

PATTERNING AND ALGEBRA

GRADE 2

ONTARIO EDITION

hands-on **mathematics**

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PORTAGE & MAIN PRESS

Winnipeg • Manitoba • Canada

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From *Hands-On Mathematics: Grade 2*, © 2006

Portage & Main Press acknowledges the financial support of the Government of Canada through the Book Publishing Industry Development Program (BPIDP) for our publishing activities.

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Patterning and Algebra
Grade 2
Ontario edition

Printed and bound in Canada by Prolific Group

ISBN 978-1-55379-103-4



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Introduction

Patterns and relations exist in all areas of mathematics. The ability to recognize and explore patterns enables students to understand all mathematical concepts and apply them when problem solving.

Note: Although the Data Management and Probability strand of the *Ontario Curriculum for Mathematics (2005)* deals with sorting and classifying, most sorting skills are prerequisites for patterning. Accordingly, sorting activities are presented at the beginning of this module, *Patterning and Algebra*. As well, the “Expressions and Equality” expectations from the Patterning and Algebra strand are addressed in the module, *Number Operations* as they are related to other concepts within that module.

In this module, students begin with sorting activities as a means of developing their ability to identify and describe attributes of objects. This will assist with their ability to identify, recognize, describe, extend, and create patterns using real objects, mathematical manipulatives, and numbers. Students also explore growing and repeating patterns using organizational tools such as diagrams and charts.

Patterning activities involve early stages of *algebraic reasoning*, as students investigate both spatial and numerical patterns. Looking at growth patterns is an important first step in developing skills in algebraic reasoning.

Mathematics Vocabulary

Throughout this module, teachers should use, and encourage students to use, vocabulary such as: *attribute, Venn diagram, Carroll diagram, intersection, compare, element, extend, identify, double, row, column, quadrant, vertical, horizontal, diagonal, and chart.*

A Mathematics Word Wall is a valuable reference for students for displaying new vocabulary. Dedicate a classroom bulletin board to your word wall, and display the letters of the alphabet along the top of the bulletin board. Use index cards to record math vocabulary introduced in each lesson, and place these on the board under the appropriate letter of the alphabet. Encourage students to refer to the Math Word Wall during activities and while doing written tasks.

3 What Is in a Name?

Materials

- *The Name Jar*, a book by Yangsook Choi
- chart paper
- blank name strips (included. Photocopy, and cut out one strip per student.) (1.3.1)
- scissors
- pocket chart
- index cards
- circle stickers (You will need one sticker for each letter in each student's first name.)
- Unifix cubes (or other interlocking cubes)
- large, intersecting, double Venn diagrams (made on chart paper)
- jar
- large Carroll diagram (made on chart paper)
- twenty-six paper plates
- markers
- crayons

Activity: Part One

Read the book *The Name Jar* with students.

Ask:

- What was the story about?
- Why did Unhei want to find another name?
- How are names different? How are names the same?

Distribute one blank name strip (1.3.1) to each student. Have students print their first names onto their strips, one letter per square.

Now, ask students to examine the letters in their own names. Have students sort themselves into groups with other classmates whose names are similar to their own in some way (for example, have more than three letters, begin with S, have an A). Have students describe their sorting. Ask:

- Can you find someone else in the class whose name is like your name in some way?
- What name attribute do you have in common?

Record onto index cards the attributes students used to sort their names, and place the cards into a pocket chart. Now, have students form new groups using different name attributes and identify the attributes they used to sort their names. Record these attributes onto index cards.

Next, play "Guess Our Sorting Rule." Using their name strips, have students sort themselves into groups by a particular name attribute. Then, have each group take turns holding up their name strips while their classmates try to guess their sorting rule.

Activity: Part Two

Have students place their name strips into a jar. Display a large, intersecting Venn diagram for students. Choose two name attributes and print them onto index cards (e.g., "starts with *L*" and "has an *E*"). Place each index card onto one of the Venn circles. Have students take turns pulling a name out of the jar, reading the name, and placing it onto the Venn diagram in the appropriate place. Ask:

- Where does this name belong on the Venn diagram? Why?

Continue until each student has had a turn and all the names have been sorted. Then, ask students:

- Can you describe our sorting?
- How many students have names that start with the letter *L*? How many do not?
- How many students have an *E* in their name? How many do not?
- How many more students have an *E* in their name than do not have an *E*?

Observe whether or not students include the intersection when describing the sorting.

3

Activity: Part Three

Begin a class discussion about how some names are long and some names are short. Ask:

- Who in the class has a short name? Who has a long name?
- Do you know any other short names or long names?

Provide each student with some circle stickers and some interlocking cubes. Have students print their first names onto the stickers, one sticker for each letter. Then, tell each student to count how many letters are in his/her name and snap together the same number of interlocking cubes. Have students stick their circle stickers onto the cubes to make name trains.

Now, ask students to compare their name trains. Hold up one name train. Ask:

- How many letters are in (Kerry's) name?
- Does anyone else in the class have five letters in his or her name?
- Is there someone in the class who has less than five letters in his or her name? More than five letters?

Line up a second name train beside the first one, and have students identify how many letters are in the second name by counting up or down from five. Ask:

- If there are five letters in the name "Kerry," how many letters are there in the name "Cassidy"? How do you know?

Line up two more name trains, and have students identify how many more or less letters there are in one of the names. Ask:

- How many more letters does (Christopher) have in his name than (Kim) has in hers? How do you know?

Now, have students sort their name trains into groups according to the number of letters in their names. Have students describe their sorting. Ask:

- Can you tell me something about our sorting?
- Can you tell me something about this group?

Activity: Part Four

Have students sort their name trains onto an intersecting, double Venn diagram using the number of letters (for example, five or more letters) and the kinds of letters (for example, more than two vowels) as attributes. Ask students to describe their sorting and make comparisons.

Now, distribute Activity Sheet A (1.3.2). As a class, decide on two name attributes students will use to sort their names. Some examples are:

- has less than six letters
- has more than two vowels
- starts with a vowel
- has an even number of letters
- has two syllables
- starts with a letter between *M* and *Z*
- has an odd number of letters
- has more than five letters

Have students record the two attributes on their activity sheets. Ask students to place their name trains on their desks. Then, using the name trains to help them, have students travel around the classroom and print their classmates' names in the appropriate areas of the Venn diagram on their activity sheets.

Note: Photocopy the activity sheet onto 11" x 17" paper.

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Activity Sheet A

Directions to students:

On the Venn diagram, record the two name attributes you will use to sort names. Use your classmates' name trains to help you decide where on your Venn diagram to print each name (1.3.2).

Activity: Part Five

Display the large Carroll diagram. As a class, decide on the attributes you will use to sort names, and record these on the chart. Have students sort their name trains onto the Carroll diagram. Encourage students to describe the sorting.

Distribute Activity Sheet B (1.3.3), and have students print the names of their classmates in the appropriate areas on their Carroll diagrams. Again, have students use their classmates' name trains to help them with this activity.

Note: Photocopy the activity sheet onto 11" x 17" paper.

Activity Sheet B

Directions to students:

Using the name trains to help you, print your classmates' names in the appropriate areas on your Carroll diagram (1.3.3).

Activity: Part Six

Note: Before beginning this activity, label each of twenty-six paper plates with one letter of the alphabet, A through Z.

Display all students' name trains. Ask students:

- What is the most common letter in all of the names in our class?
- How can we solve this problem?

Have students break apart their name trains and sort the letters onto the twenty-six paper plates. Now, have students identify the most common letter and describe their sorting in other ways. Ask:

- What is the most common letter in our class names? What is the least common letter?
- Can you describe our sorting?

Have students tell about their sorting in their math journals.

Activity: Part Seven

Distribute Activity Sheet C (1.3.4), and have students print their first names repeatedly onto the chart (one letter per box) until the entire chart is filled. Be sure students leave no spaces, and that they begin one line where they left off in the previous line. Then, have students use one colour of crayon to colour all the boxes in which they printed the *last* letter of their name. For example:

| | | | | | |
|---|---|---|---|---|---|
| S | a | r | a | h | S |
| a | r | a | h | S | a |
| r | a | h | S | a | r |
| a | h | S | a | r | a |
| h | S | a | r | a | h |
| S | a | r | a | h | S |

Once students have completed this task, have them describe the resulting visual patterns on their activity sheet charts. Challenge them to find similar patterns on classmates' activity sheets and to explain why they are similar.

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Activity Sheet C

Directions to students:

Print your first name onto the squares of the chart, one letter per square. Do this over and over until the chart is full. Be sure to begin one line where you left off in the line before. Do not leave any spaces in the chart. Colour the last letter (box) of your name each time it appears on the chart. Then, describe the pattern you see (1.3.4).

Activity: Part Eight

Have students use Activity Sheet D (1.3.5) to explore their name patterns on different-sized charts. Have them follow the same procedure as they did with Activity Sheet C (1.3.4). Also, ask students to describe the patterns they observe on these charts.

Activity Sheet D

Note: This is a two-page activity sheet.

Directions to students:

For each chart, print your first name onto the squares, one letter per square. Do this over and over until the chart is full. Be sure to begin one line where you left off in the line before. Do not leave any spaces in the chart. Colour the last letter of your name each time it appears on the chart. Then, choose two of your chart patterns, and circle them. Tell about those two patterns on your activity sheet (1.3.5).

Problem Solving

Provide students with blank Venn diagrams. Have students transfer the information from one of their completed Carroll diagrams from this lesson onto the Venn diagram.

Activity Centre

Create a chart that gives a monetary value to each letter of the alphabet. Have students determine the total values of their names. Students can then sort their names by the total values. Or, have students add two or three names together and find the total value.

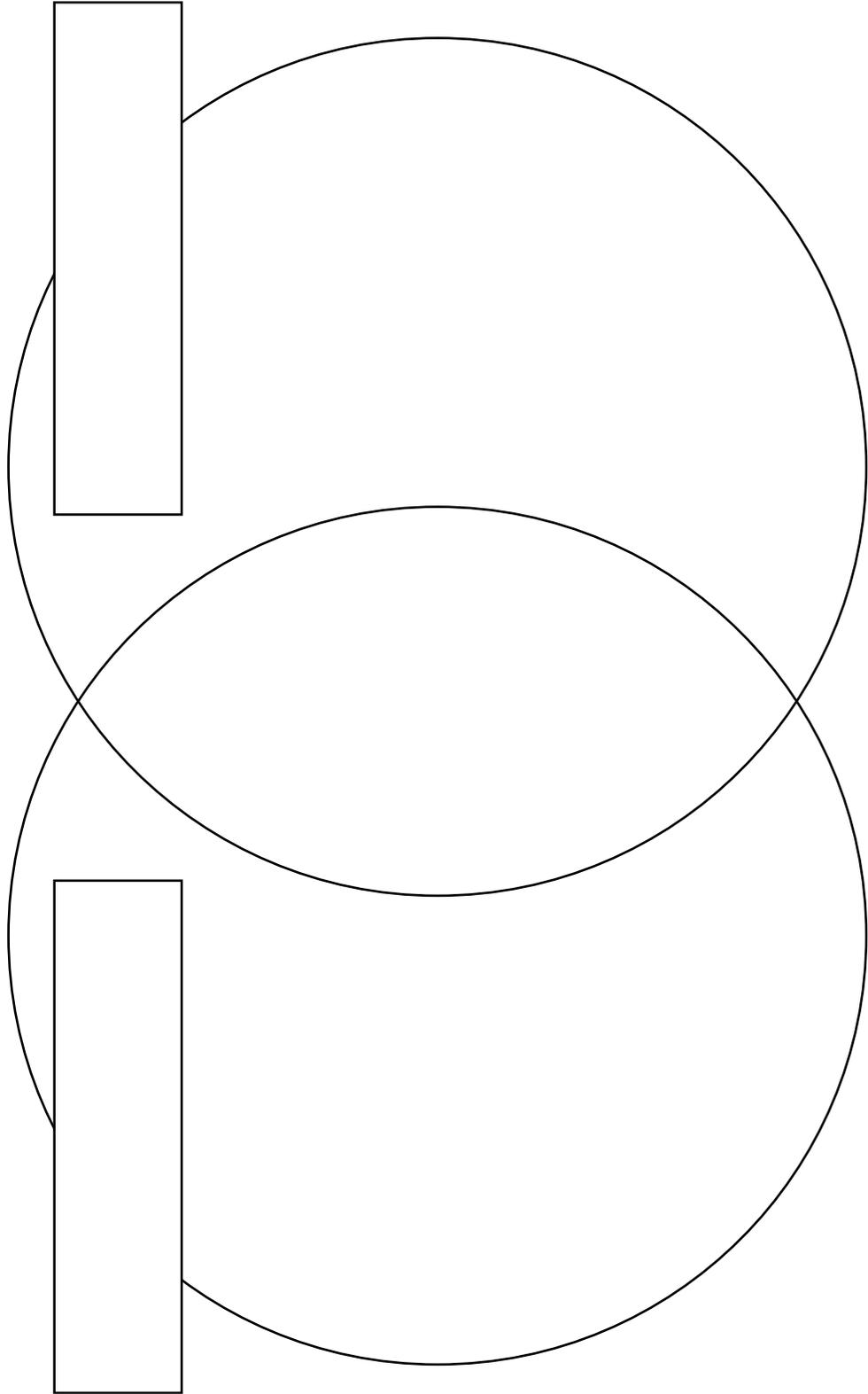
Extensions

- Have each student determine what fraction of letters in his/her name is made up of vowels and what fraction is made up of consonants. Repeat the activity with upstairs, basement, and main floor letters.
- Have students measure the lengths of their name trains and then find objects in the classroom that are the same length as, longer than, and shorter than their name trains.
- Have all students attach their name trains together and then measure the length of the entire train.
- Have all students attach their name trains together and then break them apart into groups of ten. Then, have students count by 10s to find out the total number of letters.
- Find a book that explains the meanings of names (many baby name books have this information). Students can then write about what their names mean.
- Invite a guest to the classroom to translate students' names into another language, such as Korean, like in *The Name Jar* story.

Name: _____

Date: _____

Sorting Names



Date: _____

Name: _____

More Name Sorting

Sample Pages

| | | |
|--|--------------------------------|--|
| <p>Does Not Have Five Letters</p> | <p>Has Five Letters</p> | <p>Starts with the Letter T</p> |
| | | <p>Does Not Start with the Letter T</p> |
| | | |

Date: _____

Name: _____

Name Patterns

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Describe your name pattern.

More Name Patterns

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Date: _____

Name: _____

Describe your name pattern.

Describe your name pattern.
