What should an elementary math classroom look like in 2019?

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Agenda

- Classroom environment
- The math to focus on
- Consolidating the math in a lesson
- Critical thinking
- Differentiation of instruction

The classroom

- Lots of student conversation /debate about mathematics
- Kids working in pairs/groups
- 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?

OR

The classroom

- It's always easier to add littler numbers.

The classroom

2 truths and a lie– which is the lie?

1. There is no number in the 90s that you can represent with 3 more base ten units than rods.
2. The only way to represent 47 is with 11 base ten blocks.
3. You can represent 22 with 13 base ten blocks.

The classroom

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

Lots of tools

- Thoughtful use of both manipulatives and digital resources

Counters

- 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 twice as high as another pile?

Counters

- Take 20 counters.
- How can you arrange them in 3 piles so that there is 1 really big pile and 2 small ones?

Counters

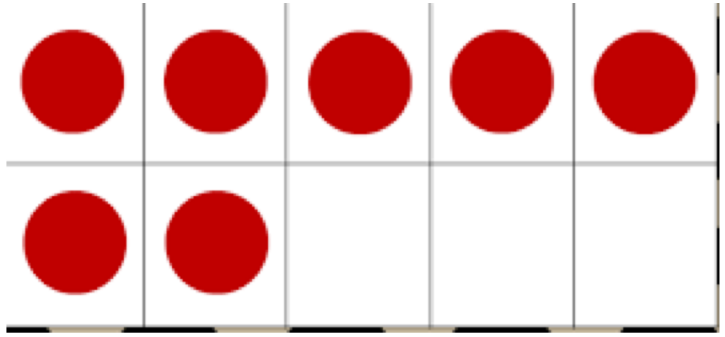
- You have red, blue and green counters.
- You have 2 more red ones than blue ones.
- You have 3 more green ones than blue ones.
- How many of each colour might you have?
- How many altogether?

Counters

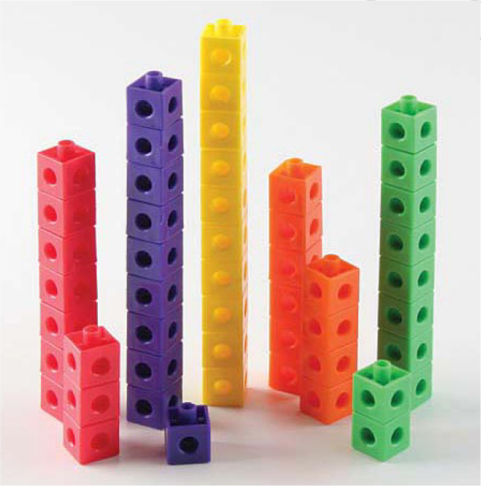
- You can show a number by putting out counters in the form of a triangle.
- What numbers can you make?
- Which are harder to make?

Ten-frames

- How could you use 10-frames to help you figure out pairs of numbers that add to 10?
- How could you use 10-frames to show why 8 + 9 = 17?
- What numbers could you show if you fill 3 ten-frames and part of a fourth one?



Linking cubes



- How could you show 43?
- How could you show that 12 – 4 = 13 – 5?
- What total lengths can you have if you use 3 colours and consecutive amounts for the colours?

Hundred chart

- 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?

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

Hundred chart

- 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
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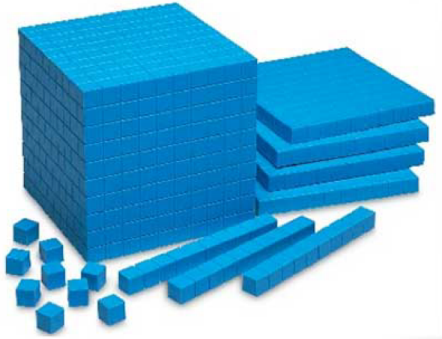
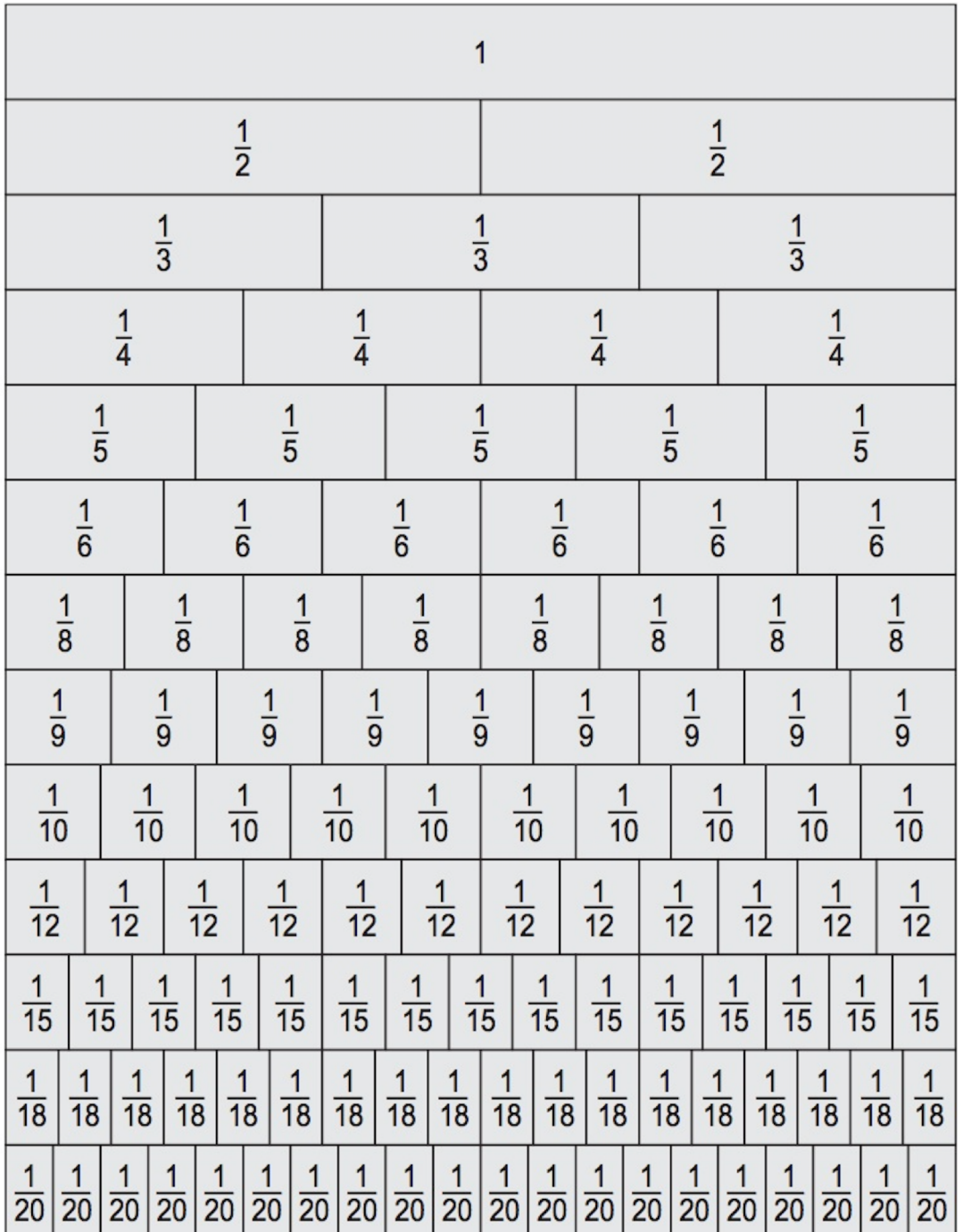
91	92	93	94	95	96	97	98	99	100



Base ten blocks

- 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 figure out 132 – 48?

Fraction Tower



Fraction Strips

- What do fractions that are 3/[] look like?
- Name fractions a little more than 2/3.
- What equivalent fractions do you see?

The classroom

- Teachers leave the “work” to the students.
- High expectations

The classroom

Curiosity is piqued.

- How long is long hair?
- What is a number that takes a lot of words to say?
- How many pop cans would it take to balance a basketball?

The classroom

- Accessible tasks with high ceilings

I might ask:

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

The classroom

- Feedback – more questions, less marks

The math to focus on

- Each outcome requires "interpretation".
- Teachers have to decide they are focusing on what is important.

The math to focus on

- For example… Grade 1 Length
- Students will be expected to demonstrate an understanding of measurement as a process of comparing by:
- -identifying attributes that can be compared
- - ordering objects
- - making statements of comparison
- - filling, covering or matching

The math to focus on

- Performance indicators
- Identify common attributes, such as length,…. that can be used to compare a given set of two objects.
- Compare and order two given objects and identify the attributes used to compare.
- Predict which object in a set is longest/shortest, determining by matching and explain the reasoning.

It might be

- Do they always have to predict longest/shortest or only some times?
- Should there ever be indirect measurement? How much if any?
- Should we “trick” kids with wiggle or curly things or items hidden behind barriers?
- Should there be more emphasis on comparing or ordering?

So a task might be

- One object looks longer than another, but it really isn't.
- What could they be and why would that happen?

Or it might be

- How could you figure out whether the window is taller than how wide the whiteboard is?

Or it might be Grade 3

- Students will be expected to demonstrate an understanding of fractions by:
- Explaining that a fraction represents a part of a whole
- Describing situations in which fractions are used
- Comparing fractions of the same whole with like denominators.

Performance indicators

- Describe everyday situations where fractions are used.
- Represent a given fraction concretely or pictorially.
- Identify, model and explain the meaning of the numerator and denominator.
- Sort a given set of diagrams of regions into those that represent equal parts and those that do not, and explain the sorting.

Performance indicators

- Name and record the fraction represented by the shaded and non-shaded parts of a given region.
- Compare given fractions with the same denominator using models.

It might be

- Does that mean we avoid fractions like fifths which rarely, if ever, occur in everyday life?
- Is the only model areas or regions or do we want number lines or masses or capacities, too?
- How important are the terms numerator and denominator?
- Do we focus on exact with pre-divided amounts or do we focus on estimation?
- Do we ask as much for “which is less?” as “which is more?”

So my task might be

- A pizza is cut into 8 slices.
- Andy had 3 fewer slices than Brent.
- What fraction of the pizza could each have?
- OR

So my task might be

- What fractions might make sense for this dot? Why?

Consolidating the math

- When we teach a lesson, there are ideas we want to ensure students meet.
- Without "lecturing", how do we set a task for students to do and then make sure those ideas come to the surface?

Grade 2 example

- I am teaching a lesson about using personal strategies to subtract numbers under 100.
- I want students to focus on the strategies and why they work and why they are selected.

My task

- I was solving two different subtraction problems and the answers were both 15.
- But I figured out the two answers really different ways.
- What numbers might have been involved in my problems and why would I have used different ways?

My consolidation

- What could the equations have been if there was a subtraction and the answer was 15?
- Why might someone say that it is much easier to figure out 30 – 15 than 41 – 26? Do you think it is?
- Would you use the same strategy to solve these: 55 – 40 and 32 – 17? Explain what you would do each time.

Critical thinking

- There are two plates of cookies.
- One has a LOT more cookies than the other.
- How many might be on each plate?

Critical thinking

- You show a number with a LOT more ten rods than one cubes.
- What could the number be?

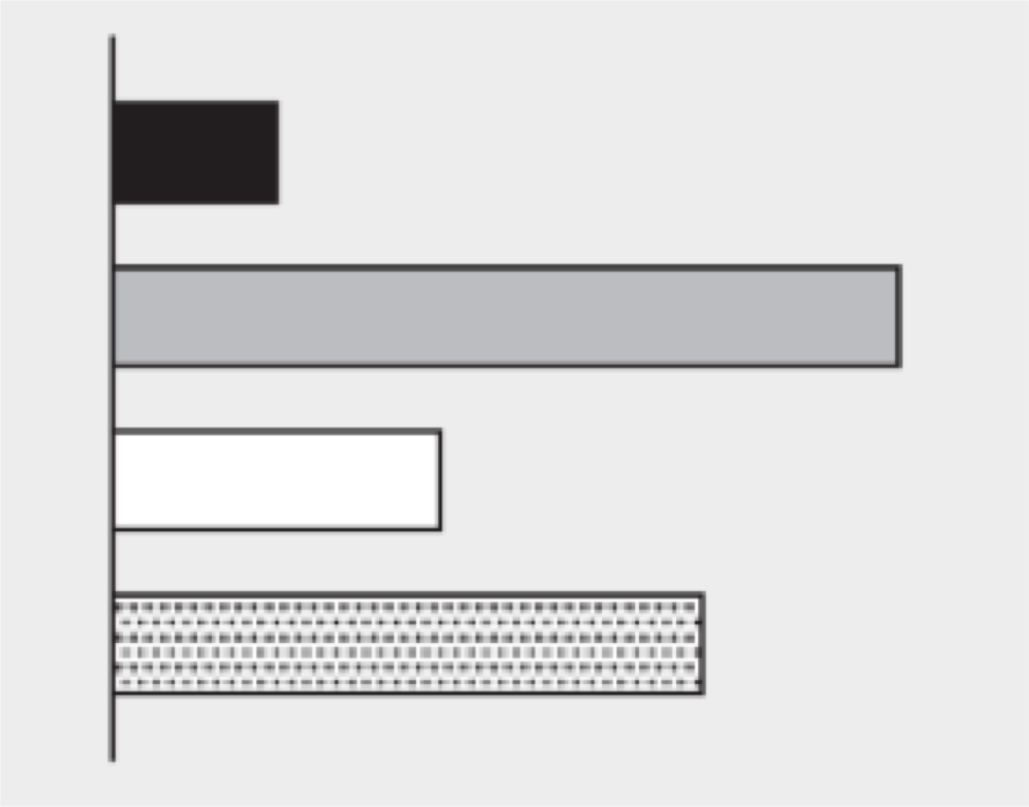
Critical thinking

- An amount you can show with 6 coins is added to an amount you can show with 3 coins.
- How many coins might you NEED to show the sum?

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 10 tens?
- What comes after 99?
- What is a perfect score on a test?

More examples

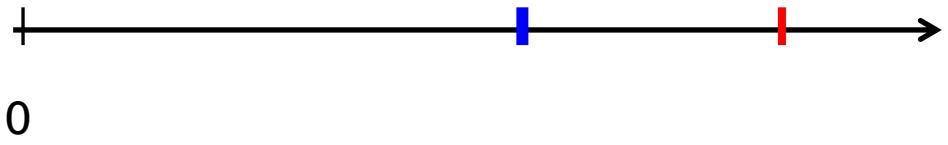
- There are a LOT of people in a car. How many might that be?
- There are NOT MANY students in a school. How many might there be?

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 more than _____.
- What could go in the blanks to make this true?

- Then, ask:
- Was the first number bigger or the second one?
- Could the first number have been 20?
- Could the two numbers be on different lines on a 100 chart?

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?*

Any questions

- Do you have additional questions you would like to discuss?

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