1 Symmetry and Surface Area

General Outcomes

- Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.
- Describe and analyze position and motion of objects and shapes.

Specific Outcomes

SS2 Determine the surface area of composite 3-D objects to solve problems.

SS5 Demonstrate an understanding of line and rotation symmetry.

By the end of this chapter, students will be able to:

Section	Understanding Concepts, Skills, and Processes
1.1	✓ classify 2-D shapes or designs according to the number of lines of symmetry
	✓ identify the line(s) of symmetry for a 2-D shape or design
	✓ complete a shape or design given one half of the shape and a line of symmetry
	✓ create a design that demonstrates line symmetry
1.2	✓ tell if 2-D shapes and designs have rotation symmetry
	✓ give the order of rotation and angle of rotation for various shapes
	✓ create designs with rotation symmetry
	✓ identify the transformations in shapes and designs involving line or rotation symmetry
1.3	✓ determine the area of overlap in composite 3-D objects
	✓ find the surface area for composite 3-D objects
	✓ solve problems involving surface area

Assessment	Supporting Learning
Assessment *for* Learning	
Method 1: Use the Math Link introduction on page 5 in *MathLinks 9* to activate student prior knowledge about the skills and processes that will be covered in this chapter. **Method 2:** Have students develop a journal entry to explain what they personally know about the motion geometry of translations, reflections, and rotations, including examples showing the coordinates of their images in the coordinate grids.	• **BLM 1–2 Chapter 1 Math Link Introduction** provides scaffolding for the Math Link introduction. • Have students use the What I Need to Work On section of their Foldable to keep track of the skills and processes that need attention. They can check off each item as they develop the skill or process at an appropriate level. • Students who require activation of prerequisite skills may wish to complete the Get Ready materials available on **BLM 1–3 Chapter 1 Get Ready**, in the *MathLinks 9 Practice and Homework Book*, and at the www.mathlinks9.ca book site.
Assessment *as* Learning	
Literacy Link (page 3) As students work on each section in Chapter 1, have them enter into their map Key Words or phrases that are connected with the centre term *symmetry and surface area*. Maps are graphic organizers that help students to remember essential characteristics of a concept and to make connections that show how the information is related.	• As students complete a section, have them review the Key Words and any other phrases and terminology that link to symmetry and surface area. Have them use a branch from the centre for each new word or phrase.
Chapter 1 Foldable As students work on each section in Chapter 1, have them keep track of Key Words, terms, and examples in their Foldable. Have them record any problems they are having in the What I Need to Work On section of their Foldable.	• The Foldable should become a living document for the student. As they progress through the chapter, have them add in any terminology, examples, and related material that will assist them in working through the chapter and reviewing for year-end exams. • As students complete each section, have them review the list of items they need to work on and check off any that have been handled.
Assessment *for* Learning	
BLM 1–4 Chapter 1 Warm-Up This BLM includes three warm-ups, one to be used at the beginning of each section. Each warm-up provides cumulative review questions for the entire student resource to that point, as well as mental math practice.	• As students complete questions from previous chapters, note which skills they are retaining and which ones may need additional reinforcement. • Use the warm-up to provide additional opportunities for students to demonstrate their understanding of the chapter material. • Have students share their strategies for completing mental math calculations.

Problems of the Week

Have all students try at least one of the problems on **BLM 1–5 Chapter 1** Problems of the Week. Many of these problems require students to think outside the box and experiment with a variety of approaches. Some have definitive answers; others can be answered in more than one way.

Students can take the problems home and consult with parents or guardians, work with other students when their work is completed, or try them on their own. The questions take a varying amount of time to solve, depending on the particular student and the problem itself. You may wish to give out these problems at the beginning of the chapter and discuss the solutions at appropriate times throughout your work on the chapter.

Chapter 1 Planning Chart

Section/ Suggested Timing	Prerequisite Skills	Materials/Technology	Teacher's Resource Blackline Masters	Exercise Guide	Extra Support	Assessment		
						Assessment *as* Learning	Assessment *for* Learning	Assessment *of* Learning
Chapter Opener • 40–50 minutes (TR page 5)	Students should be familiar with • geometry terminology • translations • reflections • rotations	• sheet of 11 × 17 paper • three sheets of 8.5 × 11 paper • sheet of 8.5 × 11 grid paper • scissors • stapler • mirror • Mira™	Master 15 Thematic Map BLM 1–1 *Math Links 9* Scavenger Hunt BLM 1–2 Chapter 1 Math Link Introduction BLM 1–3 Chapter 1 Get Ready BLM 1–4 Chapter 1 Warm-Up BLM 1–5 Chapter 1 Problems of the Week		Online Learning Centre	TR page 4 Chapter 1 Foldable, TR page 4	TR page 4	
1.1 Line Symmetry • 80–100 minutes (TR page 9)	Students should be familiar with • vertical, horizontal, and oblique lines • finding reflection images • describing reflection lines • coordinates on a Cartesian plane	• scissors • tracing paper • grid paper • ruler • coloured pencils • isometric dot paper	Master 7 Isometric Dot Paper Master 8 Centimetre Grid Paper BLM 1–4 Chapter 1 Warm-Up BLM 1–6 Section 1.1 Example BLM 1–7 Section 1.1 Extra Practice BLM 1–8 Section 1.1 Math Link	**Essential**: #1, 2, 5–7, 9, 12, 15, Math Link **Typical**: #1, 2, 5, 7, 9, 10, 12–15, 16, 18, Math Link **Extension/Enrichment**: #1, 2, 20–23, Math Link	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	Master 2 Communication Peer Evaluation TR pages 11, 19 Math Learning Log, TR page 19 Chapter 1 Foldable, TR page 19	TR pages 15, 19	
1.2 Rotation Symmetry and Transformations • 90–100 minutes (TR page 20)	Students should be familiar with • measure of angles • the number of degrees in one revolution • identifying coordinates in the plane • rotating points about a centre of rotation	• scissors • tracing paper • isometric dot paper • grid paper • ruler • paper clips (optional)	Master 7 Isometric Dot Paper Master 8 Centimetre Grid Paper BLM 1–4 Chapter 1 Warm-Up BLM 1–9 Section 1.2 Extra Practice BLM 1–10 Section 1.2 Math Link	**Essential**: #1–3, 4, 7, 9, 10, 12, 16, Math Link **Typical**: #1–3, 4, 7, 9, 10, 12, 16, 17, 19, Math Link **Extension/Enrichment**: #1–3, 10, 17–26, Math Link	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	Master 2 Communication Peer Evaluation TR pages 21, 28 Math Learning Log, TR page 28 Chapter 1 Foldable, TR page 28	TR pages 24, 28	
1.3 Surface Area • 120–135 minutes (TR page 29)	Students should be familiar with • calculating area of regular shapes • surface area of rectangular and triangular prisms • surface area of a cylinder • using a formula to calculate surface area • views of right rectangular prisms • Pythagorean relationship	• small disks or pennies • small boxes or dominoes • centimetre cubes (optional) • decks of playing cards, memo pads, business cards, and notepads (optional)	Master 7 Isometric Dot Paper Master 8 Centimetre Grid Paper BLM 1–4 Chapter 1 Warm-Up BLM 1–11 Section 1.3 Extra Practice BLM 1–12 Section 1.3 Math Link	**Essential**: #1–3, 4, 6, 8, 10, 12, 18, Math Link **Typical**: #1–4, 6, 8, 10, 12, one of 13 or 14, one of 16–19, Math Link **Extension/Enrichment**: #1–3, 14, 17, 20–23	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	Master 2 Communication Peer Evaluation TR pages 31, 38 Math Learning Log, TR page 38 Chapter 1 Foldable, TR page 38	TR pages 34, 38	
Chapter 1 Review • 40–50 minutes (TR page 39)		• centimetre or interlocking cubes • ruler • coloured pencils	Master 7 Isometric Dot Paper Master 8 Centimetre Grid Paper BLM 1–7 Section 1.1 Extra Practice BLM 1–9 Section 1.2 Extra Practice BLM 1–11 Section 1.3 Extra Practice	Have students do at least one question related to any concept, skill, or process that has been giving them trouble.	*MathLinks 9 Practice and Homework Book* *MathLinks 9 CAB*	Chapter 1 Foldable, TR page 40	TR page 40	
Chapter 1 Practice Test • 40–50 minutes (TR page 41)		• isometric dot paper • grid paper • centimetre cubes	BLM 1–12 Chapter 1 Test	Provide students with the number of questions they can comfortably do in one class. Choose at least one question for each concept, skill, or process. **Minimum:** #1–8, 10.	*MathLinks 9 CAB*	TR page 42	TR page 42	BLM 1–12 Chapter 1 Test
Chapter 1 Math Link: Wrap It Up! • 40–50 minutes (TR page 43)		• poster paper • markers • coloured pencils • PowerPoint (optional)	BLM 1–2 Chapter 1 Math Link Introduction BLM 1–8 Section 1.1 Math Link BLM 1–10 Section 1.2 Math Link BLM 1–12 Section 1.3 Math Link BLM 1–14 Chapter 1 Math Link: Wrap It Up!		Online Learning Centre			TR page 43 Master 1 Project Rubric
Chapter 1 Challenge: Making a Paper Airplane • 40–100 minutes (TR page 45)		• ruler • scissors	Master 1 Project Rubric Master 8 Centimetre Grid Paper		Online Learning Centre		TR page 46	TR page 46 Master 1 Project Rubric
Chapter 1 Challenge: Musical Instruments • 40–50 minutes (TR page 48)			Master 1 Project Rubric Master 7 Isometric Dot Paper Master 8 Centimetre Grid Paper BLM 1–15 Chapter 1 BLM Answers		Online Learning Centre		TR page 49	TR page 49 Master 1 Project Rubric