Surface Area and Volume

Opener

***Mathematics 10,* pages 54–55**

Suggested Timing

30–40 min

Blackline Masters

BLM 2–2 Chapter 2 Prerequisite Skills
BLM 2–4 Chapter 2 Foldable
BLM 2–5 Chapter 2 Unit 1 Project
BLM U1–2 Unit 1 Project Checklist

Key Terms

surface area
cylinder
lateral area
slant height
pyramid
volume
prism
cone
sphere
apex

What's Ahead

In this chapter, students learn about working with SI and imperial measurements to determine surface area and volume of 3-D objects. They begin by converting within and between SI and imperial measurements before calculating areas and volumes. They follow up by learning how to determine the surface area and volume of right cones, right pyramids, spheres, right cylinders, right prisms, and composite objects, and determine square roots and cube roots of numbers. Throughout the chapter, they solve problems involving surface area and volume.

Planning Notes

Before beginning this chapter, ask students to bring in their favourite CDs, as well as cases for their PDAs, MP3 players, and cell phones. During the first class, have students share what they like about the designs on the various cases. Once students have shared their ideas, challenge them to consider how mathematics might have been used in the development of these designs. Brainstorm ideas as a class.

Students may mention using surface area calculations to determine the amount of material needed to cover each item and volume calculations to determine the amount a case might hold.

Explain that the chapter is about converting within and between SI and imperial measurement systems, and determining surface areas and volumes of 3-D objects. Tell students that they will rely on their existing knowledge and skills of linear conversions, surface area, and volume, as well as their ability to use proportional reasoning.

Direct students to the information about industrial designers and what they do. Ask them about careers in industrial design that they are familiar with (e.g., graphic designer, furniture designer, pop bottle designer). Have students discuss what they know about the work that these designers do, and how math and surface area and volume are related to the work. You might ask which measurement systems industrial designers use in their various tasks. Which tasks might involve both SI and imperial measurement systems?

Unit Project

You might take the opportunity to discuss the Unit 1 project described in the Unit 1 opener on TR page 2. Throughout the chapter, there are individual questions for the unit project. These questions are not mandatory but are recommended because they provide some of the research needed for the final report for the Unit 1 project assignment.

The Unit 1 project is integrated throughout the chapter. You will find questions related to the project in the section 2.1 Investigate and Check Your Understanding sections.

Foldables™ Study Tool

Discuss with students the benefits of keeping a summary of what they are learning in the chapter. If they have used Foldables before, you may wish to have them report on how useful they found various designs.

- What designs have they used?
- Which designs were the most useful?
- Which, if any, designs were hard to use?
- What disadvantages do Foldables have?
- What other method(s) could they use to summarize their learning?

Discuss the Foldable design on page 55 and how it might be used to summarize Chapter 2. Encourage students to suggest revisions for this Foldable, or to replace this Foldable with another design of their choice. Allowing personal choice in this way will increase student ownership in their work.

Give students time to develop the summary method they have chosen. Ask them to include some method of keeping track of what they need to work on; discuss the advantage of doing this.

As students progress through the chapter, provide time for them to keep track of what they need to work on. This will assist them in identifying and solving any difficulties with concepts, skills, and processes. Have them check off each item as they deal with it.

Meeting Student Needs

- Consider having students complete the questions on **BLM 2–2 Chapter 2 Prerequisite Skills** to activate the prerequisite skills for this chapter.
- Some students may find it useful to use **BLM 2–4 Chapter 2 Foldable**. You can photocopy and enlarge the first page of the master onto 11 × 17 paper and distribute copies. The second and third pages of the master do not need to be enlarged. For page 1 of the master, have students fold the master so that there is a right and a left flap and a centre panel. Have students label the outside of each flap as shown in Step 1 on page 55 in the student resource. On the centre panel, consider having students staple or tape a copy of **BLM U1–2 Unit 1 Project Checklist**, which provides a list of all the related questions for the Unit 1 project. Have students use pages 2 and 3 of the master for Step 2 and Step 3 respectively. The conversion charts and formulas are included as a reference tool for students.
- Some students may find it useful to keep a taped or oral summary of what they are learning. Others may work best with a keyboarded version in a software of their choice.
- Invite an industrial designer to talk to the class about design and how math skills related to surface area and volume are used.
- To reinforce the Key Terms, post sheets of paper around the room, each labelled with one Key Term. Have student pairs respond to the following prompts for each term: definition, example in daily life, and facts. Have student pairs move around the room and use diagrams and words to contribute to each Key Term. Once each pair has contributed, have students review all the entries. As a class, debrief each sheet to conclude the activity. Leave the sheets on display throughout the chapter.
- Throughout the chapter, encourage students to use strategies such as making models and drawing diagrams to help them move from the concrete to the abstract level. Encourage students to "say their thinking." Look and listen for unorthodox, yet mathematically correct procedures as much as you observe for correcting mathematically unsound procedures.
- Consider allowing students to work with a partner on all Unit 1 project questions.
- Some students may benefit from completing all unit project questions.
- **BLM 2–5 Chapter 2 Unit 1 Project** includes all of the unit project questions for this chapter. These provide a beginning for the Unit 1 project report.

ELL

- Encourage students to create their own vocabulary dictionary for the Key Terms using written descriptions and diagrams.
- Explain that a *jewel case* is a CD storage case.

Enrichment

- Challenge students to consider the construction of buildings in the past (e.g., cathedrals, pyramids, long houses) and how builders in the past must have created ways to measure accurately. Ask them to speculate how this was accomplished without the benefit of current measurement systems and measuring tools. Students may enjoy researching the history of measurement units. You might ask them to reflect on the difficulties of using body parts as referents. Have students present their findings to the class.

Career Connection

Use the photograph and the text to highlight a career in industrial design. Invite students to research training and qualifications, employment opportunities, and career outlook. You might have them address how math concepts and skills are important in what industrial designers do. They may find the related Web Link that follows helpful.

Web Link

For more information about industrial design, go to www.mhrmath10.ca and follow the links.