Teaching with Intention; Focusing on What’s Important

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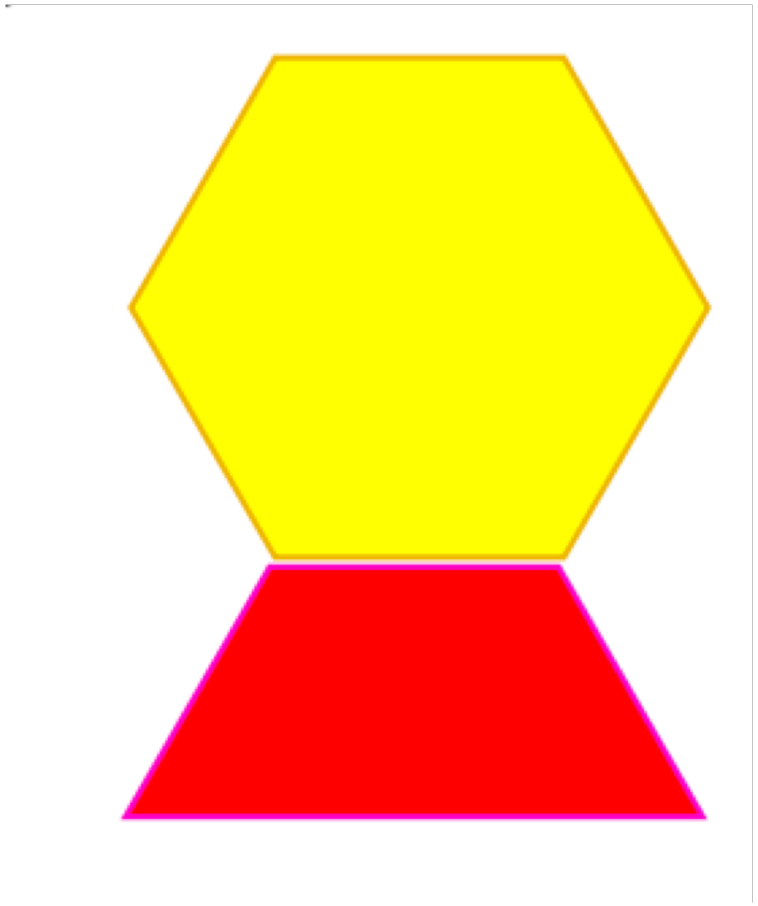
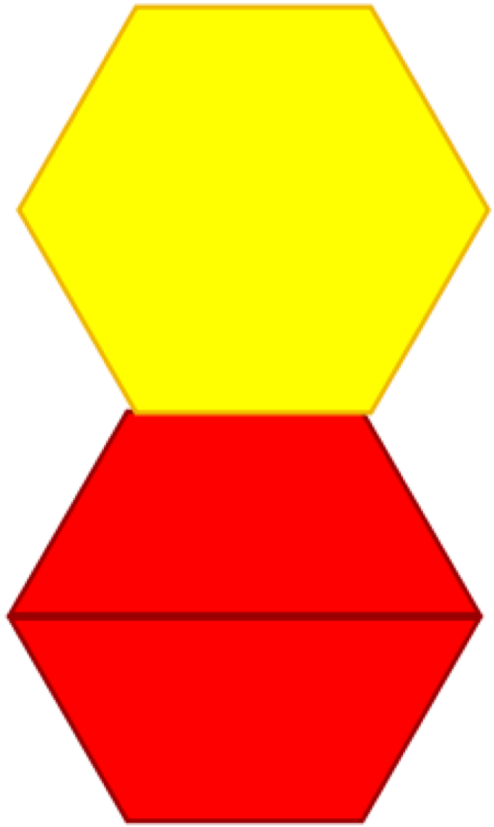
Let’s do a problem

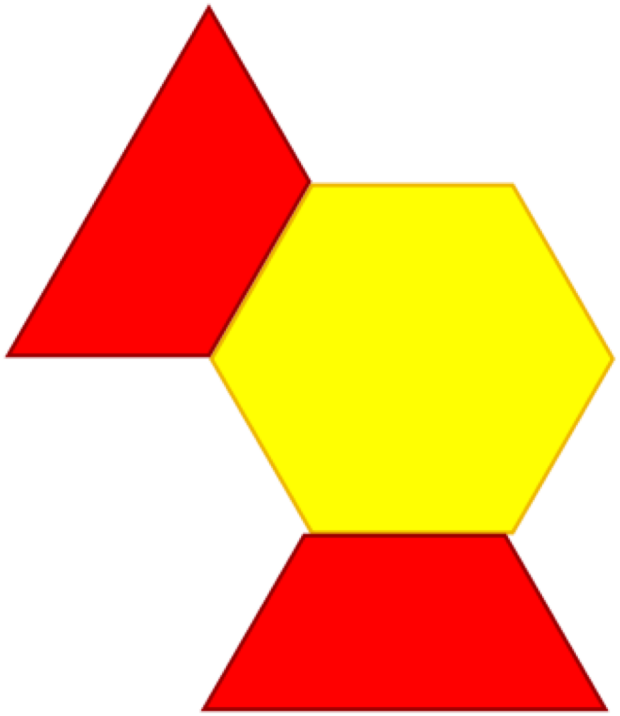
- Use your pattern blocks to do the following.
- Make a design that is half yellow.

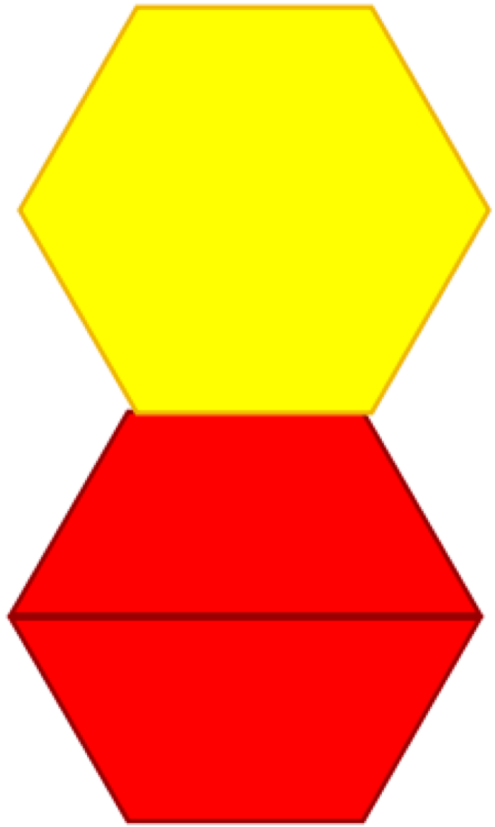
What did I get out of this?

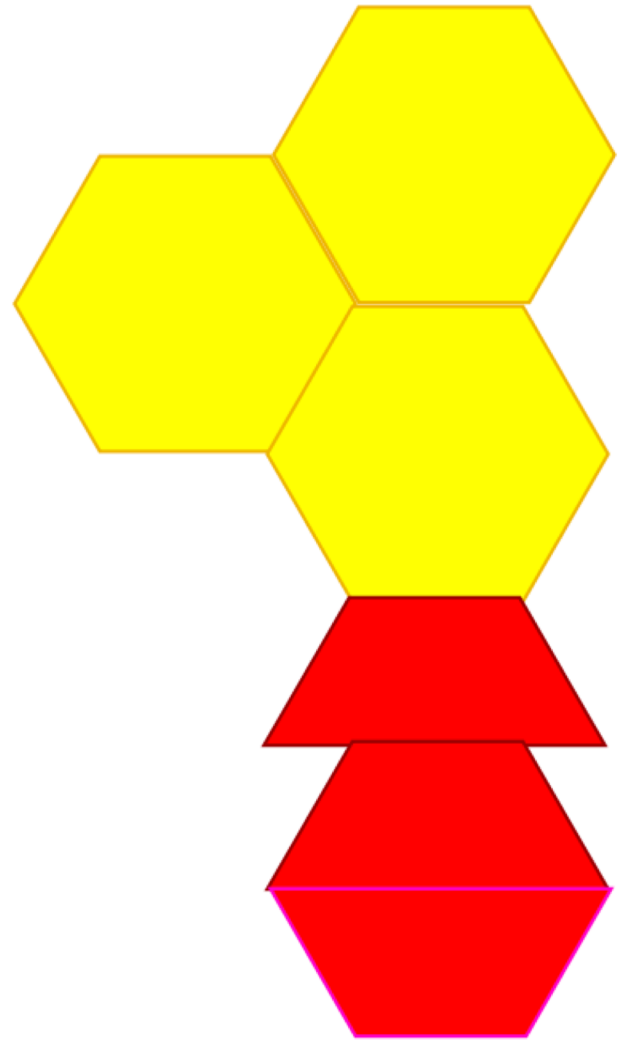
- The notion that half could be half a set or half an area.
- The notion that half does not mean symmetric.
- The notion that half yellow doesn’t tell you if the whole is big or small.





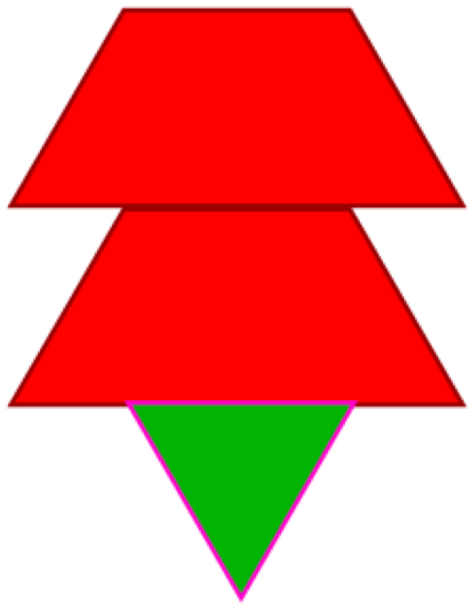


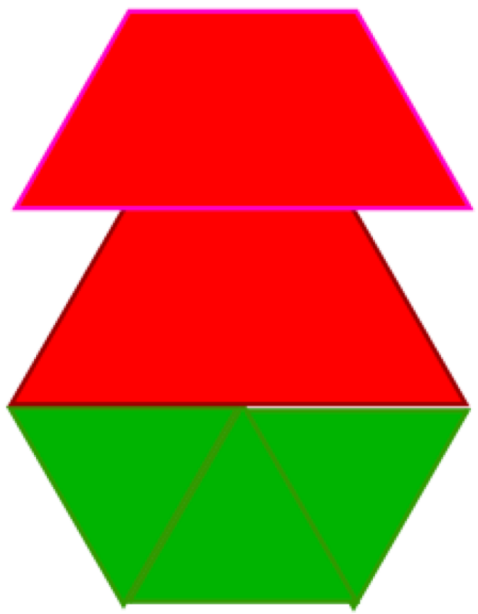




Let’s do a problem

- Use your pattern blocks to do the following.
- Make a design that is 2/3 red and 1/3 green.



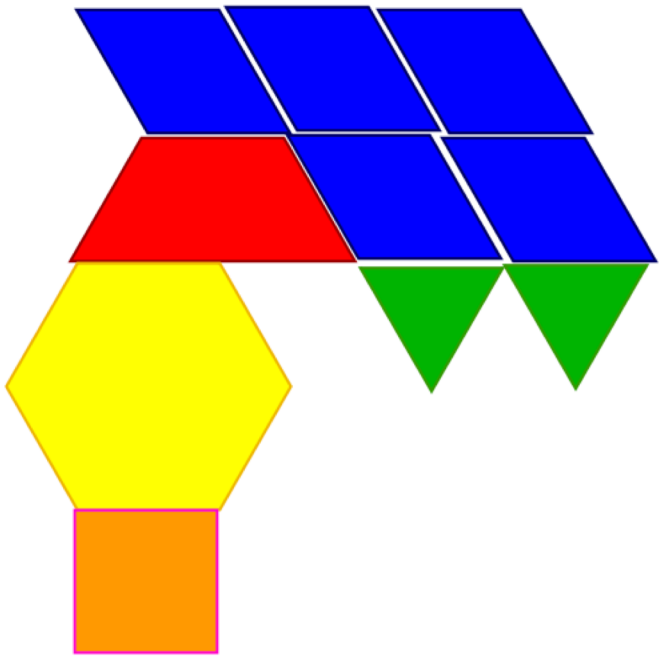


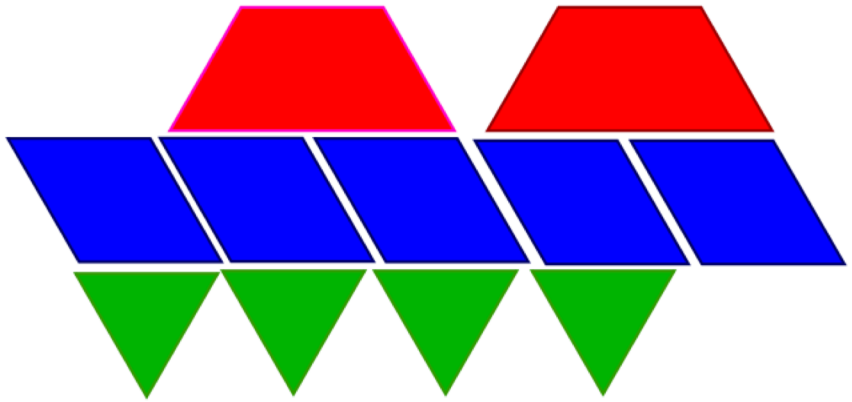
What did I get out of this?

- The notion that since 2/3 and 1/3 takes up everything, no other colours are possible.

Let’s do a problem

- Use your pattern blocks to do the following.
- Make a design that is 1/2 blue and 1/5 green.





What did I get out of this?

- The need for a “common denominator” when trying to show halves and fifths at the same time.

What expectations was I addressing?

- Grade 4:

What expectations was I addressing?

represent fractions using concrete materials, words, and standard fractional notation, and explain the meaning of the denominator as the number of the fractional parts of a whole or a set, and the numerator as the number of fractional parts being considered;

What expectations was I addressing?

- demonstrate and explain the relationship between equivalent fractions, using concrete materials (e.g., fraction circles, fraction strips, pattern blocks) and drawings

But I put “meat” on the expectations

- demonstrate and explain the relationship between equivalent fractions, using concrete materials (e.g., fraction circles, fraction strips, pattern blocks) and drawings

But I put “meat” on the expectations

I was addressing what I will call essential understandings.

Teachers need to borrow or learn about them so they don’t just “do stuff”.

I would argue

- That just “doing” expectations will not lead to mathematical success.
- Students need to meet ideas and not just solve random problems.

Valuable work

- Would be to look at expectations and think about what ideas need to be addressed.
- Teachers should be expected to be able to articulate what those ideas are.

Let’s try one together

- What ideas are embedded in this expectation?

Grade 2

- compose and decompose numbers up to 20 in a variety of ways, using concrete materials (e.g., 7 can be decomposed using connecting cubes into 6 and 1, or 5 and 2, or 4 and 3);

Grade 2

For me, it might mean:

No matter what number it is beyond 1, you can break it up into parts.

For computational persons, some ways of breaking up numbers might be helpful than others in a given situation.

Grade 2

There are more ways to break up larger numbers.

Sometimes they can be broken up into the same size parts and sometimes not.

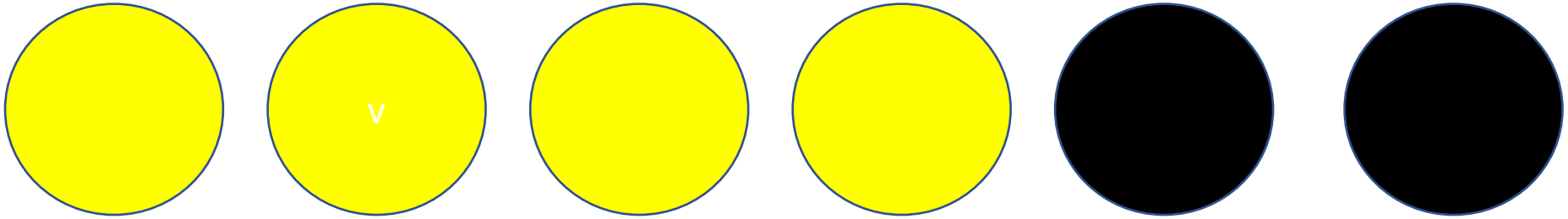
Grade 6

- represent ratios found in real-life contexts, using concrete materials, drawings, and standard fractional notation (***Sample problem:*** In a classroom of 28 students, 12 are female. What is the ratio of male students to female students?);

Grade 6

Whenever I see a ratio situation, I see many of them.

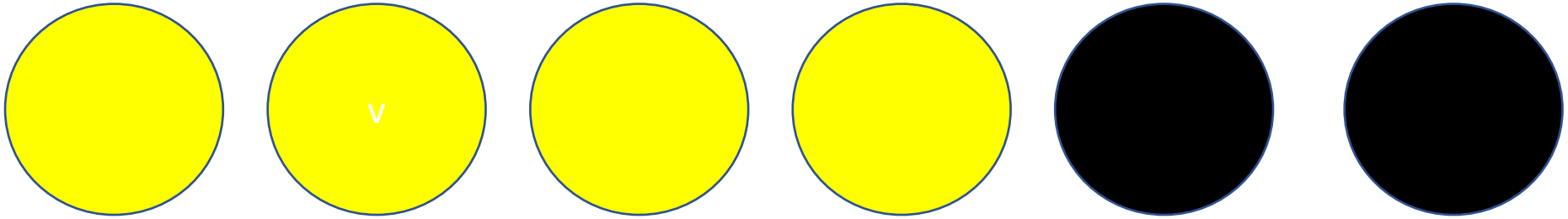
e.g. Here I see 4:2, 2:4, 2:6, 6:2, 4:6 and 6:4.



Grade 6

Whenever I see a ratio situation, I see many fractional situations.

e.g. Here I see 4/6, 2/6, 4/2, 2/4, 6/2 and 6/4.



Grade 6

Writing a ratio a different way often is the key to solving problems.

e.g. Suppose I know there are 2 boys for every girl at some event. I know there are 18 kids and want to know how many are boys.

I think of 2/3 as 12/18.

So is there a list of essential understandings?

Yes and no.

I have my Marian lists in MathUp or in Big Ideas from Dr. Small or in Eyes on Math, but they are not everybody's.

How does it play for me when teaching?

The first place is in setting learning goals for the lesson.

The second is in choosing activities to lead me to those goals.

How does it play for me when teaching?

The third is in consolidation.

The fourth is in assessment of learning.

Setting Learning Goals

Here are examples of learning goals I have set to fit the Grade 1 curriculum expectations.

Setting Learning Goals

Here are examples of learning goals I might set to fit the Grade 1 curriculum expectations.

Measurement

Instead of just that kids will compare two or more objects using measurable attributes, I might focus on the notion that when you compare the size of two objects based on one attribute, it does not always tell you how they compare on another attribute.

Position

Instead of just that kids describe relative location of objects using positional language, I would want a learning goal that helps kids understand that many descriptions of relative location can be said more than one way (either in front or behind; either under or over,…)

Grade 3

Instead of just that kids describe the relationships between coins and bills up to $10, I would want the learning goal to be that students realize it takes more smaller value coins than bigger value coins to show an amount.

Grade 3

Instead of just that kids solve problems involving the subtraction of two-digit numbers using a variety of mental strategies, I would have a learning goal that students can see why you use different decompositions of numbers to perform different mental subtractions and that sometimes we decompose both numbers, but sometimes only one.

Grade 5

Instead of just that kids represent and compare fractional amounts that include improper fractions and mixed numbers (same denominator), I would want kids to realize that mixed numbers are more useful than improper fractions to give you a sense of size of numbers.

Grade 7

Instead of just that kids add and subtract fractions with simple like and unlike denominators, I would want a learning goal where kids can tell me why the rule for adding fractions with the same denominator makes sense and why it’s so hard to tell the size of the answer when denominators are different.

Your turn

Each team needs to choose one or two expectations or cluster of expectations that you might address by being much more clear about a learning goal which is about an idea that is learned.

Choosing activities to lead to a learning goal

Once I have a goal, it should make it easier to choose an appropriate activity.

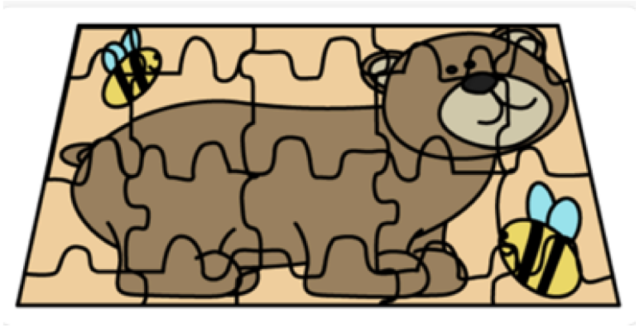
For example…

My learning goal in Grade 6 of 7 might be that the child can relate the numbers, variables and operation signs in an equation to what is going on in a real situation.

For example…

Here might be my task:

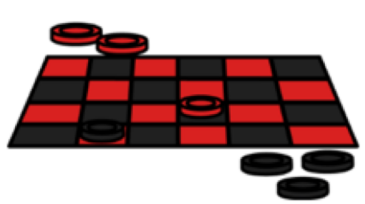
For example…



$12

$9

$6



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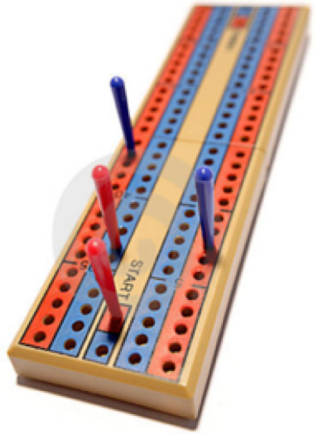

$10

For example…

The task:

- Choose one, two or three items from the flyer. Decide how many of each item you want to buy and calculate the total cost.

- Write an equation to describe what you just did. Use a different variable for the price of each type of item you choose to buy.

For example…

The task:

- Have a classmate figure out which items you had in mind based on your equation.

Consolidation

So how would I consolidate?

It would NOT be about just sharing strategies.
It would be about asking questions to lead DIRECTLY to my learning goal.

Consolidation

My questions:

- After posting some of the equations students created:
- Look at some of the equations your classmates wrote. How could you tell how many different types of items they bought?

Consolidation

My questions:

- How could you tell how many of each type they bought?
- What part of the equation told you how much they spent?
- What operation signs were in your equations? Why those?

A Primary example

My learning goal:
There are many numbers that might meet the same place value criteria. There are relationships between the numbers that work.

My task

- Create three numbers to meet each rule.
- Create three that do not.

My task

- Rule 1: There are more ten-sticks than one-cubes.
- Rule 2: There are exactly three more one-cubes than ten sticks.

My consolidation

- Who thinks they have one of the smallest numbers that satisfy the rule? Why?
- The greatest? Why?
- If a number works, will it also work if you switch the tens and ones?

My consolidation

- How do you get from one number that works to another that works?
- Can two numbers in a row ever work?
- Can every number be represented with different numbers of ten sticks?

The “steps”

- Choose a learning goal that is based on deeper understandings.
- Choose an activity to lead there.
- Consolidate with questions that don’t mince words and get right at those ideas.

Another

Families made 9 pans of lasagna for a reading sleepover event.
Each lasagna was cut into 10 equal pieces.
After supper, there were a few full lasagnas left over and 3 pieces of another lasagna.

1. How much lasagna might have been eaten? Write your answers in the following form using decimals:

   □.□ lasagnas

   List all possible answers.

2. Show or explain how you figured out your answers.

Another

1. How do you know that the total amount of lasagna eaten is □.7?

2. a) What is the least number possible for the amount of lasagna eaten? Why?

   b) What is the greatest number possible? Why?

3. Why do you get the same digits when you subtract 2.3 from 9 as when you subtract 23 from 90?

4. a) What are some strategies for subtracting 2.3 from 9?

   b) How could you estimate to check your answer?

Another example

Suppose the median of a set of eight numbers is half of the greatest number in the set of data and it is four times as much as the least number.

1. What might the data set be?
   List three or four possible solutions.

2. For which of your data sets, if any, do you think the median is a good summary of the whole set of data?

The consolidation

1. Think about how the greatest number you chose compared to the least number.
   Was it more than 10 times the least number?
   Or was it less than 10 times the least number?
   How could you have predicted that?

2. What is the least possible value the median could have?

The consolidation

3. How did you construct your set of numbers? Did you start with the least number, the median, or the greatest number?
   Did it matter?

4. Did your median have to be one of your data values?

5. Do you think the median is a good summary of the whole set of data? (A summary is a way to use just a little bit of information to describe a lot.) Explain your thinking.

Your turn

Think about the consolidation you might do around this activity:

Your turn

- Make an animal with pattern blocks.
- Start a pattern that uses at least three of the blocks in your animal and some more blocks too.
- Tell why it is a pattern.

Your turn

Think about the consolidation you might do around this activity:

You add two fractions.
The sum has a denominator of 15.
What might the fractions have been? Think of different combinations of fractions.

Assessment

Assessment needs to match instruction.

Teaching with intention means assessing with intention.

Assessment

If your real goals in math is just “doing it”, you will have mostly knowledge items with some application thrown in.

Assessment

But if your goal is to build math thinkers, you will focus much more on understanding and thinking questions.

Knowledge vs understanding

Knowledge: Write number pairs that add to 10.

Understanding: How do you know that 6 + 7 has to be more than 10 WITHOUT figuring out what it is.

Knowledge vs understanding

Knowledge: Represent 412 with base ten blocks.

Understanding: How do you know that you can represent both small numbers and big ones with 8 base ten blocks?

Knowledge vs understanding

Knowledge: Represent 412 with base ten blocks.

Understanding: How do you know that you can represent any 3-digit number in LOTS of ways using base ten blocks?

Knowledge vs understanding

Knowledge: Order from least to greatest:
3/5 7/9 1/8 5/3 4/7

Understanding: Is it easier to tell which fraction is greater when you compare 1/7 and 5/10 OR when you compare 1/3 and 3/8?

Understanding questions…

derive from the ideas you were going after in your lessons.

Your questions….

I have put a lot on your plate.
Ask any questions you might have.

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