

Planning Guide

Grade 1 *Repeating Patterns*

Patterns and Relations (Patterns) Specific Outcomes 1, 2

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Planning Guide: *Grade 1 Repeating Patterns*

Strand: Patterns and Relations (Patterns)

Specific Outcomes: 1, 2

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

Strand: Patterns and Relations (Patterns)

Specific Outcomes:

1. Demonstrate an understanding of repeating patterns (two to four elements) by:
 - describing
 - reproducing
 - extending
 - creatingpatterns using manipulatives, diagrams, sounds and actions.
2. Translate repeating patterns from one representation to another.

Curriculum Focus

This sample focuses on:

- representing and describing repeating patterns.

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. 14)

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

The foundation of algebraic thinking is investigating patterns and their representations. We are always looking for ways to generalize and formalize regularity in mathematics. This lesson focuses on patterns and regularity and ways of representing these patterns. Not only do students need to recognize the pattern, but they must also be able to extend and generalize in both words and symbols. They should be able to recognize many different forms of the same pattern. They will identify similarities and differences between and among patterns.

Patterns occur regularly in students' everyday life and they will be able to identify patterns in their daily living, including physical and geometric situations as well as numbers. The patterns being explored in Grade 1 are all repeating patterns. Teachers should be aware that some students may create growing patterns. Students will focus on the core of a repeating pattern; patterns should be written having the core repeat at least three times so it is clear to students what the pattern is.

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

Specific Outcomes

1. Demonstrate an understanding of repeating patterns (two or three elements) by:
 - identifying
 - reproducing
 - extending
 - creatingpatterns using manipulatives, sounds and actions.
2. Sort a set of objects based on a single attribute, and explain the sorting rule.



Grade 1

Specific Outcomes

1. Demonstrate an understanding of repeating patterns (two to four elements) by:
 - describing
 - reproducing
 - extending
 - creatingpatterns using manipulatives, diagrams, sounds and actions.
2. Translate repeating patterns from one representation to another.



Grade 2

Specific Outcomes

1. Demonstrate an understanding of repeating patterns (three to five elements) by:
 - describing
 - extending
 - comparing
 - creatingpatterns using manipulatives, diagrams, sounds and actions.
2. Demonstrate an understanding of increasing patterns by:
 - describing
 - reproducing
 - extending
 - creatingnumerical (numbers to 100) and non-numerical patterns using manipulatives, diagrams, sounds and actions.

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.

- Describe a given repeating pattern containing two to four elements in its core.
- Identify and describe errors in a given repeating pattern.
- Identify and describe the missing element(s) in a given repeating pattern.
- Create and describe a repeating pattern, using a variety of manipulatives, diagrams, sounds and actions.
- Reproduce and extend a given repeating pattern, using manipulatives, diagrams, sounds and actions.
- Identify and describe a repeating pattern in the environment, e.g., classroom, outdoors, using everyday language.
- Identify repeating events; e.g., days of the week, birthdays, seasons.
- Represent a given repeating pattern, using another mode; e.g., actions to sound, colour to shape, ABCABC to bear eagle fish bear eagle fish.
- Describe a given repeating pattern, using a letter code; e.g., ABCABC.

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:

- Demonstrate simple ABAB patterns for students and ask them to repeat the patterns. Use a variety of ways to represent the patterns; e.g., clap, stomp, clap, stomp or show the ABAB pattern using pattern blocks on the overhead projector.
- Give students some ABAB pattern strips showing, for example, happy face, sad face, happy face, sad face. For some of the patterns, ask them to continue the pattern, repeating it at least three times. For other patterns, remove some of the elements and ask them to fill in the missing elements.
- Give students a set of five patterns, some of which are ABAB and some are ABCABC. Use a variety of objects for the patterns, including colours, shapes, animals, letters. Ask students which ones are ABAB patterns and which ones are ABCABC. You may also ask students why the patterns are alike or different.

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 Skills** (p. 7).

Sample Structured Interview: Assessing Prior Knowledge and Skills

Directions	Date:	
	Not Quite There	Ready to Apply
Demonstrate simple ABAB patterns for students and ask them to repeat the patterns. Use a variety of ways to represent the patterns; e.g., clap, stomp, clap, stomp, or show the ABAB pattern using pattern blocks on the overhead projector.	Offers a variety of incorrect patterns, mixing up the patterns or leaving out elements.	Mimics, correctly, the pattern with a variety of sounds or noises.
Give students some ABAB pattern strips showing, for example, happy face, sad face, happy face, sad face. For some of the patterns, ask them to continue the pattern, repeating it at least three times. For other patterns, remove some of the elements and ask them to fill in the missing elements.	Completes only a portion of the pattern or incorrectly follows any of the pattern.	Completes examples of a given pattern.
Give students a set of five patterns, some of which are ABAB and some are ABCABC. Use a variety of objects for the patterns, including colours, shapes, animals, letters. Ask students which ones are ABAB patterns and which ones are ABCABC. You may also ask students why the patterns are alike or different.	- Identifies, incorrectly, some or all of the given patterns. - Is not able to say why patterns are alike or different.	- Identifies (labels), correctly, patterns as ABAB or ABCABC. - Tells why patterns are alike or different.

B. Choosing Instructional Strategies

Consider the following strategies when planning lessons.

- Provide students with many opportunities to represent patterns concretely.
- Allow students to identify patterns in their daily lives. This can include repetitive songs and rhythmic chants that are based on repeating and growing patterns.
- Patterning activities form the basis for algebraic reasoning. Using concrete materials, students can examine how patterns can be created with things such as cubes or pattern blocks.
- Students need opportunities to create patterns and to identify the core of a pattern visually.
- Expect students to explain, verbally, their answers about patterns.

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 Patterns and Relations (p. 9)

Sample Activity 1: Teaching Patterns and Relations

1. Creating Patterns

Have students work in pairs to create patterns, using simple materials including stickers, stamps, pieces of wallpaper or other cut-outs. Give them pattern strips (use bristle board or cut pieces from adding machine rolls. Printing companies will often provide end cuts, which are long strips of multi-coloured paper, free of charge). Have students make at least three complete repetitions of the pattern on the strips. Students place the pattern strips on a bulletin board and the entire class discusses what the core of the pattern is and how the pattern could be extended.

Look For ...

Do students:

- ☐ identify the core of their pattern when asked?
- ☐ complete an appropriate number of repetitions?

2. Find the Error

Show students about 10 pattern strips you have prepared. Tell them that some contain errors while others have something missing. Ask the whole class to look carefully at each strip (hold them up one at a time) and identify any patterns that may contain an error or have any missing elements. Ask each student to turn to a partner and tell the partner what he or she has discovered. Then call on a pair to explain. Repeat for all the strips.

3. Pattern Blocks

Hand out approximately 35 pattern blocks to pairs of students. Have them create three different patterns individually and place these patterns on a desktop. Some trading of pattern blocks may need to occur between groups. Encourage them to make patterns that are different and remind them about ABCABC patterns and ABBABB patterns. Once the pairs have created their patterns, ask them to think about whether or not their patterns are like the one you will identify. Create a pattern using clapping and stomping, e.g., clap, stomp, stomp, and ask students if anyone has the same pattern. Repeat this with other patterns. Have students justify their answers with explanations.

Look For ...

Do students:

- ☐ create only ABAB patterns?
- ☐ recognize when their pattern is the same as another person's pattern?

4. Everyday Patterns

Identify patterns that we practice in our daily living. These patterns may be a sequence of events or activities we follow as part of a routine. For example, when we brush our teeth, the pattern usually goes something like this: pick up toothbrush, put on toothpaste, wet the brush, brush our teeth, rinse our mouths. In the classroom, there are patterns we follow: morning bell rings, students line up, take off coats, enter classroom, take attendance. School days follow a pattern: class, recess, class, lunch, class, dismissal. Cooking follows a pattern: measure the rice, add water to pot, put rice in water, boil until cooked, serve the rice, eat the rice. Ask students to identify patterns and then go home and ask their parents about patterns. You may send a note home to the family to explain the kinds of patterns you are looking for.

5. Translating Patterns

Give students a series of patterns. These may be on a page or on an overhead; e.g.,



Ask students to translate these patterns and others into letter representations.

6. Pattern Sounds

Give students pattern blocks and ask them to create an ABBABB pattern. Then ask students, "What would this pattern sound like?" Continue asking for other patterns, such as ABCABC, AABAAB or ABBCABBC.

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

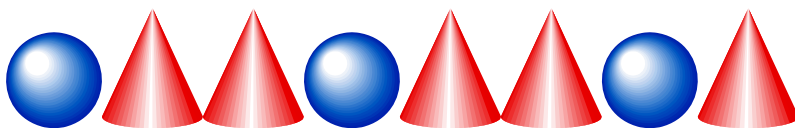
Note: Performance-based assessment tasks are under development.

1. Show a pattern of cubes, e.g., RGGRGGRGG, and ask students to tell you what the pattern is. Then show a different pattern of cubes; e.g., YYBYYBYB. Have students identify the new pattern. Then ask students to tell you how the patterns are different and how they are the same.
2. Tell students, "Mary has six green triangles and three orange squares." Show students the pieces on the overhead. Ask, "Can she make two different patterns?" Ask students to draw two possible patterns that Mary could make and explain the patterns. Ask, "What comes next in the pattern?"
3. For each pattern below, ask students to do an action representation, using claps, stomps and hops. Have students identify what the core pattern is and record it, using letter notation.
 - Circle, Square, Rectangle, Circle, Square, Rectangle, Circle, Square, Rectangle
 - Red, Red, Blue, Red, Red, Blue, Red, Red, Blue
 - Horizontal, Vertical, Horizontal, Vertical, Horizontal, Vertical
 - Green, Yellow, Yellow, Green, Yellow, Yellow, Green, Yellow, Yellow

B. One-on-one Assessment

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

1. Show the student three patterns that have an element missing; e.g.,



Have the student draw the missing element.

2. Using a set of pattern blocks, set a pattern in front of the student and ask him or her to add three more pieces; e.g., hexagon, rectangle, trapezoid, hexagon, rectangle, trapezoid, hexagon, rectangle, trapezoid (repeating the pattern at least three times shows students that it is a pattern). Then ask the student how she or he knows what comes next. The important part of the response is for the student to identify the core of the pattern.
3. Provide the student with interlocking cubes and ask him or her to make towers for the following patterns:
 - ABABAB
 - AABAABAAB
 - ABCCABCCABCC
 - ABBCABBCABBC.

C. Applied Learning

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

1. Using wallpaper samples (stores will often provide old sample books free of charge), have students look for patterns in the wallpaper. They can make artwork out of the wallpaper patterns they choose.

2. Using stickers and stamps/stamp pads, have students create pattern artwork to use as a wallpaper border around the classroom. They could also use finger paints and make handprints of different colours in pairs or triads.
3. Read pattern books, such as the ones listed below, and have students identify the patterns.

Carle, Eric. *The Grouchy Ladybug*. New York: HarperCollins, 1996.

Carle, Eric. *The Very Hungry Caterpillar*. New York: Philomel Books, 2002.

Hutchins, Pat. *The Doorbell Rang*. New York: Greenwillow Books, 1986.

With these books, you can do artwork, cooking, reading and creating your own pattern book activities.

4. Use musical patterns to demonstrate patterns. Using singing patterns (e.g., do, mi, mi) or rhythms on a drum or clapping to represent a pattern are practical and easy ways to show patterns.

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, is confused with identification of patterns or is unable to translate them into the core letters, he or she may need more work using manipulatives to create and identify simple ABAB patterns. To use simple patterns, try to ensure that only one attribute is different as students begin to identify patterns. Ensure you are using language students understand and have them mimic your patterns at first. Work up from ABAB to ABCABC to ABBABB or AABAAB to help students build on what they already know.

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.

- Provide tips for parents on practising patterns. Ask students to look for patterns at home and around the classroom and schoolyard.
- Very capable students can be encouraged to go beyond repetitive patterns to look at growing patterns; e.g., AB, ABC, ABCD or AB, ABB, ABBB, ABBBB.
- Have students explore patterns that are written in a grid formation; e.g., have students use a four by four grid and their name to see if a pattern is created. Here we use the name DAVID:

D	A	V	I
D	D	A	V
I	D	D	A
V	I	D	D

- Ask students what would happen if we had used a three by three grid or a five by five grid.

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.