NUMERACY

Elementary Numeracy in SD38

Janice Novakowski,

District Professional Learning Day, November 22 2021

#SD38numeracy

RICHMOND
SCHOOL DISTRICT NO.38

Intentions for this session

- Learn about the district's Numeracy Vision &Framework
- Think about foundational math concepts & competencies
- Share and connect to examples from classrooms
- Think about: What is numeracy? and why it is important

District Strategic Plan: K-12 Numeracy Vision and Framework

DRAFT

RICHMOND SCHOOL DISTRICT NO.38

What is numeracy?

- *Numeracy* is the willingness and ability to interpret and apply mathematical understanding to solve problems in complex situations, and the perseverance to analyze and communicate these solutions in ways that are relevant to the given context.

~BC Curriculum website, glossary

Foundations of Mathematics

- Number Sense and Operations
- Spatial Reasoning
- Fluency and Flexibility

- Curricular Content & Competencies

FOUNDATIONAL MATHEMATICS CONCEPTS & COMPETENCIES

NUMBER

- Subitizing
- Counting
- Decomposing and composing quantities
- Place value
- Fractions, Decimals, Percentages
- Integers
- Number operations
- *Estimating*
- *Mental math strategies*
- *Representing in concrete, pictorial, symbolic forms*

SPATIAL REASONING

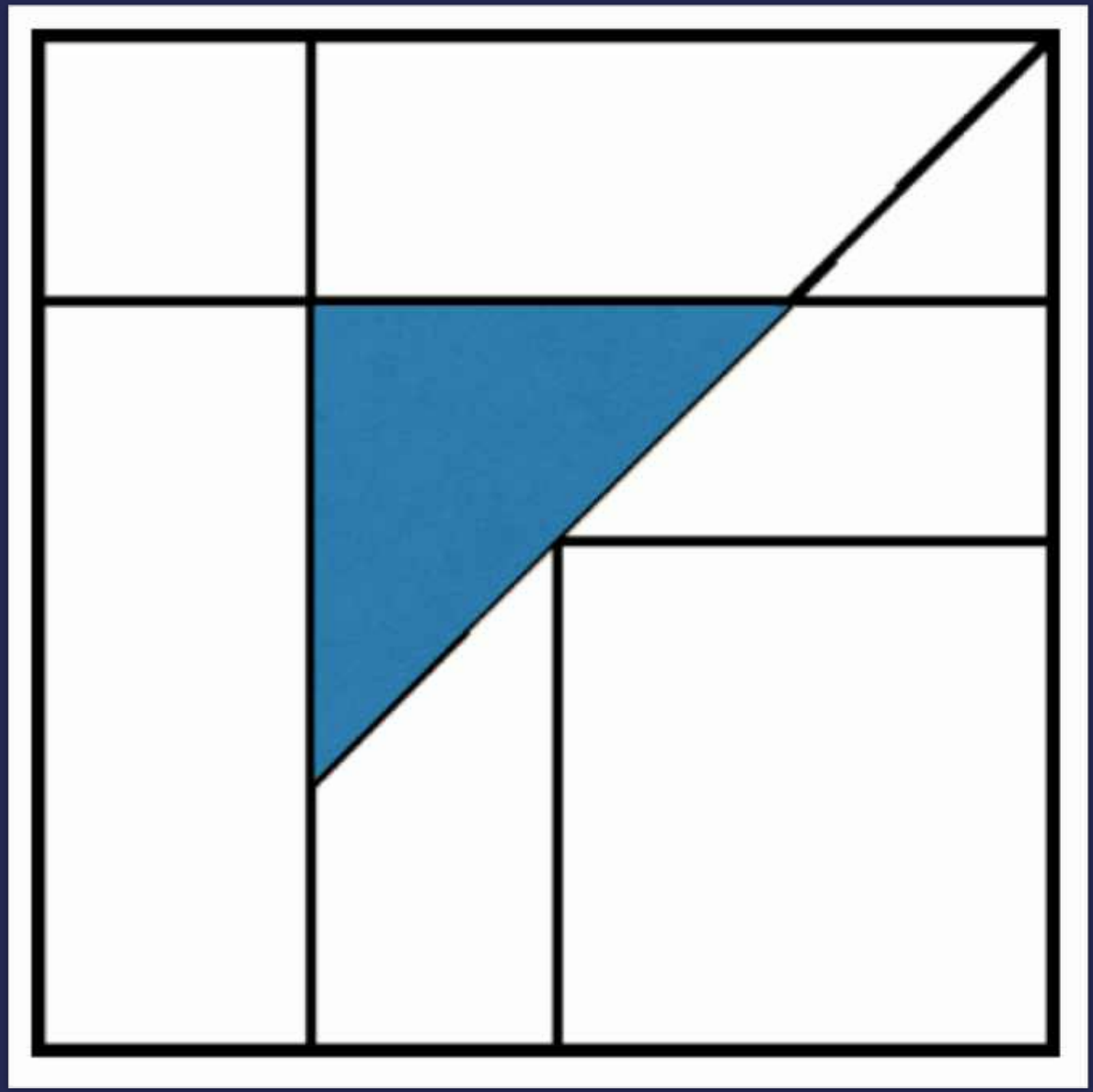
- Transforming shapes
- Decomposing and composing shapes
- Symmetry
- Positionality, locating, mapping
- Perspective taking
- Transformations across a coordinate plane
- Coding
- *Visualizing*
- *Connect mathematical ideas to each other*

High-Yield Routines

- Number Talks
- Number Talk Images
- Mystery Number/Shape
- Quick Images
- Splat!
- Clothesline
- Fraction Talks
- WODB
- Slow Reveal Graphs
- Counting Collections
- Choral Counting
- Alike and Different
- How Many?
- How Do You Know?

High-Yield Routines Burst Sessions

- events.sd38.bc.ca
- Beginning December 1
- Half hour (15 mins presentation, 15 mins questions and sharing of ideas)
- Will be recorded
- Will be hosted on District Numeracy YouTube channel



What curricular competencies were developed? How are these connected to the Core Competencies?

- Use reasoning to explore and make connections
- Estimate reasonably
- Visualize to explore mathematical concepts
- Use mathematical vocabulary and language to contribute to mathematical discussions
- Explain and justify mathematical ideas and decisions
- Connect mathematical concepts to each other

How are you providing opportunities for students to develop foundations in mathematics?

Planning

- Planning through Big Ideas or Curricular Competencies
  - focus on what students are learning
- Mathematics – one hour a day
- Numeracy experiences throughout day, connected to other curricular areas

A Year Plan

Term One	Term Two	Term Three

- Begin year with “what is math?” or “where is math?” and developing mathematical community & discourse
- Consider: core foundational content, new concepts for the grade, balancing number and spatial concepts, connections, spiraling/spacing and interleaving
- Number concepts and operations need the most dedicated time over the year
- Consider which curricular competencies complement curricular content and vice versa


Miguel Tanco
Compte sur moi
Count on me

BC Curriculum: Concept-based & Competency-driven

- Connecting the dots through big ideas/concepts…
  - individual, small group, whole class
  - weaving together competencies and content
  - instructional routines
  - practice
  - provocations and projects

- *What might a learning map of a week look like?*

Concept: Decomposing Grades 1&2

Monday	Tuesday	Wednesday	Thursday	Friday
Read 12 Ways to Make 11 by Eve Merriam, stop and predict Students choose their own number and make a mini-chart or book of ways to make that number, adding a story or problem posing, connecting pictorial & symbolic forms	Math Routine: Splat! Math Workshop: Splat! Make 10 or 20 Game with ten frames & dice Adding with decomposing strategies (mental math) Small group instruction – choose a quantity, decompose into 2, 3, 4, 5+ parts; visualize	Investigating with materials Use 12 Ways again to provide pictorial examples of composing a quantity *What is composing? decomposing? What materials help you think about composing and decomposing? What are different ways to think about this idea? How will you show what you know using concrete, pictorial and symbolic forms? What questions do you still have?*	Math Routine: Quick Images with ten frames Math Workshop: Same as Tuesday, add Find Sums App with 10, 20 o 100 frame Small group instruction– mini number talks focus on addition strategies with decomposing	Math Routine: Number Talk – addition strategies with decomposing Choice of addition questions, Investigating with materials, CGI problem, ten frame games and performance task for assessment

Concept: Fractions Grades 4&5

Monday	Tuesday	Wednesday	Thursday	Friday
Read The Lion's Share, stop and predict, give each child a piece of origami paper to use while reading Students choose their own context to create their own fraction-based story or problem pose	Math Routine: Fraction Talk Math Workshop: Fraction talk image Fraction circles and bars and symbolic notation Fraction puzzles Small groups/ conferences – represent ¼ in different ways	Investigating with materials *How are fractions and decimals related?* *What materials help you think about fractions?* *How will you show what you know? What questions do you still have?*	Math Routine: Clothesline - fractions Math Workshop: Same as Tuesday, add Equivalent Fractions App Small groups/ conferences– comparing and ordering fractions, intro to equivalent fractions for some	Math Routine: Clothesline– fractions and decimals (add some equivalents) Investigating with materials, fraction puzzles and games, and performance task for assessment

Core Competencies

Connections between Core and Curricular Competencies
BC K-5 Mathematics

Core Competencies	Curricular Competencies
Communication **Communicating** • *connect and engage with others* • *focus on intent and purpose* • *acquire and present information* **Collaborating** • *work collectively* • *support group interactions* • *determine common purposes*	**Communicating and Representing** • Communicate mathematical thinking in many ways • Use mathematical vocabulary and language to contribute to mathematical discussions • Explain and justify mathematical ideas and decisions • Represent mathematical ideas in concrete, pictorial, and symbolic forms
Thinking ***Creative Thinking*** • *create and innovate* • *generate and incubate* • *evaluate and develop* ***Critical & Reflective Thinking*** • *analyze and critique* • *question and investigate* • *design and develop* • *reflect and assess*	**Understanding and Solving** • Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving • Visualize to explore mathematical concepts • Develop and use multiple strategies to engage in problem solving **Reasoning and Analyzing** • Use reasoning to explore and make connections • Estimate reasonably • Develop mental math strategies and abilities to make sense of quantities • Use technology to explore mathematics • Model mathematics in contextualized experiences
Personal and Social ***Positive Personal & Cultural Identity*** • *relationships and cultural contexts* • *personal values and choices* • *personal strengths and abilities* ***Personal Awareness & Responsibility*** • *self advocate* • *self-regulation* • *well-being* ***Social Awareness & Responsibility*** • *build relationships* • *contribute to community & care for the environment* • *resolve problems* • *value diversity*	**Understanding and Solving** • Engage in problem-solving experiences that are connected to place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures **Connecting and Reflecting** • Reflect on mathematical thinking • Connect mathematical concepts to each other and to other areas and personal interests • Incorporate First Peoples worldviews and perspectives to make connections to mathematical concepts

Note: Many of the curricular competencies are connected to more than one core competency, and this table is just meant as a guide to support teachers in planning and assessment and to support students' connection making as they learn to self-assess their development of the core competencies. This table may also be useful in supporting the development of a competency-based IEP.

compiled by Janice Nowakowski/updated June 2020

COMMUNICATION in Mathematics

Core Competencies	Curricular Competencies
Communication • *connect and engage with others* • *focus on intent and purpose* • *acquire and present information*	**Communicating and Representing** • Communicate mathematical thinking in many ways • Use mathematical vocabulary and language to contribute to mathematical discussions • Explain and justify mathematical ideas and decisions • Represent mathematical ideas in concrete, pictorial, and symbolic forms

BC K-5 Mathematics — jnovakowski/updatedJune2020

https://blogs.sd38.bc.ca/sd38mathandscience/curriculum-connections/

Mathematical Habits of Mind

- persevere and use mathematics to solve problems in everyday life
- recognize that there are multiple ways to solve a problem
- demonstrate respect for diversity in approaches to solving problems
- choose and use appropriate strategies and tools
- pursue accuracy in problem solving

from BC K-12 mathematics curriculum

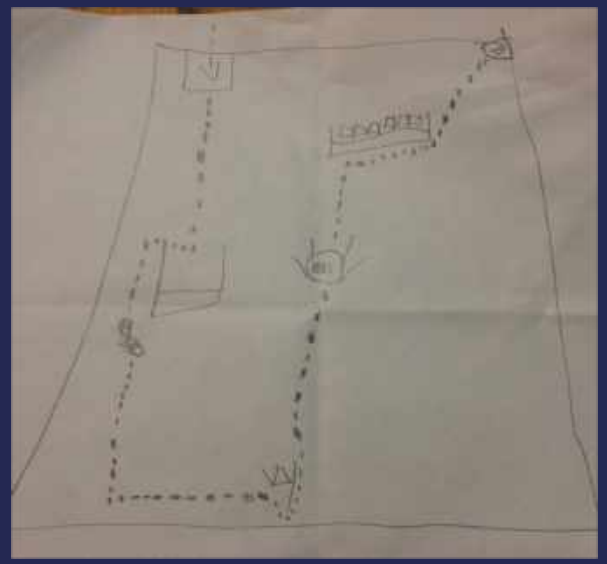
Numeracy Processes

- Interpret
- Apply
- Solve
- Analyze
- Communicate

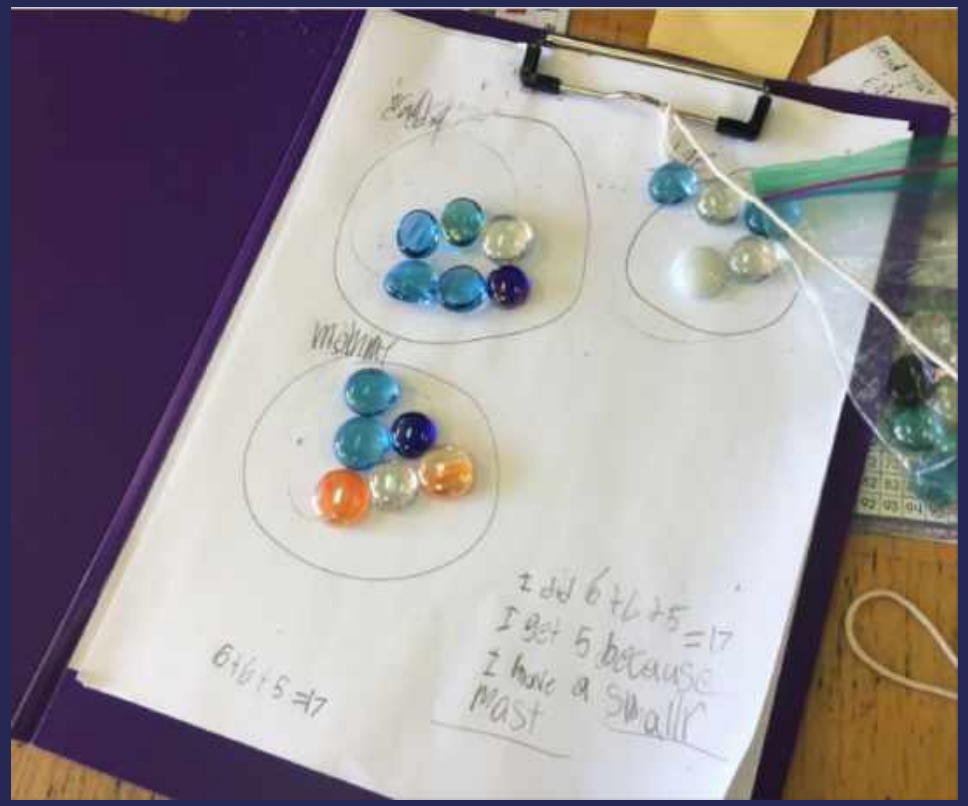
What does numeracy look like?

- In our K-7 context, numeracy looks like students using the math concepts and competencies they have learned and developed in new ways, applying them to solve problems or think about issues and applying them to other areas of learning or personal connections.

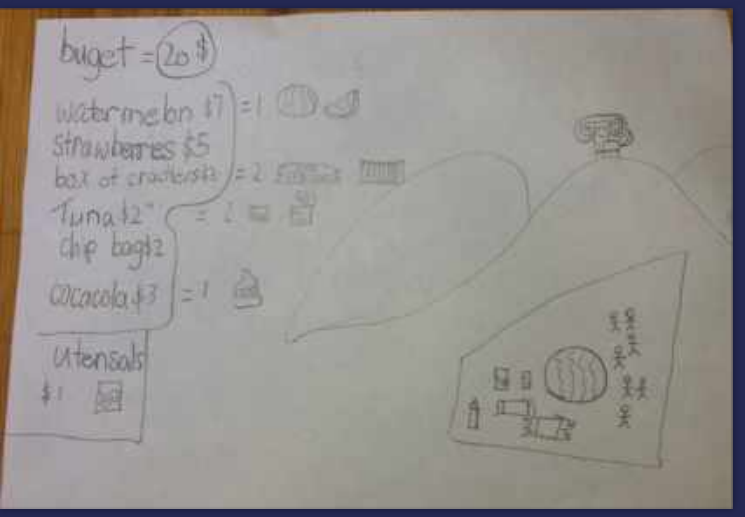
Kindergarten:
Plan and Design an Obstacle Course

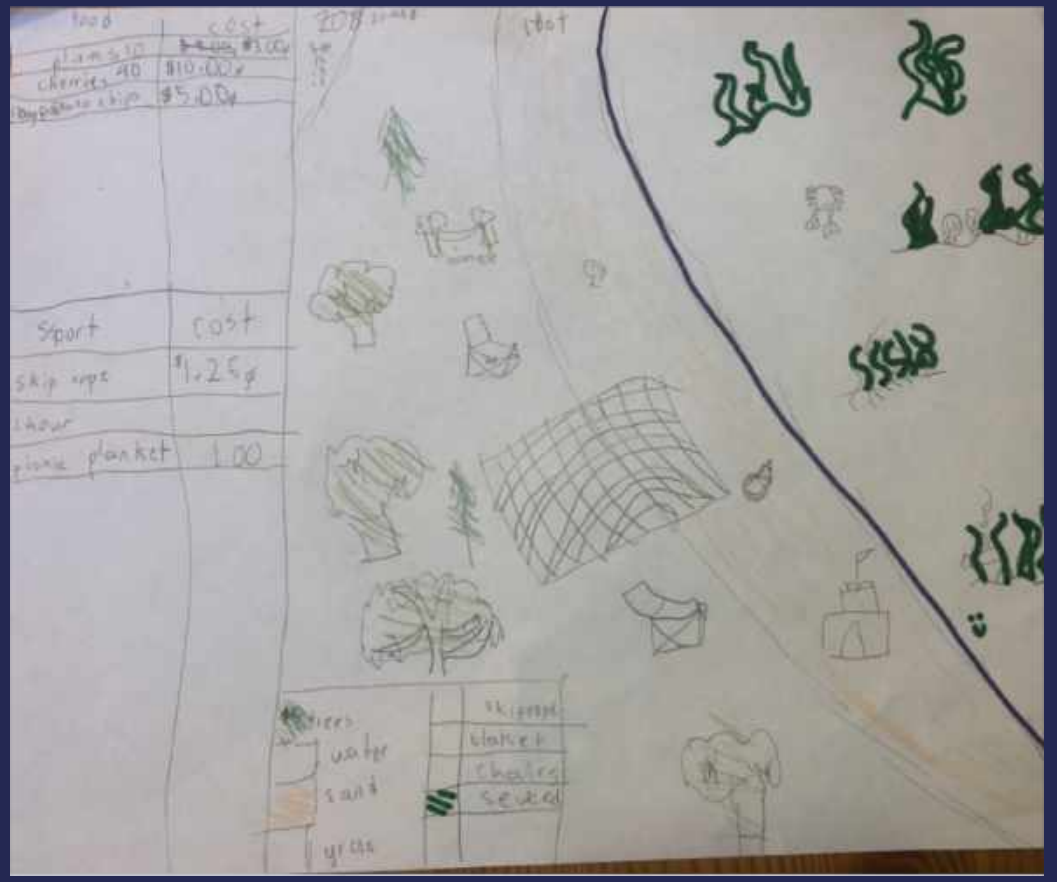


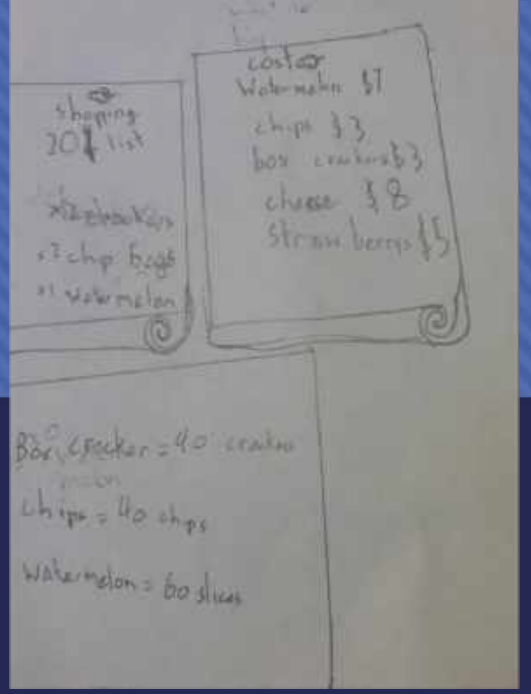
Grade One:
Sharing Strawberries

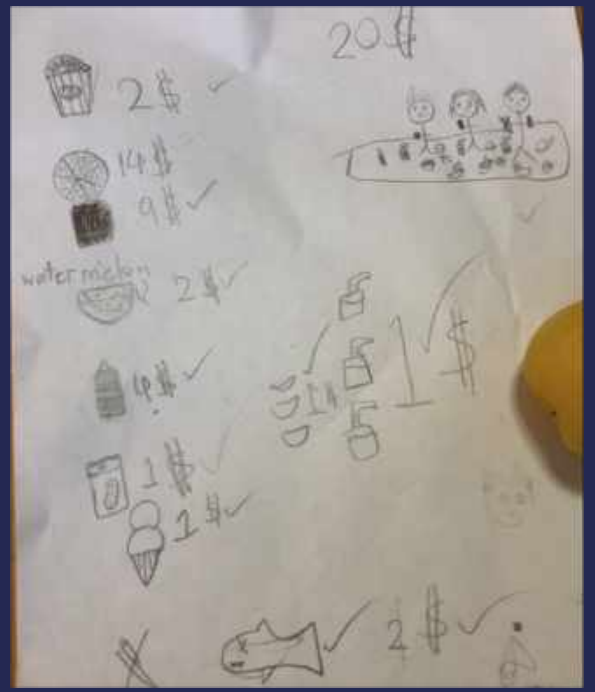


Grades Two and Three: Class Picnic Plan and Budget









Grades 5,6 & 7: Understanding the Water Crisis


NEWS | Election 2019 | Indigenous Affairs | Rights + Justice

VOTE 2019

The Water Crisis in First Nations Communities: An Election Explainer

Who's promising what, and what really needs to happen.

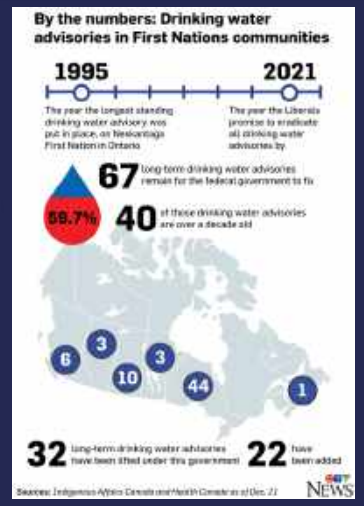
By Jamin Mike and Christopher Cheung, 17 Oct 2019 | TheTyee.ca

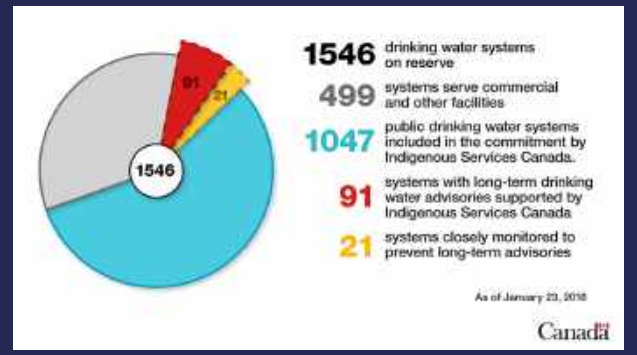
Jamin Mike is an intern with The Tyee through the Journalists for Human Rights Emerging Indigenous Reporter program. He is from Treaty 6 territory in central Saskatchewan.

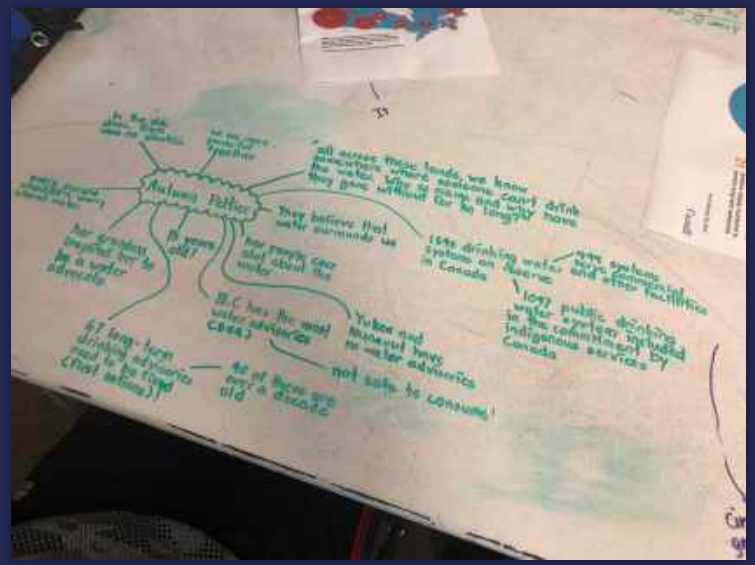
Christopher Cheung reports on urban issues for The Tyee.

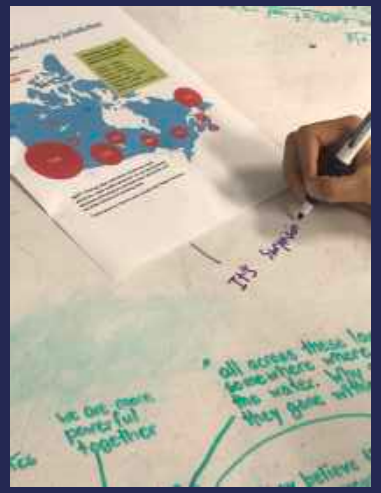
"All across these lands, we know somewhere where someone can't drink the water. Why so many, and why have they gone without for so long?"

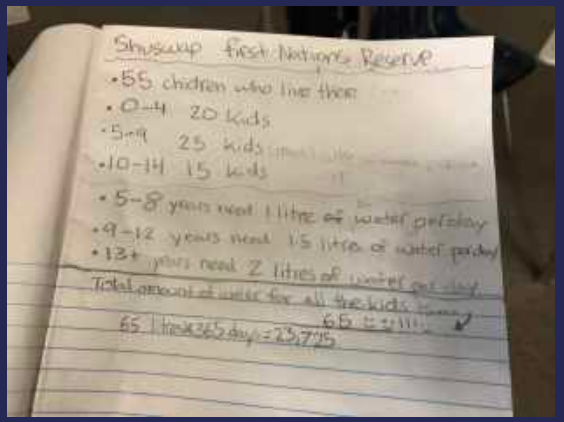
Autumn Peltier, 15 years old, Wiikwemkoong First Nation



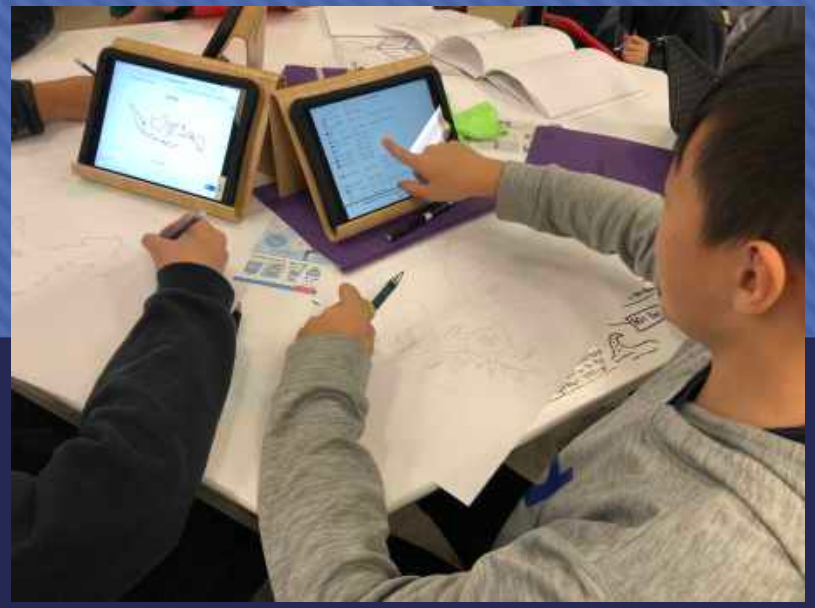








How do numbers, data and mathematical information help to create a compelling case for others to engage with and understand a global issue?

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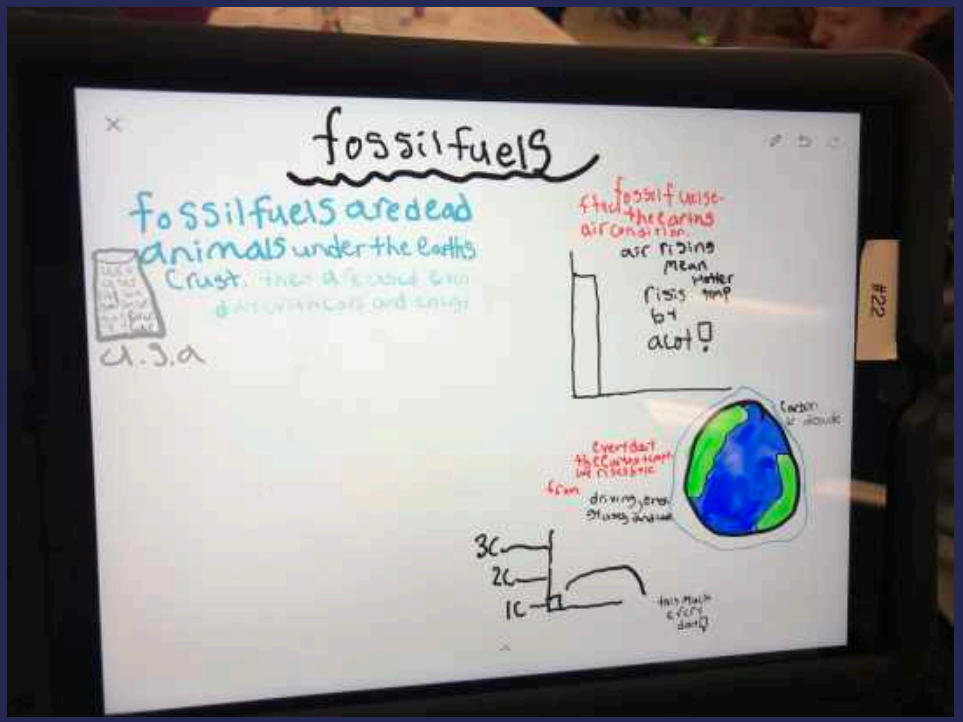
PIC-COLLAGE

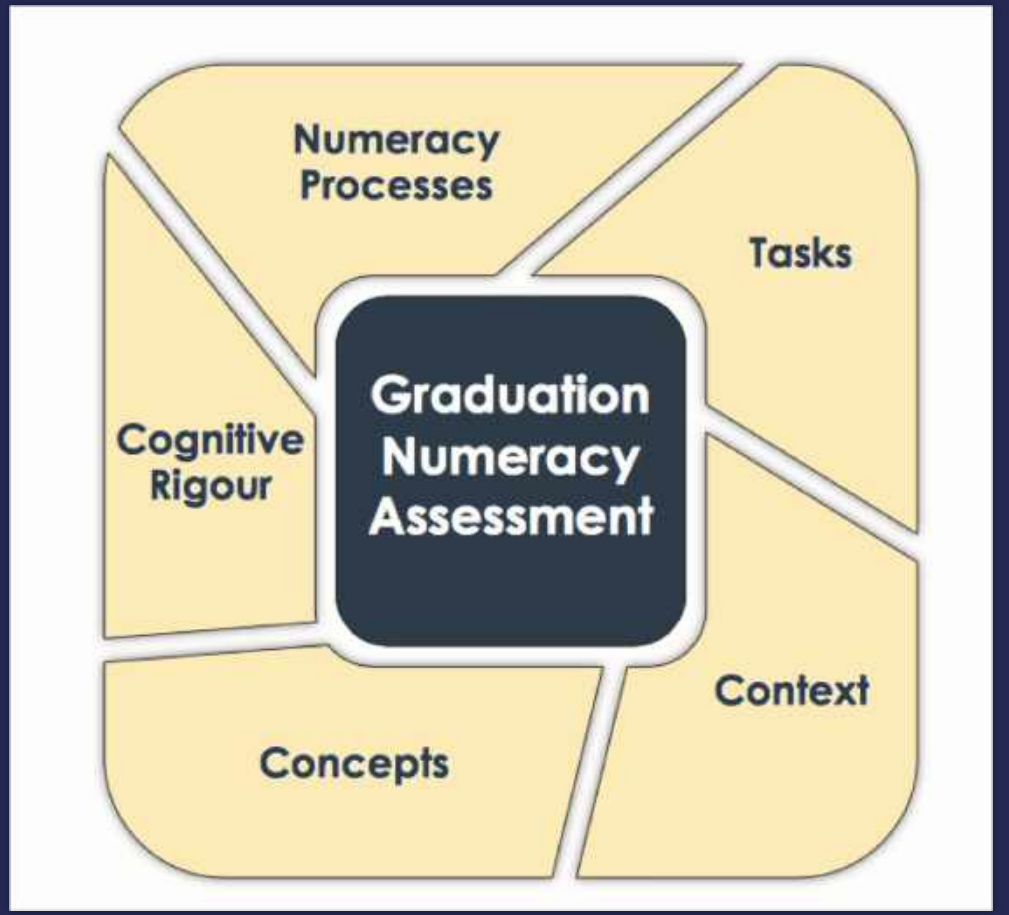

fossilfuels
fossilfuels are dead animals under the earths crust.
U.S.A
#22

Graduation Numeracy Assessment (grade 10)

- 24 common questions based on 4 tasks
- 2 written response questions (choice)
- Self-reflection
- Proficiency scale

Graduation Numeracy Assessment (grade 10)

- mathematics concepts from elementary through grade 10
- contexts include personal, career, societal and scientific
- at least one context is based in Indigenous perspectives



Numeracy Processes

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- Apply
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- Analyze
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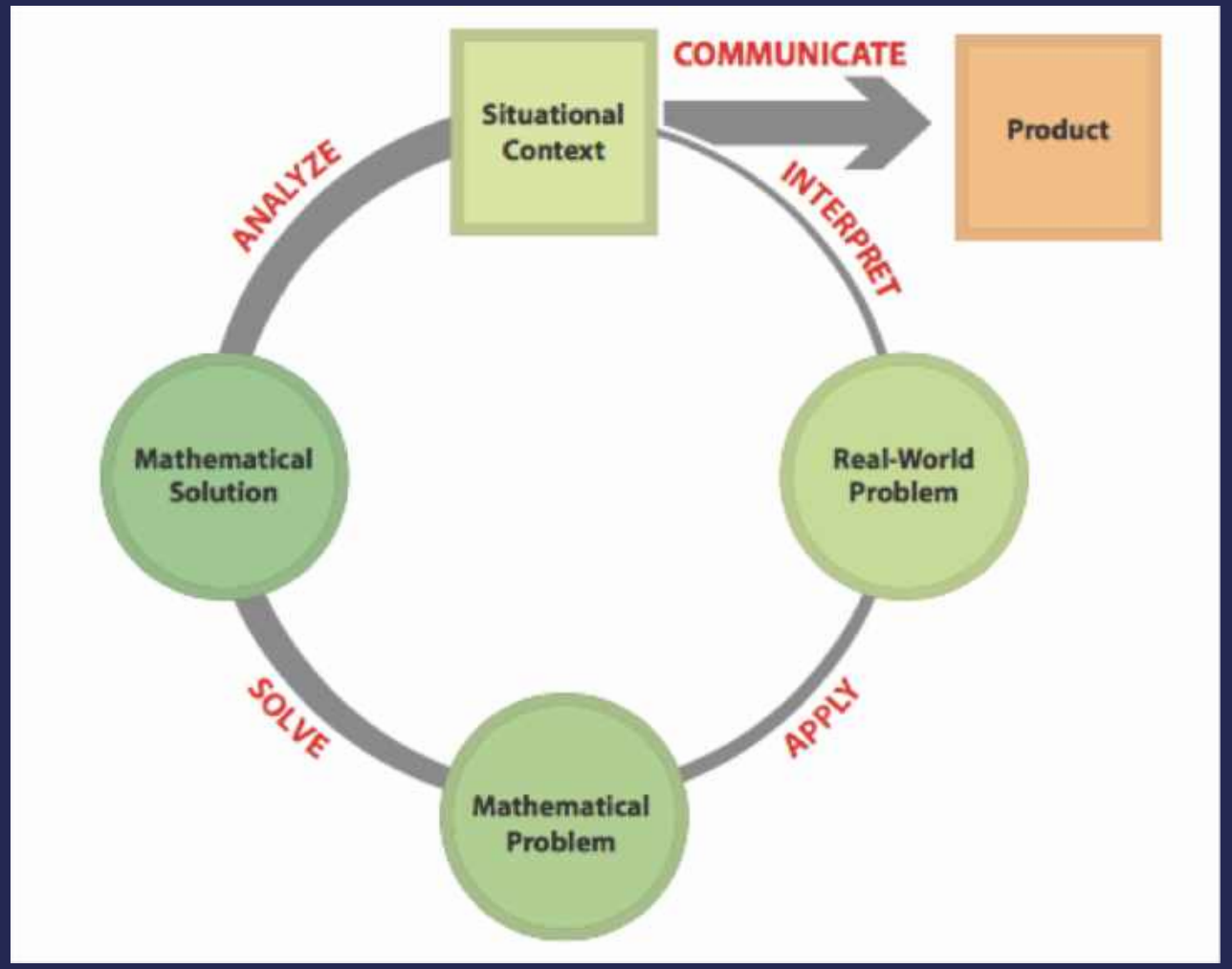


Mathematics & Numeracy

Mathematics Tasks

- Using a centimeter ruler, measure the length of your hand. What else can you measure? Record your measurements.
- What different ways can you arrange 24 pumpkin seeds in arrays?

Numeracy Task

- Pumpkin seeds need to be planted 40 centimetres apart. Plan how to plant the pumpkin seeds in our garden bed. What tools might you need? Why do think this is a good plan? How will you share your plan?

Types of Numeracy Tasks

- (Contextualized Problem)
- Fair Share
- Plan and Design
- Reasoned Estimates
- Model

What is a numeracy task?

- contextualized problem (as opposed to random numbers without context) which could be mathematized
- can be solved using a variety of strategies, skills, and concepts
- students use numeracy thinking processes to interpret, apply, solve, analyze, and communicate their solutions

Numeracy Tasks from Transitional Learning

5. Numeracy Task:
Look around your home, on a website or in book, magazine or newspaper.
Where can you find fractions and decimal numbers used to communicate information?
Write down some of the fractions and decimal numbers you find.
What are the most common fractions/decimals you find? Why do you think that is?

4. Numeracy Task:
You and two classmates are given 72 pencil crayons to share for the school year. How could the three of you share the pencil crayons fairly? What do you need to consider other than quantity?
Record your findings with pictures, numbers and words.

4 Numeracy Task:
Choose a small object or toy. Using what you have learned about shapes and measurement, use paper or cardboard to create a box that will hold the object, including a lid. What type of 3D shape will you create? What measurements of the object will you need to take? Draw a plan to begin and then create your box, testing it to make sure your object will fit. If you wanted to create a box to hold two of your objects, what shapes or measurements would you need to adjust?

Ministry Numeracy Projects

- Literacy and Numeracy Foundations (K-12)
- Graduation Numeracy Assessment (grade 10)
- K-5 Numeracy Proficiency Project
- Grades 6-12 Proficiency Project
- Renewed K-12 Numeracy Performance Standards

Assessment Resources

Assessment

observations

product

talk

(discussions, conversations, interviews)

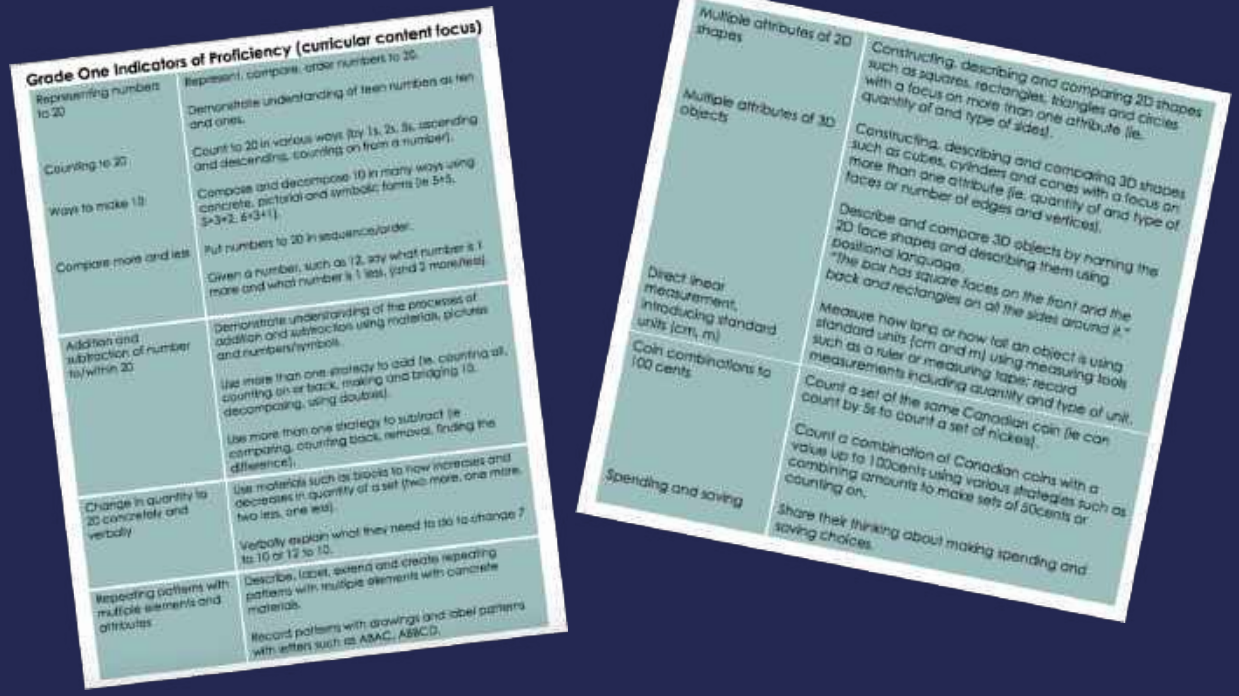
from Rethinking Letter Grades
by Caren Cameron &
Kathleen Gregory

Proficiency Scale
Indicators of Proficiency

Proficiency Scale	Emerging	Developing	Proficient	Extending
	The student demonstrates an initial understanding of the concepts and competencies relevant to the expected learning.	The student demonstrates a partial understanding of the concepts and competencies relevant to the expected learning.	The student demonstrates a complete understanding of the concepts and competencies relevant to the expected learning	The student demonstrates a sophisticated understanding of the concepts and competencies relevant to the expected learning.

SD38 Math Assessment Resources

K-7 Indicators of Proficiency

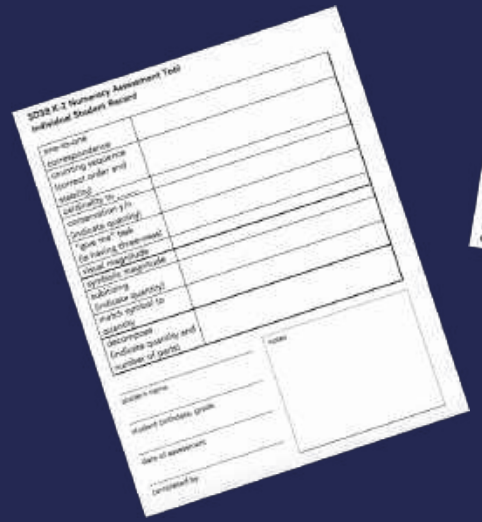


Grade One Indicators of Proficiency (curricular content focus)

Representing numbers to 20	Represent, compare, order numbers to 20.
Counting to 20	Demonstrate understanding of teen numbers as ten and ones. Count to 20 in various ways (by 1s, 2s, 5s, ascending and descending, counting on from a number).
Ways to make 10	Compose and decompose 10 in many ways using concrete, pictorial and symbolic forms (ie 5+5, 5+3+2, 6+3+1).
Compare more and less	Put numbers to 20 in sequence/order. Given a number, such as 12, say what number is 1 more and what number is 1 less, (and 2 more/less)
Addition and subtraction of number to/within 20	Demonstrate understanding of the processes of addition and subtraction using materials, pictures and numbers/symbols. Use more than one strategy to add (ie. counting all, counting on or back, making and bridging 10, decomposing, using doubles). Use more than one strategy to subtract (ie comparing, counting back, removal, finding the difference).
Change in quantity to 20 concretely and verbally	Use materials such as blocks to show increases and decreases in quantity of a set (two more, one more, two less, one less). Verbally explain what they need to do to change 7 to 10 or 12 to 10.
Repeating patterns with multiple elements and attributes	Describe, label, extend and create repeating patterns with multiple elements with concrete materials. Record patterns with drawings and label patterns with letters such as ABAC, ABBCD.

Multiple attributes of 2D shapes	Constructing, describing and comparing 2D shapes such as squares, rectangles, triangles and circles with a focus on more than one attribute (ie. quantity of and type of sides).
Multiple attributes of 3D objects	Constructing, describing and comparing 3D shapes such as cubes, cylinders and cones with a focus on more than one attribute (ie. quantity of and type of faces or number of edges and vertices). Describe and compare 3D objects by naming the 2D face shapes and describing them using positional language. "the box has square faces on the front and the back and rectangles on all the sides around it."
Direct linear measurement, introducing standard units (cm, m)	Measure how long or how tall an object is using standard units (cm and m) using measuring tools such as a ruler or measuring tape; record measurements including quantity and type of unit.
Coin combinations to 100 cents	Count a set of the same Canadian coin (ie can count by 5s to count a set of nickels). Count a combination of Canadian coins with a value up to 100cents using various strategies such as combining amounts to make sets of 50cents or counting on.
Spending and saving	Share their thinking about making spending and saving choices.

K-2 Numeracy Assessment Tool



SD38 K-2 Numeracy Assessment Tool
Individual Student Record

one-to-one correspondence
counting sequence
(correct order and stable)
cardinality
conservation (+/-)
(indicate quantity)
"give me" task
(ie having three-ness)
visual magnitude
symbolic magnitude
subitizing
(indicator quantity)
(+of/3 symbol to quantity)
decomposing
(indicate quantity and number of parts)

student name
student birthdate, grade
date of assessment
completed by
notes

Task 3: Place a small collection of counters in front of the child. Ask: Can you please grab three and show me? (Gesture a grab motion). If necessary, explain to student to grab the required amount without counting them. Put the extras back in the collection and then repeat with quantities 4 then 5.
Observe and listen for: counting in subitizing and knowing small quantities

Task 4: Create a set of 8 counters and another set of 3 counters. Ask: Without touching or counting the counters, tell me which set has more. Repeat with 7 counters and 10 counters (opposite orientation from first part of task with smaller set first and greater set second).
Observe and listen for: visual magnitude comparison

Note: An additional task between Task 4 and Task 5 to bridge concrete to symbolic representations could be to compare quantities represented in a ten frame (pictorial representation).

Task 5: Place numeral cards for 9 and 2 on the table. Ask: Which is greater? Give larger, Suggest, more if language seems to be a concern.
Repeat with 4 and 8.
Observe and listen for: symbolic magnitude comparison

SD38 K-2 Assessment Tool
Task and Concept/Skill Correlation

Task	Concepts/Skills
one	one-to-one, counting sequence, cardinality
two	conservation
three	subitizing, "give me" showing three-ness, four-ness, five-ness
four	visual magnitude comparison
five	symbolic magnitude comparison
six	subitizing both regular and irregular dot patterns
seven	matching numeric symbol to quantity
eight	decomposing quantities

collection of assessment questions for K-7 Mathematics

focus on essential learning standards:
number, number operations,
computational fluency & curricular competencies

note: questions intended to be completed by students
independently or via task-based interview
and can be used over the year for progress monitoring

created by jnovakowski/march2021

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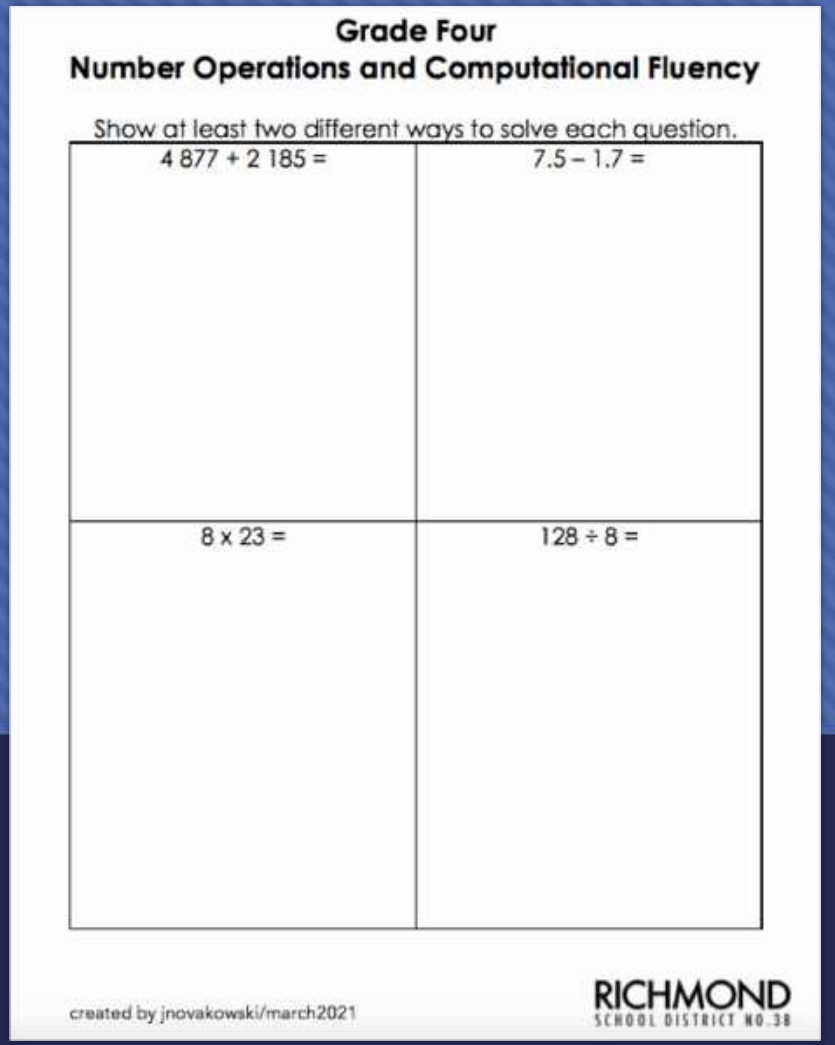

Grade Four
Number Operations and Computational Fluency

Show at least two different ways to solve each question.

4 877 + 2 185 =	7.5 – 1.7 =
8 x 23 =	128 ÷ 8 =

created by jnovakowski/march2021

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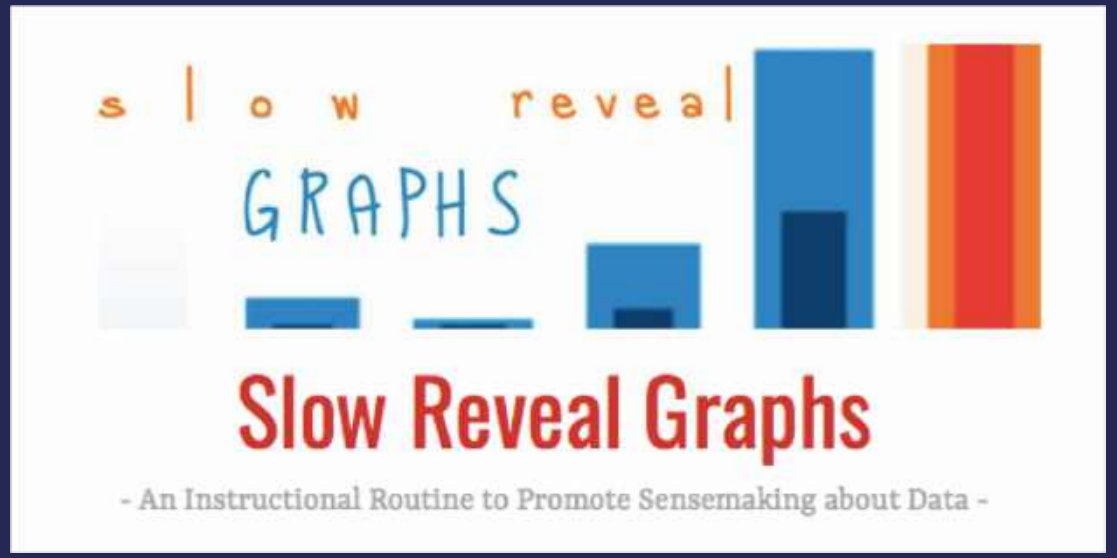
What can you do?

- Use the term numeracy in communication with your staff and families.
- Plan for embedding numeracy experiences across curriculum areas.
- Include reading, interpretation and creation of graphs and infographics across curricular areas.
- Try one named numeracy task each term and collect evidence of learning for the numeracy aspects.

Slow Reveal Graphs

- https://docs.google.com/presentation/d/1a-zvNUPdl4N70Z7aYJEqmj_04UrzNzp1mEeBSAZE2rg/edit#slide=id.g75a00444ca_0_446

- slowrevealgraphs.com



Numeracy Resources

- Graduation Numeracy Assessment
  - https://curriculum.gov.bc.ca/provincial/grade-10-numeracy-assessment
- Peter Liljedahl's Website
  - https://www.peterliljedahl.com/teachers/numeracy-tasks
- Mathematics & Numeracy site on Portal
  - Numeracy Tasks and Infographics

What are you wondering about numeracy?

Where to find information and resources:

- District Mathematics Blog
  - https://blogs.sd38.bc.ca/sd38mathandscience/
- Mathematics & Numeracy site on Portal
- SD38 Math at Home site on Portal (public)
  - https://bit.ly/SD38mathathome
- SD38 Math YouTube channel
  - https://bit.ly/SD38mathyoutube

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