

PATTERNING AND ALGEBRA

GRADE 1

ONTARIO EDITION

hands-on **mathematics**

Project Editor

Jennifer E. Lawson

Senior Author

Dianne Soltess

Mathematics Consultant

Meagan Mutchmor

Unit Writers

Patricia Ashton

Joni Bowman

Gail Ruta Fontaine

Betty Johns

Cathy Haggart

Kara Kolson

Suzanne Mole



PORTAGE & MAIN PRESS

Winnipeg • Manitoba • Canada

© 2007 Jennifer Lawson

From *Hands-On Mathematics: Grade 1*, © 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.

All rights reserved. With the exceptions of student activity sheets and evaluation forms individually marked for reproduction, no part of this publication may be reproduced or transmitted in any form or by any means – graphic, electronic, or mechanical – without the prior written permission of the publisher.

Series Editor:	Leslie Malkin
Book and Cover Design:	Relish Design Ltd.
Illustrations:	Jess Dixon
Senior Consultants:	Meagan Mutchmor Dianne Soltess
Program Reviewer:	Pat Steuart

Patterning and Algebra
Grade 1
Ontario edition

Printed and bound in Canada by Prolific Group

ISBN 978-1-55379-109-6



PORTAGE & MAIN PRESS
100-318 McDermot Avenue
Winnipeg, Manitoba, Canada R3A 0A2

Email: books@portageandmainpress.com
Tel: 204-987-3500
Toll Free: 1-800-667-9673
Fax: 1-866-734-8477

Contents

Introduction to <i>Hands-On Mathematics</i>	1	Problem Solving Black Line Master: Patterning and Algebra	140
Program Introduction	1	References for Teachers	143
Program Principles	1		
The Big Ideas of Mathematics	1		
<i>Ontario Curriculum for Mathematics (2005)</i>			
Learning Expectations	6		
Program Implementation	8		
Classroom Environment	9		
Timelines	9		
Classroom Management	9		
Planning Guidelines	10		
Assessment	13		
The <i>Hands-On Mathematics</i>			
Assessment Plan	13		
Websites	29		
Patterning and Algebra	31		
Books for Children (Sorting)	32		
Books for Children (Patterning)	33		
Introduction	34		
1 Sorting Students	36		
2 Button Sorting	40		
3 Sorting Letters	49		
4 What Is a Pattern?	55		
5 Patterns Using One Attribute	58		
6 Necklace Patterns	74		
7 Patterns Using Objects with More than One Attribute	84		
8 Patterns Using Object Placement	94		
9 Extending Patterns	99		
10 Number Patterns	107		
11 Patterns in Natural and Manufactured Objects	112		
12 Patterns in Cycles	117		
13 Patterns in Dance	130		
14 Patterns in Books and Poems	136		

Introduction

Note: This unit is divided into two sections:

1. Sorting and Classifying
2. Patterning

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. As well, the learning expectations that focus on “Expressions and Equality” (Patterning and Algebra strand) are addressed in the module, *Number Sense and Numeration*.

Sorting and Classifying

Background Information for Teachers

Sorting and classifying are fundamental life skills. We observe and use sorting daily when doing the laundry, planting a garden, putting away the dishes, and going to the grocery store.

Sorting describes the action of making groups or sets. Classifying describes the *language* (oral or written) used to identify groups or sets.

The ability to sort and classify is necessary for students’ mathematical development. Students learn to organize, to think analytically, and to express their thoughts clearly. Classifying into groups and recognizing the relationships within and among different groups encourage logical and clear thinking, which is essential to mathematical reasoning.

The first three lessons in this module focus on sorting and classifying. These activities provide students with a variety of sorting and classifying experiences. As the materials are sorted in different ways, students develop the vocabulary necessary to describe their sets (groups) of objects using attributes such as colour, size, shape, and texture.

Patterning

Background Information for Teachers

Pattern is the underlying theme of mathematics. Students need to recognize patterns and use them as tools for problem solving. This skill is extremely important for the development of a student’s mathematical understanding.

Patterning should focus on:

- Repeating patterns: e.g., stringing beads by repeating colours (*red, blue, green, red, blue, green, red, blue, green*)
- Growth patterns: e.g., determining the number of wheels on one bicycle (two wheels), two bicycles (four wheels), three bicycles (six wheels).

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.

Lessons 4 through 14 in this module focus on patterning. The activities in this section give students many hands-on opportunities to experience pattern using visual, auditory, and physical attributes. Each activity is described using manipulatives that are readily available in the classroom or that can be easily obtained. Students will learn to identify, name, reproduce, extend, create, and compare many different patterns while describing them through actions, manipulatives, diagrams, and in spoken terms.



Mathematics Vocabulary

Throughout this module, teachers should use, and encourage students to use, vocabulary such as: *attribute, sort, sorting rule, classify, set, same, different, more, most, less, least, fewer, Venn diagram, tree diagram, pattern train, size, shape, circle, triangle, square, rectangle, colour, pattern, attribute, continue, extend, repeat, increase, and decrease.*

Consider creating a Math Word Wall for new vocabulary that is introduced in ***Hands-On Mathematics***. Put the letters of the alphabet along the top of an otherwise empty bulletin board. As new terms arise in each lesson of each module, write those words on index cards, and attach them to the bulletin board under the appropriate letters.

4 What Is a Pattern?

Background Information for Teachers

When developing the concept of *patterning*, it is more meaningful for students if they become aware of patterns and discover them on their own. This activity uses the students themselves as elements of a pattern. As a result, students are able to observe and be part of a pattern. This enables them to discover, and describe for themselves, what makes a pattern.

Note: A pattern core should repeat at least three times, in order to give students sufficient information to continue it. For example, a pattern on a string of beads would be presented as: *red, green, red, green, red, green, _____, _____, _____*

Materials

- students
- chart paper
- markers

Activity

Make a pattern using students in the class (e.g., *boy, girl, boy, girl, boy, girl*). Ask:

- Who can I put next?
- How do you know?

Continue adding more students with the other students' help.

Now, make a different pattern, using different students (e.g., *facing forward, facing forward, facing backward, facing forward, facing forward, facing backward*). Ask:

- Can anyone tell me what you call this?

Tell students that you are making a *pattern*. Explain that a pattern occurs when something is repeated over and over again. Ask:

- Can you make a different pattern, placing the students in a different way?

Continue this activity making several more patterns with students. Record each pattern on chart paper, using pictures and words. Include patterns such as:

- *sit, stand*
- *hands up, hands down*
- *one leg up, both legs down*

Have students use Activity Sheet A (1.4.1) to record one pattern made with the students in the class.

Activity Sheet A

Directions to students:

Draw one pattern that we made using students in the class. Describe your pattern (1.4.1).

Problem Solving

The students in Room 6 are standing in line in a *boy, girl, boy, girl* pattern. If the first person in line is a boy, is the tenth person a girl or a boy? What about the fifteenth person? The twentieth person? How do you know?

Note: A reproducible master for this problem can be found on page 140.

Extensions

- Add the term *pattern* to the Math Word Wall.
- Take the class to the gym or outside to make other patterns using actions and objects. Examples include:
 - *throw a ball into the air, bounce, bounce, throw a ball into the air, bounce, bounce, and so on*
 - *jump, hop, jump, hop, jump, hop, and so on*
 - *hop on right leg, hop on left leg, hop on both legs, hop on right leg, hop on left leg, hop on both legs, and so on*

4

Assessment Suggestion

Assess students' understanding of a pattern by interviewing them. Have students:

- describe the pattern orally
- extend the pattern
- translate the pattern into actions

Use the Individual Student Observations sheet, found on page 18, to record your observations.

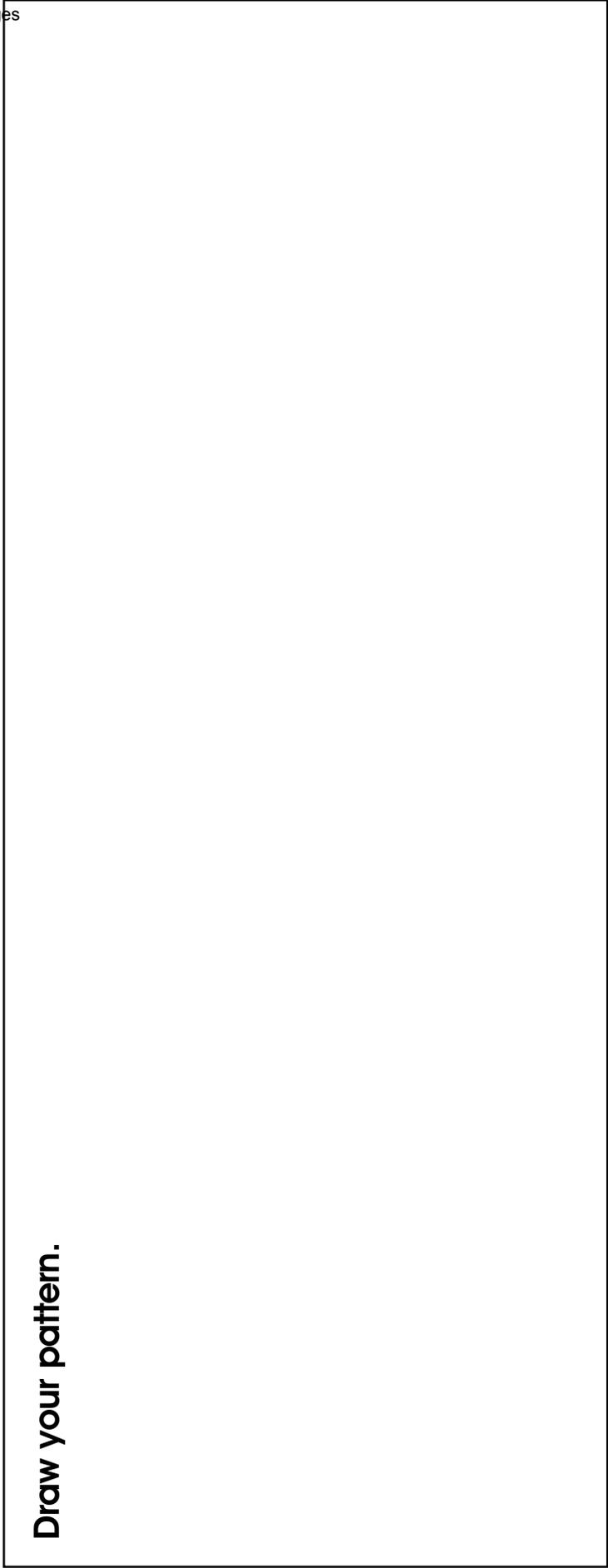
Date: _____

Name: _____

Patterns Using Students

Sample Pages

Draw your pattern.



Describe your pattern.
