What do I need to know as a teacher in order to be able to teach the concept(s)?

+Vocabulary

Equality

- Equality is the basis for comparison (more, less, equal).
- Equality is about comparing quantities.
- Equality is a relationship between 2 quantities.
- Equality is sorting by the attribute of quantity.
- Equality is important because kids don't see that equality has to do with number of things and not the physical attributes such as size, mass, etc.

Inequality

- An inequality is a mathematical sentence that shows the relationship between quantities that are not equal. The symbols used are "not equal to" (≠), "less than" (<), and "greater than" (>). (Learn Alberta)

Attribute

- Attributes are characteristics of a set of items that allow the items to be sorted and classified. (Learn Alberta)

Conservation of number

- **Conservation of number** is a mathematical concept that was first identified by Jean Piaget in the mid twentieth century. It is the recognition by a young child that quantity does not change with physical rearrangement. (Google defn) Ex. 3+2 is the same as 2+3
- **Definition: Conservation:** The understanding that something stays the same in quantity even though its appearance changes. To be more technical (but you don't have to be) **conservation** is the ability to understand that redistributing material does not affect its mass, **number** or volume. (http://www.simplypsychology.org/concrete-operational.html)

+Vocabulary

Mathematical Reasoning

- note: this is emphasized in the Alberta Mathematics Program of Studies and talked about, but it is not explicitly defined in the PoS.
    - Mathematical reasoning helps students think logically and make sense of mathematics. Students need to develop confidence in their abilities to reason and justify their mathematical thinking. High-order questions challenge students to think and develop a sense of wonder about mathematics.

      Mathematical experiences in and out of the classroom provide opportunities for students to develop their ability to reason. Students can explore and record results, analyze observations, make and test generalizations from patterns, and reach new conclusions by building upon what is already known or assumed to be true.

      Reasoning skills allow students to use a logical process to analyze a problem, reach a conclusion and justify or defend that conclusion.

- It is difficult to articulate what exactly reasoning is but, drawing on the above, here are some suggestions about what we do when we reason:
    - Evaluate situations
    - Select problem-solving strategies
    - Draw logical conclusions
    - Develop solutions
    - Describe solutions
    - Reflect on solutions

This list is not exhaustive (University of Cambridge NRICH project)

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Mathematical Connections

- Contextualization and making connections to the experiences of learners are powerful processes in developing mathematical understanding. This can be particularly true for First Nations, Métis and Inuit learners. When mathematical ideas are connected to each other or to real-world phenomena, students begin to view mathematics as useful, relevant and integrated.

  Learning mathematics within contexts and making connections relevant to learners can validate past experiences and increase student willingness to participate and be actively engaged.

  The brain is constantly looking for and making connections. "Because the learner is constantly searching for connections on many levels, educators need to orchestrate the experiences from which learners extract understanding.… Brain research establishes and confirms that multiple complex and concrete experiences are essential for meaningful learning and teaching" (Alberta Mathematics Program of Studies)

Mathematical Problem Solving

- Learning through problem solving should be the focus of mathematics at all grade levels. When students encounter new situations and respond to questions of the type How would you …? or How could you …?, the problem-solving approach is being modelled. Students develop their own problem-solving strategies by listening to, discussing and trying different strategies.

  A problem-solving activity must ask students to determine a way to get from what is known to what is sought. If students have already been given ways to solve the problem, it is not a problem, but practice. A true problem requires students to use prior learnings in new ways and contexts. Problem solving requires and builds depth of conceptual understanding and student engagement.

  Problem solving is a powerful teaching tool that fosters multiple, creative and innovative solutions. Creating an environment where students openly look for, and engage in, finding a variety of strategies for solving problems empowers students to explore alternatives and develops confident, cognitive mathematical risk takers. (Alberta Mathematics Program of Studies)

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Symbolically

Representing a situation or solving a problem symbolically means doing so using an abstract representation.

The number 13 is a representation for thirteen of any object. It can represent 13 apples, 13 blocks of concrete, 13 houses, etc.

At no time are any actual "concrete" thirteen or eight objects used to represent the situation, nor are there pictorial representations of objects. 13, 8 and 13 + 8 = 21 are symbolic representations leading to the conclusion that:

- Thirteen apples plus eight apples results in a total of twenty-one apples.
- Thirteen blocks of concrete plus eight blocks of concrete results in a total of twenty-one blocks of concrete.
- Thirteen houses plus eight houses results in a total of twenty-one houses.
- And so on. (Learn Alberta)

Concretely

- Representing a situation or solving a problem concretely means doing so using actual objects. (Learn Alberta)

Pictorially

- Representing a situation or solving a problem pictorially means doing so using drawings or representations of actual objects. A visualization of the situation and solution takes place rather than an actual concrete experience of the situation and solution. (Learn Alberta)

Equation

- An equation is a statement showing that two mathematical expressions are equal. (Learn Alberta)

What do I need to know as a teacher in order to be able to teach the concept(s)?

+Vocabulary

Variable

- A variable is a symbol used to represent:
  - a number in an expression
  - an unknown value in an equation
  - a number or element of a set in a relation connecting two or more sets (Learn Alberta)

Preservation of equality

- When performing the same operation with the same value to both sides of the equation the equality is preserved. AB ED Parent Communication
- In order for equations to be equivalent, the same operations have to be performed on each side where the value of the variable does not change. E.g., 3n + 1 = 7 and 3n = 6 are equivalent equations because 1 is subtracted from each side in the first equation to make the second equation. This is called 'preservation of equality'. NewFoundland Grade 6 Math Curriculum Guide, page 108