GEOMETRY AND SPATIAL SENSE
GRADE 3
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

From *Hands-On Mathematics: Grade 3*, © 2006

Series Editor:	Leslie Malkin
Book and Cover Design:	Relish Design Ltd.
Illustrations:	Jess Dixon
Senior Author:	Dianne Soltess
Mathematics Consultant:	Meagan Mutchmor

Geometry and Spatial Sense
Grade 3
Ontario edition

Contents

Introduction

In grade three, students continue to investigate geometry concepts and skills that apply directly to the world in which they live. Concrete experiences will assist students in identifying and understanding the relationship between two- and three-dimensional figures, as well as in describing the relative position of objects.

In this module, students:

- describe, classify, and construct three-dimensional objects and two-dimensional shapes as well as relate them to each other

- use numbers and direction words to describe the relative position of objects in one dimension and using everyday contexts

Mathematics Vocabulary

Continue to use your classroom math word wall as a means of reinforcing new vocabulary. As new terms are introduced in the lessons, record the words on index cards, and display them under the appropriate letters of the alphabet on your math word wall.

Throughout this module, teachers should use, and encourage students to use, vocabulary such as: *circle, triangle, square, rectangle, rhombus, parallelogram, angle, right angle, cube, sphere, cylinder, cone, rectangular prism, triangular prism, triangle-based pyramid, square-based pyramid, congruent, north, south, east*, and *west*.

3 | Symmetry

Background Information for Teachers

Symmetry refers to the correspondence of parts of a figure on opposite sides of a line. For example, the isosceles triangle is symmetrical with respect to the line through vertex *B*, perpendicular to the base AC. This is the *line of symmetry*, as in the diagram below:

line of symmetry
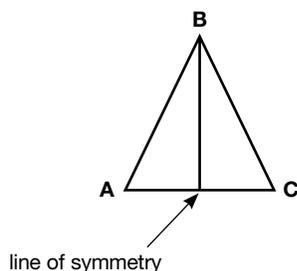
Materials

- construction paper
- scissors (one pair for each student)
- 30-centimetre rulers (one for each student)
- two-dimensional shapes (included with lesson 1. Photocopy each shape, and cut out.) (4.1.1)
- small two-dimensional shapes (Photocopy one sheet of shapes for each small group of students.) (4.3.2)
- glue
- pencils
- transparent mirrors (for example, Mira transparent mirrors. You will need one mirror for each student.)

Activity: Part One

To begin the activity, hold up a piece of construction paper, and fold it in half lengthwise. Trace a half heart on the folded paper as in the diagram below:

Cut out the half-heart shape, leaving the folded seam intact. Unfold the heart, and ask students:

- Are both sides of this heart the same?
- How can you prove that both sides are the same? (refold the heart along the centre line)
- When both sides of a shape are identical, what do we call the shape? (symmetrical)

Distribute a piece of construction paper and a pair of scissors to each student. Ask students to fold their pieces of paper in half and cut out an interesting shape, being sure to leave the folded seam intact. Have students unfold their shapes, and ask:

- Is your shape symmetrical?
- How can you prove that your shape is symmetrical?
- What is the name of the line (fold) that divides your shape into two identical halves? (line of symmetry)

Distribute Activity Sheet A (4.3.1) and 30-centimetre rulers, and have students use the rulers to draw a line of symmetry through each shape.

Activity Sheet A

Directions to students:

Use a ruler to draw a line of symmetry through each shape (4.3.1).

Activity: Part Two

Have students sit in a large circle. To review each two-dimensional shape (4.1.1) with students, hold it up, ask them to name it, and then have students list three characteristics of it. For example, a square has four sides, all sides are equal, and opposite sides of the square are parallel.

▶

3

Now, fold the square in half horizontally. Unfold it again, and ask students:

■ Are both sides of the square equal?

Use a ruler and a pencil to trace over the folded line to show the line of symmetry. Ask students:

■ Can you find another line of symmetry on the square?

Fold the square vertically to show the second line of symmetry. Use the ruler and pencil to trace over the line. Ask students:

■ Are there any other lines of symmetry?

Identify the remaining two lines of symmetry by folding the square diagonally in both directions and using the ruler and pencil to trace over the lines of symmetry. Ask:

■ How many lines of symmetry does a square have? (4)

Divide students into small groups, and distribute to each group a sheet of small two-dimensional shapes (4.3.2), two copies of Activity Sheet B (4.3.3), a pair of scissors, some glue, a 30-centimetre ruler, and a pencil.

Tell students they will now work together to find out how many lines of symmetry there are in various two-dimensional shapes. Ask students to cut out one of the two-dimensional shapes and glue it onto the first column of the activity-sheet chart. Next, tell students to print the name of the shape in the second column of the chart. Have students decide how many lines of symmetry the shape has and then use a ruler to draw each line of symmetry onto the shape. Finally, ask students to record the number of lines of symmetry in the third column. Have students complete their charts by repeating the process for each of the remaining shapes.

Note: To help them find the lines of symmetry, students may fold each shape into its various "halves" before they glue it to the chart and then draw the line of symmetry over the fold line(s). Each group will need three copies of Activity Sheet B (4.3.3) in order to fit all eight shapes onto the chart.

Activity Sheet B

Directions to students:

Cut out one of the two-dimensional shapes, and glue it onto the first column of the chart. Print the name of the shape in the second column. Decide how many lines of symmetry the shape has, and use a ruler to draw each line of symmetry onto the shape. (To help you find the lines of symmetry, you may fold each shape into its various "halves" before you glue it to the chart, and then draw the lines of symmetry over the fold lines). Record the number of lines of symmetry in the third column. Repeat the process for each of the remaining shapes (4.3.3).

Once all groups have completed their activity sheets, gather students into a large circle again. Review and discuss each shape on students' sorting charts as well as the corresponding number of lines of symmetry. If there is a discrepancy between groups regarding the number of lines of symmetry, have each group explain its reasoning. Discuss the correct answer, and have students make the appropriate changes to their charts if necessary.

▶

3

Problem Solving

Distribute to each student a copy of the Problem Solving sheet called "Symmetrical Images" (4.3.4) and a pencil. Have students predict, and then draw, the other half of each symmetrical image on the activity sheet. Then, distribute transparent mirrors, and have students test their predictions.

Note: Ensure that students understand that the mirror will now act as a line of symmetry for their new image, as in the diagram below:


original image   mirror/line of symmetry
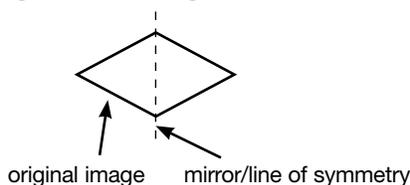
Extensions

■ Add the terms *symmetrical* and *line of symmetry* to your classroom math word wall.

■ Distribute to each student a geoboard and two colours of elastic band. Have each student use one colour of elastic band to create a symmetrical shape on the geoboard. Then, tell students to use the other colour of elastic band to show the line of symmetry on their geoshape.

■ Divide the class into pairs of students, and distribute pattern blocks and a piece of paper to each pair. Tell students to fold their paper in half, and ask one student from each pair to use pattern blocks to create a design on one side (half) of the fold line. Then, have the partners use pattern blocks to make symmetrical designs on the other side of the fold line. Ask students to reverse roles and repeat the activity.

■ Have students determine which printed letters of the alphabet are symmetrical. Then, challenge students to create words using only symmetrical letters. For example: HAT, MOM, WOW.

■ Go on a symmetry walk. Have students look for symmetrical objects in the classroom, around the school, and in the playground.
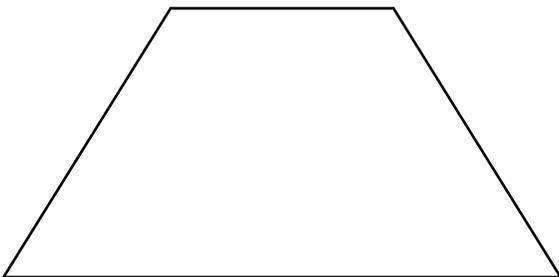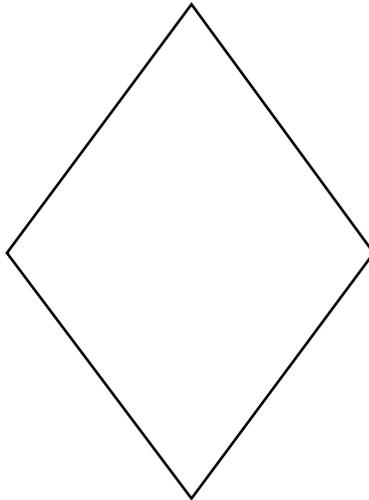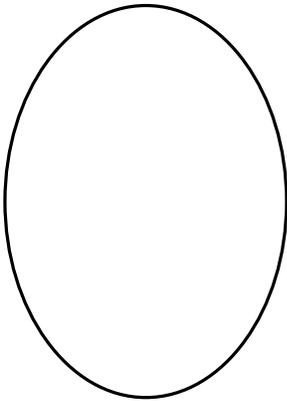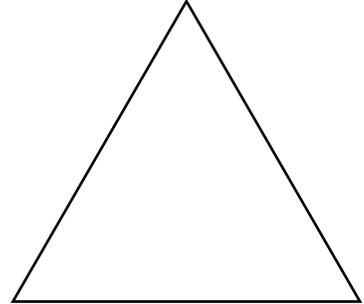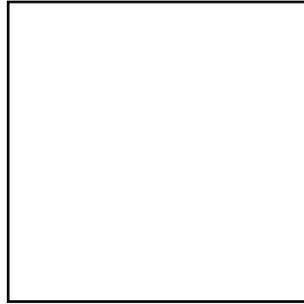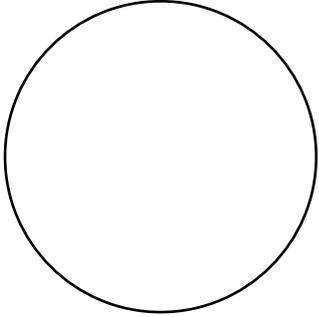
Assessment Suggestion

Circulate as students complete Activity Sheet B (4.3.3). Assess whether or not students are able to correctly identify and draw the line(s) of symmetry for each two-dimensional shape. Record your results on the Individual Student Observations sheet, found on page 16.

Date: _____   **Name:** _____

Lines of Symmetry

Portage & Main Press
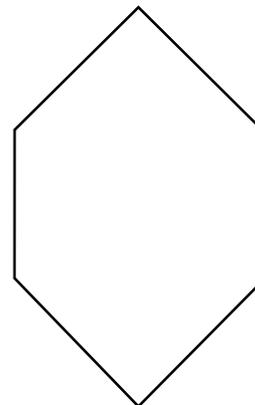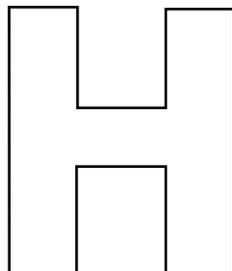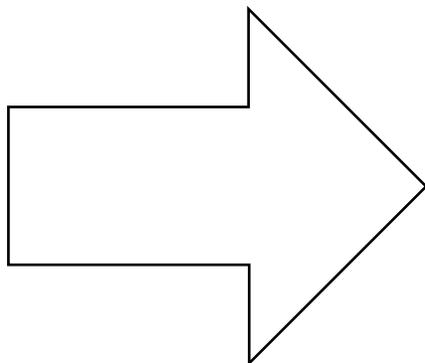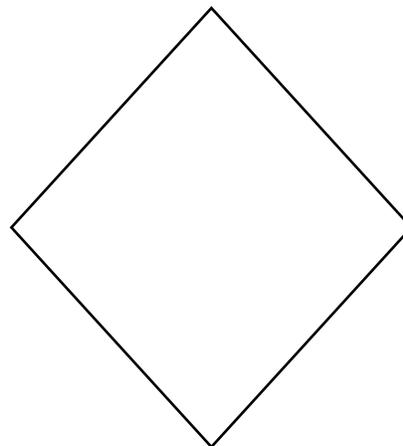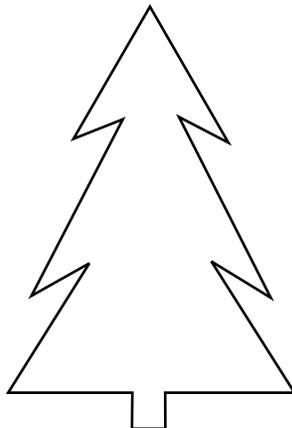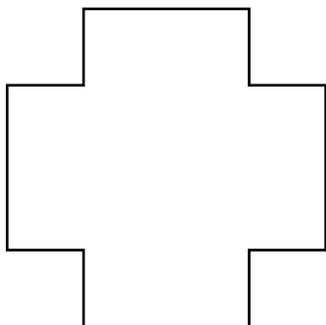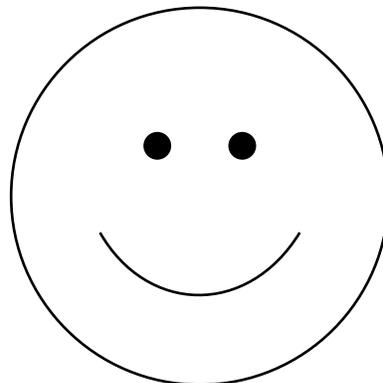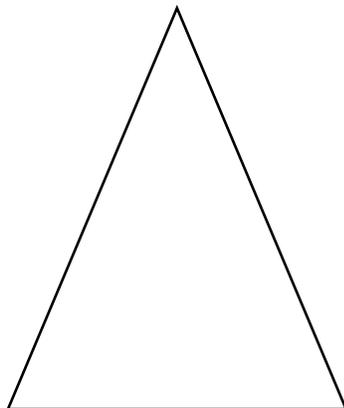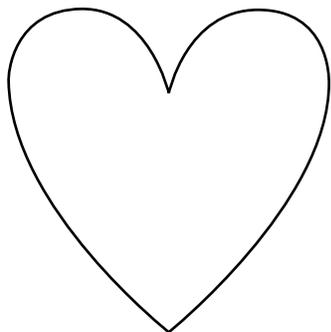
Small Two-Dimensional Shapes

Date: _____   **Names:** _____

_____

_____

How Many Lines of Symmetry?

Shape	Shape Name	Number of Lines of Symmetry

Date: _____   **Name:** _____

Symmetrical Images

Problem Solving

Portage & Main Press