shape in a pattern is a red triangle.

What could the pattern look like?

Maybe



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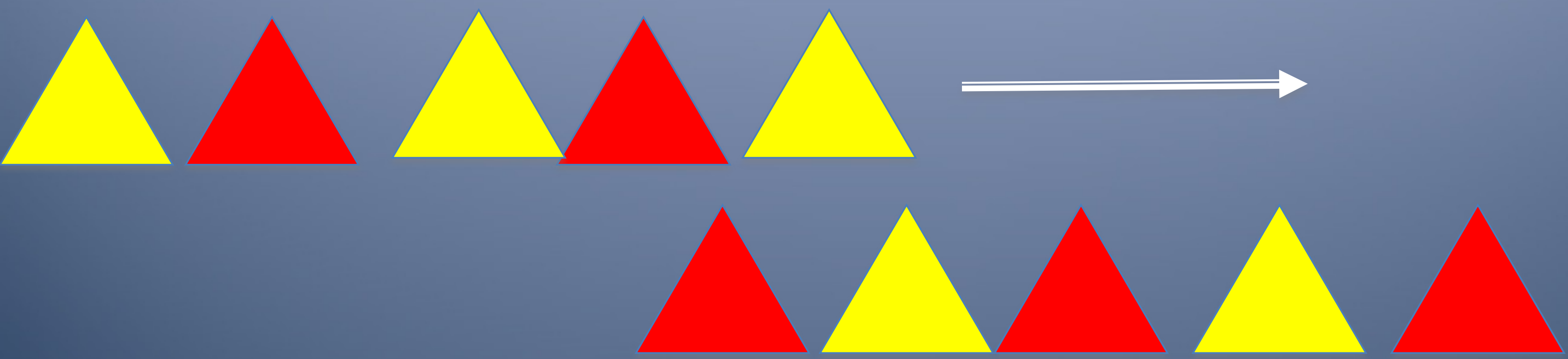

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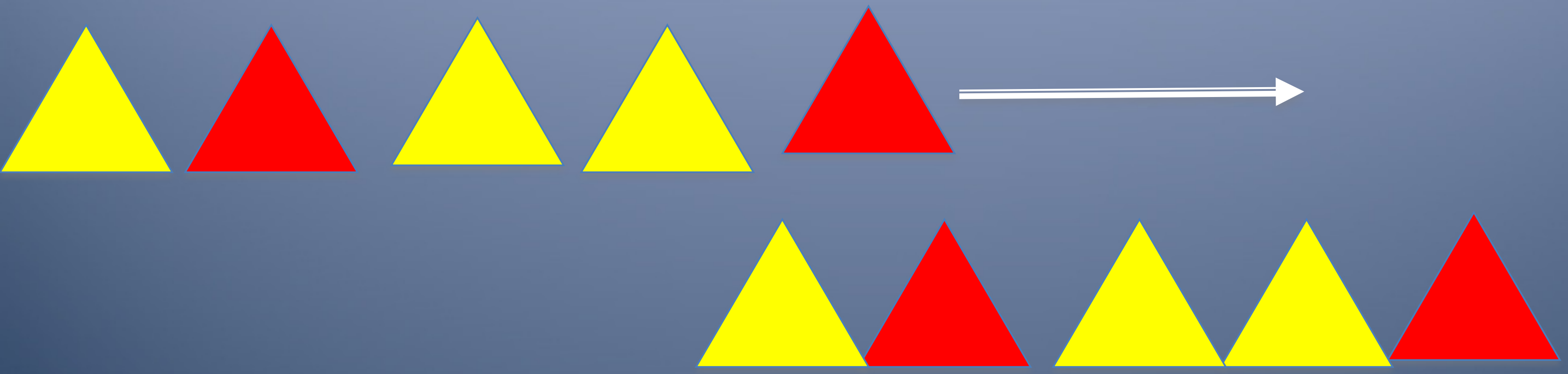


For example…

A 3-D shape has more edges than vertices.

What could it be?

For example…

The value of unknown number in an equation that has the number 5 in it somewhere has to be 12.

What could the equation be?

Maybe

$5 \times [] + 4 = 64$

$5 + [] = 8 + 9$

$[] - 5 = 7$

But also… a visible passion for what you are teaching

And not as obvious…. A deep understanding of the math

How important are connections to learning?

We search for meaning.

We search for relationships to what we already know.

But how do we build connections?

Does the curriculum help?

I’m not so sure.

Does the curriculum help?

Do the outcomes really tell us what about a topic is important? How it connects to other topics?

A focus on big ideas/essential understandings

I have chosen…

to use the term “big ideas” to look at very long term ideas and “essential understandings” to focus on important, but shorter term, ideas.

Big Idea Example

Any shape can be decomposed into smaller shapes and that the decomposition might provide insights into what we know about the larger shape.

Essential Understanding Example

Any polygon can be decomposed into triangles.

Today…

I am focusing on the big ideas.

Different representations of a number show different things about it.

Let’s consider the number 16.

How do these different representations of 16 tell me different things about it?

Representations of 16

X	X	X	X	X
X	X	X	X	X

X	X	X	X	X
X				

Representations of 16

8 + 8

X	X	X	X
X	X	X	X
X	X	X	X
X	X	X	X

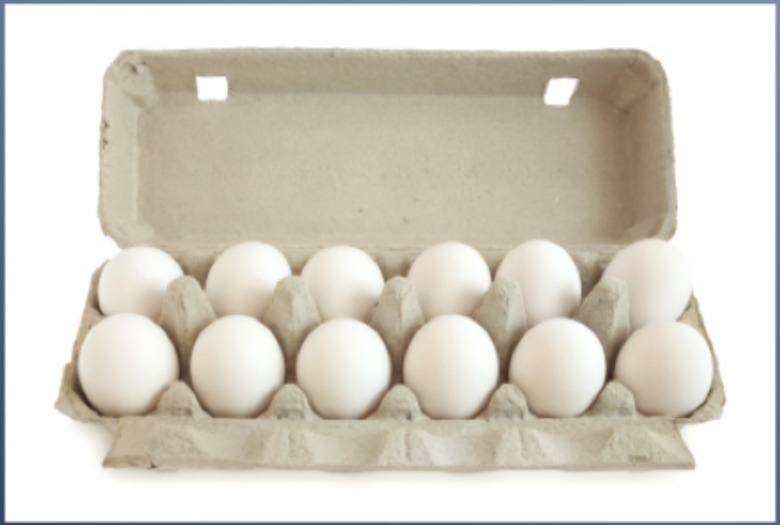
10 + 6

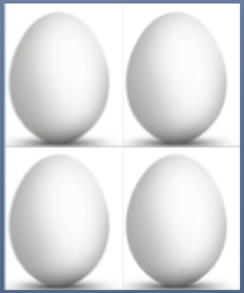
20 – 4

Representations of 16

X	X
X	X
X	X
X	X
X	X
X	X
X	X
X	X

Representations of 16





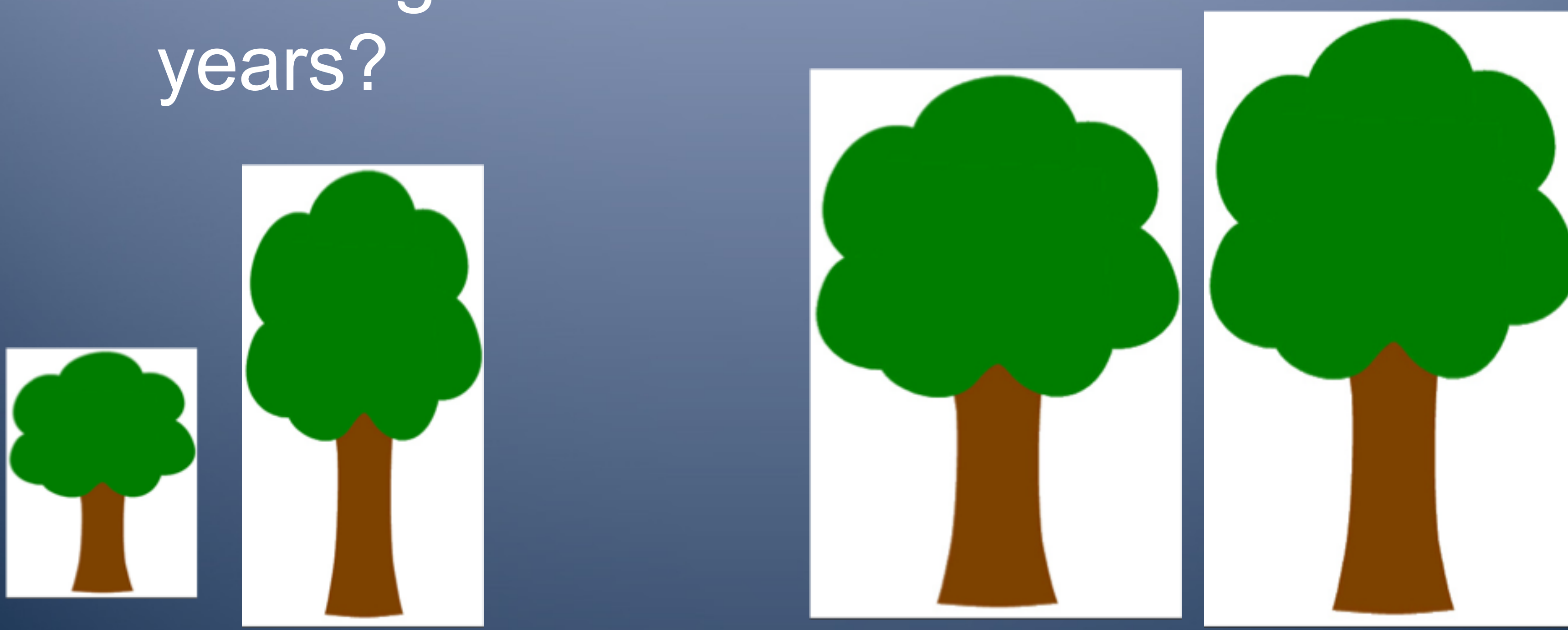
Now you consider a different number

It does not matter whether it is big or small.

The same would be true.

The comparison of any two numbers can be thought of in two fundamentally different ways.

Which grew more over the last few years?



5 feet 9 feet 20 feet 25 feet

So how could you compare:

12 and 18?

20 and 24?

Any multiplication or division situation involves a "unit" change.

What unit change is involved?

3 bowls each held 8 apples.
How many apples were there?

Any multiplication or division situation involves a "unit" change.

What unit change is involved?

80 cookies are put into bags of 3.
How many bags are required?

Every measurement is a comparison.

Who is taller- Hannah or Jason?

Every measurement is a comparison.

Hannah is 52” tall.

Every measurement is a comparison.

It was a big kitchen.

Different tests can often be used to determine if an object is a certain kind of shape or figure or not.

What do you HAVE to measure to be sure whether or not this is a square?

Knowing the measurements of one shape can sometimes provide information about the measures of another shape.

If you double the length and width of a rectangle, what do you know about the new area?

Knowing the measurements of one shape can sometimes provide information about the measures of another shape.

A triangle has the same height and base as a parallelogram.

What do you know about the areas?

More big ideas

These are sample big ideas. A more complete set for each strand has been developed.

Impact

They help you “shape” the activities/problems you use with your students.

Impact

They help students know what really matters amongst all that happened during a class period.

Impact

If you bring these relationships to students’ attention, those connections will, undoubtedly, help them learn new things.

A lot of things matter, but..

Making the math you teach coherent will go a LONG way to helping your students.