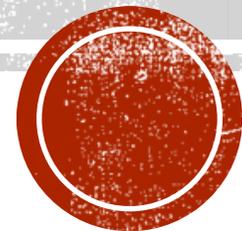


GROWING AS A MATH TEACHER

Marian Small

March 2017



AGENDA

- Big ideas
- Intertwining number sense skills into other strands
- Consolidation skills



WHY BIG IDEAS

- To interpret curriculum in a meaningful way.
- To differentiate instruction

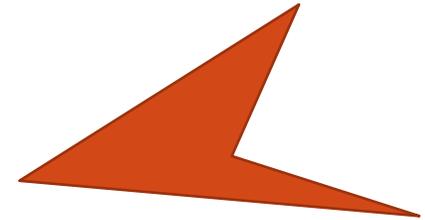
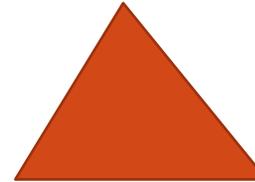
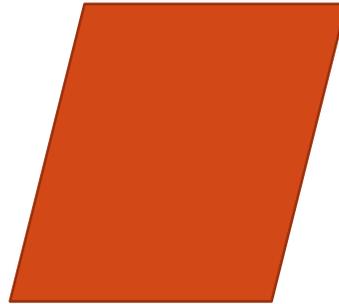


WHAT ARE THE MOST IMPORTANT GEOMETRY IDEAS?

- Different attributes of shapes and figures can be used to sort and classify them.



WHICH OF THESE SHAPES DOES NOT BELONG?



WHAT ARE THE MOST IMPORTANT GEOMETRY IDEAS?

- Different tests can often be used to determine if an object is a certain kind of shape or figure.



ARRANGE YOURSELVES

- Arrange a yarn loop into a square.
- How could you test to see if it really is a square?



WHAT ARE THE MOST IMPORTANT GEOMETRY IDEAS?

- Any shape or figure can be represented in many ways. Each highlights something different about the shape or figure.



BUILD A CUBE

- Using playdo
- Creating a skeleton
- Making a net



WHAT ARE THE MOST IMPORTANT GEOMETRY IDEAS?

- Composing and decomposing a shape or figure can provide information about it.

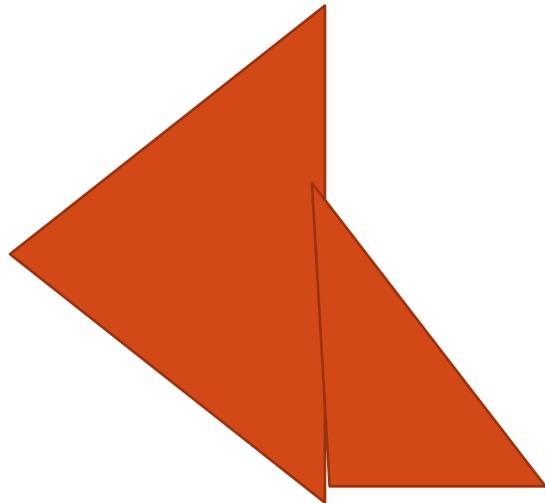
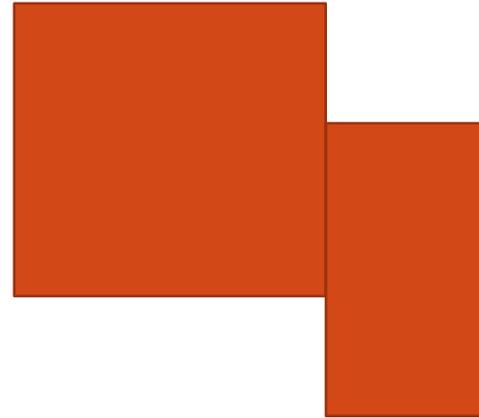
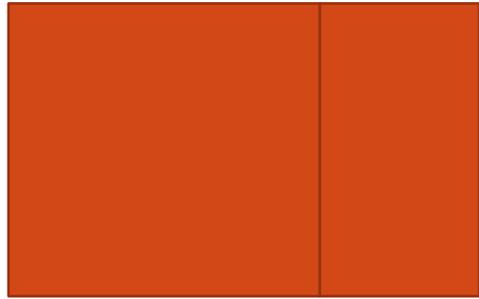


THINK ABOUT THIS

- A shape is made by using a full shape and then another half of it.
- What could the shape be?



MAYBE



WHAT ARE THE MOST IMPORTANT GEOMETRY IDEAS?

- Shapes and figures can be transformed in a variety of ways without affecting their size or proportions.



WHAT ARE THE MOST IMPORTANT GEOMETRY IDEAS?

- Different systems can be used to describe the location of objects.



WHAT ARE THE MOST IMPORTANT NUMBER IDEAS?

- That counting can be used to solve many mathematical problems
- A sense of how much
- The ability to represent numbers different ways
- The ability to compose/decompose/recompose numbers



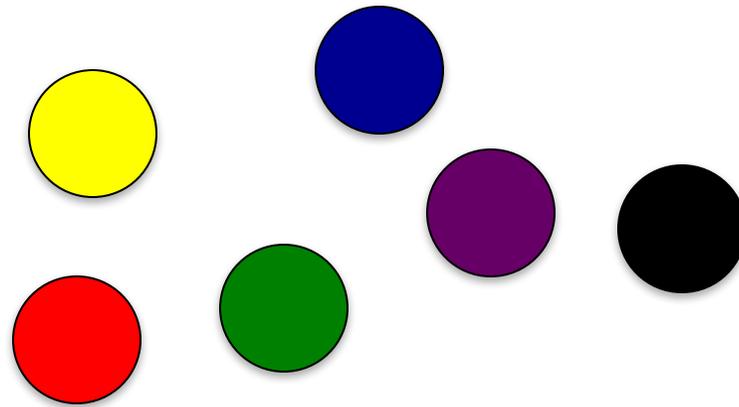
WHAT ARE THE MOST IMPORTANT NUMBER IDEAS?

- An understanding of what addition and subtraction mean and how they relate
- An understanding of what multiplication and division can mean
- How fractions, ratios, etc. relate



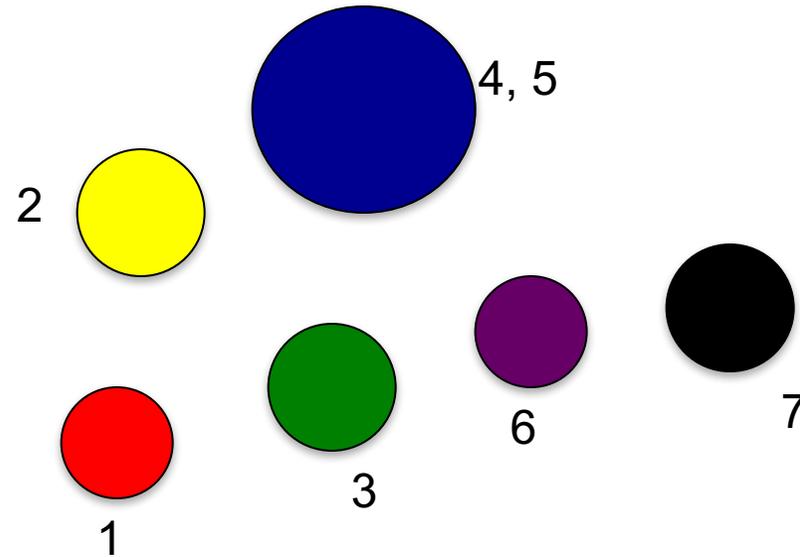
COUNTING ISSUES

- Which dot should you count first?



COUNTING ISSUES

■ Liam counted

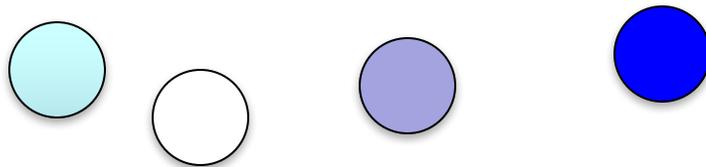
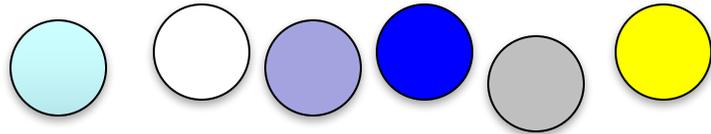


■ Do you agree?



COUNTING ISSUES

- Is this the same amount?



COUNTING ISSUES

- When you are on a number line and doing $4 + 3$, do you say 4, 5, 6 or 5, 6, 7 or 4, 5, 6, 7?

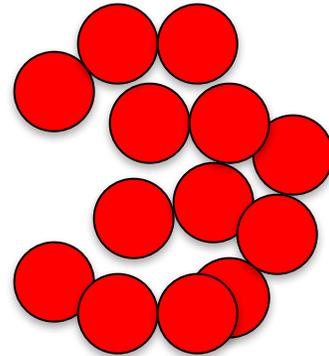
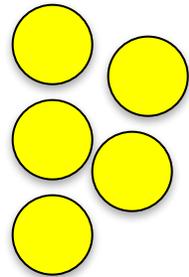


ONE-TO-ONE CORRESPONDENCE

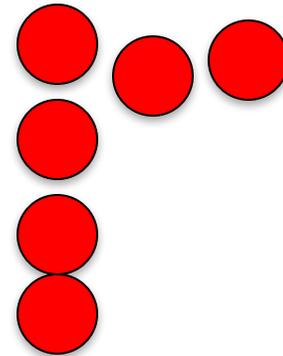
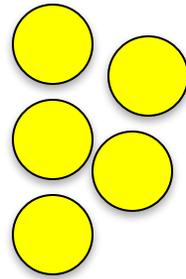
- When do you need it and when don't you?
- Do numbers have to be lined up?



WHICH IS MORE?



WHICH IS MORE?



WHICH IS MORE AND WHY?

■ 51 or 38?

■ $\frac{1}{2}$ or 91

■ $3\frac{1}{4}$ or $\frac{1}{3}36$



WHICH IS MORE AND WHY?

■ 5112 or 3802?

■ 1.2 or 9.1

■ 3.4 or $.36$



WHICH IS MORE AND WHY?

■ $3/5$ or $9/4$

■ $1/3$ or $8/11$



I MIGHT ASK

- A fraction has the denominator 50.
- Is it a big fraction or a little one or does it depend?
- If it depends, how does it depend?



A SENSE OF HOW MUCH

- There are a lot of people in a car. How many might that be?
- There are not many students in a school. How many might be there?
- Is 10 a lot or a little?
- A number is a lot more than 20. What might it be?
- A number is about 50. What might it be?



A SENSE OF HOW MUCH

- Where might you find about 500 people?
- A city is very small. What might its population be?
- Is 1000 a lot or a little?
- A number is a lot more than five twos. What might it be?
- A number is about 60 tens. What might it be?



A SENSE OF HOW MUCH

- When might you use the fraction $3/5$?
- What percentage would you call a lot of a whole?

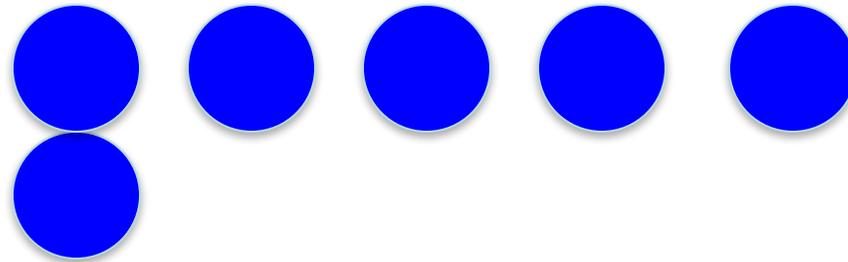
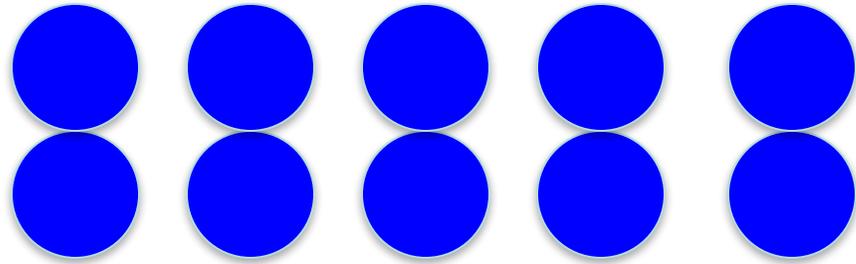


REPRESENTING NUMBERS

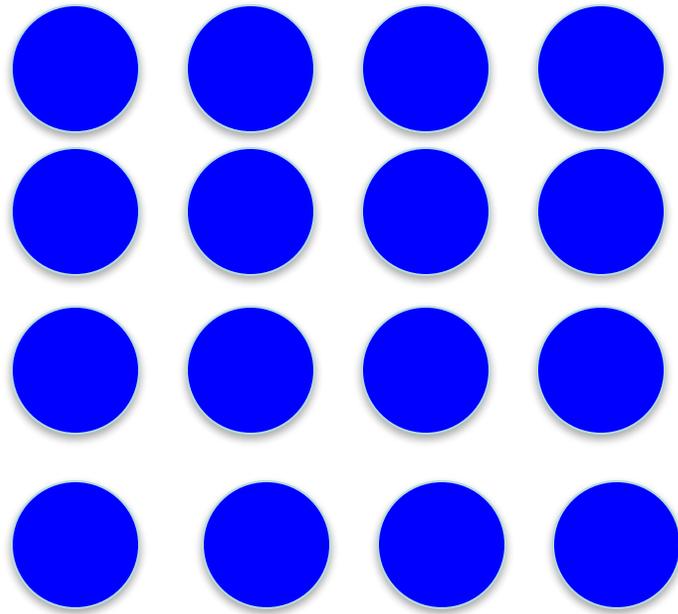
- Recognize that different representations of numbers tell you different things about them
- For example, what do each of these tell you about 16?



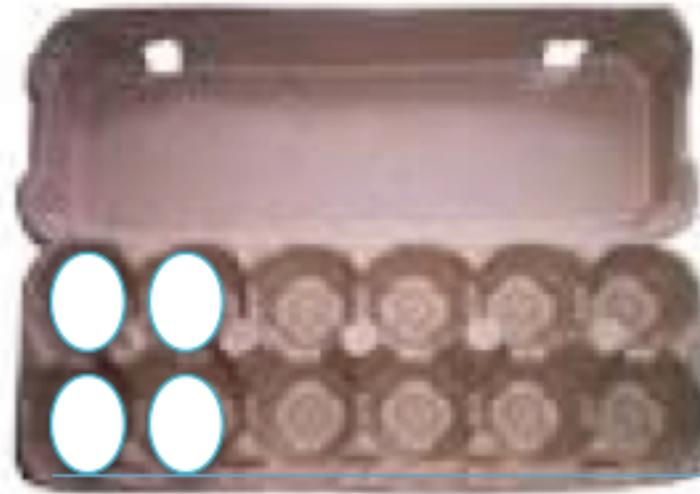
MAYBE



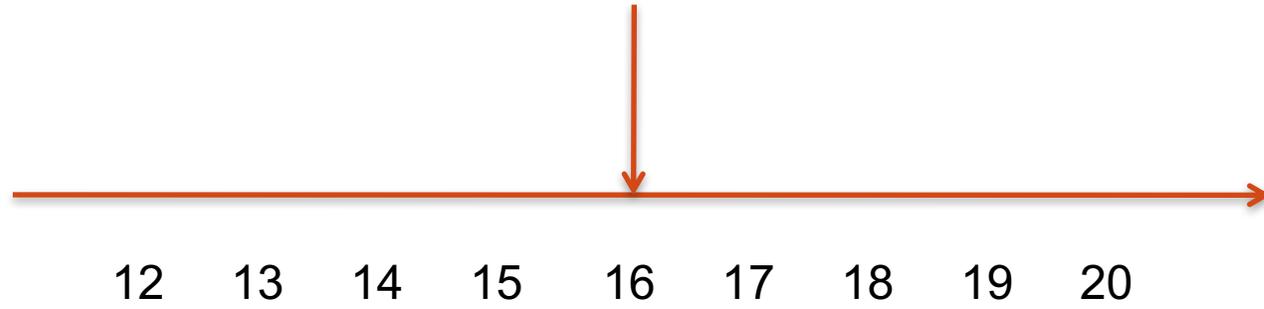
MAYBE



MAYBE



MAYBE



MAYBE

- $20 - 4$

- $8 + 8$

- $32 \div 2$



REPRESENTING NUMBERS

- The same is true for bigger numbers, e.g. 225.



WHAT DOES EACH TELL?

- $250 - 25$
- $\langle 9 \text{ quarters} \rangle$
- $450 \div 2$
- $200 + 20 + 5$
- $113 + 112$
- $\langle 45 \text{ sets of tally marks} \rangle$



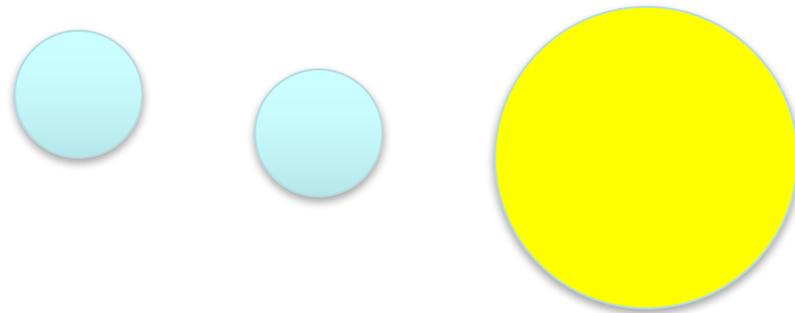
MAYBE

- You used 8 fraction pieces.
- Did you show more than a whole or less than a whole?



DIFFERENT REPRESENTATIONS FOR FRACTIONS

- What different sorts of pictures could you draw for $\frac{2}{3}$?
- Would this be included?



I COULD ASK

- Draw a picture that represents 25% or draw one that shows 90%.



DECOMPOSING AND RECOMPOSING

- I want students to realize that any number can be decomposed many ways and then recomposed another way.



I MIGHT ASK

- Use 20 counters.
- Arrange them into 3 piles so that:
 - A) the piles are close to the same size.
 - B) one pile is double the size of another
 - C) one pile is really big



I MIGHT ASK

- How might you break up the number 26 so that:
- It's easy to subtract from 75?
- It's easy to add to 38?



I MIGHT ASK

- I decomposed a number into 10s, 5s and 25s.
- What could the amount be?



I MIGHT ASK

- How could you think of 2500 as the product of 3 numbers?
- As the product of 4 numbers?
- How could you decompose 58 to show it is not prime?
- How might you break up the number 400 so that: It's easy to subtract 239 from it?



ADDITION AND SUBTRACTION

- I want students to know that addition is always about combining but that subtraction could mean different things



8 — 3 CAN MEAN

- Adding on to 3 to get 8
- Taking away 3 from 8
- Comparing 8 to 3



I WANT STUDENTS TO KNOW

- Adding and subtracting undo each other.
- That any subtraction can be computed by adding.
- That it is often useful to add or subtract in parts.
- Strategies for maintaining the same sum
- Strategies for maintaining the same difference



AN UNDERSTANDING OF \times AND \div

- What multiplication and division mean
- Multiplying and dividing undo each other.
- That any division can be computed by multiplying.
- That it is often useful to multiply or divide in parts.
- How to maintain the same product
- How to maintain the same quotient



HOW FRACTIONS, DECIMALS, RATIOS, PERCENTS RELATE

- I want students to realize that fractions, decimals and percents are all comparisons.
- I want students to realize that any ratio situation can be described by many fractions.
- I want students to realize that using equivalent rates or ratios is useful.



FRACTIONS, DECIMALS AND PERCENTS ARE COMPARISONS

- $2/3$ is a comparison between 2 and 3.
Any fraction equal to $2/3$ has a numerator $2/3$ of the denominator.
- The decimal $0.[] [] []$ is a comparison between $[] [] []$ and 1000.
- 42% is a comparison between 42 and 100.



INTERTWINING NUMBER SKILLS INTO OTHER STRANDS

- Some of it is automatic.
- You can't do much in measurement without number.
- You can't do much in pattern or data without number.



SOME SAMPLE TASKS

- The perimeter of a rectangle is three times as much as the length.
- What can the dimensions be?



SOME SAMPLE TASKS

- One pitcher of juice holds 4 times as much as another pitcher.
- What could the two capacities be?



SOME SAMPLE TASKS

- The 10th term in a repeating pattern is the same as the 22nd. How long could the core be?



SOME SAMPLE TASKS

- A growing pattern includes both the terms 48 and 102
- What could the pattern be?



SOME SAMPLE TASKS

- What would be a good scale for a bar graph to show this data?
- 38, 42, 17, 38, 19, 7, 55, 23



SOME SAMPLE TASKS

- The mean of a set of data is triple the median.
- What could the data set be?



MORE DELIBERATE ACTIONS

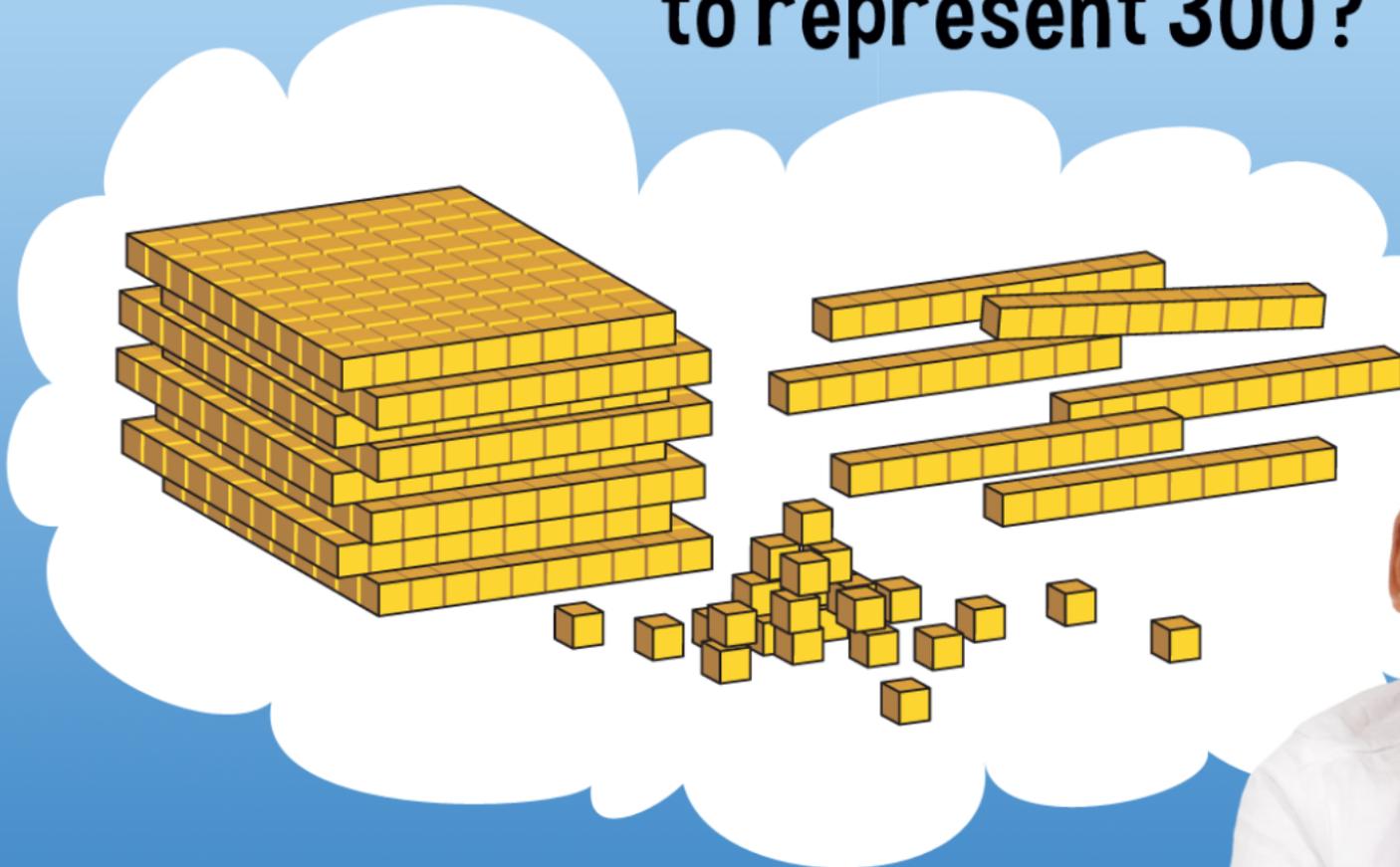
- Using number talks when not doing number strands.



SOME NUMBER TALKS



How many base ten blocks could you use to represent 300?



How would you figure out this sum?

$$448 + 352$$



3-ACT VIDEOS

- <https://gfletchy.com/the-cookie-monster/>



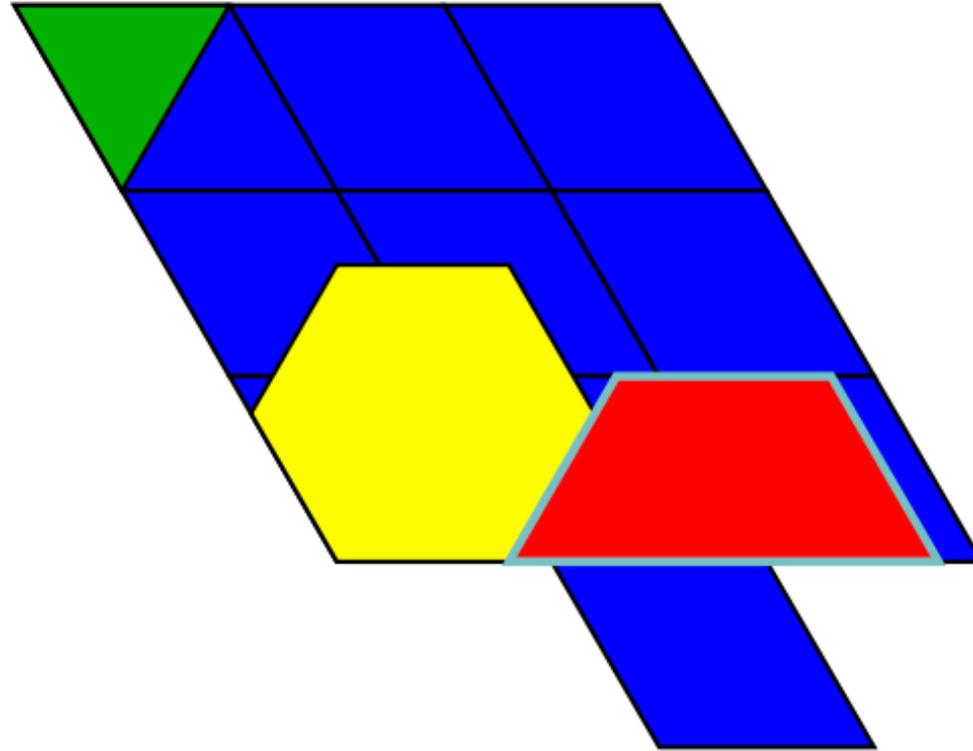
CONSOLIDATION

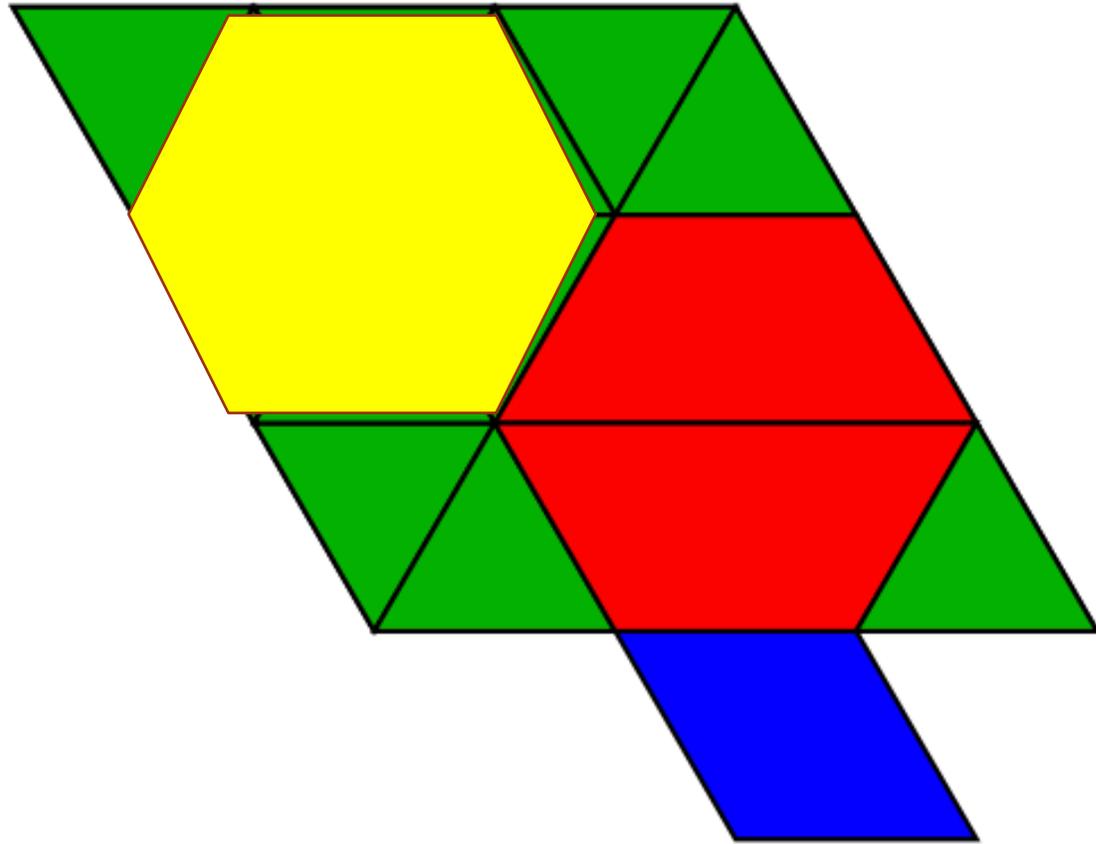


AN EXAMPLE

- The main task for a grade 1 lesson might have been:
- Use at least four different colours of pattern blocks to create a design that has an area of about 10 blue blocks. How do you know your area is correct?







CONSOLIDATE

- Some of you did not have many green. Some of you had a lot. Who do you think used more blocks? Why?
- What is the most number of blocks anyone could have used?
- What is the least?



CONSOLIDATE

- Why can different looking shapes have the same area?



AN EXAMPLE

- The main task for a grade 3 lesson might have been;
- Use 10 counters, different colours if you wish.
- What fractions are you showing?



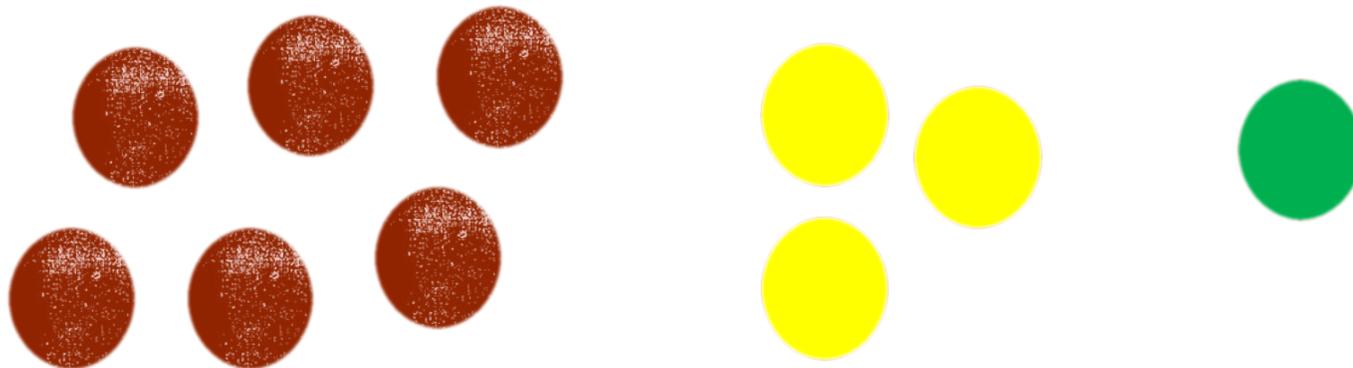
CONSOLIDATION

- Many of you said $4/10$ or $6/10$ or $7/10$.
Why did so many people say tenths?
- Did you have to say tenths?



CONSOLIDATION

- (No, since we want to raise equivalent fractions, e.g. half are yellow OR we could look at the fractions that compare parts, e.g. $\frac{1}{3}$ as many greens as yellows)



GRADE 6 PLACE VALUE

 How many words might you use to write a number less than 100 000? Give an example for each possible number of words. When would you use a lot of words? When would you use only a few words? How do you know there are no other possibilities?



SOME ANSWERS THAT MIGHT ARISE

- 12 one word
- 25 two words
- 103 three words
- 148 four words
- 24 100 five words
- 36 102 six words
- 78 132 seven words



CONSOLIDATE QUESTIONS

- Do bigger numbers take more words always? sometimes? Never?
- Can a big number take not many words? How?
- Does the number of digits influence the number of words? How?
- How do you know there can't be more than 7 words for numbers under 100 000?



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