

Planning Guide

Grade 1 *Equality and Inequality*

Patterns and Relations (Variables and Equations) Specific Outcomes 4, 5

This Planning Guide can be accessed online at:

http://www.learnalberta.ca/content/mepg1/html/pg1_equalityandinequality/index.html

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Planning Guide: *Grade 1 Equality and Inequality*

Strand: Patterns and Relations (Variables and Equations)

Specific Outcomes: 4, 5

This *Planning Guide* addresses the following outcomes from the Program of Studies:

Strand: Patterns and Relations (Variables and Equations)

Specific Outcomes:

4. Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).
5. Record equalities, using the equal symbol.

Curriculum Focus

This sample focuses on:

- understanding the concept of equality.

What Is a Planning Guide?

Planning Guides are a tool for teachers to use in designing instruction and assessment that focuses on developing and deepening students' understanding of mathematical concepts. This tool is based on the process outlined in *Understanding by Design* by Grant Wiggins and Jay McTighe.

Planning Steps

The following steps will help you through the Planning Guide:

- **Step 1: Identify Outcomes to Address** (p. 3)
- **Step 2: Determine Evidence of Student Learning** (p. 5)
- **Step 3: Plan for Instruction** (p. 6)
- **Step 4: Assess Student Learning** (p. 11)
- **Step 5: Follow-up on Assessment** (p. 13)

Step 1: Identify Outcomes to Address

Guiding Questions

- What do I want my students to learn?
- What can my students currently understand and do?
- What do I want my students to understand and be able to do based on the Big Ideas and specific outcomes in the program of studies?

Big Ideas

When students begin the study of equality, it is important for them to see that the equal sign represents a relation, not an operation. It tells us that the quantity on the left is the same as the quantity on the right. Students should see that the expression which may include an operation really represents single quantities but are simply equivalent forms. For example, $10 + 8$ and $7 + 11$ are both equivalent representations for 18.

Using a balance scale, students begin to understand the concept of equating two quantities. Working with balance scale problems, students are building the foundation for further study in the area of algebra and solving equations.

In everyday life, we sort things by comparison relationships. For example, we might note that Ron is taller than Mary or that Monica takes more time than Valerie to complete her homework. Relationships also apply to number, as we might note that five is two less than seven or 12 is three more than nine. Students need to explore the concept of inequalities by recognizing and creating symbolic representations for "less than" and "greater than." They should recognize the relationship between these inequalities. Given two expressions, students should be able to identify if the quantities they represent are equal or not equal and how they can sort the quantities using inequalities.

Sequence of Outcomes from the Program of Studies

See <http://education.alberta.ca/teachers/core/math/programs.aspx> for the complete program of studies.

Kindergarten



Grade 1

Specific Outcomes

4. Describe equality as a balance and inequality as an imbalance, concretely and pictorially (0 to 20).
5. Record equalities, using the equal symbol.



Grade 2

Specific Outcomes

4. Demonstrate and explain the meaning of equality and inequality, concretely and pictorially.
5. Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol.

Step 2: Determine Evidence of Student Learning

Guiding Questions

- What evidence will I look for to know that learning has occurred?
- What should students demonstrate to show their understanding of the mathematical concepts, skills and Big Ideas?

Using Achievement Indicators

As you begin planning lessons and learning activities, keep in mind ongoing ways to monitor and assess student learning. One starting point for this planning is to consider the achievement indicators listed in the *Mathematics Kindergarten to Grade 9 Program of Studies with Achievement Indicators*. You may also generate your own indicators and use them to guide your observation of the students.

The following achievement indicators may be used to determine whether students have met this specific outcome.

- Construct two equal sets, using the same objects (same shape and mass), and demonstrate their equality of number, using a balance limited to 20 elements.
- Construct two unequal sets, using the same objects (same shape and mass), and demonstrate their inequality of number, using a balance limited to 20 elements.
- Determine if two given concrete sets are equal or unequal and explain the process used.
- Represent a given equality, using manipulatives or pictures.
- Represent a given pictorial or concrete equality in symbolic form.
- Provide examples of equalities where the given sum or difference is on either the left or right side of the equal symbol (=).
- Record different representations of the same quantity (0 to 20) as equalities.

Some sample behaviours to look for in relation to these indicators are suggested for many of the instructional activities in Step 3, Section C, **Choosing Learning Activities** (p. 8).

Step 3: Plan for Instruction

Guiding Questions

- What learning opportunities and experiences should I provide to promote learning of the outcomes and permit students to demonstrate their learning?
- What teaching strategies and resources should I use?
- How will I meet the diverse learning needs of my students?

A. Assessing Prior Knowledge and Skills

Before introducing new material, consider ways to assess and build on students' knowledge and skills related to patterns and relations. For example:

- Begin by asking students which is the larger quantity, given two numbers. Repeat this several times.
- Present some addition facts to 10, e.g., four add three is seven, and ask students if it is true or not true.
- Say to students, "I am going to give you a number sentence and I want you to write it down, using numbers and symbols." For example, two add eight is 10. Give several of these and then ask them, "How would we write that something is not equal?" Introduce the not equal to symbol if none of the students can identify it. Do the same with greater than and less than by giving some examples, using equal to and not equal to and then asking, "How could we write that something is greater than something else?"

As you do these kinds of activities, it is important to have students verbalize their thinking whenever possible.

If a student appears to have difficulty with these tasks, consider further individual assessment, such as a structured interview, to determine the student's level of skill and understanding. See **Sample Structured Interview: Assessing Prior Knowledge and Skills** (p. 7).

Sample Structured Interview: Assessing Prior Knowledge and Skills

Directions	Date:	
	Not Quite There	Ready to Apply
Ask students which is the larger quantity, given two numbers. Repeat this several times.	<ul style="list-style-type: none"> Identifies the incorrect number of the two. 	<ul style="list-style-type: none"> Identifies the correct larger number.
Present some addition facts to 10, e.g., four add three is seven, and ask students if it is true or false.	<ul style="list-style-type: none"> Identifies true or false incorrectly or appears to be guessing. 	<ul style="list-style-type: none"> Identifies, correctly, whether statements are true or false.
Say to students, "I am going to give you a number sentence and I want you to write it down, using numbers and symbols." For example, two add eight is 10. Give several of these and then ask them, "How would we write that something is not equal?" Introduce the not equal to symbol if none of the students can identify it. Do the same with greater than and less than by giving some examples, using equal to and not equal to and then asking, "How could we write that something is greater than something else?"	<ul style="list-style-type: none"> Uses a variety of symbols incorrectly. Uses self-created symbols. 	<ul style="list-style-type: none"> Uses correct symbols in the correct places within the number sentence.

B. Choosing Instructional Strategies

Consider the following strategies when planning lessons.

- Provide students with many opportunities to represent number sentences concretely.
- Students need many opportunities to come to understand that the equal sign represents a relation, not an operation. Use of the words "the same as" for the equal sign will help them see the relation.
- Balance activities form the basis for understanding equality. Using concrete materials, students can examine how a balance operates like the seesaw in the playground.
- Students need opportunities to create equations and to identify the equations visually.
- Expect students to explain, verbally, their answers about equalities and inequalities. Number sentences that demonstrate "is greater than" and "is less than" are known as "inequalities" and students should become familiar with that terminology. Number sentences using an equal sign are known as "equalities."
- Students should learn to read number sentences from left to right and right to left.

C. Choosing Learning Activities

The following learning activities are examples of activities that could be used to develop student understanding of the concepts identified in Step 1.

Sample Activities:

1. **Teaching Equations and Inequalities** (p. 9)

Sample Activity 1: Teaching Equations and Inequalities

1. Story Problems

Read the following story problems to students and have them use manipulatives to solve the problem. Reread the problems and have them draw pictures to help solve the problems. Then have students write the equations that could be used to solve the problems.

- There are eight girls and seven boys in the classroom. How many students are in the classroom altogether?
- There are 18 people eating in a restaurant. Five people leave. How many are left in the restaurant?

Look For ...

Do students:

- identify the key ingredients in the equation from the story?
- draw appropriate addends for the story?

2. Balance Equations

Give students the following problems and ask, "Will the balance tilt?" In the middle of the balance, students write the symbol to complete the number sentence (<, > or =).

$$\frac{3 + 2}{\quad} \quad \frac{8}{\quad}$$

Δ

$$\frac{5 + 7}{\quad} \quad \frac{6 + 6}{\quad}$$

Δ

$$\frac{4 + 8}{\quad} \quad \frac{2 + 9}{\quad}$$

Δ

$$\frac{3 + 9}{\quad} \quad \frac{7 + 5}{\quad}$$

Δ

3. Complete the Number Sentence

For each of the following, have students write an expression (either a whole number or a combination of numbers showing an operation) to complete the number sentence.

$4 + 2 = \underline{\quad\quad\quad} \quad \underline{\quad\quad\quad} = 7 + 11$

$5 + 3 = \underline{\quad\quad\quad} \quad \underline{\quad\quad\quad} = 8 + 10$

Do the same questions with not equal to symbols. Accept many different correct answers.

4. Complete the Inequalities

Have students write an expression (either a whole number or a combination of numbers showing an operation) to complete these inequalities:

$\underline{\quad\quad\quad} > 5 + 2 \quad 7 + 1 < \underline{\quad\quad\quad}$

$4 + 7 > \underline{\quad\quad\quad} \quad \underline{\quad\quad\quad} < 7 + 7$

Accept many different correct answers for each.

Look For ...

Do students:

- complete the inequality appropriately?

5. Flash Cards

Create cards with number sentences, like flash cards. Ask students to tell you whether the sentences are correct or not. If they are not correct, ask how we could correct them.

$$7 = 3 + 4$$

$$10 - 3 = 7$$

$$10 + 5 = 15$$

$$6 = 9 - 4$$

6. Equations

Working in pairs, have students write as many different equations as possible for a number from 1 to 20. For example, one pair may have the number 13 and write the following:

$$13 = 1 + 12$$

$$13 = 2 + 11$$

$$13 = 3 + 10 \text{ and so on.}$$

Step 4: Assess Student Learning

Guiding Questions

- Look back at what you determined as acceptable evidence in Step 2.
- What are the most appropriate methods and activities for assessing student learning?
- How will I align my assessment strategies with my teaching strategies?

Sample Assessment Tasks

In addition to ongoing assessment throughout the lessons, consider the following sample activities to evaluate students' learning at key milestones. Suggestions are given for assessing all students as a class or in groups, individual students in need of further evaluation, and individual or groups of students in a variety of contexts.

A. Whole Class/Group Assessment

Note: Performance-based assessment tasks are under development.

Ask students to use manipulatives to solve the following problems. They should draw pictures and write an equation to show how they solved each problem.

- John saw five sparrows feeding at the birdfeeder. He went away and later he looked and counted 14 sparrows at the birdfeeder. How many more sparrows flew to the birdfeeder while he wasn't looking?
- There are seven children playing baseball. Six more children join them. How many children are there altogether?

B. One-on-one Assessment

Assessment activities can be used with individual students, especially students who may be having difficulty with the outcome.

Ask the student to tell you if the following sentences are correct. If they are not correct, ask the student how to make them correct.

$$4 + 7 = 9 + 2$$

$$18 > 7 + 9$$

$$8 + 7 = 10 + 6$$

$$3 + 6 = 7 + 2$$

$$11 + 7 = 16 + 2$$

$$5 + 1 < 7 + 4$$

C. Applied Learning

Provide opportunities for students to use their learning in a practical situation and notice whether or not the strategies transfer.

1. Using a pan balance from the science laboratory, have students determine what some very common items weigh. Have them compare items of similar weight to see how the balance reacts. Do the same with items that weigh different amounts so they begin to understand the idea of balance. Compare items such as a baseball and a tin of tuna.
2. A similar activity can be done using the playground seesaw. Have students of similar weight try to balance the seesaw. Then have them write sentences to describe what they saw; e.g., John has a greater mass than Betty.

Step 5: Follow-up on Assessment

Guiding Questions

- What conclusions can be made from assessment information?
- How effective have instructional approaches been?
- What are the next steps in instruction?

A. Addressing Gaps in Learning

If a student is having difficulty learning the concept of an equation, you may have to go back to writing simple equations, using the basic number facts from 1 to 10. Students should have access to counters as they work on writing equations such as $2 + 4 = 6$. Students should also have counters to check which of two numbers is larger and how they can write an inequality using symbols.

Students may need additional time to reinforce the notion of the equation as a balance, using a pan balance.

B. Reinforcing and Extending Learning

Students who have achieved or exceeded the outcomes will benefit from ongoing opportunities to apply and extend their learning.

Consider strategies, such as the following.

- Have students complete number sentences where they fill in the missing numbers; e.g.,

$$4 + \underline{\quad} = 15$$

$$7 + 3 = \underline{\quad} + 6$$

$$15 > \underline{\quad} + 9$$

$$\underline{\quad} + 3 < 5 + 4$$

$$11 + \underline{\quad} = \underline{\quad} + 10$$

$$\underline{\quad} - 2 = 6 + 3$$

- Provide students with challenging questions, for example:

In a Grade 1 class, there are six girls and nine boys. The other class has more girls and fewer boys. If this class has an equal number of boys and girls, how many students are in the class? Are there other answers?

Nadir has some nickels and dimes. If Nadir has 10 coins altogether and she has 60 cents, how many nickels does she have?

- Have students write their own problems, using as a basis a number sentence you provide; e.g., what word problem might be answered using the equation $9 + 2 = 11$?
- Have students write number sentences that are missing the $=$, $<$ or $>$. Ask students to work with a partner and have them trade their number sentences with the missing symbols and try

to complete their partner's sentences. (Hint: students might want to write a complete sentence and then remove the symbol.)

Bibliography

Step 2 References

Alberta Education. *The Alberta K–9 Mathematics Program of Studies with Achievement Indicators*. Edmonton, AB: Alberta Education, 2007.

Other References

Wiggins, Grant and Jay McTighe. *Understanding by Design*. Alexandria, VA: Association for Supervision and Curriculum Development, 1998.