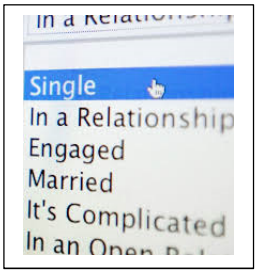
Home Connections in Mathematics

"In a relationship": Algebraic Reasoning for all



More than our Facebook status, relationships matter. In fact, when K-12 students work with relationships, they are engaging in algebraic reasoning.

> **Algebraic reasoning** is about looking for, and using, relationships to support understanding mathematical ideas and the world around us.

For many of us, algebra is a bit of a dirty word. It evokes memories of confounding procedures to 'isolate the variable' where procedure over understanding ruled. But real algebra is about making connections and seeing the bigger picture –it is about understanding.

Some Important Ideas in Algebraic Reasoning

Understanding Big Ideas in Calculations

When students try to learn about addition, subtraction, multiplication, and division by memorizing procedures or facts, the load becomes a very heavy burden. Seeing connections makes the work easier; kids who see connections say things like "Hey, multiplying by 7 is just like a x5 and a x2!"

Algebraic reasoning involves generalizing rules through investigation. Students can learn that the order doesn't matter when adding two numbers or when multiplying two numbers.

Understanding Equality

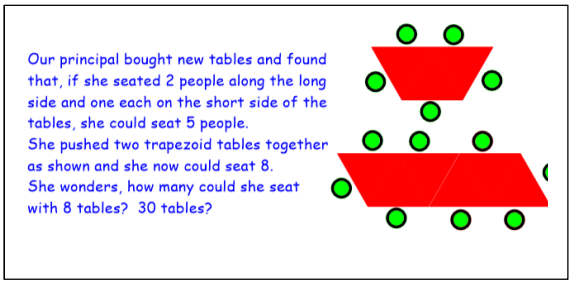
Many of us, and many of our children, believe that the equal sign means 'the answer' when, in reality, it means 'is the same as'.

Equality means 'the same as'		
7 and 13	Is the same as…	40 shared into two sets
		4 fives
		7 groups of 3 less 1

How we can support our children

- **Invite visualization and modelling**

Research shows that students' work building and drawing growing patterns (like 2, 5, 8, etc.) supports their later work with linear functions in gr.9 and 10. Try this problem:



- **Play Function Machine!**

Our children need opportunities to relate sets of numbers to one another. Create a rule (keep it simple for younger children) to change input numbers into output numbers but don't share it with your child! Give examples of inputs and outputs in *an unordered table* (e.g., *"When I put 4 into the machine, 12 came out. When I put 11 into the machine 33 came out…What's my rule?*) Ask them to guess your rule!

A) What's My Rule?

Input	Output
4	6
11	13
6	8

B) What's My Rule?

Input	Output
9	20
3	8
12	26

We can help our children see algebra as something that is fun rather than frightening, a subject filled with puzzles to be solved and connections to be made.

Rule for Function Machine A (input plus 2 makes the output)
Rule for Function Machine B (Double the input plus 2 makes the output)