GROWING AS A MATH TEACHER

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AGENDA

- Teaching to Big Ideas
- Planning Topics/Lessons
- Teaching through Problem Solving

TEACHING TO BIG IDEAS

- Clustering expectations
- Choosing the two or three things you think matter most about a topic to help build lesson goals

CLUSTERING EXPECTATIONS

- For example: Gr. 1
- Compose and decompose numbers up to 20…
- Represent… whole numbers
- Solve a variety of problems involving + and –

CLUSTERING EXPECTATIONS

- For example: Gr. 4
- Solve problems involving the multiplication of one-digit whole numbers…
- Describe relationships that involve simple whole-number multiplication

CLUSTERING EXPECTATIONS

- For example: Gr. 7
- Represent linear growing patterns…
- Make predictions about linear growing…
- Develop and represent the general term of a linear growing pattern,…

CLUSTERING EXPECTATIONS

- Some of you have access to books called Open Questions for a 3-Part Lesson for either Number Sense and Numeration or Measurement and Pattern and Algebra

- Clustering is done for you (as one approach).

DECIDING WHAT MATTERS MOST

- When you teach a topic, you need to decide in advance what matters most and emphasize that.
- So…

DECIDING WHAT MATTERS MOST

- Consider these topics.What 1 or 2 (ONLY) ideas matter most when teaching:
- Grade 2: length measurement
- Grade 5: data
- Grade 8: fraction operations

FOR ME, FOR EXAMPLE

- Length measure in Grade 2:
- Expectations are about: benchmarks for 1 cm and 1m, estimating and measuring using standard and non-standard units, record measurements, choose a standard unit, estimating and measuring around objects,

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THE IDEAS FOR ME ARE:

- Length measure in Grade 2:
- Knowing one measurement helps you estimate another one.
- You can think of measuring as using one unit a lot of times or many of the same unit.

SO

- I might repeatedly ask questions (throughout the year) like:
- Choose a measurement (in metres or centimetres). Describe how many of something else it would take to make that distance. How do you know?

GRADE 5 DATA

- Collect using survey or experiment, collect and organize in chart or table or graph including stem and leaf…, read and draw conclusions from primary data, median, describe shape of a set of data, compare two sets of data

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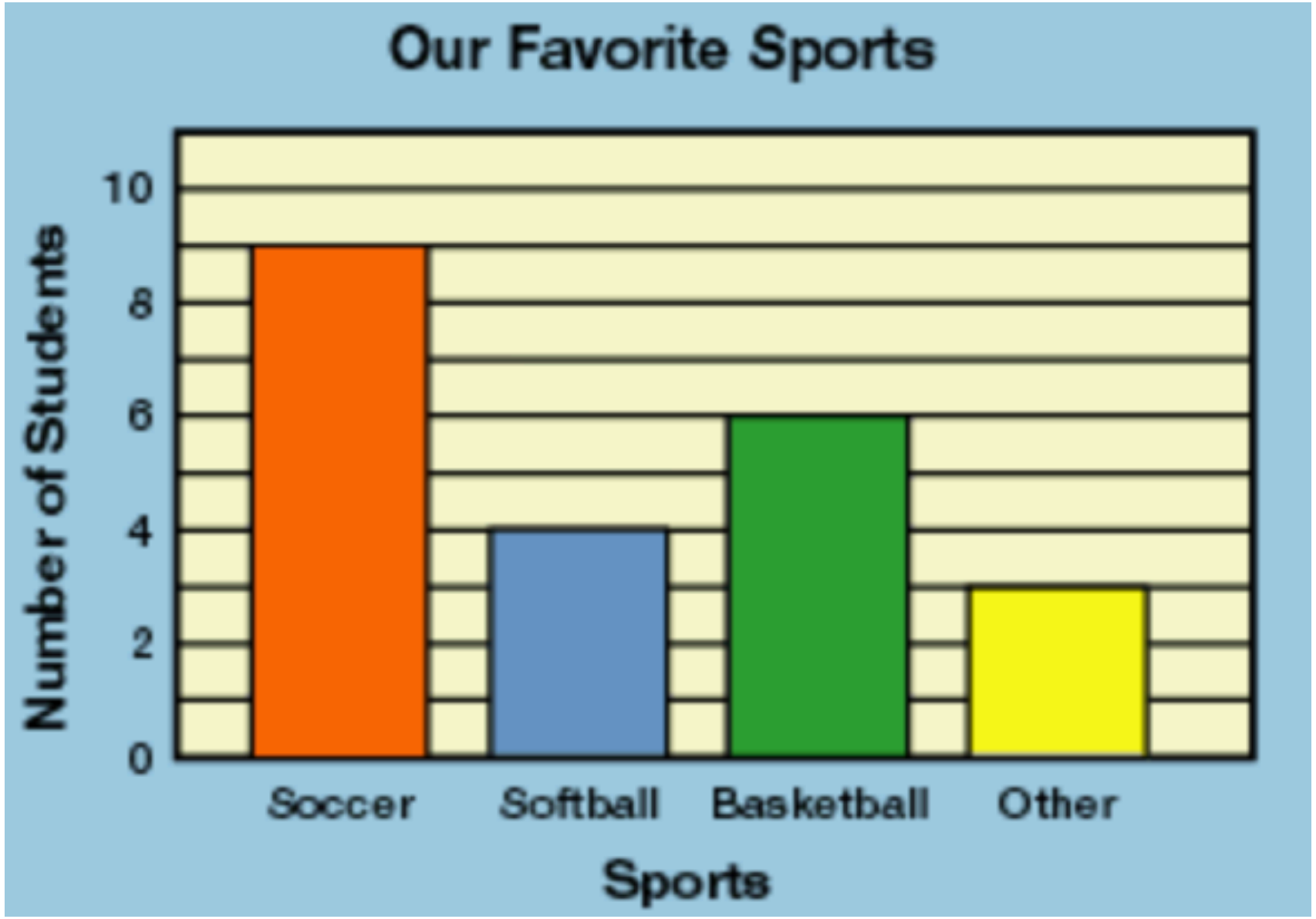
THE MOST IMPORTANT IDEAS FOR ME:

- When you have a set of data, you need to be able to describe what it tells you.
- You need to be able to justify your conclusions.

SO

- I might repeatedly ask: What do you think this tells us?


Our Favorite Sports
Number of Students
10
8
6
4
2
0
Soccer
Softball
Basketball
Other
Sports

Student	English	Math	Science	Spanish	Geography
Jacob	75	76	67	68	71
Ethan	74	58	76	66	87
Michael	56	80	62	79	83
Jayden	78	73	82	70	95
William	71	90	76	63	64
Alexander	87	85	90	78	94
Noah	83	98	75	76	62
Daniel	95	66	95	86	82
Aiden	64	97	78	88	76
Anthony	94	42	56	88	90

GRADE 8 FRACTION OPERATIONS

- Solve problems involving +, –, x and ÷ with simple fractions
- Use estimation when solving problems involving operations with whole numbers, decimals, percents, integers, and fractions…
- Represent the multiplication and division of fractions, using a variety of tools…

THE IDEAS FOR ME

- That operations with fractions mean the same thing as they did with whole numbers.
- Estimation of answer size .

SO

- I might ask…
- WITHOUT CALCULATING:
- How do you know that ¾ x 5/3 is less than 5/3?

- How do you know that 2/3 ÷ 1/10 is a lot?

SO WHAT DO THESE DECISIONS MEAN?

- They suggest to you how to develop a year plan that emphasizes what you really want to emphasize.

YEAR PLANNING

- You need to ensure that you get in all the strands.
- Although some prefer doing all number first, I don't.
- I would prefer spiralling between strands.

YEAR PLANNING

- I would take the ideas I care about most and revisit them through the year with different lenses.
- I would make sure I did some data, geometry, pattern and measurement every week or two, not necessarily a whole topic.

YEAR PLANNING

- I would start with a “happy” topic, one that is interesting to kids and carries no baggage.

SO IT MIGHT LOOK LIKE THIS:

- Grade 4:
- Patterns
- Decomposing multiplicatively
- Representing whole numbers
- Drawing conclusions from data

SO IT MIGHT LOOK LIKE THIS:

- Estimating and comparing whole numbers
- + and – whole numbers; estimation
- Length
- Time
- Representing fractions

SO IT MIGHT LOOK LIKE THIS:

- Comparing and ordering fractions
- Area
- Representing decimals
- Estimating and comparing decimals
- Adding and subtracting decimals
- Mass, capacity and volume

SO IT MIGHT LOOK LIKE THIS:

- Angles
- Shapes and figures
- Algebra
- Multiplying and dividing by tens, hundreds,…
- More complex multiplication and division

SO IT MIGHT LOOK LIKE THIS:

- Location and movement
- Probability

- But infusing geometry a bit each month
- Data a bit each month
- Measurement a bit each month
- Pattern a bit each month

PLANNING TOPICS

- Backwards design
- You decide what you believe are the most important ideas in a topic you want to address.
- You think about what sort of final task you want students to be able to complete

FOR EXAMPLE

- Grade 3 Fractions
- You might decide your focus is on meeting different representations of fractions- part of whole, part of set, number line, part of other measures (e.g. capacity or mass).

YOU MIGHT THINK OF A FINAL TASK

- E.g.
- I want you to be able to show :
- A representation for 7/9 that makes it easy to see it's almost a whole.
- A representation for 2/4 that makes it easy to see that it's ½ .

YOU MIGHT THINK OF A FINAL TASK

- A representation for 5/5 that shows why it is the same as 4/4 or 3/3.
- A representation for 2/5 that shows it's almost ½ , but not quite.

YOU MIGHT THINK OF A FINAL TASK

- A representation that shows why 2/3 of 9 is 6.
- A representation for 2/3 of a mass.

NOW YOU GO BACK AND

- Figure out what sorts of lessons you need.

PLANNING A LESSON

- Let's talk about 3-part lessons which include an activation, an action piece and a consolidation.

BACKWARDS DESIGN

- Start with the learning goal/consolidation– what do I want students to be able to respond to at the end?

CHOOSE AN ACTION TASK

- Choose a task that would have potential to get you where you want to go.

PLAN CONSOLIDATION QUESTIONS

- Plan those final questions you really care about to bring out the math.
- Tie them to the work the kids did.
- Don’t dwell on solutions; dwell on the math ideas you want to bring out.

ACTIVATION

- Go back and think about what you'd do to get kids ready for the main task, without giving away the problem aspect of that task.

HERE IS A GRADE 4 EXAMPLE

- I want students to be able to describe how a fraction changes when the numerator changes and when the denominator changes.
- But I want to engage them in thinking and make it interesting.

I WANT THEM TO BE ABLE TO ANSWER QUESTIONS LIKE:

- How are the pictures of 3/8 and 3/9 alike and different?
- How are the pictures of 3/8 and 5/8 alike and different?
- When I look at a representation of a fraction, where do I find the numerator? The denominator?

I CHOOSE A POSSIBLE TASK

- Choose a number between 3 and 8.
- Create a fraction where your number is the numerator.
- Use fraction pieces to represent that fraction.
- Create a fraction where your number is the denominator.
- Use fraction pieces to represent that fraction.

I CONSOLIDATE:

- This was Lara's representation:

- What number do you think she chose? Why? Was it for the numerator or denominator? Could it have been the other?

I CONSOLIDATE

- It it was for the denominator,

- what picture might she have drawn if that number was for the numerator? Etc. etc.

I CONSOLIDATE

- Lisa drew a number line representation and her number was 7.
- What do you think her pictures looked like? Etc. etc.

I CONSOLIDATE

- I go back to more general questions:
- How are the pictures of 3/8 and 3/9 alike and different?
- How are the pictures of 3/8 and 5/8 alike and different?
- When I look at a representation of a fraction, where do I find the numerator? The denominator?

ACTIVATION

- To get kids ready to do the task, I might ask:
- Think of 2 different ways to represent 8/10. OR

TEACHING THROUGH PROBLEM SOLVING

- You just saw an example, but let's look at a few more, focusing on the use of manipulatives.

GRADE K

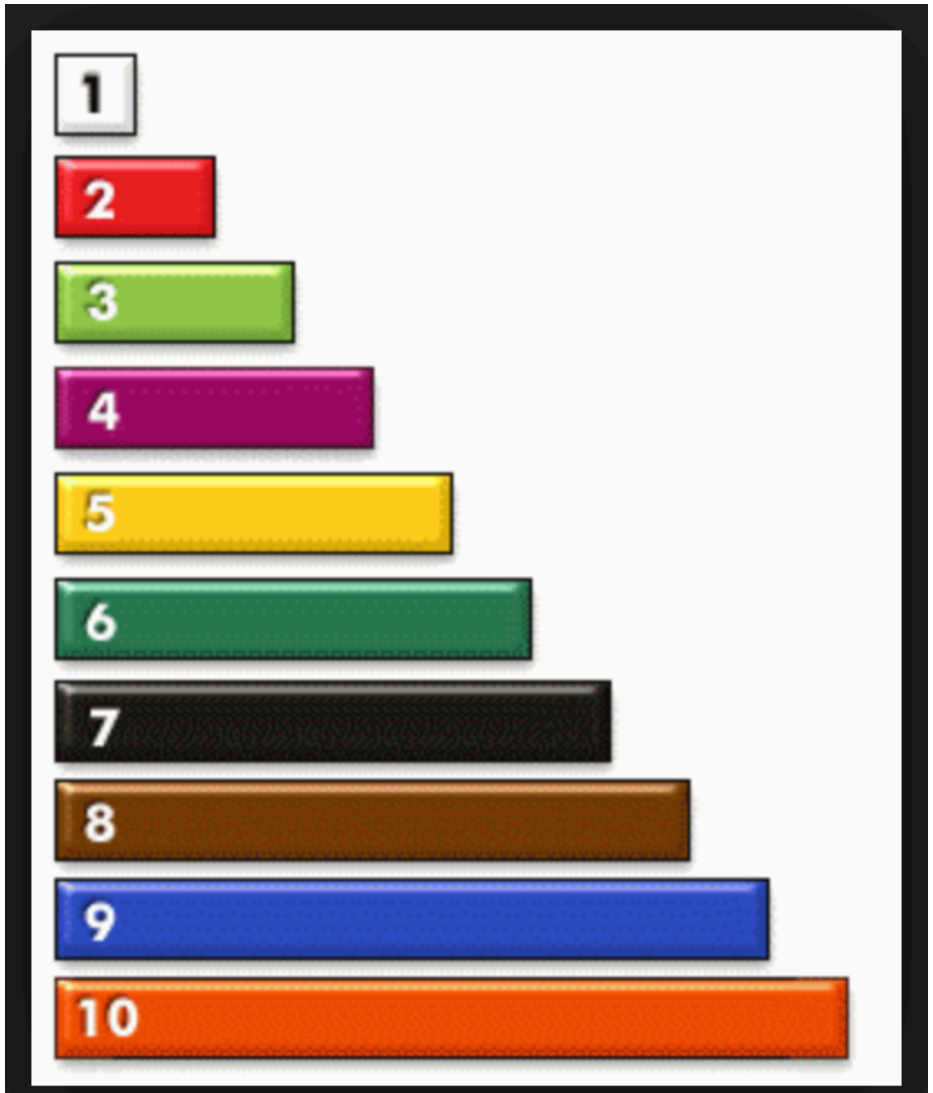
- Sara is holding forks and spoons.
- There are 2 more spoons than forks.
- Altogether there are not even 10 things in Sara's hand.
- How many of each might there have been?

GRADE 1/2

- On a 100 chart, you cover 4 numbers in a square.
- The greatest number is 11 more than the smallest.
- Where is the square? Could the total of all of the numbers in the square be 60?

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

CUISENAIRE RODS

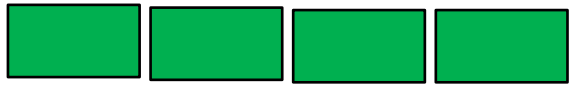


GRADE 3/4

- This shows 32 with cuisenaire rods.

GRADE 3/4

- This shows 4 x 3 with cuisenaire rods.



GRADE 3/4

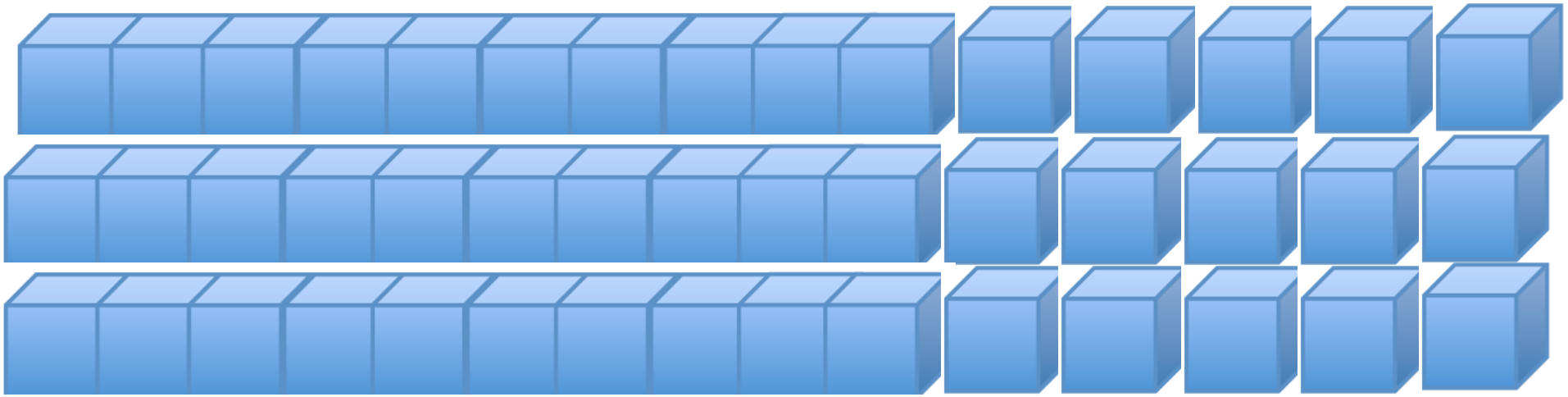
- Use some orange rods and one other colour rod to make a number, e.g.

GRADE 3/4

- What trains of one colour of rods can you make that are the same length?
- Write the multiplication sentences for each situation.

BASE TEN MULTIPLICATION

- This shows 3 x 15.



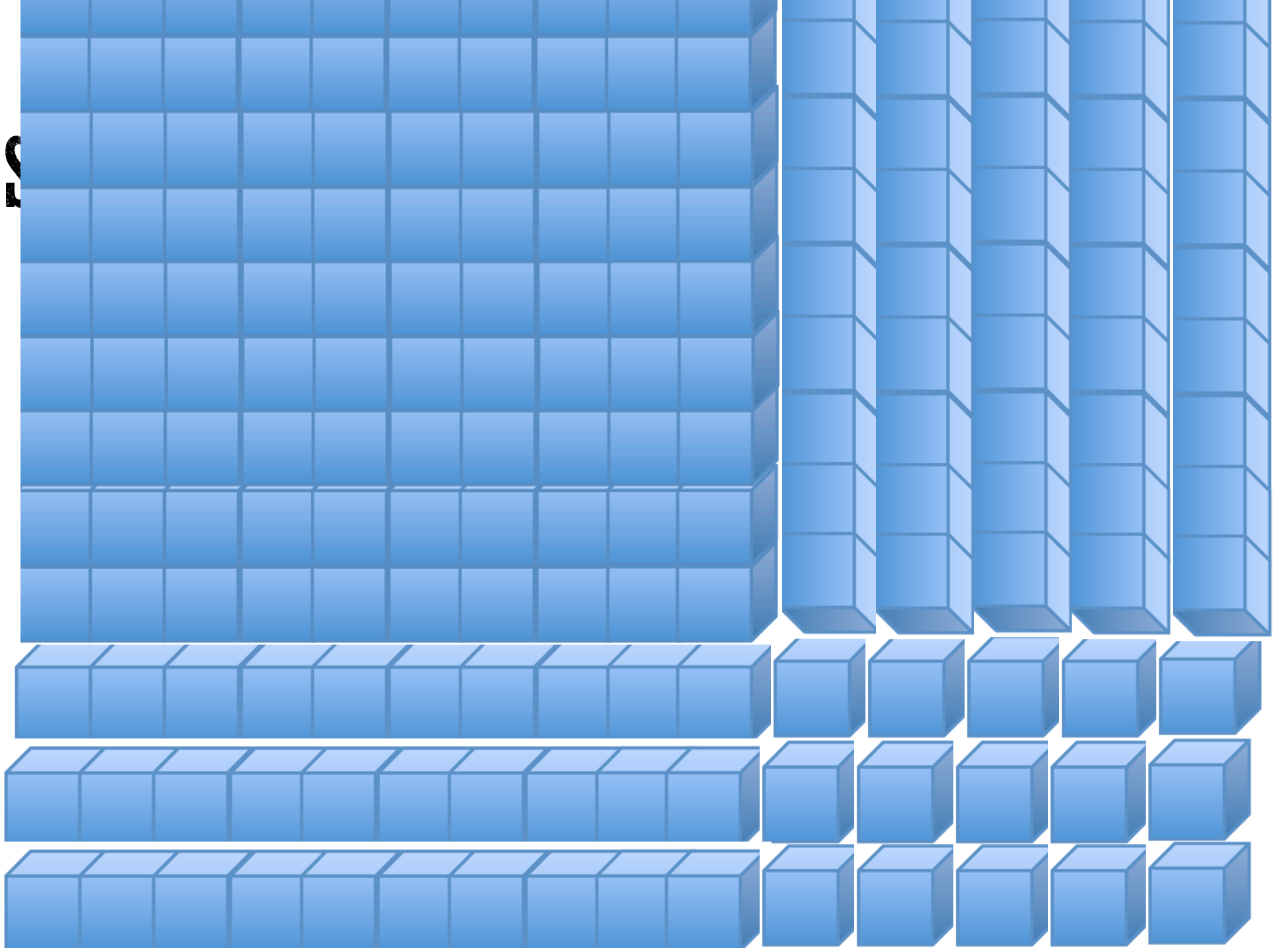
- 18 blocks are used altogether.

THE NEXT PICTURE

Shows 13 x 15.

24 blocks are used altogether.

BAS



GRADE 5/6

- The students in a class each brought in the same amount of money for a photo.
- The total amount collected could be shown by making a base ten block rectangle using exactly 40 blocks.
- How many kids? How much money?

TOOLS FOR FRACTIONS

- Fraction towers

1																			
$\frac{1}{2}$	$\frac{1}{2}$																		
$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$																	
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$																
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$															
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$														
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$												
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$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$					
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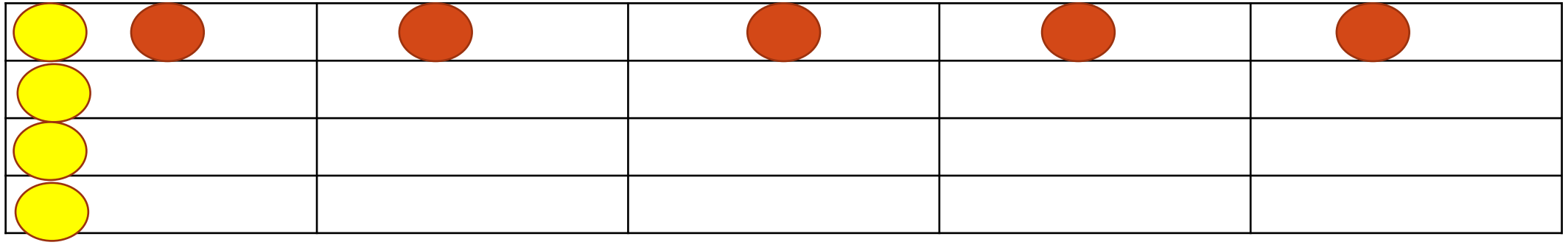
$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$

USING A CLOCK

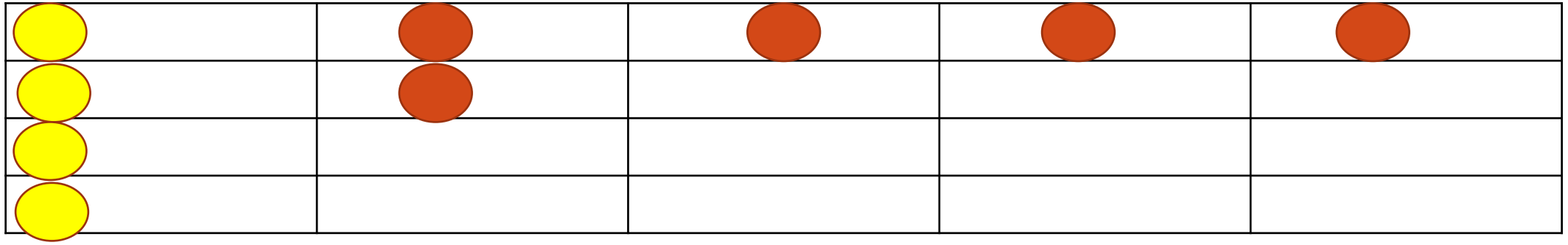
- To add 1/5 + ¼ , I think about hours having 60 minutes.
- 1/5 hour is 12 minutes
- ¼ hour is 15 minutes.
- So the total is 27 minutes, 27/60 of an hour.

USING A GRID

USING A GRID



USING A GRID



GRADE 7/8

- Mom put together all of the orange juice that were in different cups.
- She measured and it ended up being about ½ cup and another 2/3 cup and another ¼ cup.
- How many cups did she end up with?

THESE WERE

- Just examples.

- But hopefully you can see that manipulatives are useful and trusting that students can figure things out is essential.

DOWNLOAD

- www.onetwoinfinity.ca
- Recent presentations
- OML