

# Equality and Relational Thinking

In the Grade 3 Provincial Assessment, the second competency assesses the student's ability to understand that the equal symbol represents an equality of the terms found on either side of the symbol. In order to meet expectations, students are expected to be able to use relational thinking with regard to addition and subtraction in order to determine equality.

Carpenter, Franke, and Levi have presented four benchmarks that students move through as they develop their understanding about the equal sign. These benchmarks can be correlated with the Provincial Assessment Scoring Rubric.

## Benchmark 1: Basic Number Sense

Students clearly articulate their conceptions of the equal sign and how it is used.

= means "write the answer." So the answer to  $8 + 4 = \square + 5$  could be 12 or 17 or 7.

**Provincial Assessment:**  
Students at this level would be "needing ongoing help."

## Benchmark 2: Experience with a Variety of Equation Types

Students "accept as true some number sentence that is not of the form  $a + b = c$ ."

Yes, these are true.  
 $7 = 3 + 4$   
 $2 + 8 = 5 + 5$   
 $356 + 42 = 354 + 44$

**Provincial Assessment:**  
Students at this level would be "approaching expectations."

## Benchmark 3: Calculating to Determine Truth (Operational Thinking)

Students "recognize that the equal sign represents a relation between two equal numbers."

True or False?  
 $8 + 4 = 7 + 5$   
"8 + 4 = 12 and 7 + 5 = 12, so it is a true statement."

**Provincial Assessment:**  
Students at this level would be "approaching expectations."

## Benchmark 4: Relational Thinking

Students "are able to compare the mathematical expressions without actually carrying out the calculations."

True or False?  
 $8 + 4 = 7 + 5$   
"7 is one less than 8 but 5 is one more than 4, so it is true."

**Provincial Assessment:**  
Students at this level would be "meeting expectations."



## Why is Relational Thinking Important?

Relational thinking involves using fundamental properties of number and operations to transform mathematical expressions, rather than simply calculating an answer by following a prescribed sequence of procedures. Relational thinking is the foundation of algebra.

The development of relational thinking does not happen automatically for children. It needs to be fostered through carefully planned instruction.

## Suggested Strategies

The following strategies can be found on pages 17–19 of the Patterns and Relations section of *Grade 1 Mathematics: Support Document for Teachers* (Manitoba Education and Advanced Learning, 2014):

- 2-pan balance scale
- double number line
- manipulatives and pictures
- nifty number sentences
- 20 bead frame
- pocket chart

The following strategies can be found on pages 24–27 of the Patterns and Relations section of *Grade 2 Mathematics: Support Document for Teachers* (Manitoba Education and Advanced Learning, 2014):

- *Equal Shmequal* by Virginia Kroll (book)
- true and false statements
- dominoes
- balance scale, equation cards, and cubes
- nifty number sentences
- pocket chart
- double number line

The following strategy can be found on page 19 of the Patterns and Relations section of *Grade 3 Mathematics: Support Document for Teachers* (unpublished draft):

- Free Facts

**Note:** Relational thinking does not stop at Grade 3. In Grades 4 to 6, children use relational thinking in multiplication and division. In Grade 6 and up, relational thinking is used in algebra.

## Reflection and Discussion

- How is relational thinking being fostered?
- What classroom routines are in place to support relational thinking on a daily basis?
- What supports do you need related to relational thinking?

*Grade 1 Mathematics: Support Document for Teachers* can be found at [www.edu.gov.mb.ca/k12/cur/math/support\\_gr1/index.html](http://www.edu.gov.mb.ca/k12/cur/math/support_gr1/index.html).

*Grade 2 Mathematics: Support Document for Teachers* can be found at [www.edu.gov.mb.ca/k12/cur/math/support\\_gr2/index.html](http://www.edu.gov.mb.ca/k12/cur/math/support_gr2/index.html).