

Planning for the New Grade 5 Math

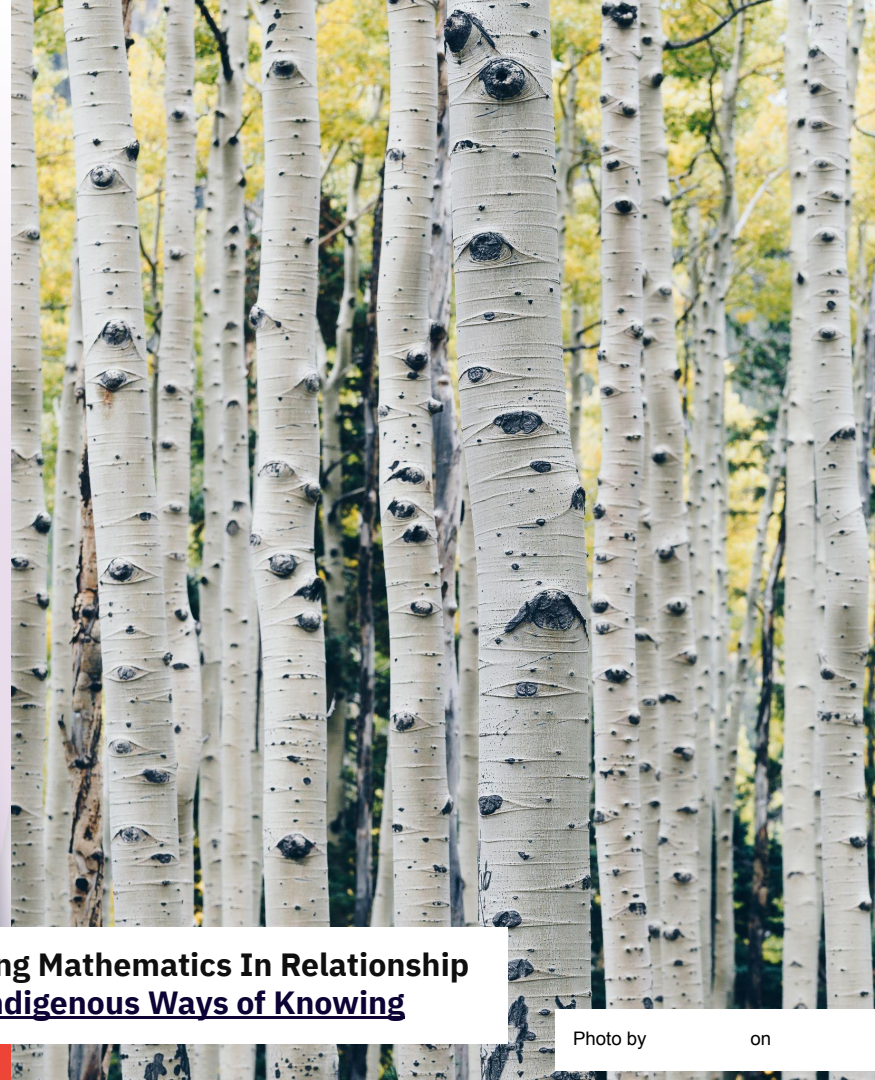


**Provincial Session 4
(February, March, April)**

February 20, 2024

Land Acknowledgement

In the spirit of reconciliation, we want to acknowledge that this gathering is taking place on traditional lands across the province of Alberta, home to many diverse First Nations, Métis and Inuit peoples. We acknowledge that this land is a traditional meeting ground giving voice to its original peoples and the story of creation of this country in a way that history has forgotten.



Teaching Mathematics In Relationship
with Indigenous Ways of Knowing

Photo by

on

Make It Visible...Make It Real

On our agenda today:

- Fractions - Interpret Improper Fractions - 5N5
- Add and subtract fractions with Common denominators - 5N6
- Ratios represent relationships between quantities - 5N7
- Students interpret algebraic expressions - 5A1.2
- Estimating Area Activity - 5M1
- LARGE Numbers!

Number: Quantity is measured with numbers that enable counting, labelling, comparing and op

5N5 Students interpret improper fractions.

- Fractions allow counting and measuring between whole quantities.
- Improper fractions and mixed numbers that represent the same number are associated with the same point on the number line. (interpret related to money initially)

5N6 Students add and subtract fractions with common denominators.

- Fractions with common denominators are multiples of the same unit fraction.
- Properties for addition and subtraction of natural numbers apply to fractions.

* Review of math facts with different strategies should be ongoing

5A1.2 Students interpret numerical and algebraic expressions.

- Algebraic expressions use variables to represent quantities of unknown value.
- Algebraic expressions may be composed of one algebraic term or the sum of algebraic and constant

terms. (focus more on expressions and writing them in real contexts)

5N5 Students interpret improper fractions. (comparing to benchmarks)

- Fractions allow counting and measuring between whole quantities.
- Improper fractions and mixed numbers that represent the same number are associated with the same point on the number line.

5N6 Students add and subtract fractions with common denominators

- Fractions with common denominators are multiples of the same unit fraction.
- Properties for addition and subtraction of natural numbers apply to fractions. (tie in with improper fractions)

* Review of math facts with different strategies should be ongoing

5N7 Students employ ratios to represent relationships between quantities.

- A ratio is a comparison of two quantities in a specific situation.
- Fractions, decimals, ratios, and percentages can represent the same part-whole relationship (tie into money examples)

* Review of math facts with different strategies should be ongoing

Algebra: Equations express relationships between quantities.

5A1.2 Students interpret numerical and algebraic expressions.

5A1.3 Students interpret numerical and algebraic expressions.

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5N6 Students add and subtract fractions with common denominators.

- Fractions with common denominators are multiples of the same unit fraction.
- Properties for addition and subtraction of natural numbers apply to fractions.

* Review of math facts with different strategies should be ongoing

Students interpret improper fractions.

5N5

Knowledge	Understanding	Skills & Procedures
<p>A fraction can represent quantities greater than one.</p> <p>An improper fraction has a numerator that is greater than its denominator.</p> <p>Natural numbers can be expressed as improper fractions with a denominator of 1.</p> <p>A mixed number of the form $A\frac{b}{c}$, composed of a number of wholes, A, and a fractional part, $\frac{b}{c}$, can represent an improper fraction.</p>	<p>Fractions allow counting and measuring between whole quantities.</p> <p>Improper fractions and mixed numbers that represent the same number are associated with the same point on the number line.</p>	<p>Relate fractions, improper fractions, and mixed numbers to their positions on the number line.</p> <p>Count beyond 1 using fractions with the same denominator.</p> <p>Model fractions, including improper fractions and mixed numbers, using quantities, lengths, and areas.</p> <p>Express improper fractions and mixed numbers symbolically.</p> <p>Express an improper fraction as a mixed number and vice versa.</p> <p>Compare fractions, including improper fractions and mixed numbers, to benchmarks of 0, $\frac{1}{2}$, and 1.</p>

It is important that students have a context for an improper to a mixed fraction relationship and not just a “rule” of how to convert from one to another.

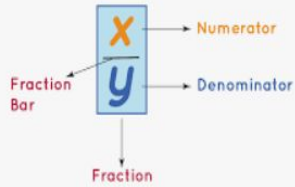
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
“Sharing”	<p>In a quantity partitioned into two equal groups, each group represents one-half of the whole quantity. In a shape or object partitioned into two identical pieces, each piece represents one-half of the whole.</p> <p>Symmetry</p>	<p>“Quarters”</p> <p>Model a unit fraction.. (10 or fewer parts)</p> <p>Compare unit fractions of the same/different wholes.</p> <p>Make the whole from a unit fraction.</p>	<p>Fractions are numbers between natural numbers.</p> <p>Fractions can represent part-to-whole relationships.</p> <p>A unit fraction describes the size of the equal parts of a fraction.</p> <p>The size of the parts and the total number of equal parts in the whole are inversely related. (Money)</p>	<p>There are infinitely many equivalent fractions that represent the same number.</p> <p>Exactly one of infinitely many equivalent fractions is in simplest form. (GCF)</p> <p>Decimal numbers that terminate (do not repeat) are fractions with denominators of 10, 100, etc.</p> <p>Fractions, decimals, and percentages can represent the same part-whole relationship.</p>	<p>Fractions allow counting and measuring between whole quantities.</p> <p>Improper fractions and mixed numbers that represent the same number are associated with the same point on the number line.</p>	<p>Model an equal-sharing situation in more than one way. Describe an equal-sharing situation using a fraction. Express a fraction as a division statement and vice versa. Convert a quotient from fraction to decimal form using division.</p>

Grade 4	Grade 5	Grade 6
<p>There are infinitely many equivalent fractions that represent the same number.</p> <p>Exactly one of infinitely many equivalent fractions is in simplest form. (GCF)</p> <p>Decimal numbers that terminate (do not repeat) are fractions with denominators of 10, 100, etc.</p> <p>Fractions, decimals, and percentages can represent the same part-whole relationship.</p>	<p>Fractions with common denominators are multiples of the same unit fraction.</p> <p>Properties for addition and subtraction of natural numbers apply to fractions.</p>	<p>Fractions with common denominators have the same units. Any numbers with the same unit can be compared, added, or subtracted.</p> <p>Multiplication does not always result in a larger number. Multiplication of a natural number by a fraction can be interpreted as repeated addition of the fraction. Multiplication of a fraction by a natural number can be interpreted as taking part of a quantity.</p>

"Fraction is..."

Symbolic

Numerator and Denominator in a Fraction

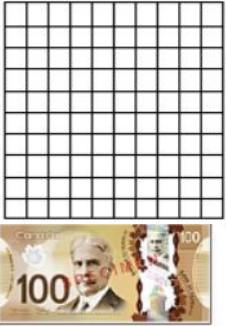


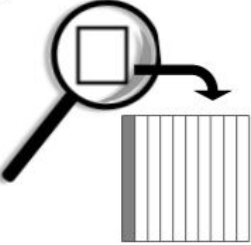
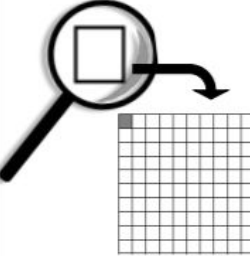


RELATIONSHIPS

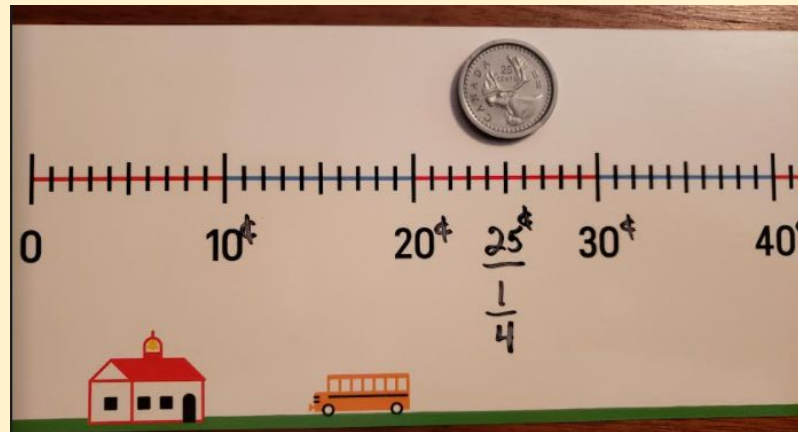
WHAT IS A FRACTION?

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

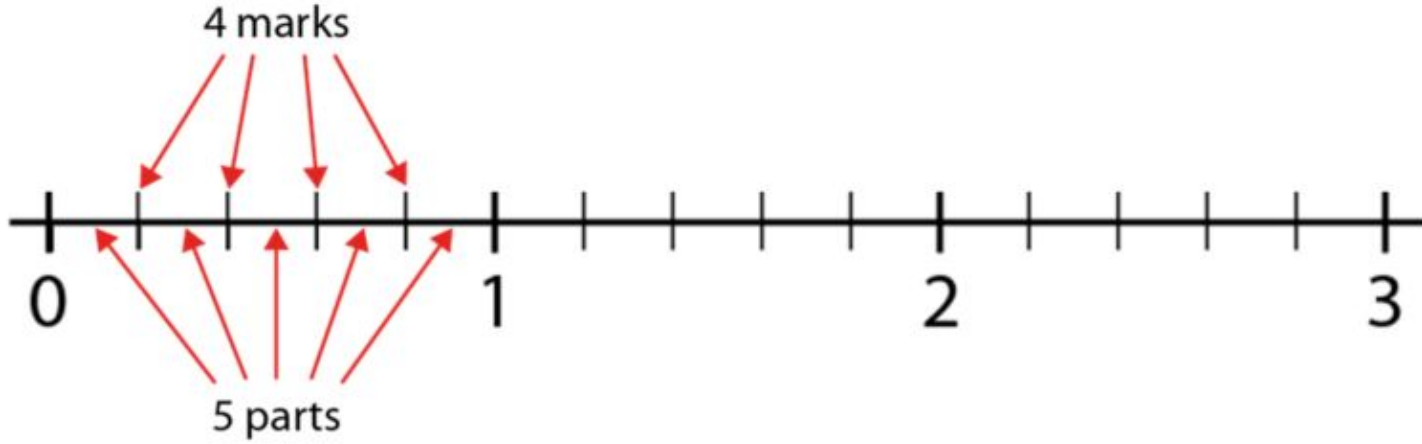


Hundreds	Tens	Units	Tenths	Hundredths
 <p>100.00</p>	 <p>10.00</p>	 <p>1.00</p>	 <p>0.1 $\frac{1}{10}$</p>	 <p>0.01 $\frac{1}{100}$</p>

Real World
Context



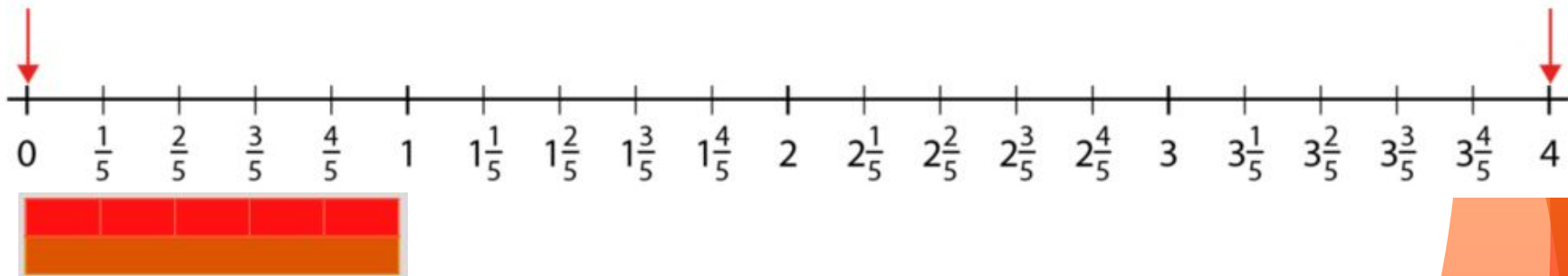
How to read the number line for unit fractions



$$\frac{1}{5}$$

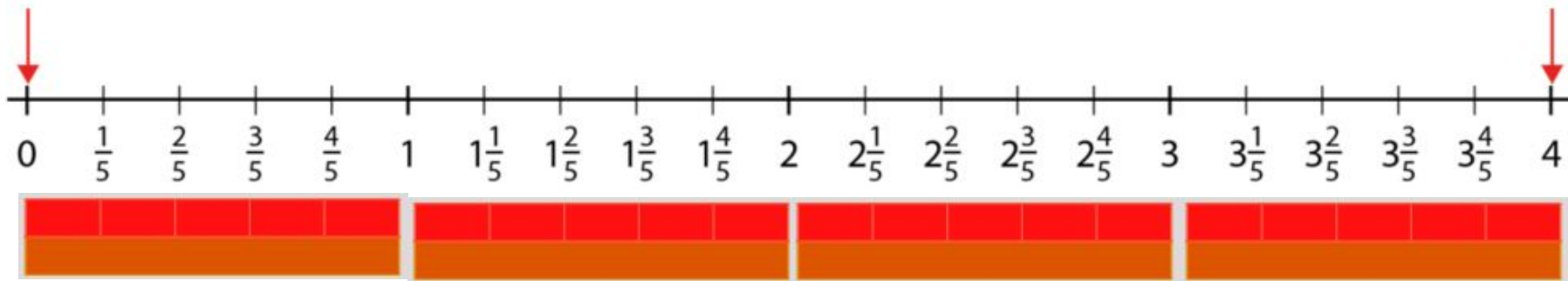
Source: 3.5 Improper Fractions & mixed numbers. NCETM Mastery PD (2019 Pilot)

Count by unit fractions of $\frac{1}{5}$ and write the values above the line. Model the values.

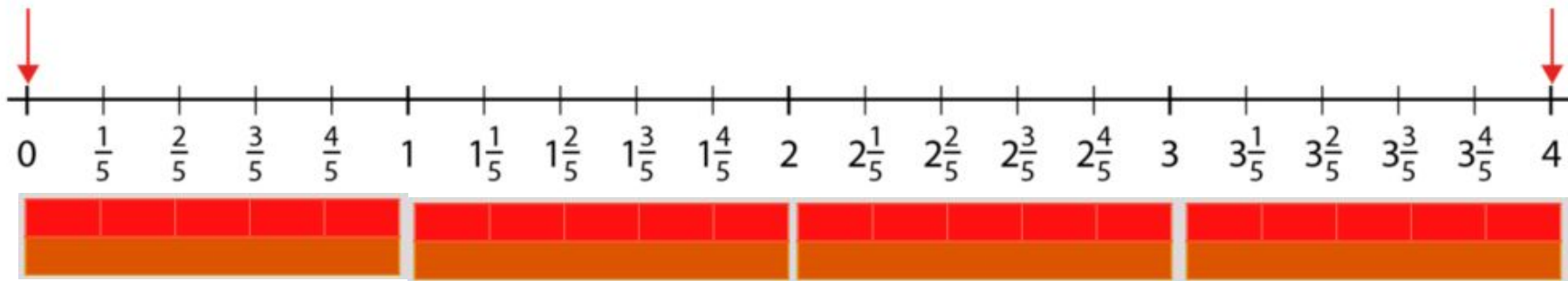


Cuisenaire rods

Count by unit fractions of $\frac{1}{5}$ and write the values above the line. Model the values.

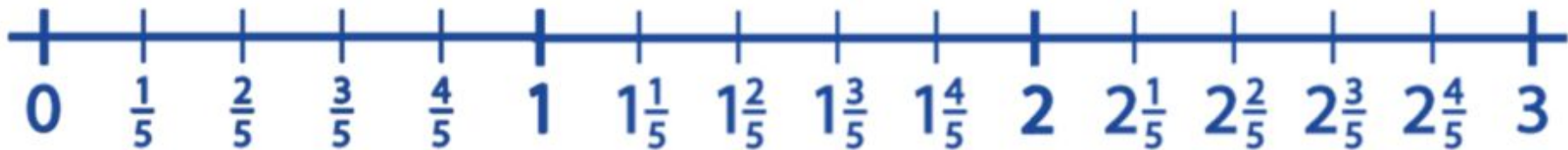
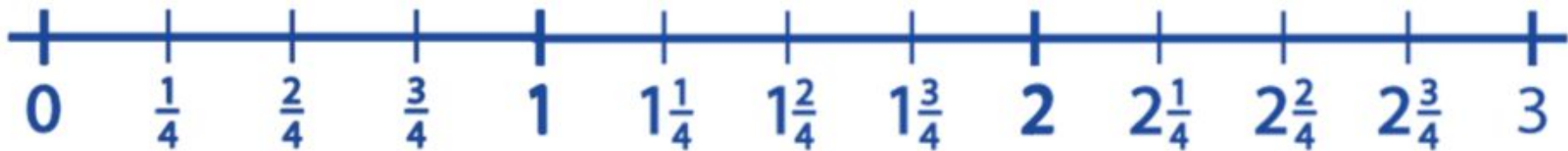


Count by unit fractions of $\frac{1}{5}$ and write the values below the line.

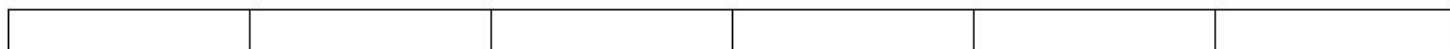
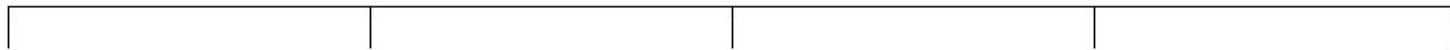
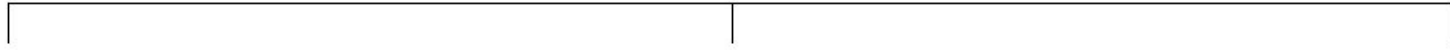


What are the monetary values of each point?

How might knowing this help place 1.26?

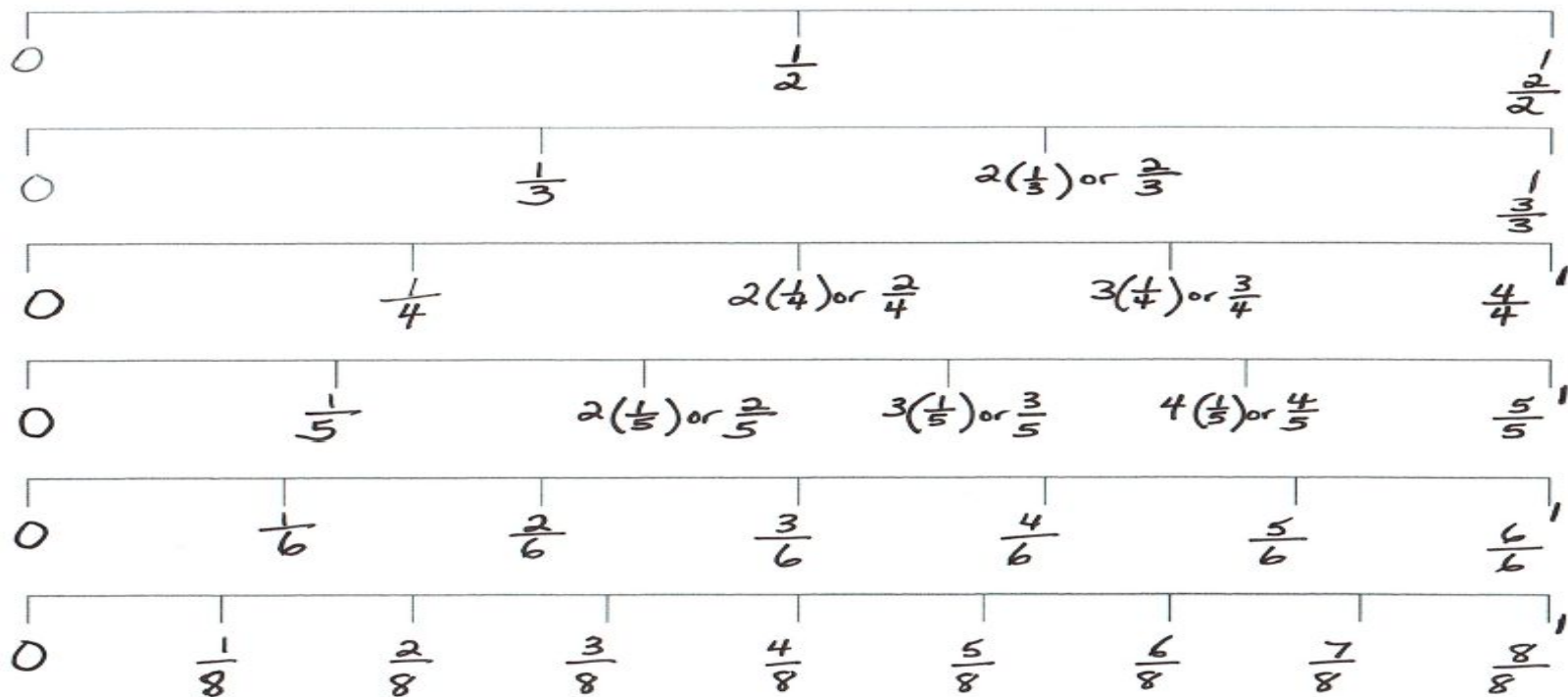


- *Tell me any number between two and three.*
- *Tell me a number very close to three.*
- *Tell me any number even closer to three than the previous number.*
- *Tell me a number greater than two that is very close to two.*
- *Tell me a number smaller than two that is very close to two.*



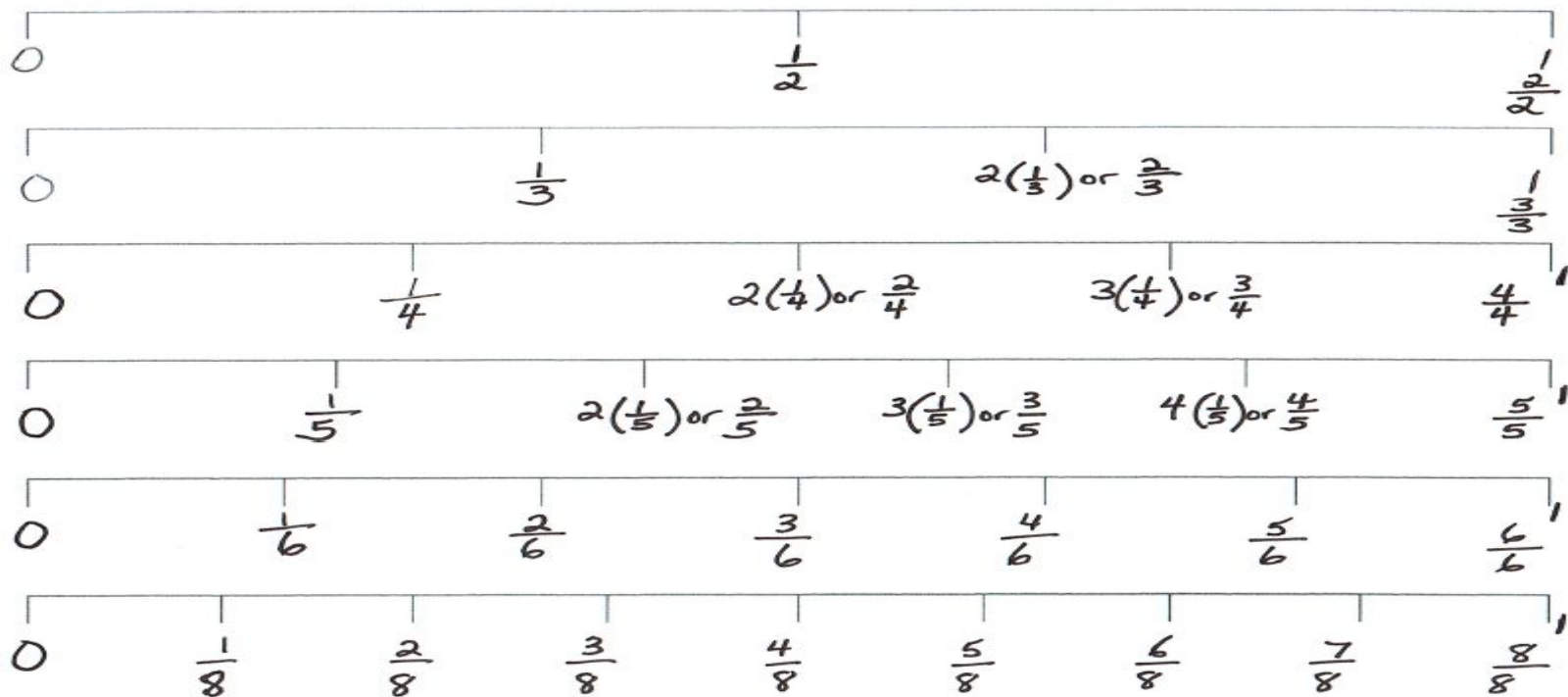
Place 0 down the left side of each number line.
Place 1 down the right side of each number line.

Count by each unit fraction and number each 'tick' mark.



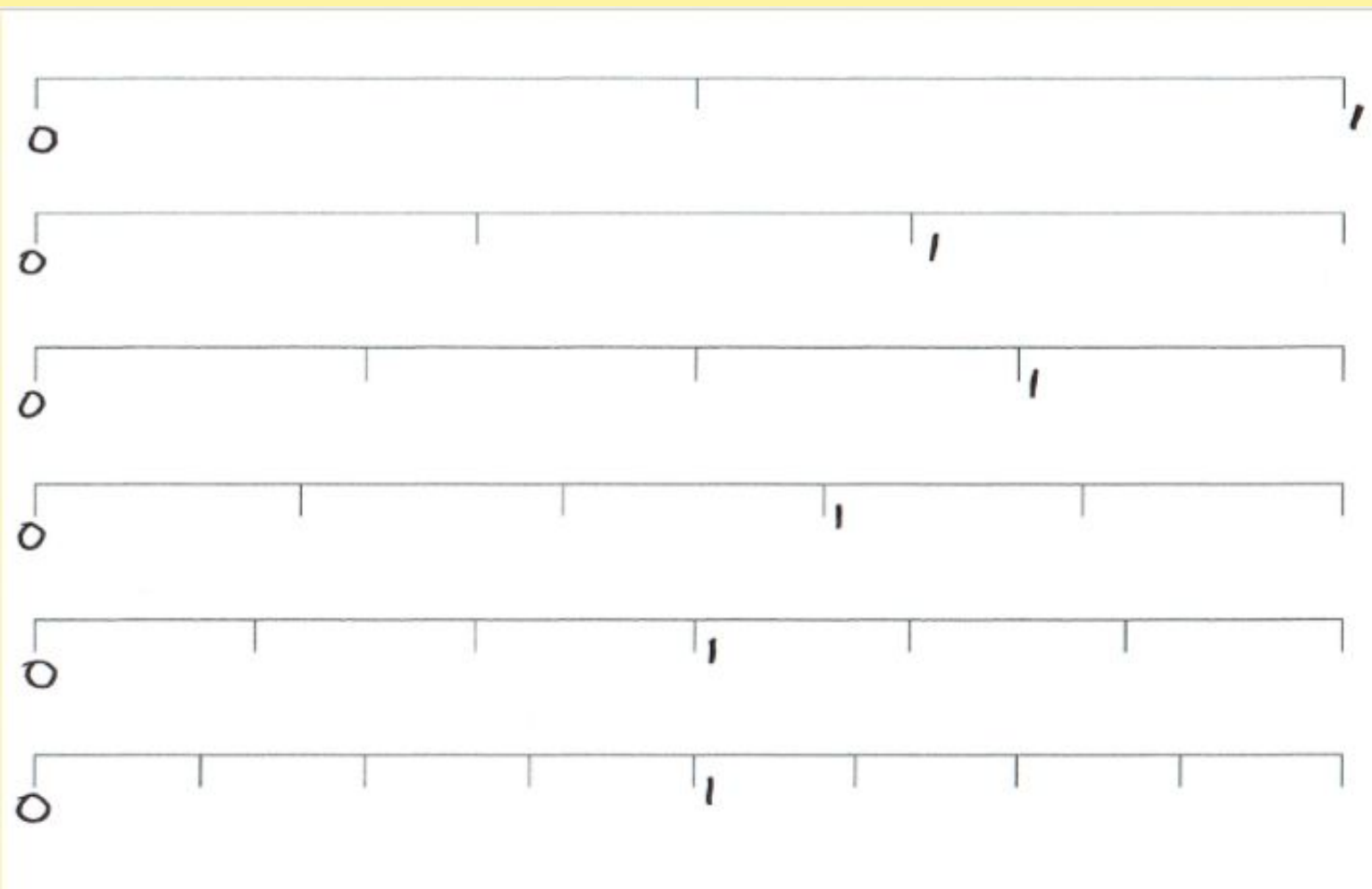
Compare

how can you recognize half?

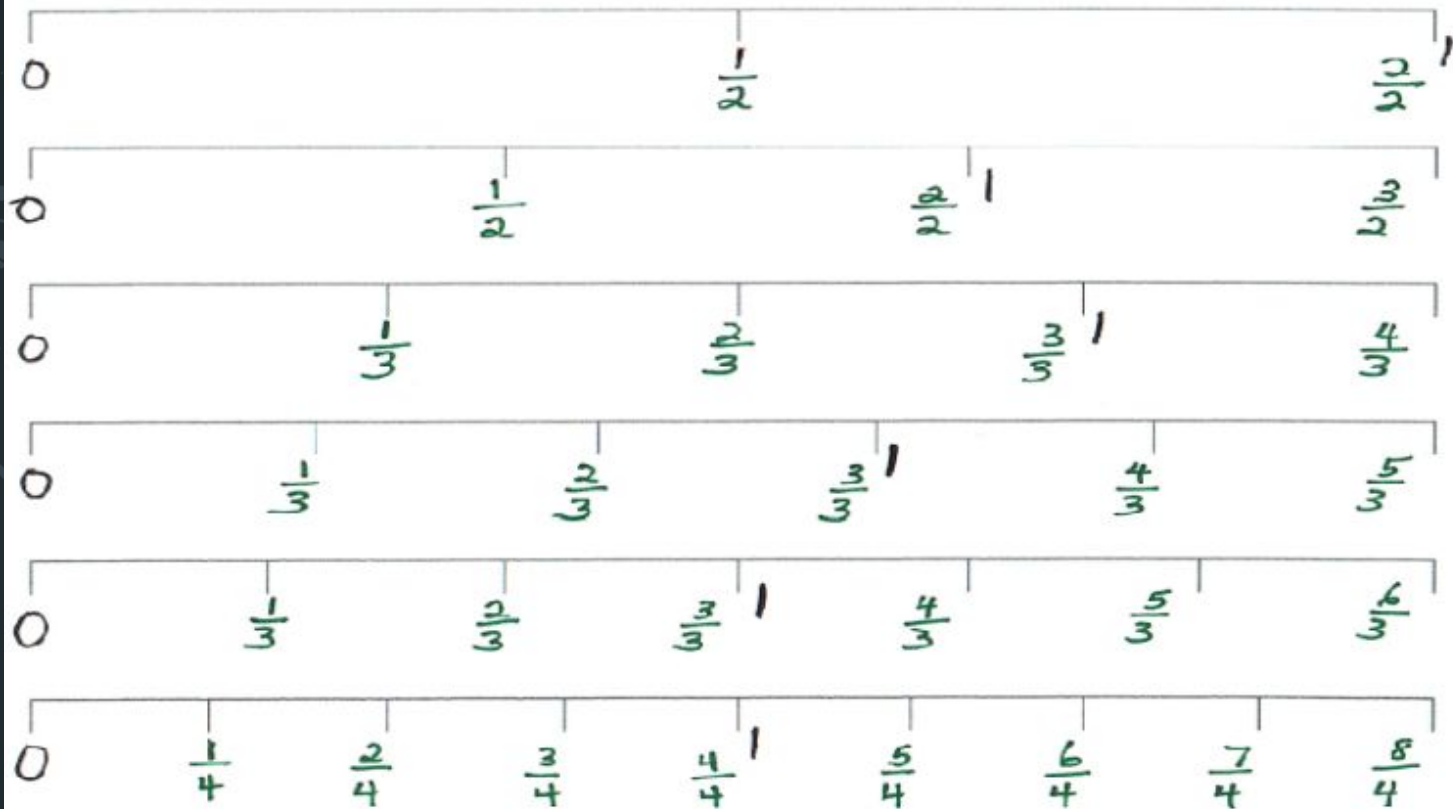


Compare

how can you recognize half?



Surface
Deep
Transfer



How much is $\frac{3}{2}$?

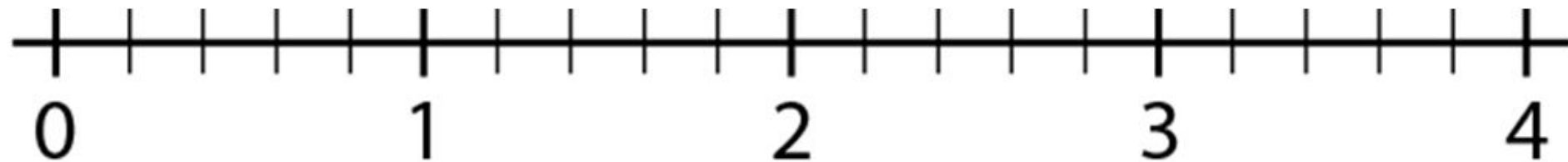
Would students know where to put the benchmarks on any number line?

$$\frac{3}{5}$$

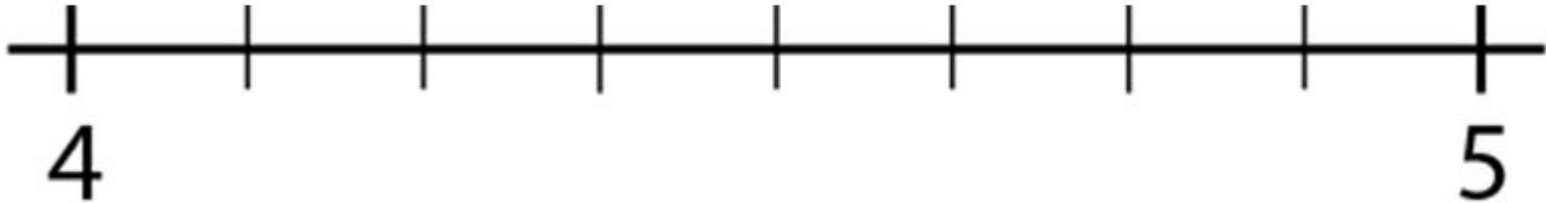
$$1\frac{2}{5}$$

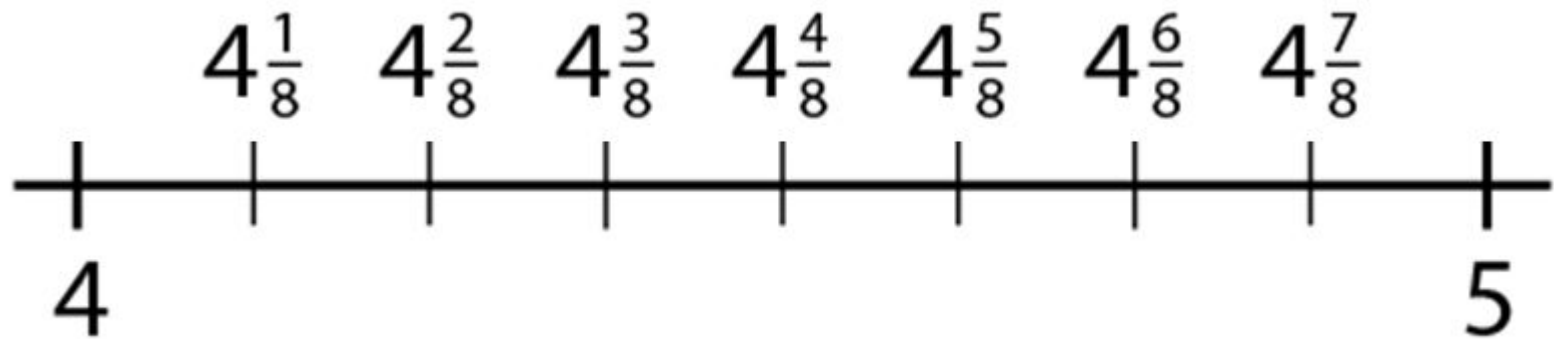
$$2\frac{1}{5}$$

$$2\frac{4}{5}$$

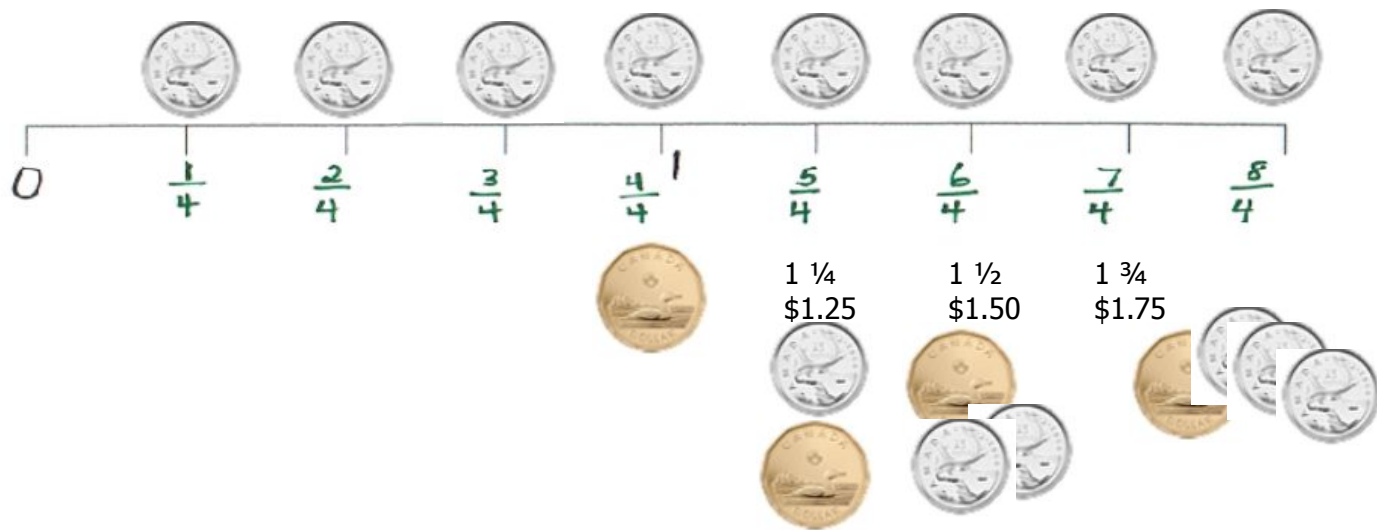


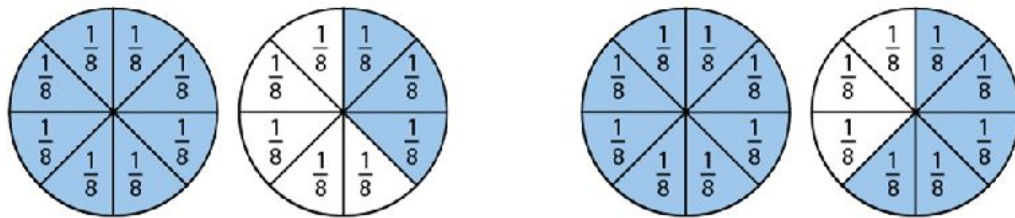
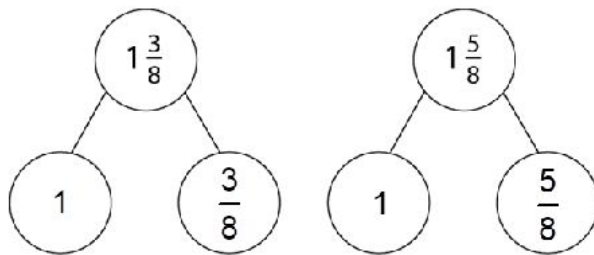
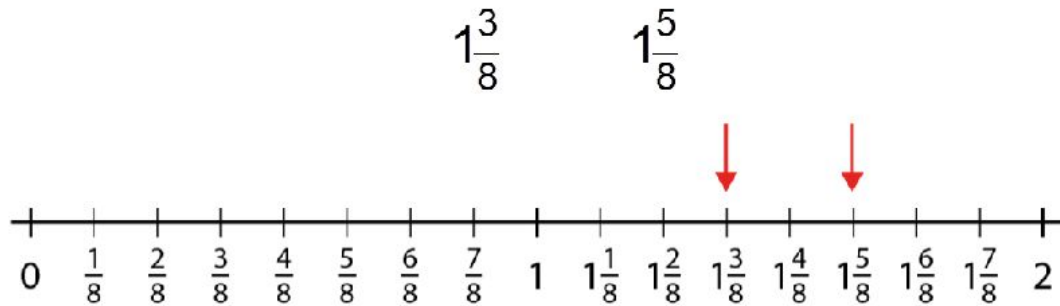
What numbers belong to each missing value on the number line?





Money offers the context to learn about counting by a unit fraction, adding/subtracting fractions (multiplies of the same unit fraction), interpreting improper fractions, writing mixed fractions.





Knowledge	Understanding	Skills & Procedures
<p>Fractions with common denominators can be composed or decomposed to model the change in a quantity of unit fractions.</p> <p>Addition and subtraction of fractions with common denominators does not change the unit fraction from which they are composed.</p> <p>Fractions greater than one can be added or subtracted as mixed numbers or improper fractions.</p>	<p>Fractions with common denominators are multiples of the same unit fraction.</p> <p>Properties for addition and subtraction of natural numbers apply to fractions.</p>	<p>Investigate the composition and decomposition of a quantity within using unit fractions.</p> <p>Express the composition or decomposition of fractions with common denominators as a sum or difference.</p> <p>Compare strategies for adding or subtracting improper fractions to strategies for adding or subtracting mixed numbers.</p> <p>Add and subtract fractions with common denominators within 100, including improper fractions and mixed numbers.</p> <p>Solve problems requiring addition and subtraction of fractions with common denominators, including improper fractions and mixed numbers.</p>

5N5 Students interpret improper fractions.

- Fractions allow counting and measuring between whole quantities.
- Improper fractions and mixed numbers that represent the same number are associated with the same point on the number line. (interpret related to money initially)

5N6 Students add and subtract fractions with common denominators.

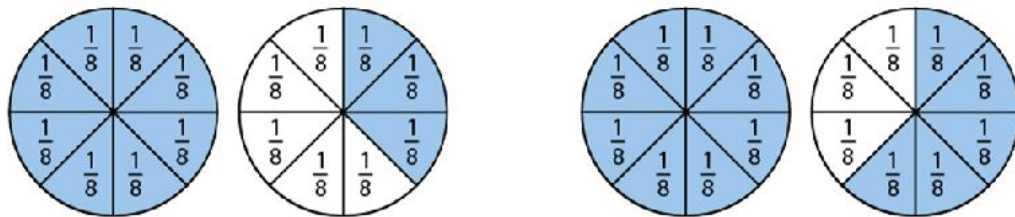
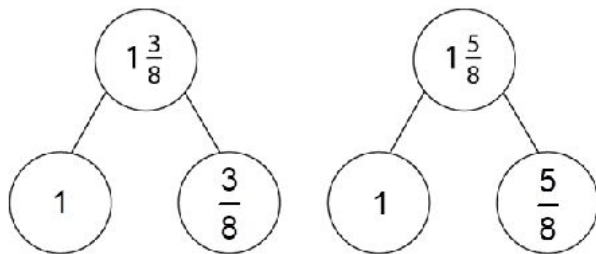
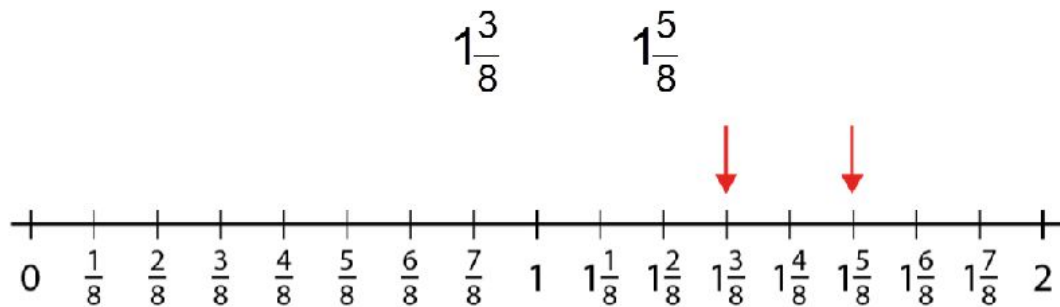
- Fractions with common denominators are multiples of the same unit fraction.
- Properties for addition and subtraction of natural numbers apply to fractions.

* Review of math facts with different strategies should be ongoing

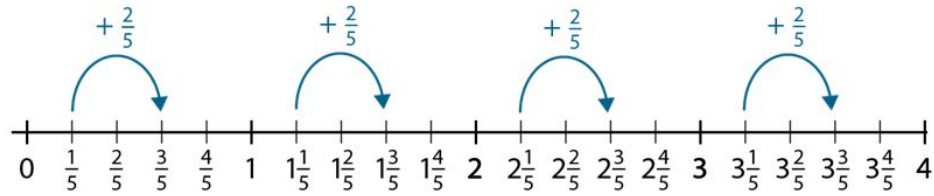
Representing and Thinking About Fractions (also links to Ratios)

(Based on research by Dr. Cathy Bruce TMERC 2013)

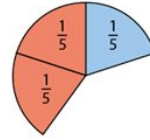
Decimal and Fraction Cards - assist students in seeing the various forms of numbers. (equivalent forms). Provide a game format.



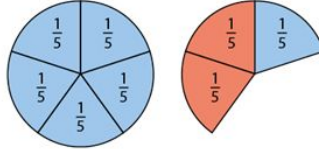
Patterns for addition



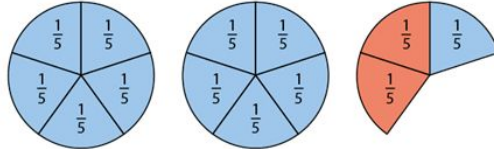
$$\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$$



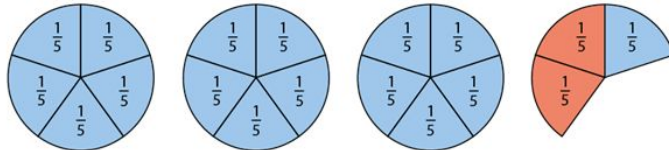
$$1\frac{1}{5} + \frac{2}{5} = 1\frac{3}{5}$$



$$2\frac{1}{5} + \frac{2}{5} = 2\frac{3}{5}$$



$$3\frac{1}{5} + \frac{2}{5} = 3\frac{3}{5}$$



5N7 Students employ ratios to represent relationships between quantities.

- A ratio is a comparison of two quantities in a specific situation.
- Fractions, decimals, ratios, and percentages can represent the same part-whole relationship (tie into money examples)

* Review of math facts with different strategies should be ongoing

Number: Quantity is measured with numbers that enable counting, labelling, comparing, and operating.

How can ratios provide new ways to relate numbers?

Students employ ratios to represent relationships between quantities.

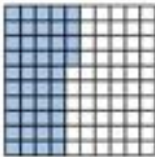

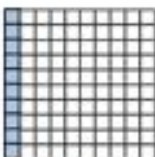
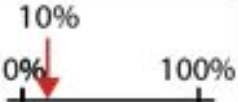
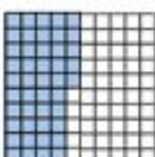

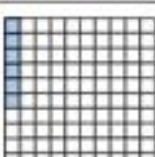

Knowledge	Understanding	Skills & Procedures
<p>A ratio can express part-part or part-whole relationships between two countable or measurable quantities.</p> <p>A ratio can be expressed with a fraction or with a colon.</p> <p>A percentage represents a part-whole ratio that compares a quantity to 100.</p>	<p>A ratio is a comparison of two quantities in a specific situation.</p> <p>Fractions, decimals, ratios, and percentages can represent the same part-whole relationship.</p>	<p>Express part-part ratios and part-whole ratios of the same whole to describe various situations.</p> <p>Express, symbolically, the same part-whole relationship as a ratio, fraction, decimal, and percentage.</p>

Revisit the many forms that fractions can take.
Ratios can be introduced by revisiting “sets”

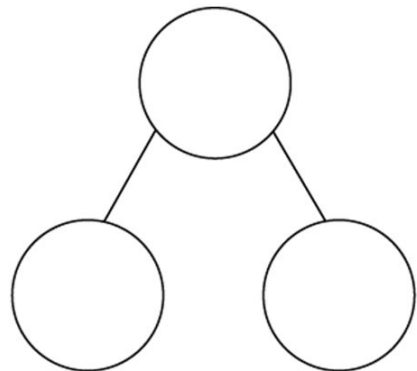
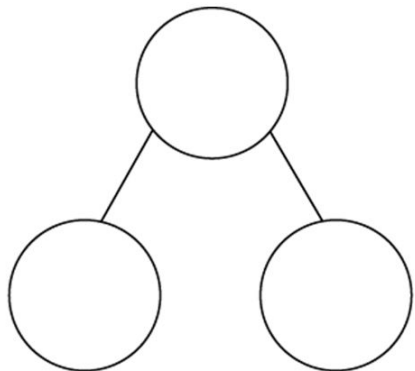
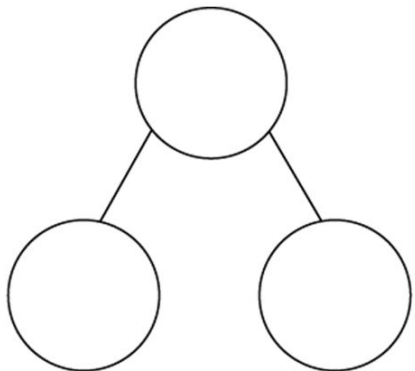
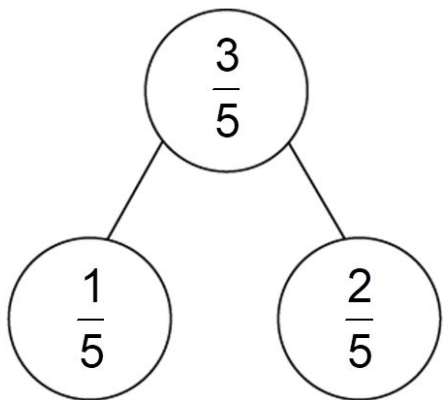
Fraction Board Games

Fraction Dominos

Fractions of Sets that could also be used as ratios (Mathies)

Percentage	Fraction	Hundred square	Number line
44%	$\frac{44}{100}$		
10%	$\frac{10}{100}$		
45%	$\frac{45}{100}$		
6%	$\frac{6}{100}$		

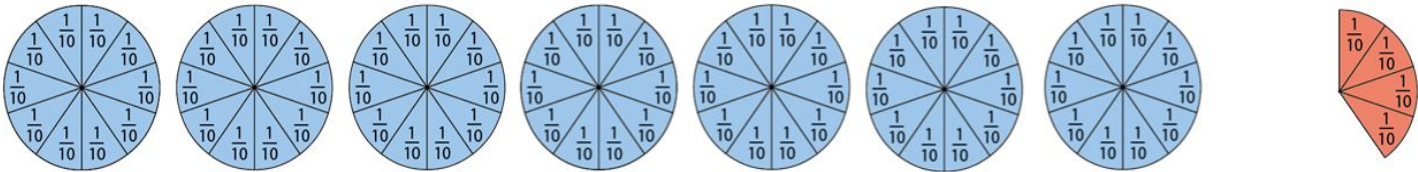
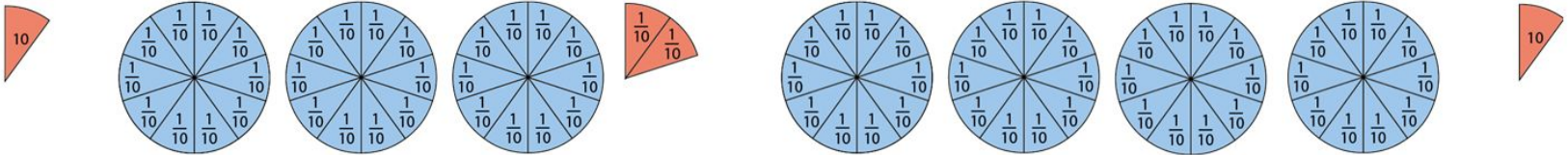
$$\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$$



Modelling

$$\frac{1}{10} + 3\frac{2}{10} + 4 + \frac{1}{10}$$

$$\frac{1}{10} + \quad 3\frac{2}{10} \quad + \quad 4 \quad + \quad \frac{1}{10}$$



$$7\frac{4}{10}$$

$$\frac{1}{10} + 3\frac{2}{10} + 4 + \frac{1}{10}$$

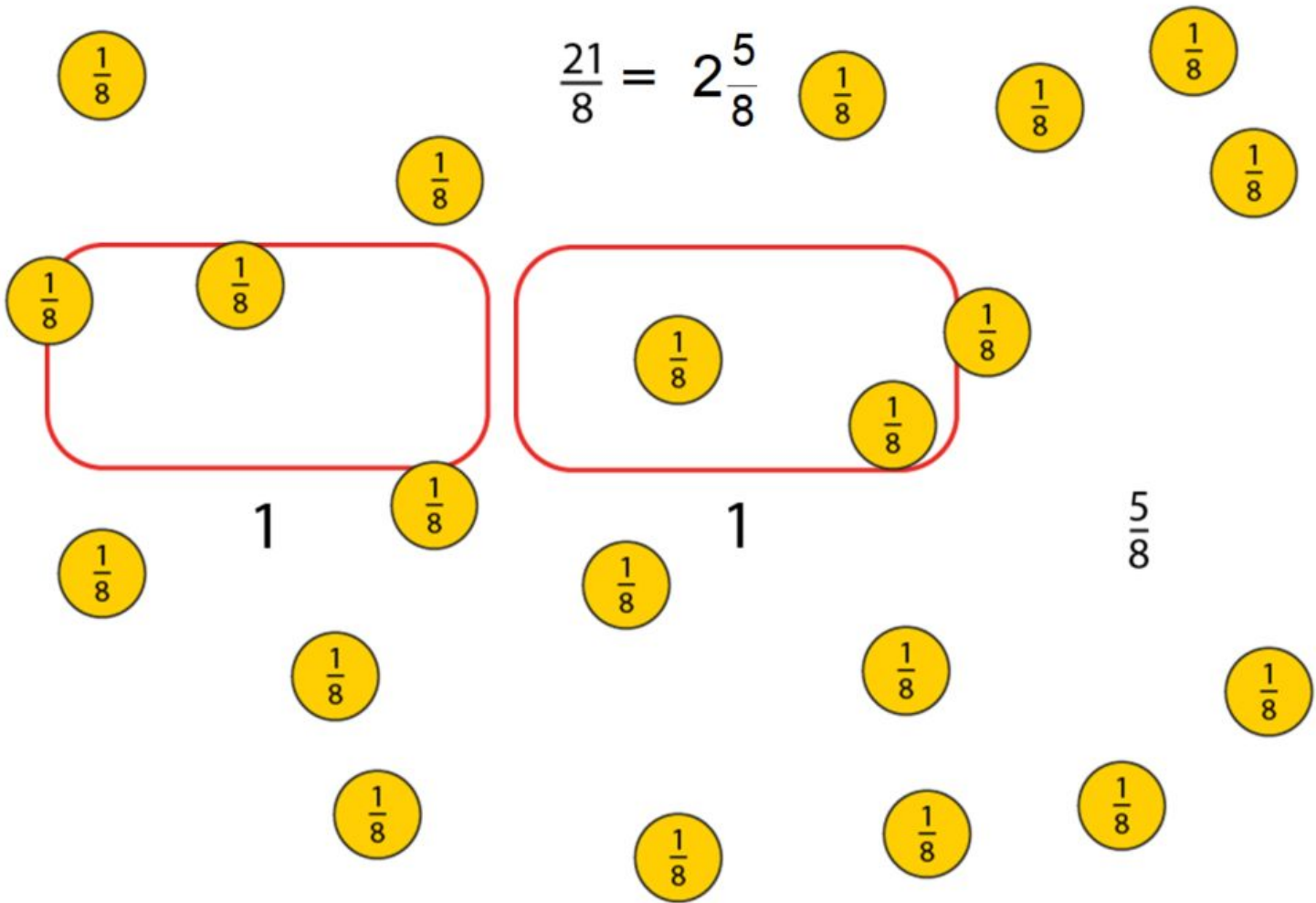
$$\frac{1}{10} + 3 + \frac{2}{10} + 4 + \frac{1}{10}$$

$$3 + 4 + \frac{1}{10} + \frac{2}{10} + \frac{1}{10}$$

Diagram illustrating the addition of integers and fractions:

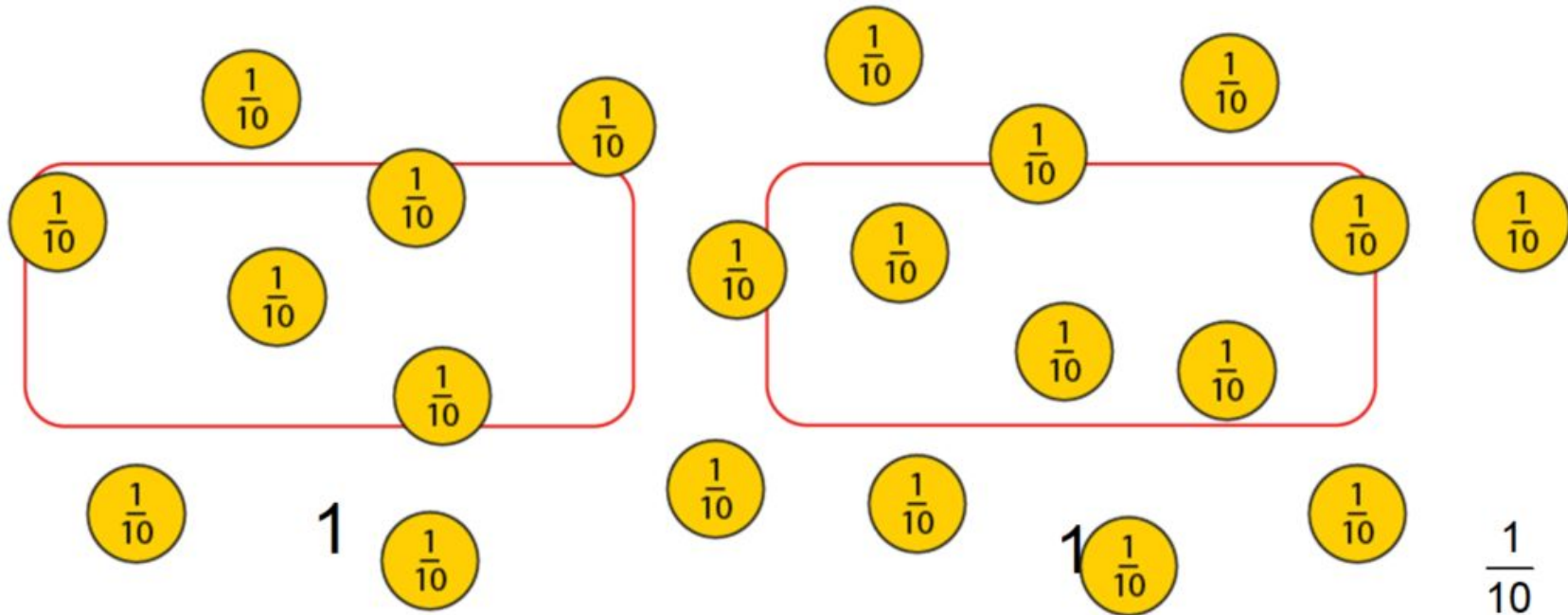
- $3 + 4 = 7$
- $\frac{1}{10} + \frac{2}{10} + \frac{1}{10} = \frac{4}{10}$
- $7 + \frac{4}{10} = 7\frac{4}{10}$

Breaking
down to
similar parts



Improper fraction	Prompt question	Mixed number
$\frac{21}{10}$		

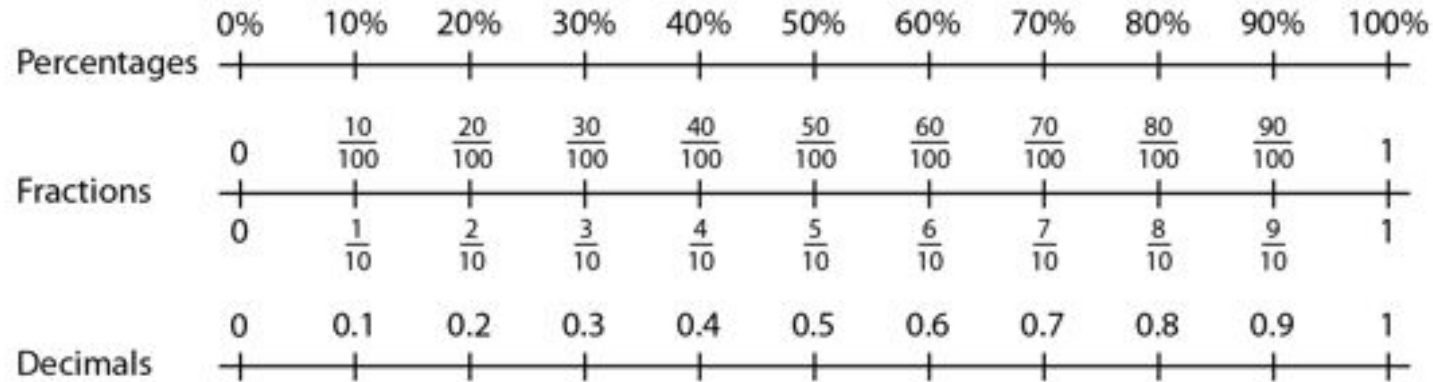
What question should we pose?



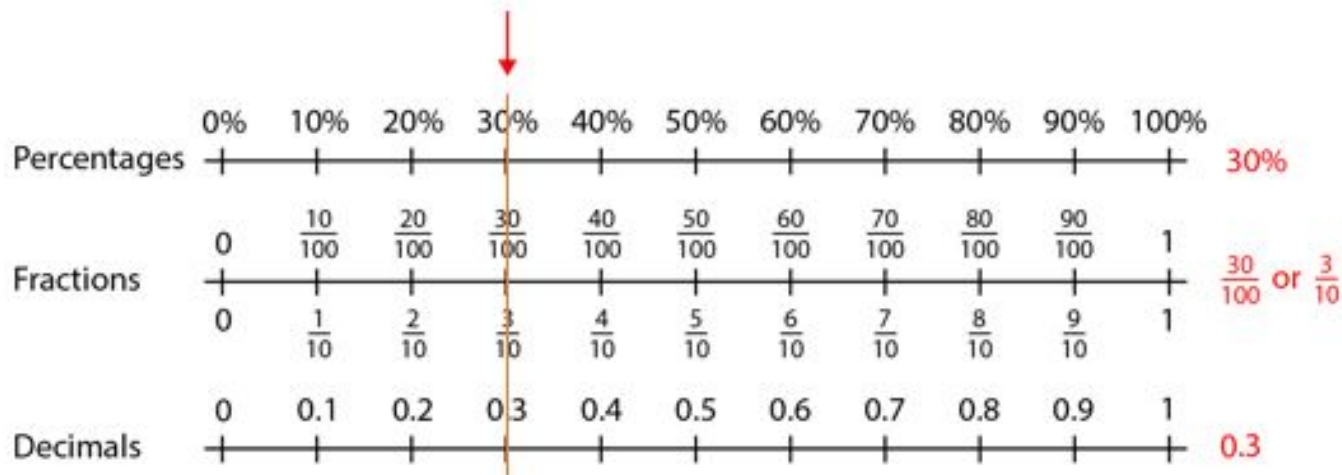
Improper fraction	Prompt question	Mixed number
$\frac{21}{10}$	How many groups of $\frac{10}{10}$ in $\frac{21}{10}$? (2 groups and 1 more tenth.)	$2\frac{1}{10}$
$\frac{21}{9}$	How many groups of $\frac{9}{9}$ in $\frac{21}{9}$?	
$\frac{21}{8}$	How many groups of $\frac{8}{8}$ in $\frac{21}{8}$?	
$\frac{21}{7}$	How many groups of $\frac{7}{7}$ in $\frac{21}{7}$?	
$\frac{21}{6}$	How many groups of $\frac{6}{6}$ in $\frac{21}{6}$?	
$\frac{21}{5}$	How many groups of $\frac{5}{5}$ in $\frac{21}{5}$?	
$\frac{21}{4}$	How many groups of $\frac{4}{4}$ in $\frac{21}{4}$?	
$\frac{21}{3}$	How many groups of $\frac{3}{3}$ in $\frac{21}{3}$?	
$\frac{21}{2}$	How many groups of $\frac{2}{2}$ in $\frac{21}{2}$?	

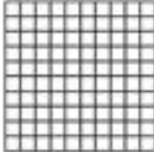

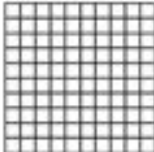

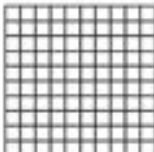

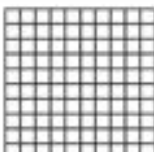

What formative assessment question might you ask at this point?

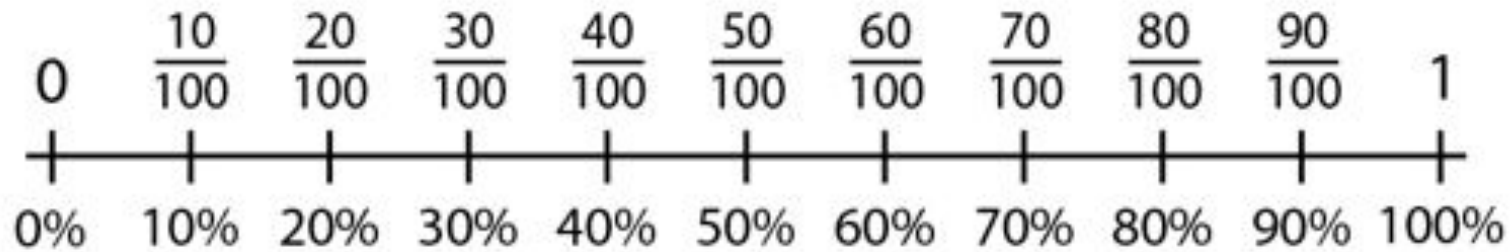
What could your 'exit ticket' read?

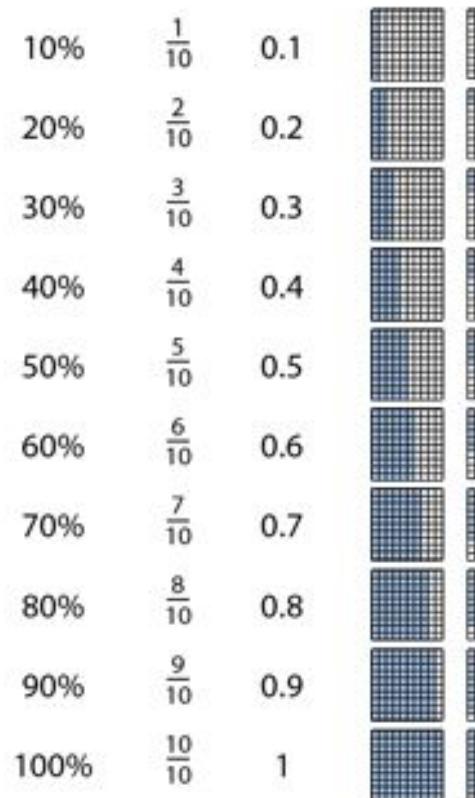


If these are **dollar amounts**, students make a real connection!

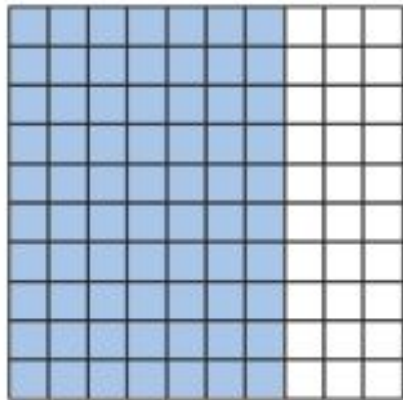


Percentage	Fraction	Hundred square	Number line	Decimal
80%	$\frac{\square}{100}$			0.80
45%	$\frac{\square}{100}$			0.45
31%	$\frac{\square}{100}$			0.31
9%	$\frac{\square}{100}$			0.09





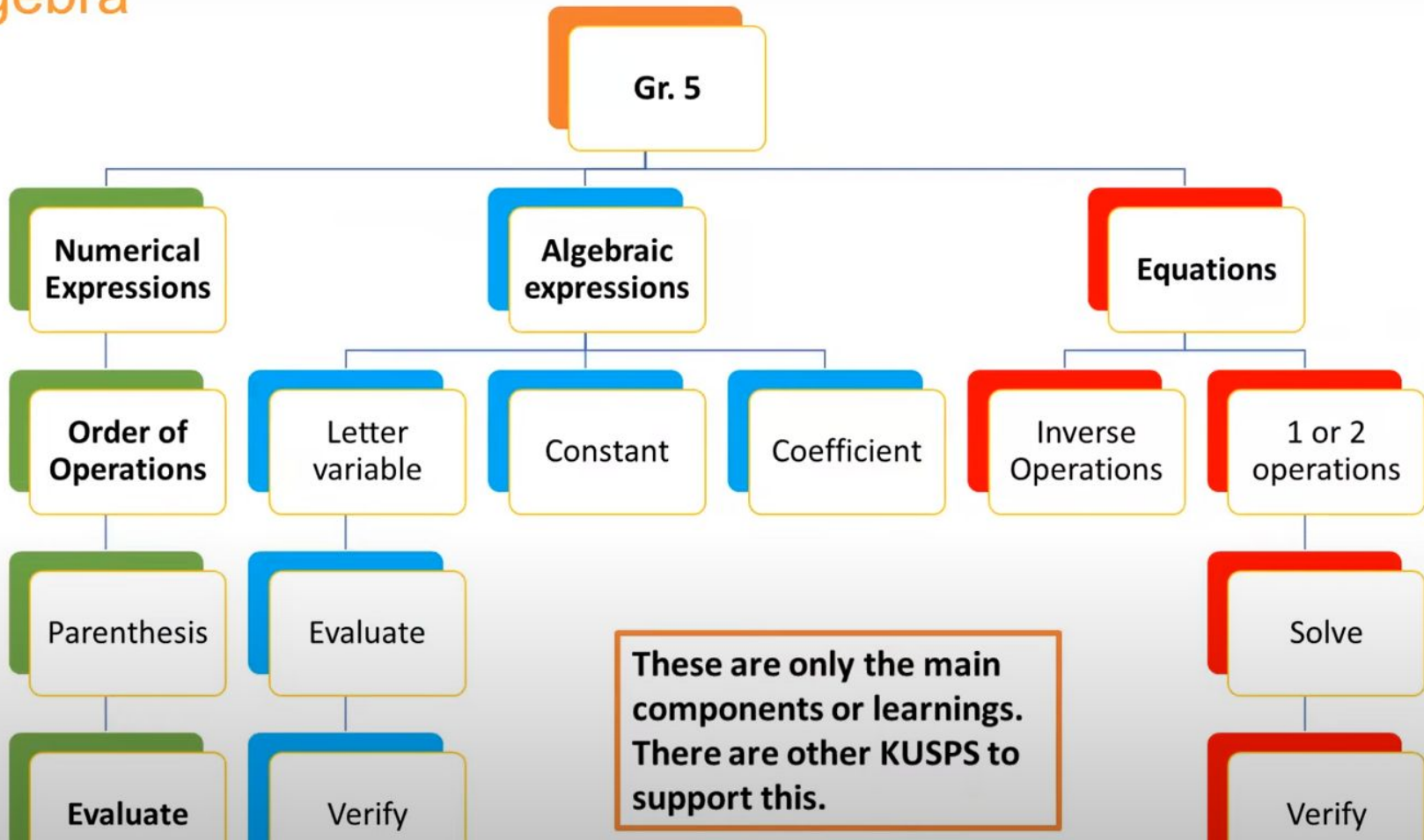
70%



100 ¢ = \$1.00



Part of a dime



Grade 3	Grade 4	Grade 5	Grade 6
Knowledge of basic fact 10×10	Order of operations (no parenthesis) $x, \div, +, -$	Evaluate numerical expressions with multiple operations (with addition and subtraction in parenthesis)	Evaluate numerical expressions using order of operations and powers
Equality between a number and an expression 7 has the same value as $4 + 3$ $7 = 4 + 3$	Create numerical expressions with multiple operations $3 \times 6 + 2$	Work with algebraic expressions with a variable, constant, and coefficient $3n + 2$	Understand and apply algebraic properties:
Equality between 2 expressions of the same number $3 + 3 = 4 + 2$	Evaluate numerical expressions with multiple operations $5 + 4 - 3$	Evaluate algebraic expressions of form $x + 6, 2x, x/2, 2x + 6$ when given the value of the variable	Simplify algebraic expressions by combining like terms $2x + 3x$
Equations can have unknown values that can be represented by symbols $5 - \text{○} = 2$	Understand and apply preservation of equality in an equation without an unknown value (hands on) $7 = 7 \rightarrow 7 + 2 = 6 + 3$	Using inverse operations to solve an equation, limited to 1 or 2 operations	Solve equations with algebraic expressions on both sides of the equations. limited to 1 or 2 operations
Determine an unknown value of an equation (Using <u>manips</u> , balance, reasoning)	Solve an equation with an unknown value, limited to one operation $7 + ? = 13$	Verify solutions to equations through evaluation	Verify solutions to equations through evaluation

Algebra: Equations express relationships between quantities.

5A1.2 Students interpret numerical and algebraic expressions.

- Algebraic expressions use variables to represent quantities of unknown value.
- Algebraic expressions may be composed of one algebraic term or the sum of algebraic and constant terms. (Focus more on evaluating expressions in preparation for equations)

5A1.3 Students interpret numerical and algebraic expressions.

- Equality is preserved by applying inverse operations to algebraic expressions on each side of an equation.
- The expressions on each side of an equation will be equal when evaluated using the correct solution.

Measurement: Attributes such as length, area, volume and angle are quantified by measure.

5M1 Students estimate and calculate area using standard units.

- Area can be expressed in various units according to context and desired precision.
- Rectangles with the same area can have different perimeters.

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Let's Consider Variables and Algebraic Expressions... What are they?

Terminology:
Variable
Coefficient
Constant
Expression
Equation

Knowledge	Understanding	Skills & Procedures
<p>Numerical expressions with multiple operations may include parentheses to group numbers and operations.</p> <p>The conventional order of operations includes performing operations in parentheses before other operations.</p>	<p>Numerical expressions represent a quantity of known value.</p> <p>Parentheses change the order of operations in a numerical expression.</p>	<p>Evaluate numerical expressions involving addition or subtraction in parentheses according to the order of operations.</p>
<p>Expressions that include variables are called algebraic expressions.</p> <p>A variable can be interpreted as a specific unknown value and is represented symbolically with a letter.</p> <p>Products with variables are expressed without the multiplication sign.</p> <p>Quotients with variables are expressed using fraction notation.</p> <p>An algebraic term is the product of a number, called a coefficient, and a variable.</p> <p>A constant term is a number.</p> <p>A variable can be replaced by a given number in order to evaluate an expression.</p>	<p>Algebraic expressions use variables to represent quantities of unknown value.</p> <p>Algebraic expressions may be composed of one algebraic term or the sum of algebraic and constant terms.</p> <p>5A1.2</p>	<p>Relate repeated addition of a variable to the product of a number and a variable.</p> <p>Express the product of a number and a variable using a coefficient.</p> <p>Express the quotient of a variable and a number as a fraction.</p> <p>Recognize a product with a variable, a quotient with a variable, or a number as a single term.</p> <p>Write an algebraic expression involving one or two terms to describe an unknown value.</p> <p>Evaluate an algebraic expression by substituting a given number for the variable.</p>

Start with evaluations: if $x = 5$

x

$$x + 2 \longrightarrow (5) + 2$$

$$2x + 1 \longrightarrow 2(5) + 1$$

$$3x + 1 \longrightarrow 3(5) + 1$$

$$2x - 4 \longrightarrow 2(5) - 4$$

x

5

4

4

x

$$x + 2 = 4$$

$$2x + 1 = 3$$

$$3x + 1 = 7$$

$$2x - 4 = 4$$

The process of applying inverse operations can be used to solve an equation.

The value of the variable obtained by solving an equation is the solution.

Equality is preserved by applying inverse operations to algebraic expressions on each side of an equation.

The expressions on each side of an equation will be equal when evaluated using the correct solution.

Write equations involving one or two operations to represent a situation.

Investigate order of operations when performing inverse operations on both sides of an equation.

Apply inverse operations to solve an equation, limited to equations with one or two operations.

Verify the solution to an equation by evaluating expressions on each side of the equation.

Solve problems using equations, limited to equations with one or two operations.

Students do not know integers yet so the operations can be only be subtraction and or division.

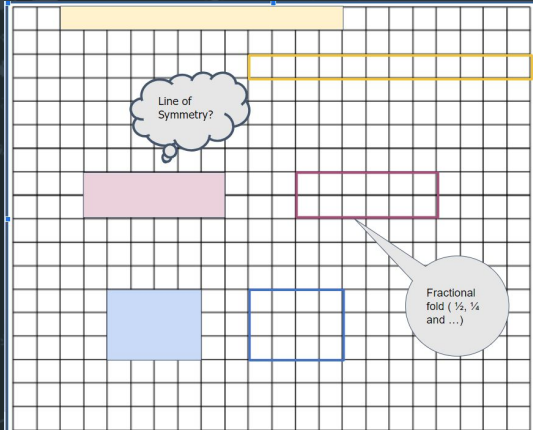
Equivalence and Compensation - a slide deck that would help bridge the understanding towards a balance model of solving equations.

Alge-tiles - Didax.com

Solving equations with the tiles will be in the April session.

5M1 Students estimate and calculate area using standard units.

- Area can be expressed in various units according to context and desired precision. (link to ratios)
- Rectangles with the same area can have different perimeters.



Estimate

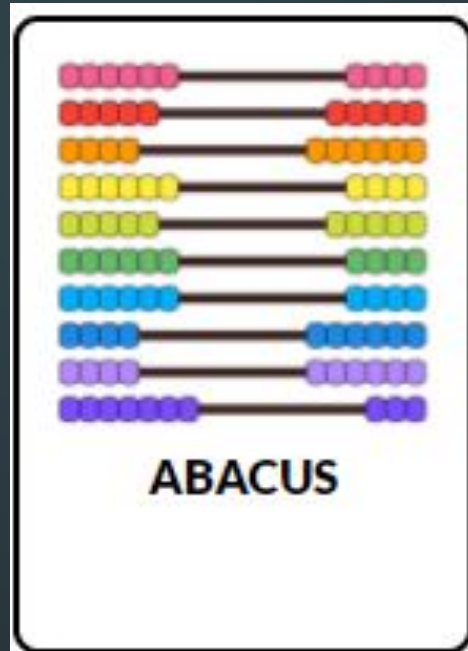
Estimating Area

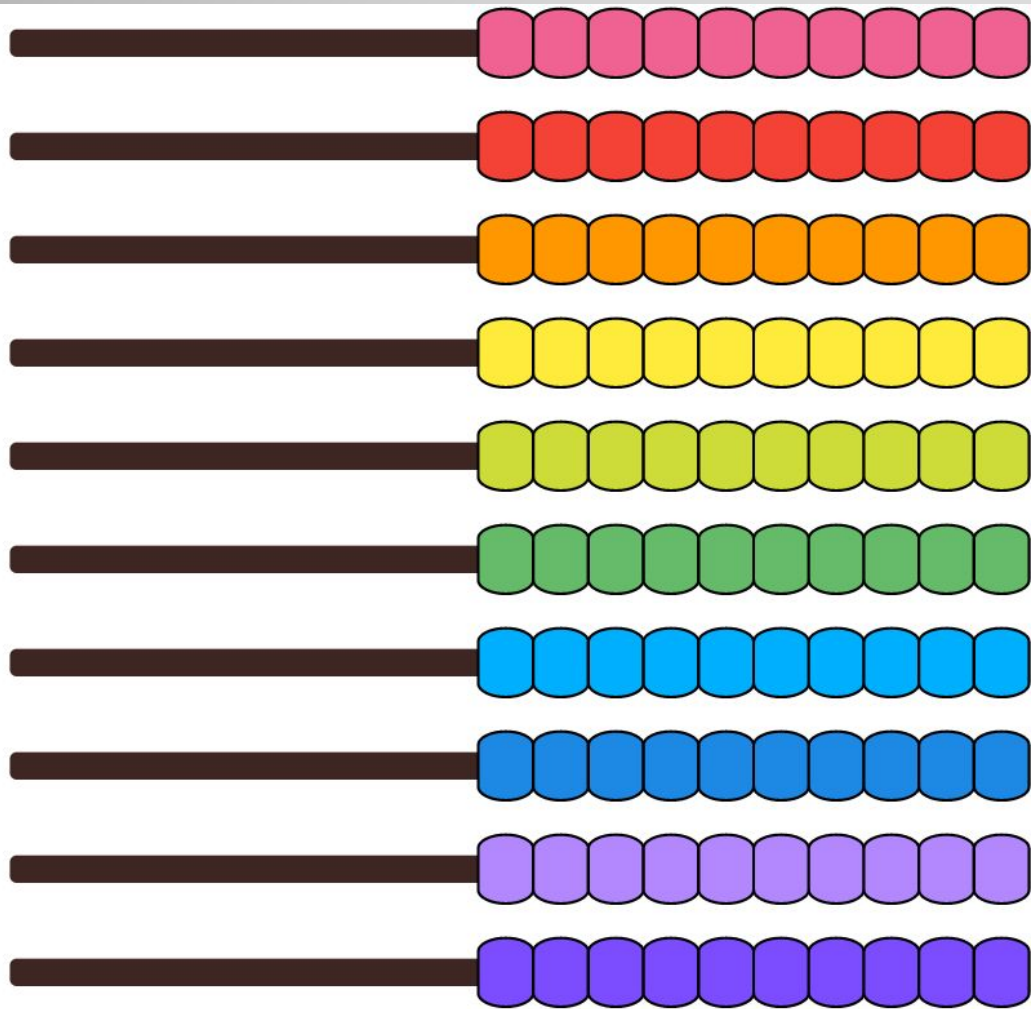
Students estimate and calculate area using standard units.

Knowledge	Understanding	Skills & Procedures
<p>Area is expressed in the following standard units, derived from standard units of length:</p> <ul style="list-style-type: none"> square centimetres square metres square kilometres <p>A square centimetre (cm^2) is an area equivalent to the area of a square measuring 1 centimetre by 1 centimetre.</p> <p>A square metre (m^2) is an area equivalent to the area of a square measuring 1 metre by 1 metre.</p> <p>A square kilometre (km^2) is an area equivalent to the area of a square measuring 1 kilometre by 1 kilometre.</p> <p>Among all rectangles with the same area, the square has the least perimeter.</p>	<p>Area can be expressed in various units according to context and desired precision.</p> <p>Rectangles with the same area can have different perimeters.</p> <p>Using string/tape, mark off the areas so students have a visual comparison.</p> <p>What fraction is one square of the total area in a rectangle? (Unit connection)</p>	<p>Relate a centimetre to a square centimetre.</p> <p>Relate a metre to a square metre.</p> <p>Relate a square centimetre to a square metre.</p> <p>Express the relationship between square centimetres, square metres, and square kilometres.</p> <p>Justify the choice of square centimetres, square metres, or square kilometres as appropriate units to express various areas.</p> <p>Estimate an area by comparing to a benchmark of a square centimetre or square metre.</p> <p>Express the area of a rectangle using standard units given the lengths of its sides.</p> <p>Compare the perimeters of various rectangles with the same area.</p> <p>Describe the rectangle with the least perimeter for a given area.</p> <p>Solve problems involving perimeter and area of rectangles.</p>

Revisit Large Numbers

Abacus





Billion

Hundred Million

Ten Million

Million

Hundred thousands

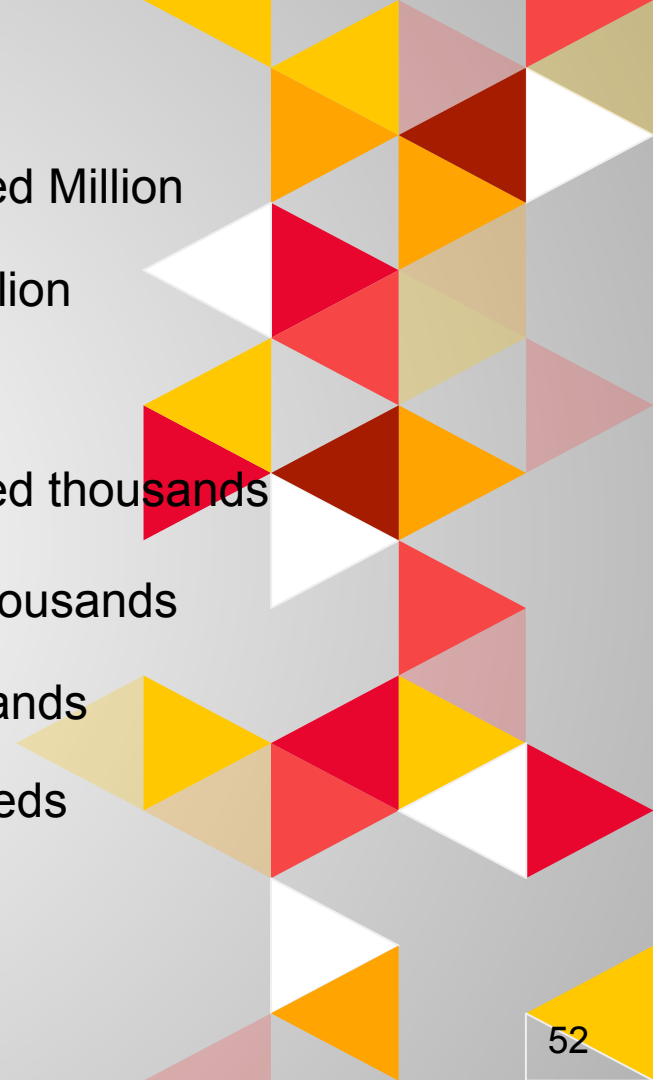
Ten Thousands

Thousands

Hundreds

Tens

Ones





Resource Sites:

www.arpdc.ab.ca

Select
Mathematics and
Your Grade

CPAR Documents
(in Mathematics,
Science, ELAL and
Computing
Science)

Mathematical Verbs

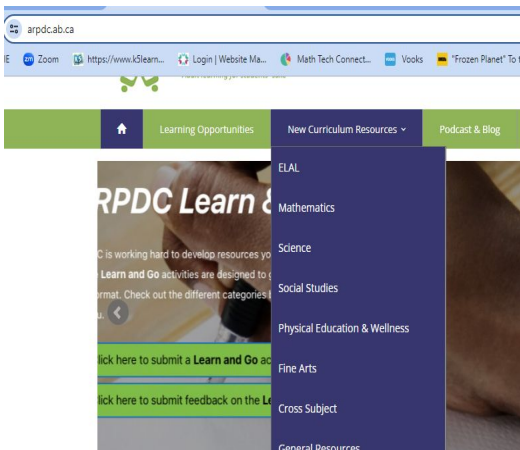
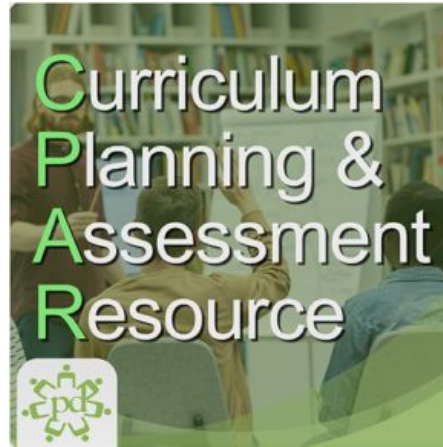
[K-3 Mathematics
Verbs](#)

[Grades 4-6
Mathematics Verbs](#)

Videos unpacking K-3
Mathematics

Videos Unpacking
Grades 4-6

Mathematics (3 out of
5 sessions posted)



Thanks!

Any questions?

- chris.zarski@arpdc.ab.ca
- **Connect with your local consortia consultant**



Alberta **Regional** Consortia

