



# KINDERGARTEN MATHEMATICS

## Patterns and Relations



# Kindergarten: Patterns and Relations

Mathematics is the study of patterns and relationships. Recognizing and exploring the inherent patterns in mathematics make it easier for children to see relationships and understand concepts.

Children first learn about patterns by discriminating similarities and differences as they sort. As they begin to understand the relationships between objects, they can start to make predictions. They then proceed to the recognition of visual, kinesthetic, and auditory patterns in their environment. From recognition, they progress to extension of patterns, translation of a given pattern to other modes, and finally to the creation of their own.

Teachers should be mindful of the needs of all students in the classroom including EAL (English as an Additional Language) students. Manitoba's schools include young people of varied backgrounds and who have varying degrees of fluency in a number of different languages. When selecting activities and resources to support sorting and patterning, teachers are encouraged to ensure these choices support inclusion of all students that is respectful to the culture of the students.

Cultural background and language can influence the way children identify, translate, and create a pattern. For example, the patterns created by First Nations students may not fit English language criteria for patterns, but may make perfect sense to a First Nations language speaker. One of the reasons for this is that First Nations languages, such as Ojibwe, categorize things differently than they are categorized in English. Some First Nations language speakers categorize nouns, pronouns, and even verbs into animate or inanimate. Yet some things, such as rocks, would be classified as animate by a First Nations language speaker and inanimate or non-living by an English speaker depending on the circumstance of the situation.

First Nations, Métis, and Inuit languages do not follow a universal form and are diverse among the First Nations, Métis, and Inuit communities in Manitoba. Teachers are encouraged to seek support from within the community to ensure that classroom instruction and resources used are accurate and authentic and reflect sensitivity of the First Nations, Métis, and Inuit peoples of the community.

It is important to interview, in a non-judgmental manner, the students who appear not to have the concept of patterns. Children must feel comfortable communicating verbally about why a particular combination of objects, sounds, shapes, actions, or colours form a pattern. An interview will help clarify if the misunderstanding is culturally based or not. Further investigation into cultural background, either through reading or talking to the parents, may be necessary to verify the assessment made. Teachers should provide a wide variety of work and play with patterns of all kinds, including those from different cultures. Language and cultural activities should be carefully organized and incorporated into lesson plans to enrich the teaching content.

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## NOTES

# Kindergarten: Patterns and Relations (Patterns) (K.PR.1)

## Enduring Understandings:

Patterns show order in the world.

Patterns can be found in many different forms.

## Essential Question(s):

Where are patterns found?

What is a pattern?

What is the repeating unit (core) in the pattern?

## SPECIFIC LEARNING OUTCOME(S):

## ACHIEVEMENT INDICATORS:

**K.PR.1** Demonstrate an understanding of repeating patterns (two or three elements) by

- identifying
- reproducing
- extending
- creating

patterns using manipulatives, sounds, and actions.  
[C, CN, PS, V]

- Distinguish between repeating patterns and non-repeating sequences in a set by identifying the part that repeats.
- Copy a repeating pattern (e.g., actions, sound, colour, size, shape, orientation) and describe the pattern.
- Extend a variety of repeating patterns to two more repetitions.
- Create a repeating pattern using manipulatives, musical instruments, or actions, and describe the pattern.
- Identify and describe a repeating pattern in the classroom, the school and outdoors (e.g., in a familiar song, in a nursery rhyme).

## PRIOR KNOWLEDGE

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Experiences with sorting and classifying may help with the learning of patterns. The ability to work with patterns is strengthened by the recognition and identification of attributes such as colour, size, and shape.

Students may know some nursery rhymes and songs with repeating verses or choruses.

## BACKGROUND INFORMATION

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Repeating patterns can be extended in both directions.

It is difficult to identify a pattern from a small part of the pattern. Therefore, the pattern core should be repeated more than twice.

The teacher's role involves posing questions that alert students to patterns which occur naturally in the sequence of the day, such as in the songs sung, the books read, and the games played in gym. This is an ongoing and natural process. Activities should highlight patterns that are visual, kinesthetic, and auditory.

## MATHEMATICAL LANGUAGE

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Repeating pattern, core, position words (after, between, beside, before, next), attribute vocabulary (colour, size and shape)

## LEARNING EXPERIENCES

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### Assessing Prior Knowledge

1. Use a small collection of pattern blocks.  
Have the students tell you about the blocks.
2. Have them group/sort them. Note: Some students may have difficulty with the terms 'sort' or 'group'. Adjust the directions as needed.  
(If students are unable to sort on their own, model sorting by colour. Then, have the students complete the sorting.)
3. Make a pattern using cubes by alternating colours such as: blue, yellow, blue, yellow, blue, yellow. (Note: Left to right sequence is not important here.) Ask: Can you make a line of cubes just like mine? Tell me about the line of cubes.
4. Make an ABC pattern with the cubes. (Example: red, blue, green, red, blue, green, red, blue, green) Ask: Which cube comes next? (Put it in the cube line.) How did you know which cube to choose? Can you show me the part that repeats?



### Observation Checklist

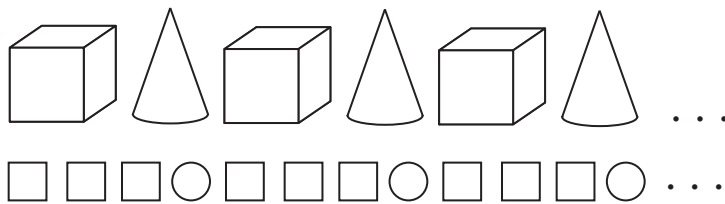
Students are able to

- Identify the following attributes  
     colour \_\_\_\_\_                      size \_\_\_\_\_  
     shape \_\_\_\_\_                      other \_\_\_\_\_
- Sort by  
     one attribute \_\_\_\_\_
- Recognize the pattern \_\_\_\_\_      Copy the pattern \_\_\_\_\_  
     Describe the pattern \_\_\_\_\_
- Extend the pattern \_\_\_\_\_      Identify the core \_\_\_\_\_

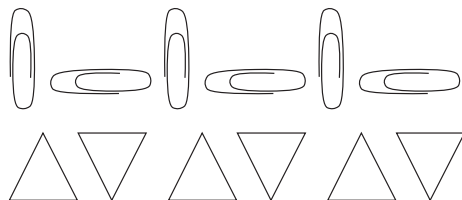
- **Copy a repeating pattern (e.g., actions, sound, colour, size, shape, orientation) and describe the pattern.**
- **Extend a variety of repeating patterns to two more repetitions.**

Teacher works with the children to copy, describe, and extend patterns, such as:

- people patterns (e.g., 1 stands, 1 sits, 1 stands. . . ; hand up, hand down, hand up. . .)
- colour patterns (e.g., red, red, blue, red, red, blue. . .)
- geometric patterns (e.g., see below)

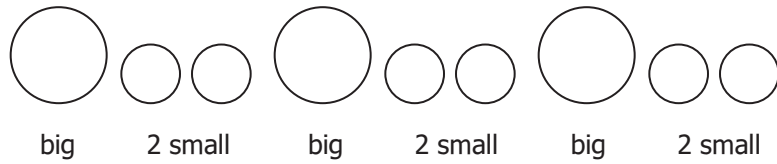


- object patterns (e.g., leaf, stone, stick, leaf, stone. . .)
- action patterns (e.g., clap, snap, clap, snap. . .)
- music patterns (e.g., beat, beat, beat, pause, beat, beat, beat, pause. . .)
- orientation patterns (e.g., see below)



Teacher's questions should focus students' attention on the underlying mathematical skills or concepts elicited by the learning experience(s).

- size patterns (e.g., see below)



During these experiences ask questions such as

- What comes next/before/after? How do you know?
- Can you finish the pattern?
- What part of the pattern repeats?



### Observation Checklist

Students are able to

- copy a pattern with a two element (AB) core
  - copy a pattern with a three element (ABC) core
  - extend a pattern with a two element core
  - extend a pattern with a three element core
- using a variety of materials and modalities.

### ■ Create a repeating pattern using manipulatives, musical instruments, or actions, and describe the pattern.

- Provide a variety of materials such as cubes, keys, small toys, and pattern blocks. Have students use them to create their own repeating patterns. Ask students to describe their pattern(s).
- Use a xylophone that has different coloured keys. Provide a set of construction paper strips that match the colours on the xylophone. Students can compose their own musical pattern, record it with the coloured strips glued on to paper strips, and leave them with the xylophone so that others can play it.
- Involve the students in creating their own action patterns for others to follow. Pictures of the actions can be glued to paper strips to record their patterns.

Example:





During these learning experiences ask questions such as

- Can you make a new pattern using the same materials?
- What other materials could you use to make the same pattern?
- What will come next in your pattern?
- Are these patterns the same?
- Which shapes, colours, sizes have you used in your pattern?
- How is this pattern different from this pattern?



### Observation Checklist

Students are able to

- create a pattern with a two element (AB) core
- create a pattern with a three element (ABC) core
- describe a pattern with a two element core
- describe a pattern with a three element core using a variety of materials and modalities.

### ■ Identify and describe a repeating pattern in the classroom, the school, and outdoors (e.g., in a familiar song, in a nursery rhyme).

- Pose questions which alert students to patterns in natural circumstances (e.g., in songs, in books, in the sequence of the day, in clothing, on floors, in games.)
- Discuss with students patterns found in nature (e.g., leaf patterns, petal arrangements, animal stripes . . .).
- “Let’s find all the patterns in our room.” (Examples: clothing, tiles, wall trim, wrapping paper, windows . . .).
- Go on a “Pattern Patrol” in search of patterns around the school.
- Use a digital camera to take pictures of student-created and environmental patterns. The pictures can be compiled along with student descriptions to make a class Pattern book. (Literacy with ICT connection.)



### Observation Checklist

Students are able to

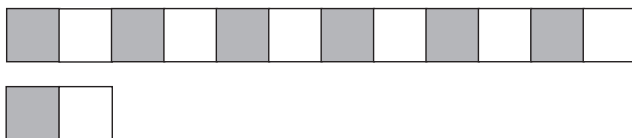
- recognize patterns in music, poetry, and stories
- recognize patterns in their environment
- describe a pattern with a two element (AB) core
- describe a pattern with a three element (ABC) core using a variety of materials and modalities.

### ■ Distinguish between repeating patterns and non-repeating sequences in a set by identifying the part that repeats.

BLM  
K.PR.1.1&2

- Show students a set of repeating patterns and non-repeating sequences on paper strips. Students sort them into two groups – Patterns and Non-Patterns – and give reasons for their placement.
- Make repeating patterns with unifix/interlocking cubes. Have students snap off the part that repeats (core). Match the snapped off core with the rest of the pattern so that students can see the repetition.

Example:



### Observation Checklist

Students are able to

- distinguish between patterns and non-patterns
- identify the pattern core for an AB pattern
- identify the pattern core for an ABC pattern

## Integrating Patterns into Kindergarten Routines and Centres

CENTRE	SUGGESTED ACTIVITIES
Arts & Crafts	<p>Make patterns by: painting, cutting and pasting, drawing, stamping, using playdough or stickers.</p> <p>Connect to the Paper cluster in Science.</p>
Sand	<p>Make patterns using cookie cutter shapes in wet sand.</p> <p>Use a variety of materials (shells, sticks, etc.) to make patterns.</p>
Blocks/Construction	<p>Make a pattern using two or three different types of blocks.</p> <p>Make structures with patterns as part of their design.</p> <p>Use blocks to copy or extend a given pattern.</p>
Math	<p>Explore patterns with materials such as: pegs and pegboards, beads and laces, pattern blocks, unifix or interlocking cubes, buttons, keys, coloured pasta shapes, colour tiles, etc.</p>
Role Play/Dress-Up	<p>Make pattern necklaces and bracelets with beads and laces.</p> <p>Arrange toy animals in patterns (e.g., farm animals going into the barn).</p> <p>Make patterns with small cars going into the parking garage or driving on the road.</p>
Music	<p>Sing songs with repeating choruses or verses.</p> <p>Play repeating patterns on percussion instruments.</p> <p>Compose their own musical patterns and play them for others.</p>
Pocket Chart	<p>Use different shapes and objects to make patterns in the pocket chart.</p>
Book/Reading	<p>Find patterns in the illustrations.</p> <p>Find patterns in predictable text.</p>

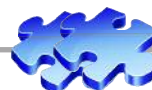


### Observation Checklist

Students are able to

- apply their knowledge of pattern in different contexts
- demonstrate an interest in finding and creating patterns

## PUTTING THE PIECES TOGETHER



### Investigation: Manitoba Wrapping Paper Company Design Challenge

**Scenario:** Our class has been asked by the Manitoba Wrapping Paper Company to help them design new wrapping paper. The company wants their wrapping paper to have three different repeating patterns on each sheet. Each sheet can use a combination of two or three different rubber stamps/stickers/shapes.

**Note:** If possible show students some examples of sheets of wrapping paper.

Have students work in partners.

Provide each group with a large piece of paper (11" x 17") divided into three sections and no more than three different rubber stamps or types of stickers/shapes. Allow them the freedom to try to solve the problem. Scaffold the task, if necessary, while students are working on the investigation (not before).

Select a variety of solutions to have students share in a whole-class meeting.


**Note:** In working with a Kindergarten class on this task we found that students, although very successful, needed support. Extra adults (perhaps older students) would be ideal. If this is not possible, it is suggested that the task be done as a teacher station/centre with groups rotating through tasks over several days