



Unpacking the New Grade 2 Math

Provincial Group

November 29, 2022



Chris Zarski

Land Acknowledgment

We respectfully acknowledges that we are situated on Treaty 6 territory, traditional lands of First Nations, including the Cree, Blackfoot, Métis, Nakota Sioux, Saulteaux, Inuit, and many others whose histories, languages, and cultures continue to influence our vibrant community.





Agenda for Today!

- identifying key skills and concepts in the part of our curriculum
- revisiting what research tells us about fractions and effective **strategies** for teaching counting
- extending **strategies** for 2N2.1 and 2N3.1as students begin to move towards 50. Begin 1N2.1
- providing resources that can help support ongoing **pedagogy** in teaching counting to 50

November

2N1.1 Students analyze quantity to 1000. (50-100)

- There are infinitely many natural numbers.
- Every digit in a natural number has a value based on its place.
- Each natural number is associated with exactly one point on the number line.

2N1.2 Students analyze quantity to 1000. (50-100)

- A quantity can be interpreted as a composition of groups.

2N1.3 Students analyze quantity to 1000. (50-100)

- All natural numbers are either even or odd.

2N1.4 Students analyze quantity to 1000. (50-100)

- A quantity can be estimated when an exact count is not needed.

2N2.1 Students investigate addition and subtraction within 100.

- A sum can be composed in multiple ways.

(no regrouping)

2N3.1 Students interpret part whole relationships using unit fractions.

- Fractions can represent part-to- whole relationships.
- One whole can be interpreted as a number of unit fractions. (example: 2 50 cents pieces make 100
- 10 dimes $\frac{1}{10} \frac{1}{10} \frac{1}{10} \frac{1}{10} \frac{1}{10} \dots$)

December

2N1.1 Students analyze quantity to 1000. (50-100)

- There are infinitely many natural numbers.
- Every digit in a natural number has a value based on its place.
- Each natural number is associated with exactly one point on the number line.

2N1.2 Students analyze quantity to 1000. (50-100)

- A quantity can be interpreted as a composition of groups.

2N1.3 Students analyze quantity to 1000.

- All natural numbers are either even or odd.

2N1.4 Students analyze quantity to 1000.

- A quantity can be estimated when an exact count is not needed.

2N1.5 Students analyze quantity to 1000.

- Inequality is an imbalance between two quantities.

2N2.1 Students investigate addition and subtraction within 100.

- A sum can be composed in multiple ways.

(no regrouping)

2N3.1 Students interpret part whole relationships using unit fractions.

- Fractions can represent part-to-whole relationships.
- One whole can be interpreted as a number of unit fractions.

January

2N1.1 Students analyze quantity to 1000. (100-500)

- There are infinitely many natural numbers.
- Every digit in a natural number has a value based on its place.
- Each natural number is associated with exactly one point on the number line.

2N1.2 Students analyze quantity to 1000. (100 working to 1000)

- A quantity can be interpreted as a composition of groups.

2N1.3 Students analyze quantity to 1000.

- All natural numbers are either even or odd.

2N1.4 Students analyze quantity to 1000.

- A quantity can be estimated when an exact count is not needed.

2N1.5 Students analyze quantity to 1000.

- Inequality is an imbalance between two quantities.

2N2.1 Students investigate addition and subtraction within 100.

- A sum can be composed in multiple ways.

(no regrouping)

2N3.1 Students interpret part whole relationships using unit fractions.

- Fractions can represent part-to-whole relationships.

February

2N2.1 Students investigate addition and subtraction within 100. (start regrouping)

- A sum can be composed in multiple ways.

How can addition and subtraction be interpreted? 2N2.1

Students investigate addition and subtraction within 100.

Knowledge	Understanding	Skills & Procedures
<p>The order in which more than two numbers are added does not affect the sum (associative property).</p>	<p>A sum can be composed in multiple ways.</p>	<p>Visualize 100 as a composition of multiples of 10 in various ways.</p> <p>Compose a sum in multiple ways, including with more than two addends.</p>

Visualize and Compose!

No regrouping.

Important links for 2N3.1

In what ways can parts compose a whole?

2N3.1

Students interpret part-whole relationships using unit fractions.

Knowledge	Understanding	Skills & Procedures
<p>A whole can be a whole set of objects, or a whole object, that can be partitioned into a number of equal parts.</p> <p>The whole can be any size and is designated by context.</p> <p>A unit fraction describes any one of the equal parts that compose a whole.</p>	<p>Fractions can represent part-to-whole relationships.</p> <p>One whole can be interpreted as a number of unit fractions.</p>	<p>Model a unit fraction by partitioning a whole object or whole set into equal parts, limited to 10 or fewer equal parts.</p> <p>Compare different unit fractions of the same whole, limited to denominators of 10 or less.</p> <p>Compare the same unit fractions of different wholes, limited to denominators of 10 or less.</p>
<p>2N3.1 Students interpret part whole relationships using unit fractions.</p> <ul style="list-style-type: none">• Fractions can represent part-to- whole relationships.• One whole can be interpreted as a number of unit fractions. (example: 2 50 cents pieces make 100• 10 dimes $\frac{1}{10} \frac{1}{10} \frac{1}{10} \frac{1}{10} \frac{1}{10} \dots$)		<p>Model one whole, using a given unit fraction, limited to denominators of 10 or less.</p>

Model
Partition
Compare
Compare
Model

Grade 2 Skills and Concepts December - January

Compare the same **unit fractions** of different **wholes**, limited to denominators of 10 or less.

Compare different **unit fractions** of the same **whole**, limited to denominators of 10 or less.

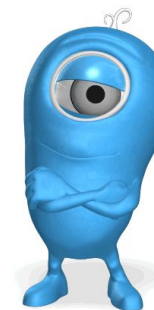
Compose a **sum** in multiple ways, including with more than two **addends**.

Visualize 100 as a **composition** of multiples of 10 in various ways

Model a **unit fraction** by **partitioning** a whole **object** or whole **set** into **equal parts**, limited to 10 or fewer **equal parts**.

Model one **whole**, using a given **unit fraction**, limited to **denominators** of 10 or less.

Compare, Compose,
Visualize, Model



What are the Skills?

Learning to Count is repetitive:

necessary -yes!

But we need to keep it
engaging, active, targeted
and real world connected.



How can addition and subtraction be interpreted? 2N2.1

Students investigate addition and subtraction within 100. 50-100, 100-500

Knowledge	Understanding	Skills & Procedures
The order in which more than two numbers are added does not affect the sum (associative property).	A sum can be composed in multiple ways.	Visualize 100 as a composition of multiples of 10 in various ways. Compose a sum in multiple ways, including with more than two addends.

math facts to 20
Making "tens"
Multiples of 10 - skip counting by 10's (also 5's, 2's, 20's, 25's, 50's)
Money - equivalents

How do you model and visualize the 'associative property'?

Let's start with Money

How can we meet these outcomes and leverage money in the process?



TENS

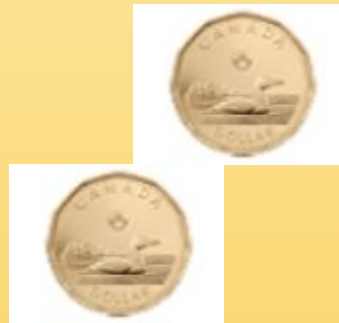


Ones



Answer:

Can you convert
and Trade?



How else can we make \$68.00

How do we do this for cents?

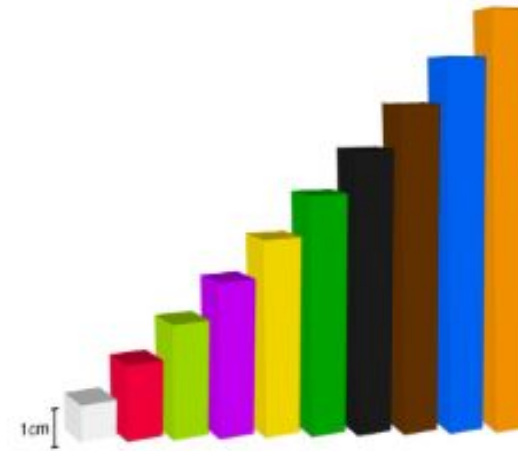
100 ¢

Design 2 problems - no regrouping

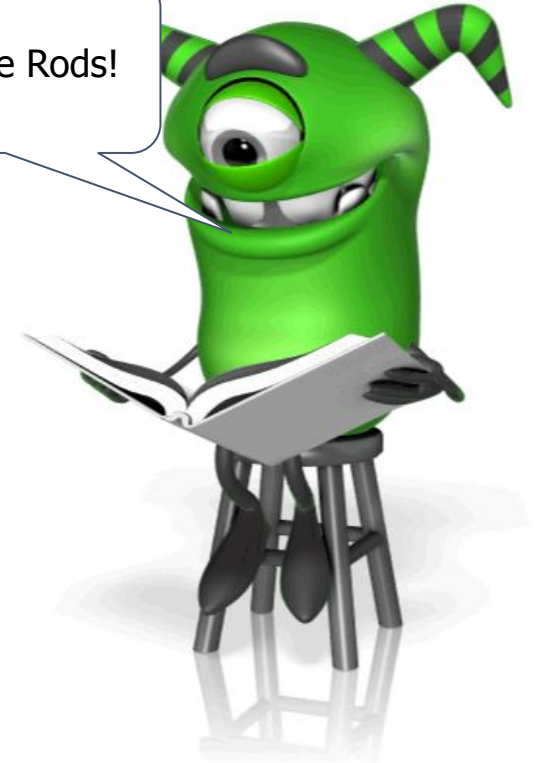
Skip counting - converting & trading?

Add more than two amounts of money? Model Associative Property

Cuisenaire Rods



Get your
Cuisenaire Rods!

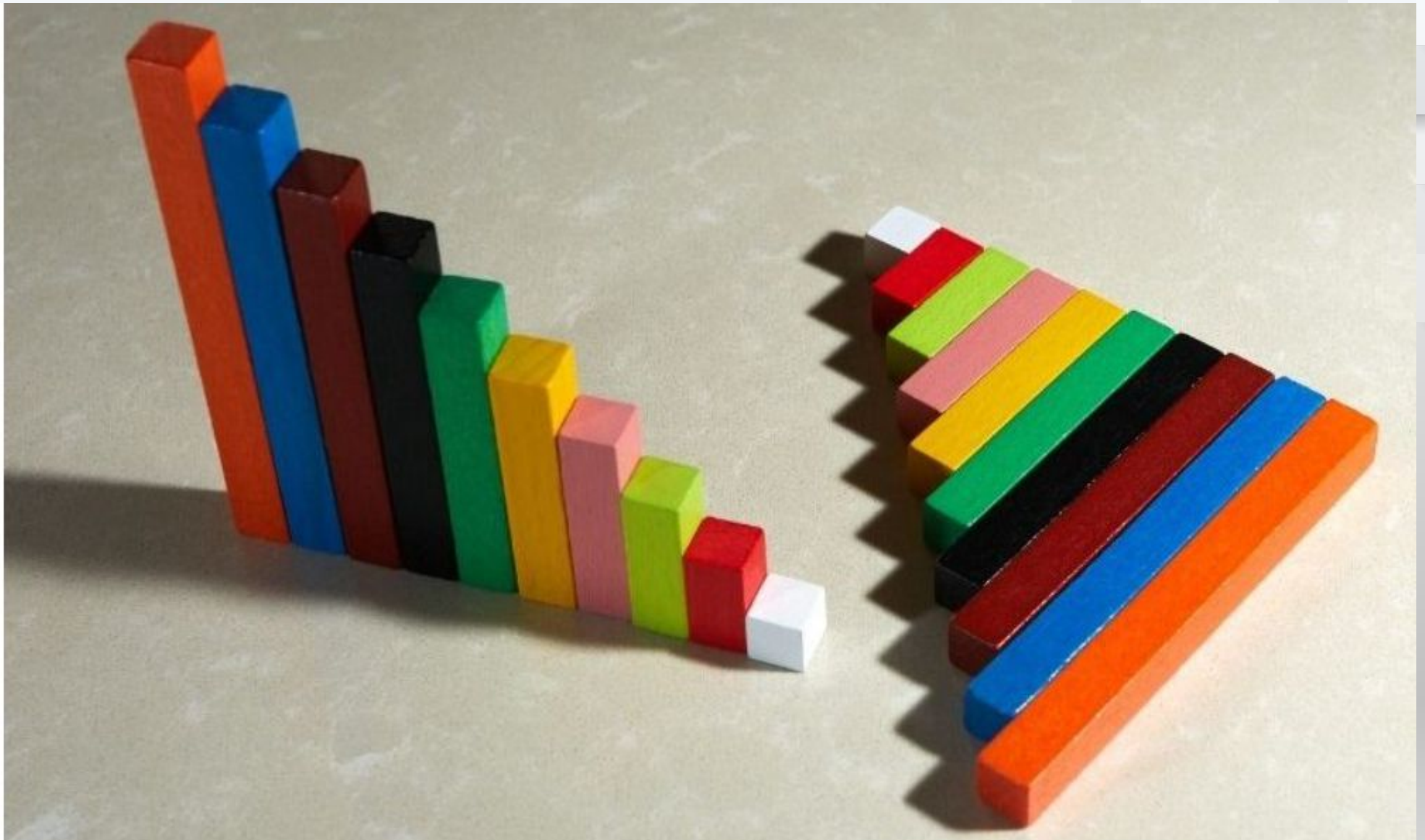


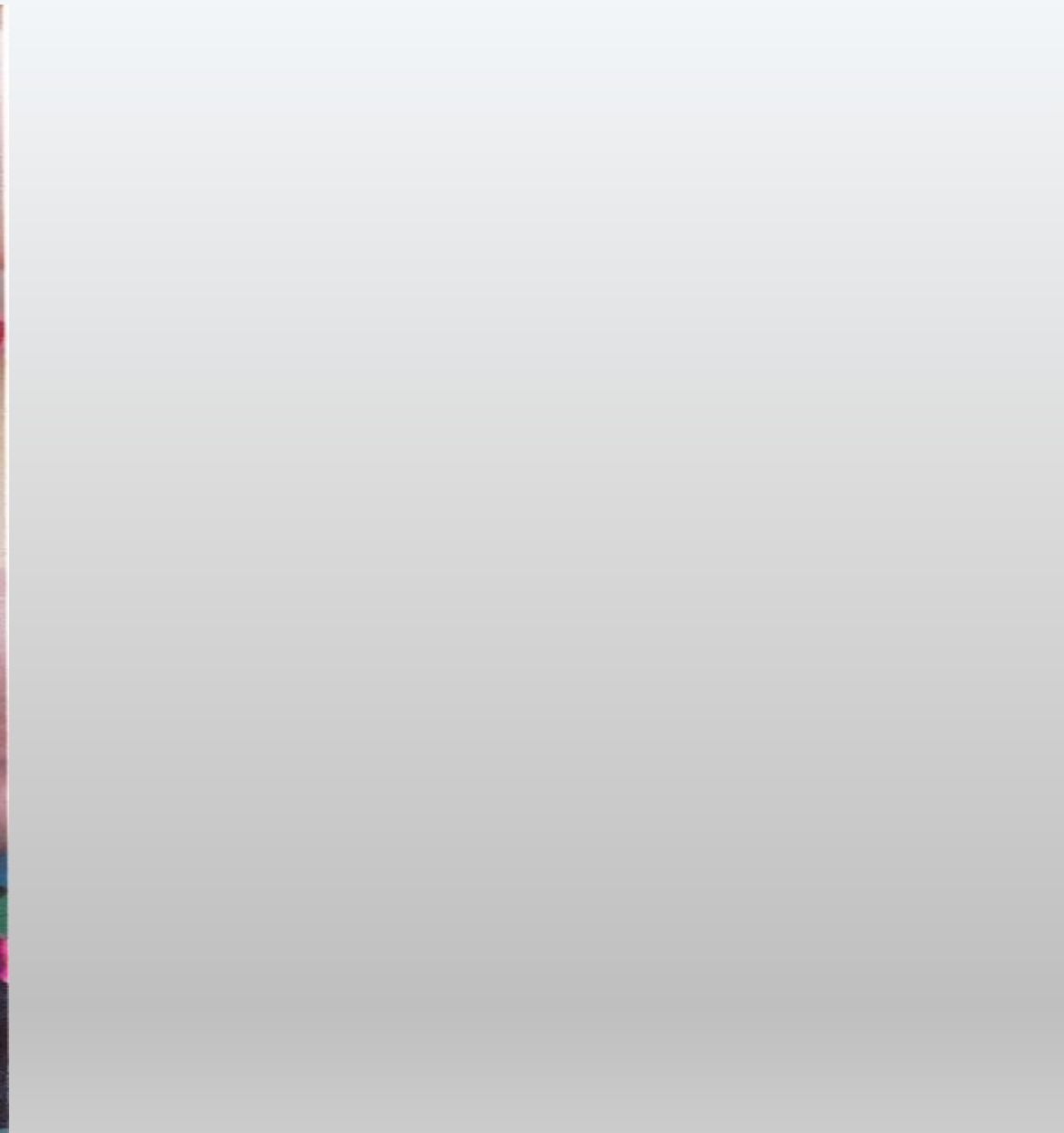
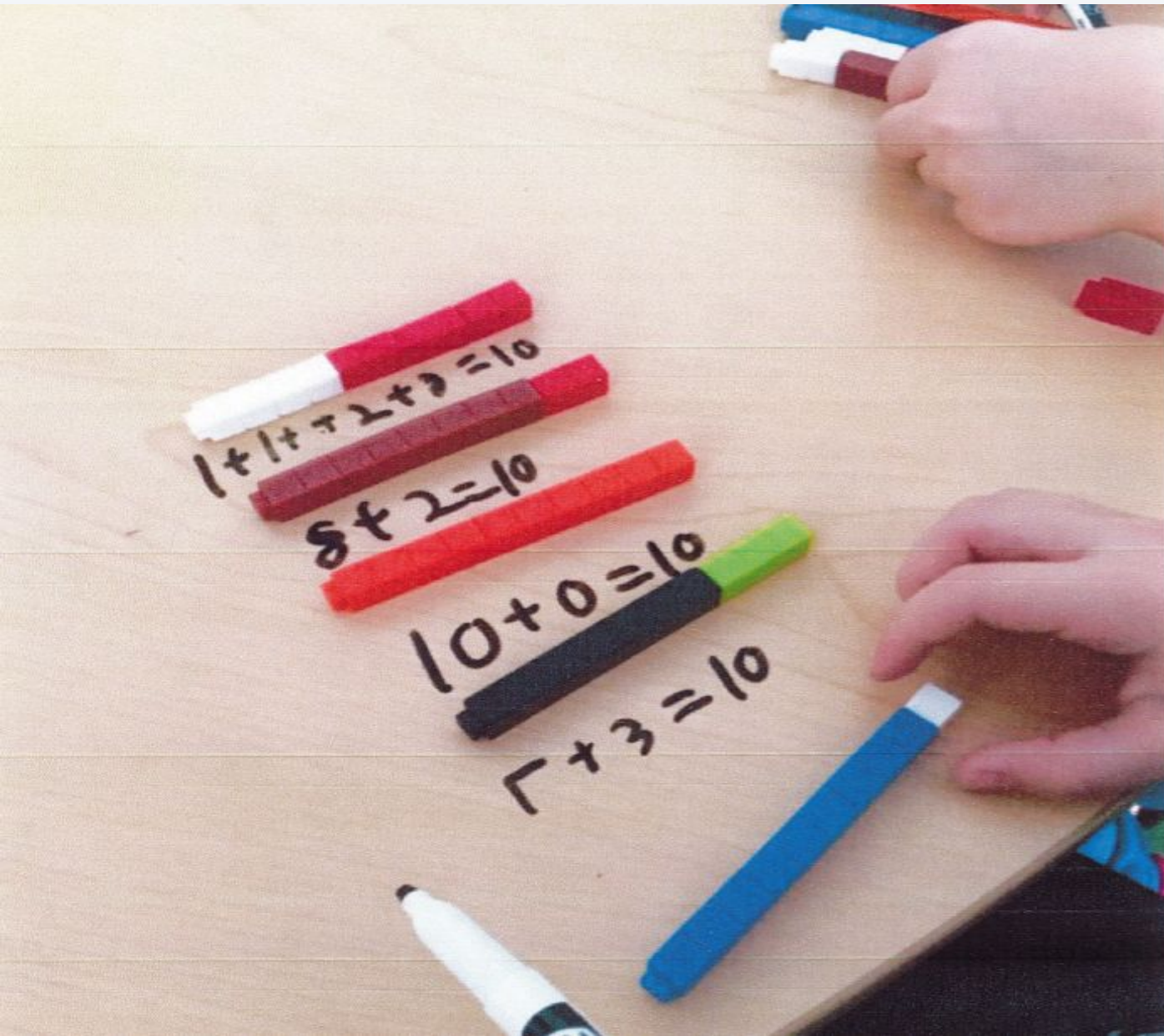
Using Cuisenaire Rods

The screenshot displays the 'Cuisenaire environment' interface. At the top, the title 'Cuisenaire environment' is centered, with a gear icon for settings on the right. The main workspace is a light beige area where a staircase of Cuisenaire rods is built on the right side. The rods are stacked from bottom to top in the following order: orange, blue, brown, black, dark green, yellow, pink, light green, red, and white. On the right edge, there is a vertical toolbar with an 'Add rods' label, a row of colored circles corresponding to the rod colors, and a trash can icon at the bottom.

At the bottom of the interface, there are several control panels. From left to right: a navigation panel with four purple arrow icons; a panel with a purple square containing an orange rod and a 'Rotate' button with a circular arrow icon; a 'File' panel with 'Save' and 'Load' buttons; a 'Grid' panel with 'on' and 'off' buttons; a 'Labels' panel with 'on' and 'off' buttons; a 'Zoom' panel with '+' and '-' buttons; and a 'Clear rods' button.

Navigation tabs are located at the bottom of the workspace: 'Home', 'Prefabs', 'Activities', 'Collaborate', and 'Hide'.





Cuisenaire environment

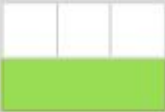


Add rods



Eventually want to move to what makes up a 3, for example.

What two colours make up an orange?



Home

Prefabs

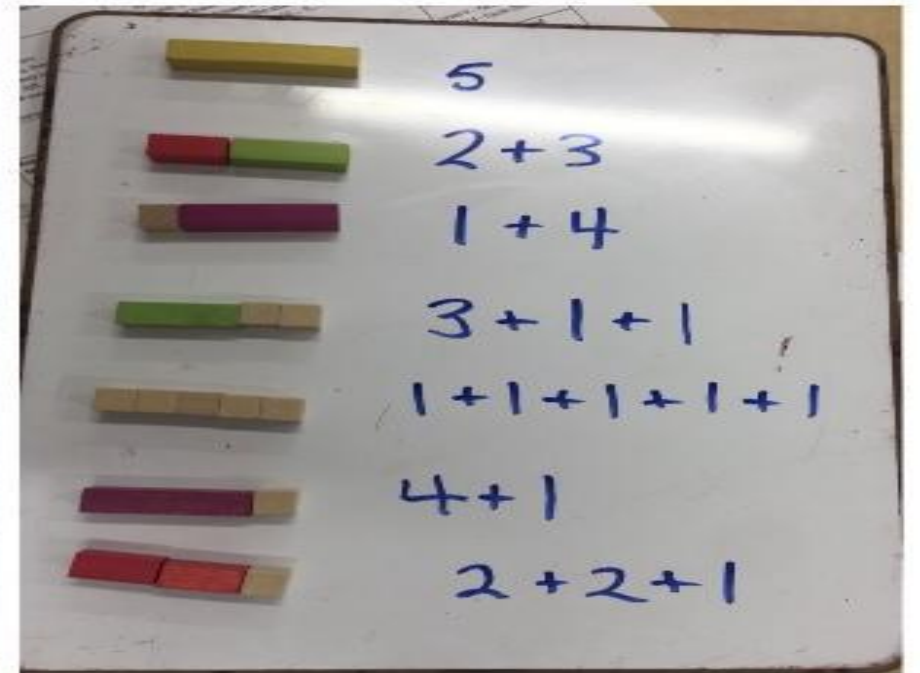
Activities

Collaborate

Hide



How many ways can you show a number, decomposing numbers.



Concept Circles Promote Reasoning



Research on Number Lines



“Experience moving physically along numbers sequenced in a line helps children develop a ‘mental number line’—a spatial representation of quantity that helps them reason about which is more and how much more.”YM

Number Line

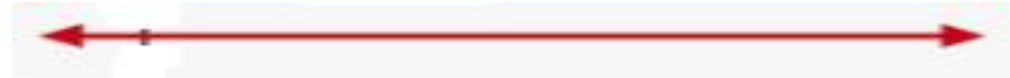
Students Internalize Concepts (near, far, more, less, before, after, one more or two more)

Students can compare numbers

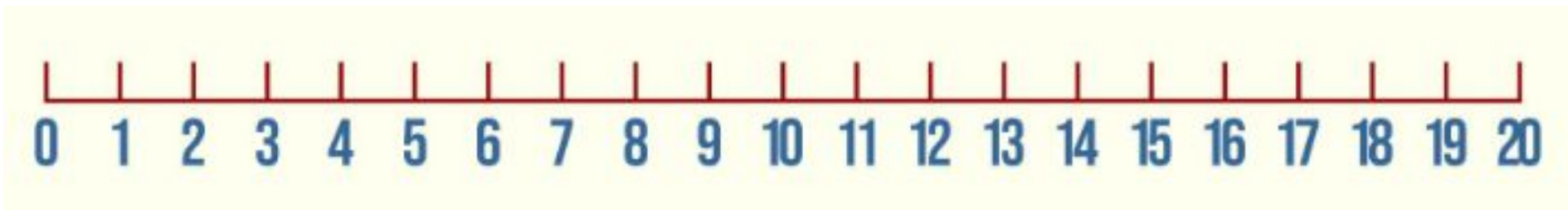
Teachers must build vocabulary throughout the activity

What is a Numberline?

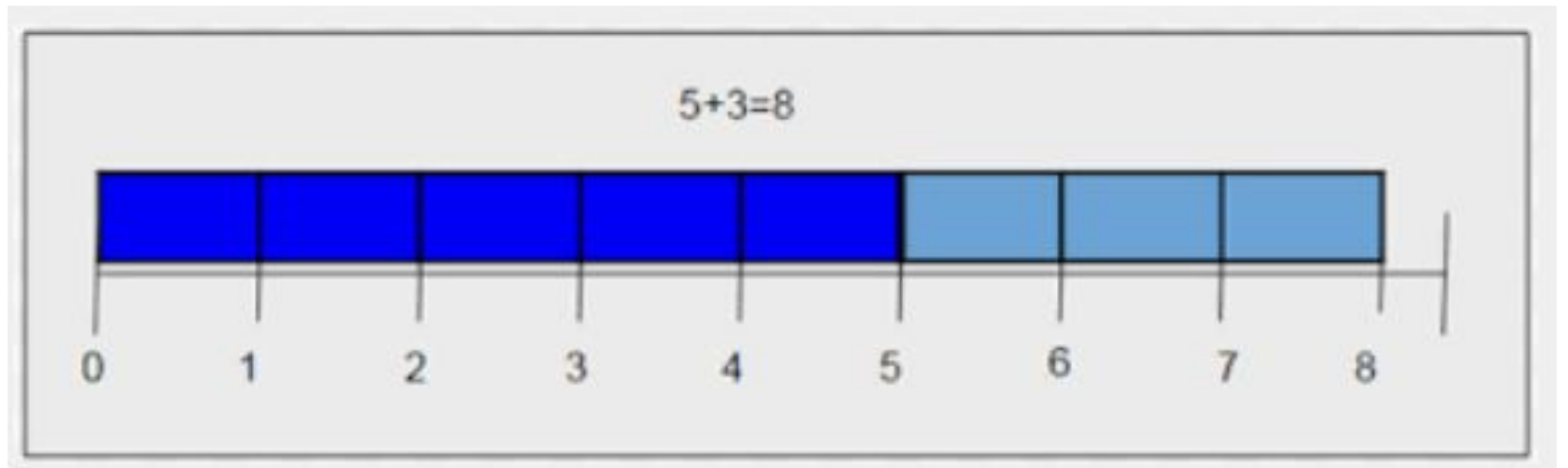
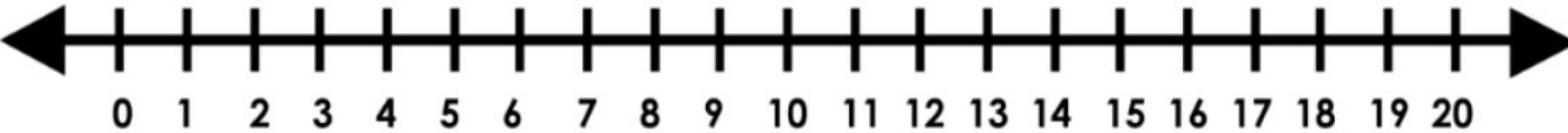
- A straight **horizontal** line
- It has arrows on the ends
- It has smaller **vertical** lines at **regular increments**
- Each of the vertical lines can have a number associated with it.



- From 0 to 1 is really important!



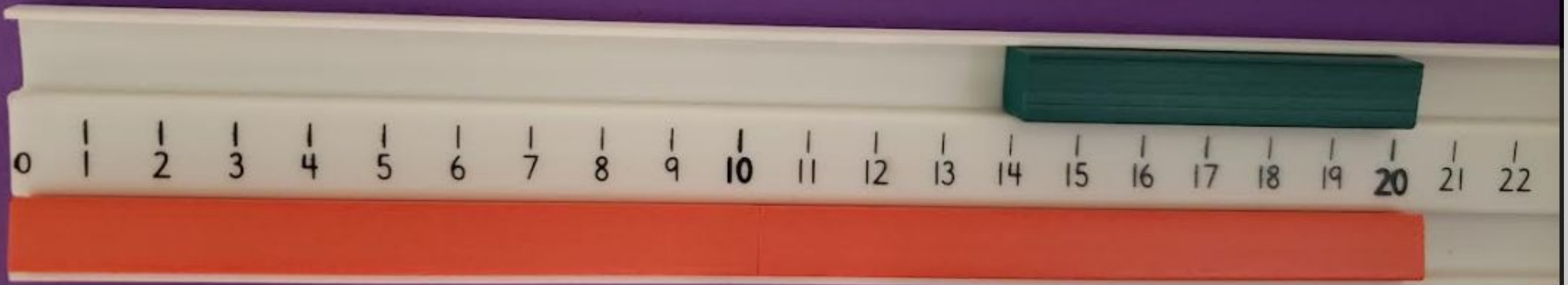
Looking at Numbers 1-20



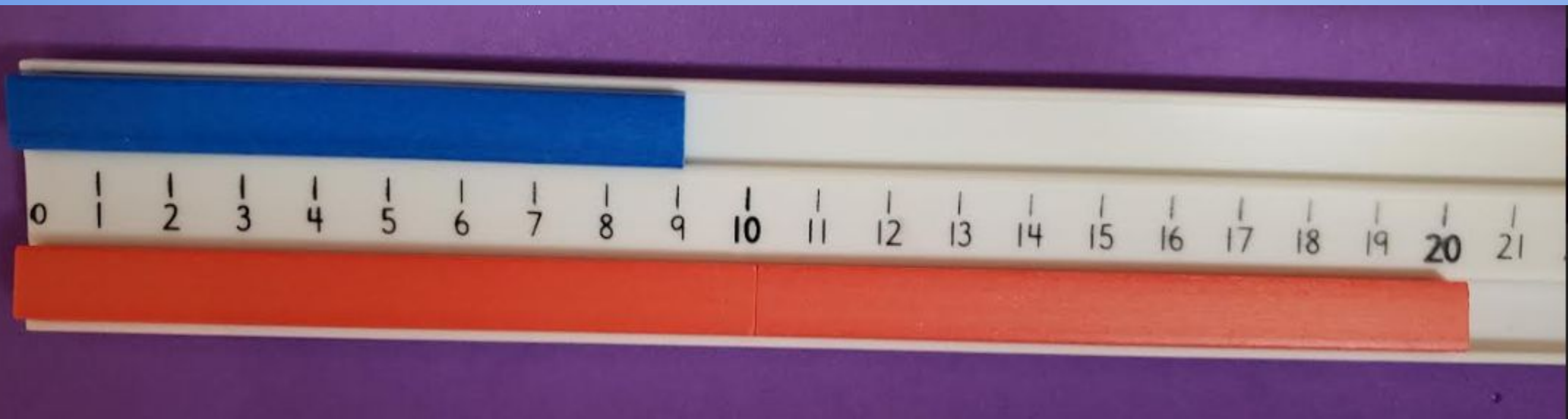


10 plus a
number



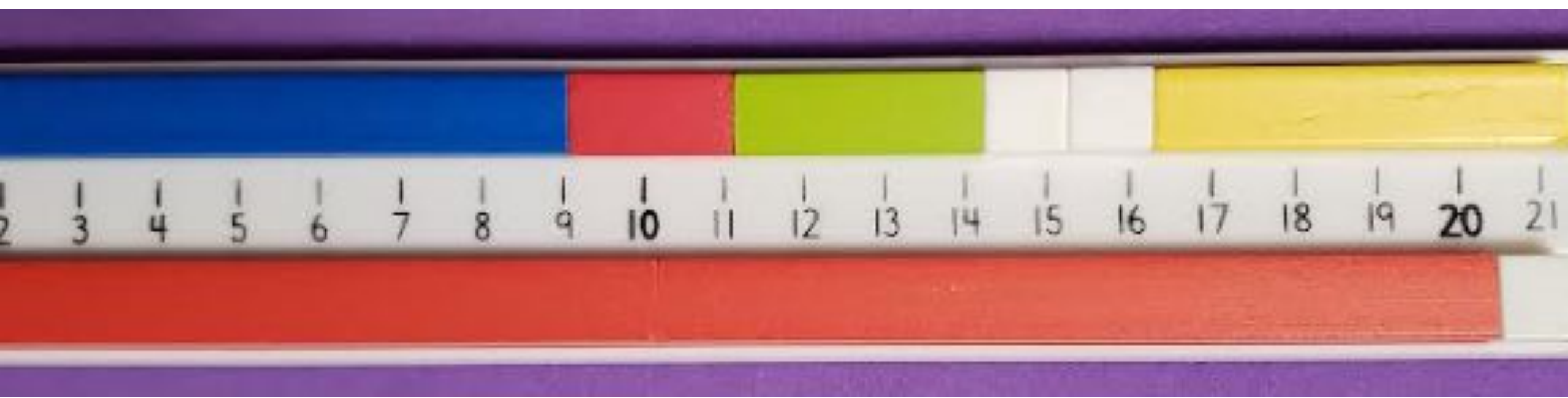


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22



Every addition can be a subtraction





2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Skip Counting

0 1 2 3 4 5 6 7 8 9 **10** 11 12 13 14 15 16 17 18 19 20

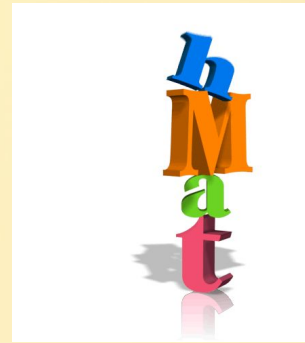
19 **20** 21 22 23 24 25 26 27 28 29 **30** 31 32 33 34 35 36 37 38 39 40

31 32 33 34 35 36 37 38 39 **40** 41 42 43 44 45 46 47 48 49 50



Ensure tens are not the same as the ones in colour. They should be visibly distinguishable.

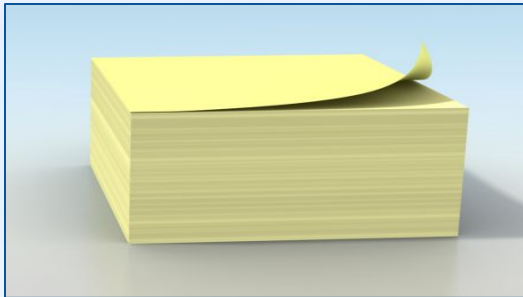
Let's move to 2N3.1



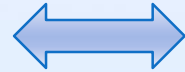


So what does the research tell us
about fractions?

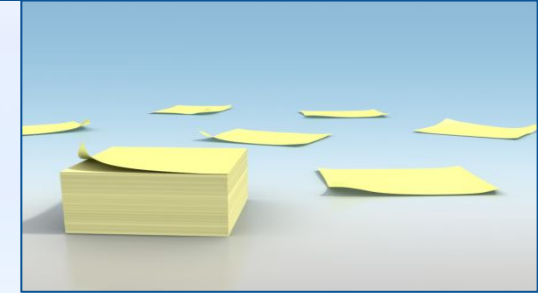
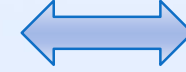
An opportunity for a re-consider!



- Fractions involve difficult-to-learn and difficult-to-teach concepts that present ongoing pedagogical challenges to the mathematics education community.



- These difficulties begin early in the primary years (Empson & Levi, 2011; Moss & Case, 1999) and persist through middle school (Armstrong and Larson, 1995; Kamii and Clark, 1995), then into secondary and even tertiary education (see Orpwood, Schollen, Leek, Marinelli-Henriques, & Assiri, 2011).



- The challenges and misunderstandings students face in understanding fractions (Gould, Outhred, & Mitchelmore, 2006; Hiebert 1988; NAEP, 2005) persist into adult life and pose problems in such wide-ranging fields as medicine and health care, construction and computer programming.

So what did the research tell us?

1

Understanding:
the roles and relationships between the numbers

$$\frac{1}{3} > \frac{1}{2}$$

2

Moving to Algorithms too quickly:
models removed quickly, symbolic terminology, procedural

3

Inconsistent Language

"2 over 5" or "2 out of 5" is actually "two fifths"

4

Lack of Connection to Previous Learning:
assume it is obvious a child knows what a fraction represents; real world connections

5

Unit Fraction Glance:

insufficient time devoted to the concept of the "unit" fraction as opposed to algorithms and mathematical definitions.

6

The 'Why' of the Rules:

Lack of time devoted to why we do what we do; connections to unit fraction.

7

Representing -

Over-emphasis on Part-Whole:
Fractions are not only part-whole, many other representations

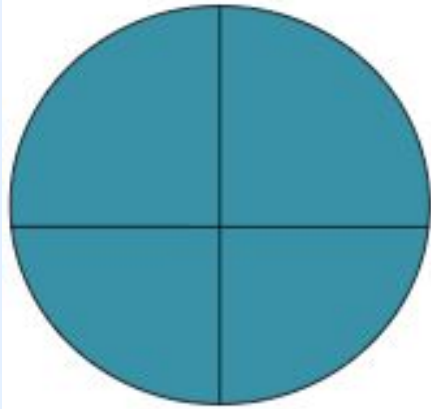
8

North-American overuse of Circles:

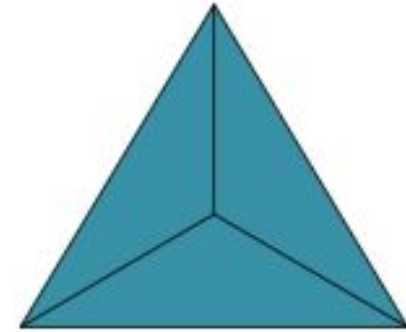
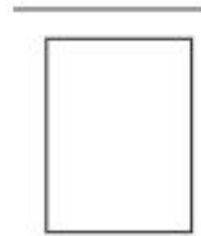
Circles offer us limited understanding when first learning fractions

Find the unit fraction for these diagrams

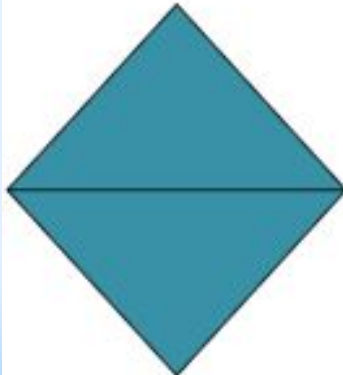
Avoid this 'count and fill in' type of worksheet soon after we talk about a unit fraction.



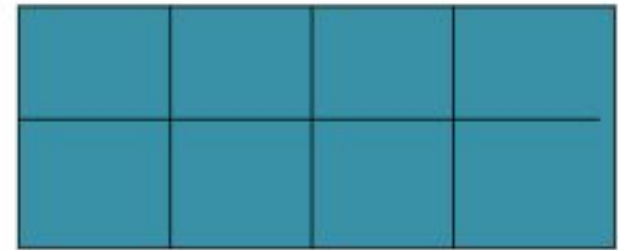
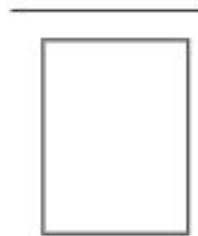
1



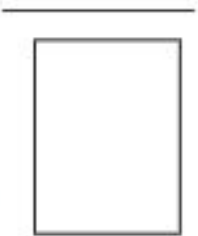
1



1

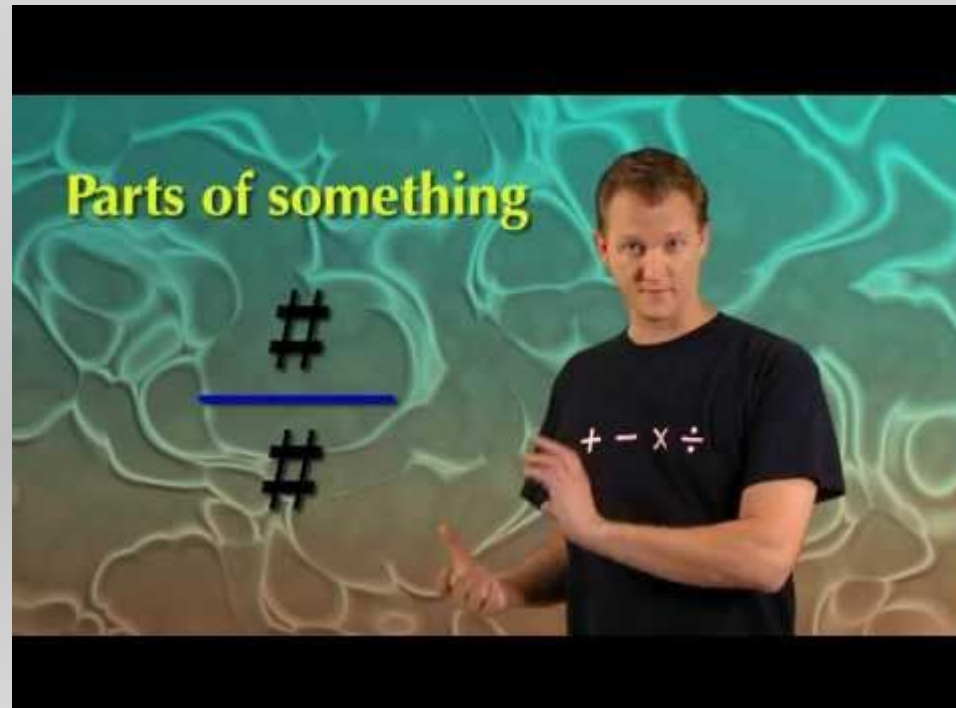


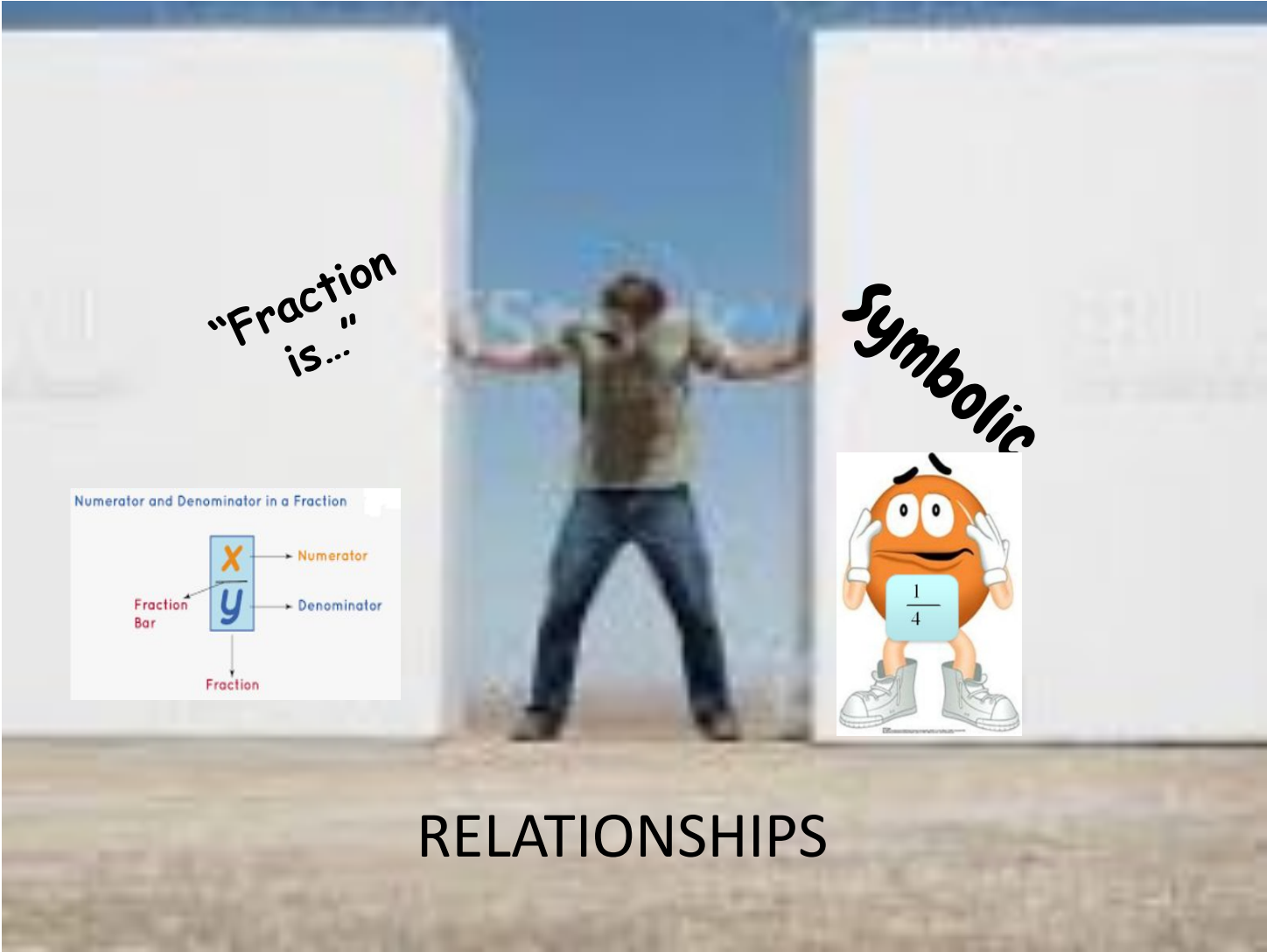
1





Fractions *can* represent part-to whole relationships





RELATIONSHIPS

WHAT IS A FRACTION?

A fraction is a **number** which can tell us about the relationship between two quantities.



Create the Unit Fractions Visually





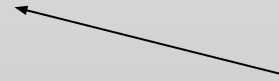
1



Numerator
(1 dime)



10



Denominator (10
dimes for 1 dollar)



Same coin being represented



Denominator

The denominator says how many **equal** parts and the **quantity** being represented



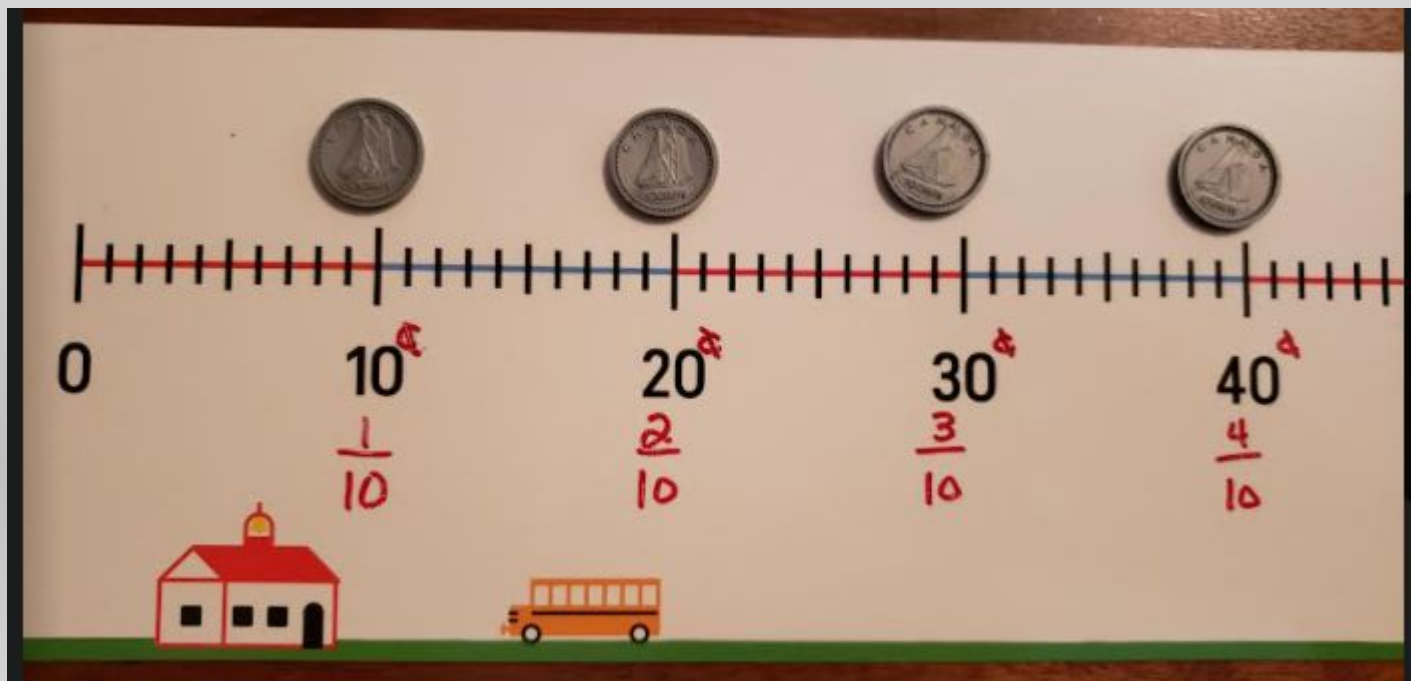
$$\frac{1}{\quad}$$



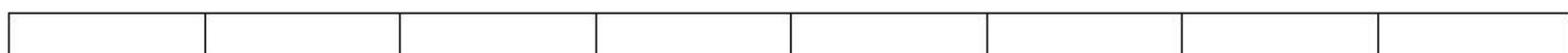
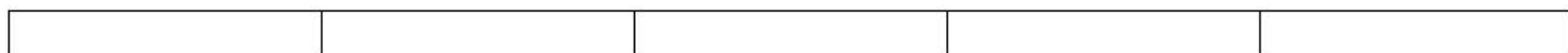
→ 2 50 ¢ coins is 1 dollar or 100 ¢

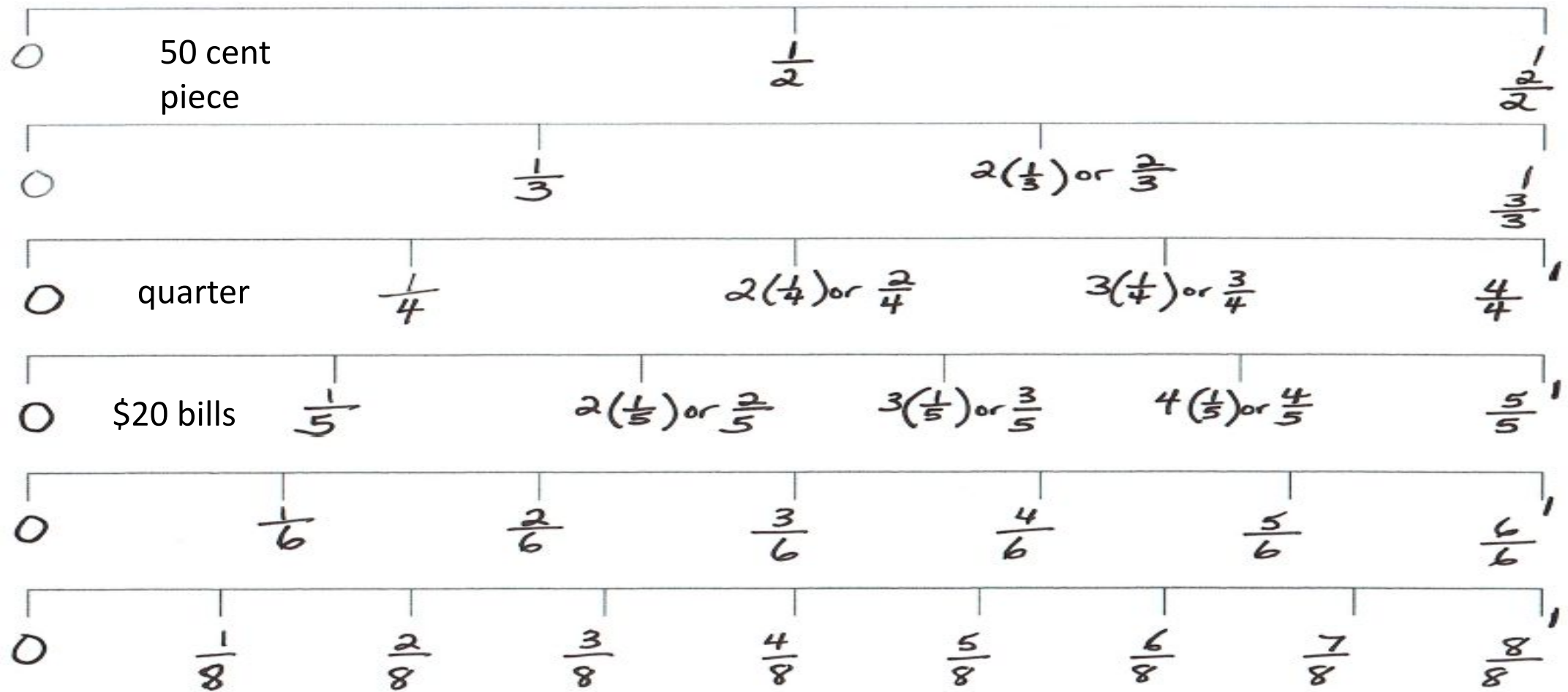
$$\frac{2}{2}$$

Same coin being represented





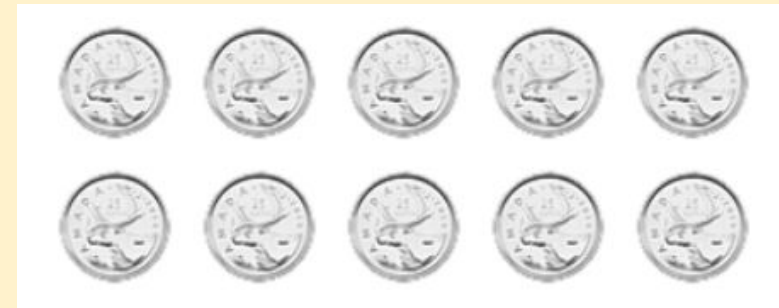
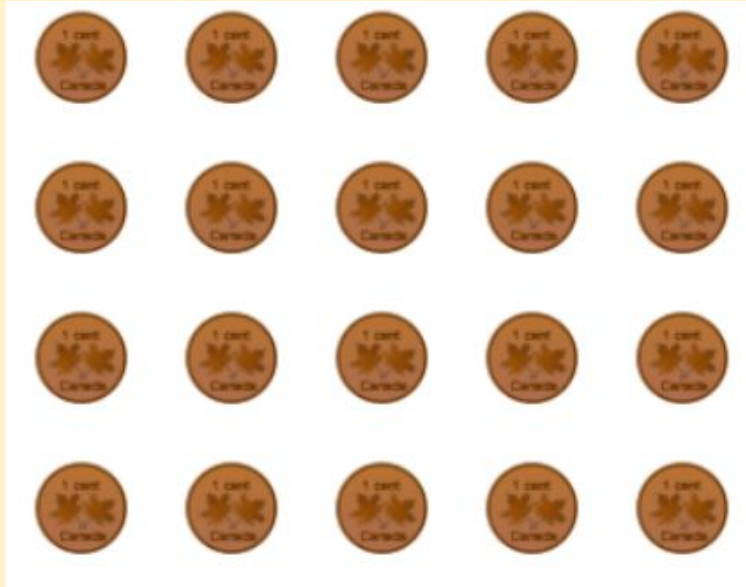




Compare

how can you recognize half?

Grade 1 and 2 Skip Counting - Representing Numbers to 100



Math Facts 10 x 10 12 x 12

Grade 1 and 2 Skip Counting - seeing 100 or 1000



Rename



Drawing on the ideas of grouping, regrouping and partitioning, rename numbers in multiple ways in terms of place value parts without the use of manipulatives

Work on Mastery to 100

Tens

Ones



What number is this?

What number is in the tens place?

How many tens in this number?

How many ones in this number?

What number is this?

What number is in the tens place?

How many tens in this number?

How many ones in this number?

How many tens in...



How many ones?

Work on Mastery to 100

Hundreds

Tens

Ones



What number is this?

What number is in the tens place?

How many tens in this number?

How many ones in this number?

\$100

\$10

\$1



\$100

\$10

\$1



4

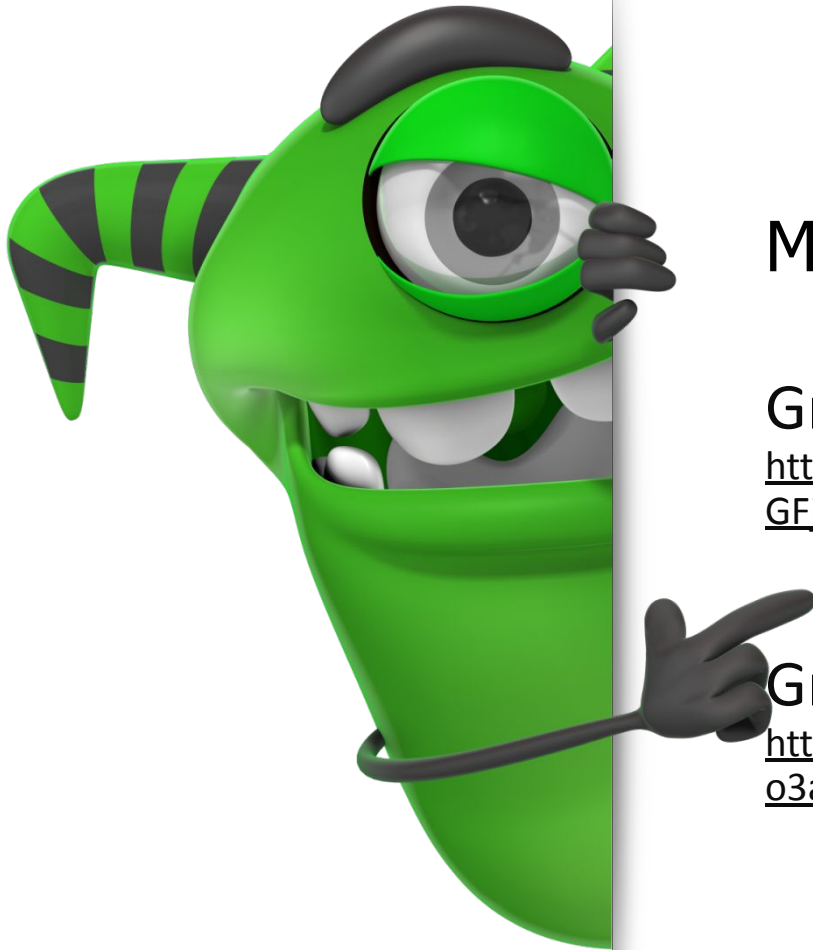


3



4

Be cautious of what we use for assessing learning.



Math Games - [Fractions](#)

Grade 1 Ontario Math - Fractions

<https://cubeforteachers.com/folders/3bJqkwyKXANApxl6s6y8lf3lOYFd2M5slcPu9YB2KBiwZGFjdKAUA5kOphY5NwHM?q=1.B1.6&idx=posts&p=0>

Grade 2 Ontario Math - Fractions

<https://cubeforteachers.com/folders/PliSotwOSqBY4iodosCiTWSGylnrf1rviPP7JvZXyAqIPNKP03adGhXXmoRd1NbU?q=2.B1.6&idx=posts&p=0>

Continuous Review



Leveraging Money





Skip Counting in a Real World Context

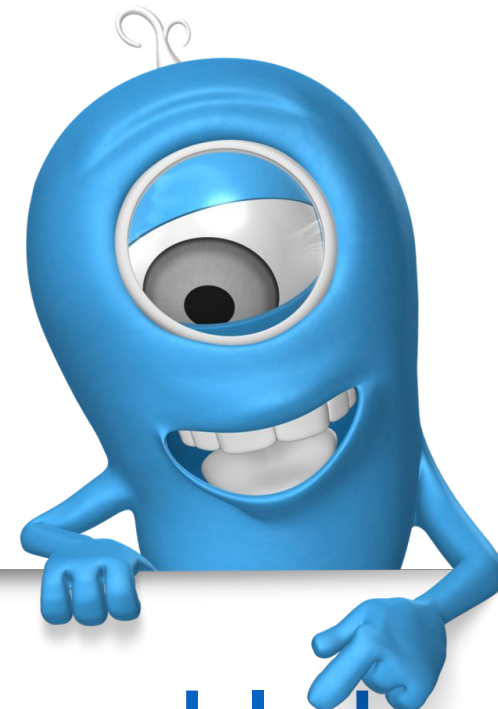
OCTOBER 2020

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
27	28	29	30	01	02	03
04	05	06	07	08	09	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31





Learning
Trajectories



Sparklebox

Numberlines and resources

Sources:

Bruce, C., Chang, D., Flynn, T. *Foundations to Learning and Teaching Fractions: Addition and Subtraction - Literature Review*. Trent University. 2013

Bruce, C et al. Actions to Develop Fractions Understanding as contained in *Paying Attention to Mathematics Education*.
<http://www.edugains.ca/resourcesMath/CE/LessonsSupports/Fractions/SupportDocs/ActionstoDevelopUnderstandingFractions.pdf>

Dean, M. Counting for Additive Thinking in Grades 1-2 Classrooms. MCATA Presentation. Fort McMurray Public School System.

_____. Institute of Educational Science. *IES - Developing Effective Fractions Instruction for Kindergarten Through Grade 8*. 2010
<https://www.readkong.com/tmp/developing-effective-fractions-instruction-for-kindergarten-7236374.pdf>

Greenberg, D. Funny and Fabulous Fraction Stories. Scholastic Education

Ways We Use Fractions. Edugains Teacher Support:

<http://www.edugains.ca/resourcesDP/Resources/PlanningSupports/mathforTeachingWaysWeUseFractions.pdf>

Scholastic Educational Supplies

Rogers, A. *Six Aspects of Place Value*. Numeracy Teachers Academy.

<https://www.numeracyteachersacademy.com/blog/defining-place-value-the-6-aspects>

Thank you!

Chris Zarski
czarski@carcpd.ab.ca

Where are the files going to be?

Math Folder

