What should K-6 math look like?

Marian Small

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Agenda

- Classroom environment
- The math to focus on
- The 3-part lesson
- Critical thinking
- Differentiation of instruction

The classroom

- Lots of student conversation /debate about mathematics
- Kids working in pairs/groups
- You could set up debates.
- e.g.., I might ask:

The classroom

- Jason says that you can’t get a little answer when you subtract two big numbers.
- Lia says you can.
- With whom do you agree? Why?

The classroom

2 truths and a lie– which is the lie?

1. A number that takes 4 words to say can be greater than a number that takes 7 words to say.
2. A number with more digits is always greater.
3. You can represent 1000 with 19 base ten blocks.

The classroom

- A safe environment- mistakes not a big deal
- Lots of use of thinking tools, whether manipulatives or technology

Most valuable tools for number work

- Counters
- Ten-frames
- Cuisenaire rods
- Linking cubes
- Hundred charts
- Base ten blocks
- Hundredth grids
- Thousandths grids
- Fraction pieces
- Pattern blocks

Counters

- A task might be:

- Take 20 counters.
- How can you arrange them in 3 piles so that the piles are close to equal in size?
- How can you arrange them in 2 piles so that one pile is about double another pile?

Counters

- You have red, blue and green counters.
- You have 2 more red ones than blue ones.
- You have 3 more green ones than blue ones.
- How many of each colour might you have?
- How many altogether?

Counters

- You have a bunch of counters.
- Almost half are red.
- How many of what colours might you have?

Counters

- You have red, green and blue counters.
- The mean (average) number of counters for a colour is 10.
- How many of each might you have?

Hundred chart

You might ask:

- What number might be in the bottom left quarter of the chart?
- What numbers is 34 near?
- How could you use the chart to add 43 + 25?
- How could you use the chart to figure out 62 – 18?
- What would happen if you coloured all numbers including the digit 2?

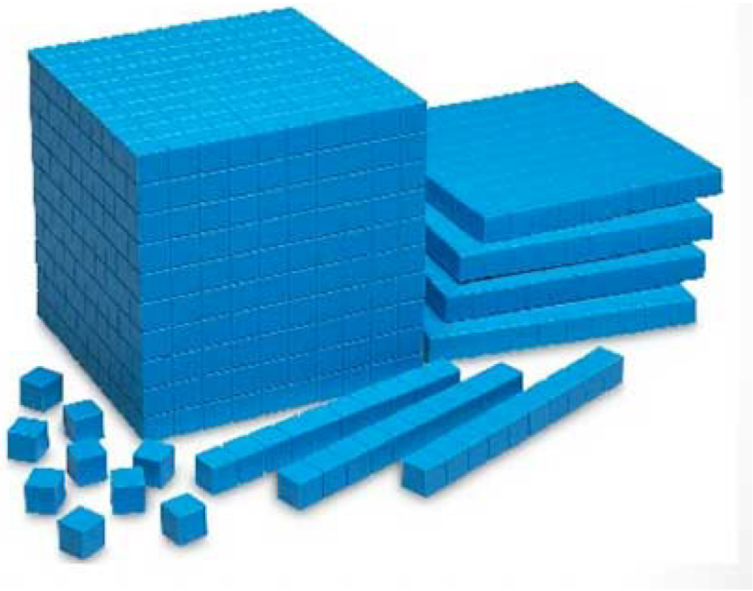
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Base ten blocks

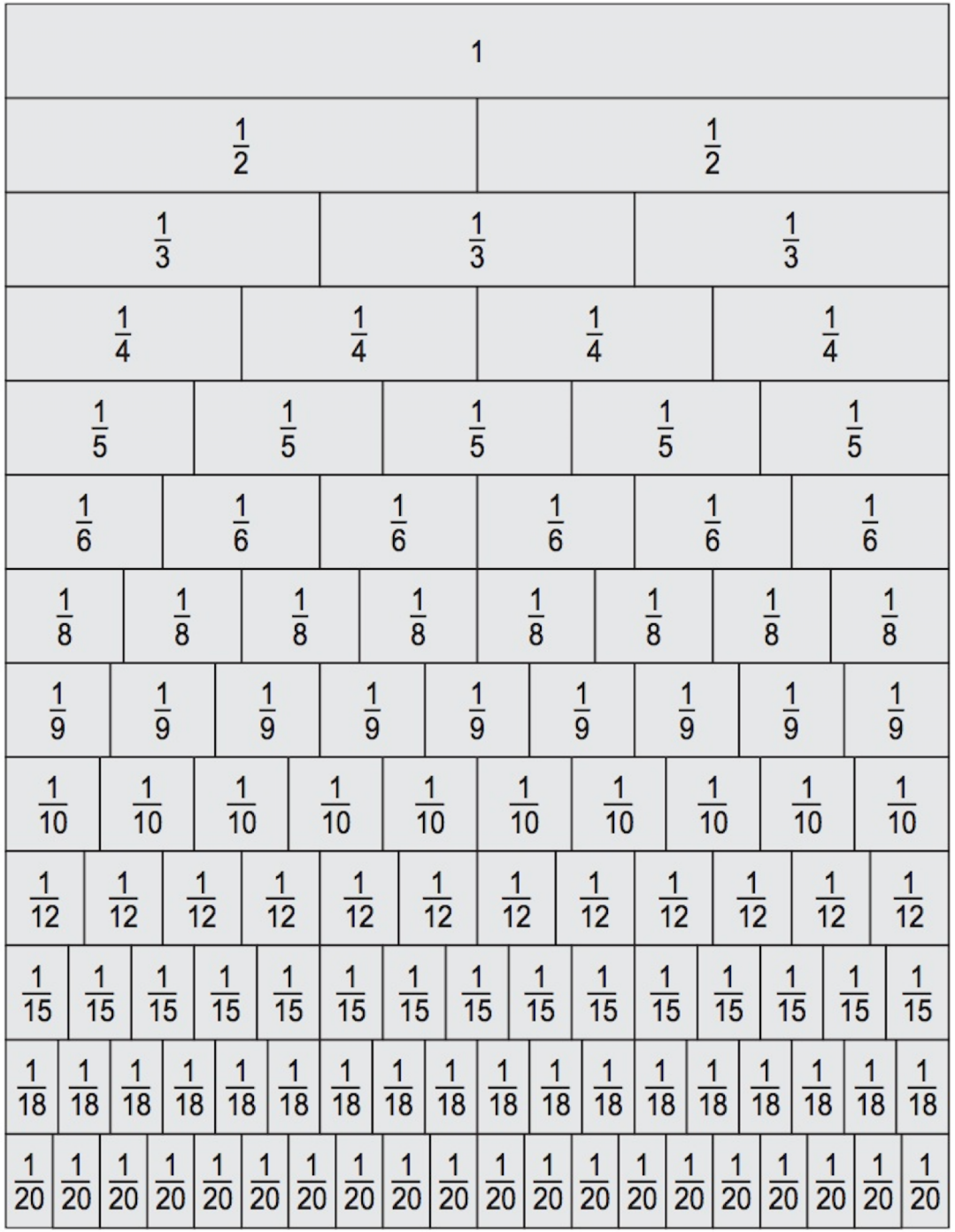
You might ask:

- What numbers can you represent with 12 blocks?
- What numbers can you represent with a lot of sticks and only a few small cubes?
- How can you use the blocks to figu
- How can you model :

- 4 x 32?
- 24 x 32?



Fraction To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Fraction Strips

You might ask:

- What equivalent fractions do you see?
- Name fractions a little more than 2/3.
- What fraction is about half as big as which other one?
- What fraction is about 1 1/2 times as big as which other one?

The classroom

Curiosity is piqued.

- How long is long hair?
- How many text messages does a typical 12 year old send in a year?
- How much recycling does your school do?

The classroom

- Accessible tasks with high ceilings

I might ask:

- Choose two numbers so that when you add them, the answer is double when you subtract them.
- Come up with at least a few answers.

The math to focus on

- The seven processes require attention no matter the grade level.
- Students need opportunities to:
- Problem solve
- Communicate
- Reason
- Reflect
- Connect
- Represent
- Select tools and strategies

The math to focus on

- Each expectation requires “interpretation”.
- Teachers have to decide they are focusing on what is important.
- For example… Grade 1:
- Estimate, measure and record lengths, heights and distances
- What are the most important markers for you that the student has been successful on this expectation?

It might be

- How reasonable are their estimates? (i.e. can they relate two measurements to each other)
- Do they use unit size as a factor?
- Do they recognize bad measuring vs good measuring?

It might be

- Do they have a good sense of which attributes matter and which don’t when they measure?
- Do they realize units need to be the same size and why?
- Do they choose appropriate units?

It might be

- Do they know what to do if they don’t have enough units?
- Do they know what to do if the fit is not perfect?

So a task might be

- Maybe we provide some paper clips–maybe 4 of one size and 5 of another.
- Ask them to predict something that will be about 20 paper clips long.
- Explain their prediction.
- Test it.
- Then ask how the answer would change with this paper clip? (show a giant one)

Or it might be Grade 4

- Describe relationships that involve simple whole number multiplication
- What are the important markers?

It might be

- That some numbers are whole number bunches of other numbers, but some are not.
- That one number can be, e.g. twice another and A LOT more than it or NOT A LOT more than it.
- That visually saying one number is twice or three times or four times another is saying that if the first number of counters is in each box, I have 2 or 3 or 4 of those boxes.

So my task might be

- You add a number to its triple.
- List a bunch of possible sums- some big and some small.
- List a bunch of numbers that could not be the sums- some big and some small.
- Why do these answers make sense?

The 3-part lesson

- Getting started
- Action
- Consolidation

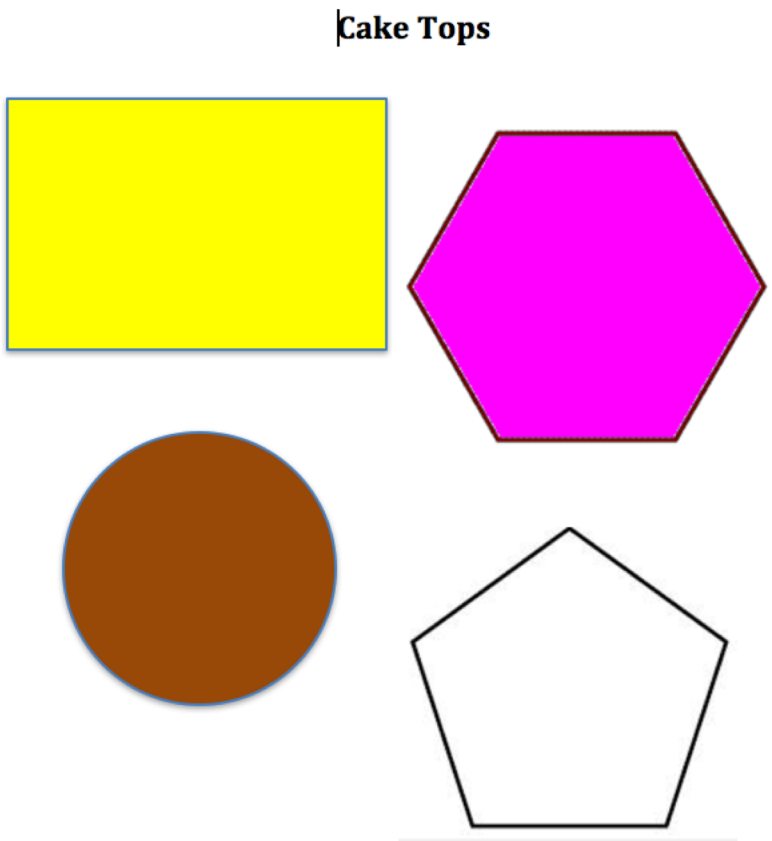
- The action is a problem that is focused on a meaningful learning goal.
- The consolidation is planned to bring out the big ideas based on the work on the action but about the learning goal.
- The getting started is planned last to provide a way into the action.

An example

- **Getting Started:**
- <We provide kids with some fraction materials, e.g. four colour square tiles, fraction strips, fraction circles; pattern blocks; a number line from 0 to 1>
-
- Ask: What are some things you know about the fraction two thirds?
- Show what two thirds might look like.

An example

- **Main Task:**



An example

- Cut each cake into a DIFFERENT NUMBER of slices.
- For each cake, decide on how many slices to keep and how many to give away, but:
- You have to give away MOST of the cake.
- You have to give away a DIFFERENT NUMBER of slices for each cake.
- Tell what fraction of the cake you gave away and what fraction you kept. And how you know those fractions are correct.

An example

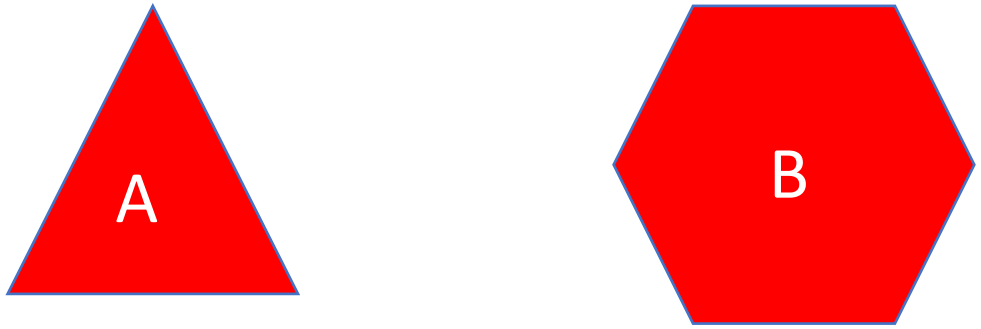
- Did the shape of your cake make any different in deciding how many slices to cut it into? Explain.
- Look at the fractions you wrote.
- What does the denominator of each fraction tell?
- What the numerator tell?
- Were the numerators and denominators closer together for the slices you kept or the slices you gave away? Why?

An example

- Look at the pairs of fractions you wrote for each shape.
- What do you notice about the numerators in each pair?
- Suppose you cut the cakes into a different number of equal slices. Would your fractions change? How?
- What fractions would you use if you gave away the whole cake?

Critical thinking

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



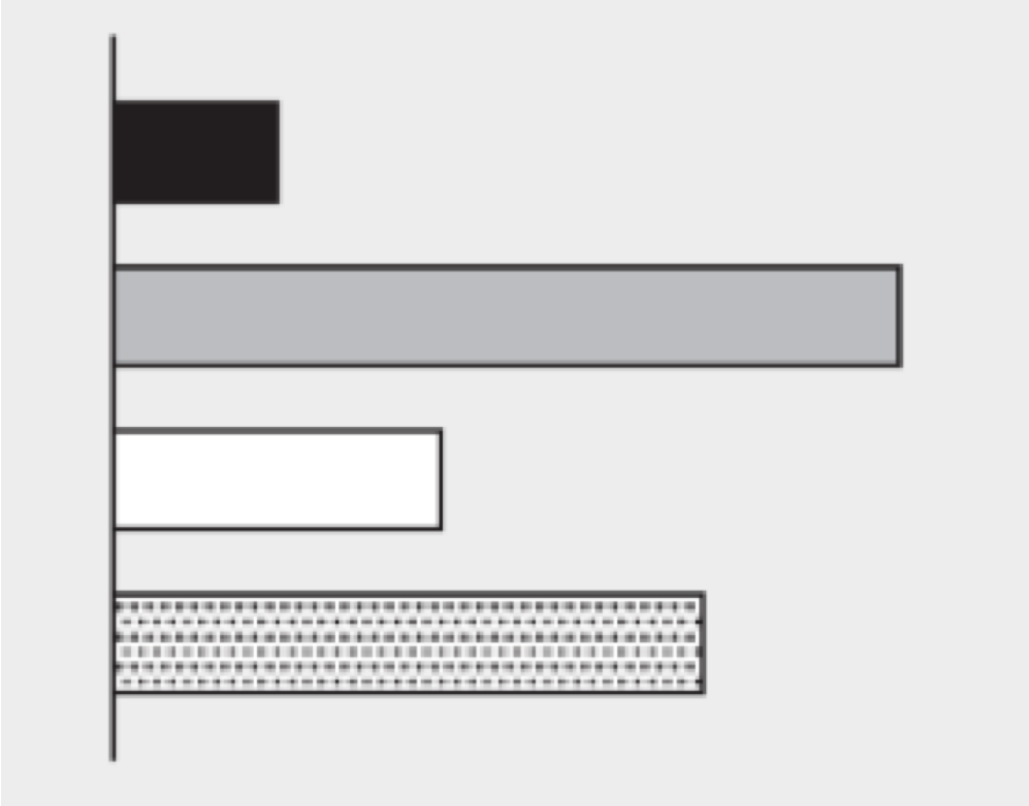
Critical thinking

- There is a plate with a LOT of cookies.
- You think it is VERY EASY to share them equally onto either 3 plates or 5 plates.
- How many cookies might there have been?

Critical thinking

- Which is a better description of how far away your birthday is?
- Is it 50 days?
- Is it about 7 weeks?
- Is it almost 2 months?
- Why is it better?

Critical thinking



Critical thinking

- How could 1000 be a lot?
- How could it be a little?

Critical thinking

- Who doesn’t belong?

- 11
- 14
- 23
- 17

Differentiation

- The strategy I count on the most is the use of open questions.
- I also use parallel tasks.

Open questions

- The answer is 100.
- What might the question have been?

Maybe

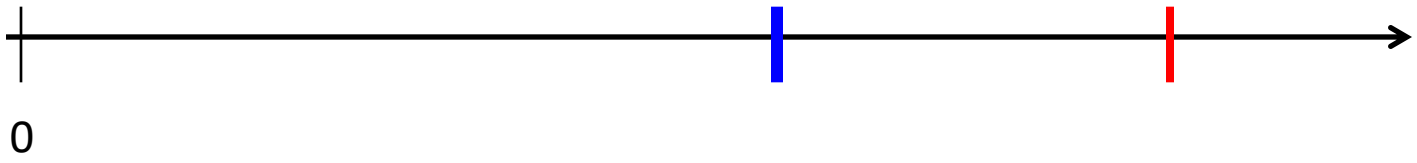
- How old is really old?
- What is the first 3-digit number?
- What is a number with a digit sum of 1?
- What is 10 x 10?
- What comes after 99?
- What is a perfect score on a test?
- What is an easy number to multiply by?

More examples

- The 10th shape in a pattern is a red triangle.
- What could the pattern look like?

More examples

- Choose a number for the red mark. Then choose an appropriate number for the blue mark.



More examples

- A number is just A LITTLE more than ½.
- What might it be?

More examples

- ____ is 4 times as much as _____.
- What could go in the blanks to make this true?

- Then, ask:
- Was the first number bigger or the second one?
- Could they have been equal?
- Was the second number more or less than half of the first?
- Could the first number have been 20?
- Could the second one?
- How about 21?

More examples

- Two fractions are equivalent.
- One has a numerator and denominator that are fairly close together.
- The other has a numerator and denominator that are really far apart.
- What could they be?

More examples

- You buy an item and give the clerk one bill. Your change is one bill and 6 coins.
- What might the price have been?

Parallel tasks

- Very similar tasks that differ only in complexity, but address the same ideas.
- They can be debriefed using common questions.
- For example…

Choice 1: Choose a number to subtract from 20. Draw two different pictures that would help you figure out the result.

Choice 2: Choose a number to subtract from 5. Draw two different pictures that would help you figure out the result.

- *How did you decide what number to choose?*
- *Could you have predicted about how much your answer would be?*
- *How do the pictures show the subtraction?*
- *How are your pictures alike? How are they different?*

Choice 1: Choose two 3-digit numbers to add for a total close to 400. How could you use base ten blocks to help you add?

Choice 2: Choose two 2-digit numbers to add for a total close to 40. How could you use base ten blocks to help you add?

- *How would you model the total you were trying to get close to?*
- *What would you do to show a number close to that number?*
- *How did you select the two numbers to make that total?*
- *How did using the blocks make the problem easier to solve?*

Lisa's dad was driving 16 miles every 15 minutes.

Choice 1: How far would he drive in 20 minutes?

Choice 2: How far would he drive in 2.5 hours?

- *Why was it more helpful to know the distance for 15 minutes than for, say, 17 minutes?*
- *What other numbers of minutes would it be very easy to figure out the distance for? Why those amounts of time?*
- *Is it possible to figure out the distance for any number of minutes or only certain numbers?*

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