7.4 Properties of Circles

Study Guide and Exercise Book Pages
144 to 147

Tools
- geometry set
- grid paper
- computer with dynamic geometry software
- graphing calculator
- computer algebra system

Related Resources
- G–1 Grid Paper
- G–2 Placemat
- T7–4 How to Do Section 7.4 Example Using *The Geometer's Sketchpad®*

Key Terms
- radius
- circumference
- diameter
- chord
- arc
- tangent to a circle
- secant to a circle
- sector
- central angle
- inscribed angle
- segment
- subtend

Definitions of Key Terms can be found on the Online Learning Centre at **www.mcgrawhill.ca/books/mct12**.

Teaching Suggestions

Key Concepts

- Have students add new terminology and accompanying diagrams to their chapter reference sheets. Quiz students on the terminology before beginning the lesson. Use flash cards or write terms on the board and have students come up and draw an appropriate diagram.
- Explain to students why the formula for the length of an arc, $a = \frac{\theta}{360^\circ}(2\pi r)$, makes sense by showing that it is a fraction of the formula for the circumference of a circle.
- Explain to students why the formula for the area of a sector, $A = \frac{\theta}{360^\circ}(\pi r^2)$, makes sense by showing that it is a fraction of the formula for the area of a circle.
- You may wish to review ratios with students.

Example

- Remind students to set their calculators to degree mode. This is also important when they are calculating the sine and cosine of angles in the questions.
- Have students note that the arc of a circle is represented by a lower-case a, and that area of a sector and area of a segment are both denoted by an upper-case A. Have students memorize which "capital A formula" is for area of a sector, and which is for area of a segment. If students understand that a sector of a circle looks like a slice of pizza and it is simply a portion of the whole, then they will be able to identify the sector formula more easily.

Questions

- For help with **questions 2** and **5**, refer students to the **Example**.
- For **question 3**, help students to rearrange the arc length formula to solve for θ. Alternatively, students may wish to substitute given values into the original formula first, and then solve.
- For **question 4**, help students to rearrange the arc length formula to solve for r.
- For **question 6**, help students to find the height of the triangle by using ratios of special triangles or by using primary trigonometric ratios. Remind students of the formula for the area of a triangle.
- For **question 7**, some students will require guidance to replace the $\frac{\theta}{306^\circ}$ in the formula for the area of a sector with $\frac{a}{2\pi r}$. Have students add the newly created formula to their chapter reference sheets.
- For **question 9**, help students to rearrange the formula for sector area to solve for r.
- In **question 11a**), have students note that they can find the answer quickly by making the calculation, $\frac{3}{4} \times$ circumference $= \frac{3}{4} \times 2\pi r$. This will help them to mentally connect the formulas for length of the arc and for circumference.
- In **question 11**, define *subtend*.
- For **question 13**, remind students that the volume of the patio can be defined as the area of the base multiplied by the thickness. Encourage them to draw a neat three-dimensional diagram for their solution.

Common Errors

- Students may confuse the area of a sector with the area of a segment.

R_x Tell students that it is imperative for them to be able to match diagrams of the terms with the names of the terms. Have them think of a memory aid that they can use to match each diagram in **question 1** to its correct term. They could also think of a memory aid that they can use to differentiate between formulas for the area of a sector and the area of a segment.

Differentiated Instruction

- Use a **placemat** divided into eight parts to summarize the Key Terms found in this section.
- Add new terms and diagrams to a **word wall**.

Ongoing Assessment

- To assess student understanding, ask:
  - How often did you check the related example in the Study Guide and Exercise Book to help you with questions? For which questions?
  - Can you draw diagrams for each of the new Key Terms?

- You may wish to have students create their own real-life word problem. A partner can proofread the problem for clarity before solving it.
- **Question 17** requires students to understand how the formula for the area of a sector was created. Most students should be able to complete this question.

Technology Suggestions

- After working through the pencil-and-paper solution for the **Example**, work through each part using *The Geometer's Sketchpad*®. You can create a template for a circle and a sector, and then create a calculation for measurements, such as the area of a circle, area of a sector, etc. This template can be used to check or illustrate the questions. Refer to **T7–4 How to Do Section 7.4 Example Using *The Geometer's Sketchpad*®** for more details.
- For the **Example**, the formulas for lengths and areas can be programmed into TI-83 Plus/TI-84 Plus or TI-Nspire™ CAS. Be sure to set the angle measurement to degrees. Programs can be saved for use to check answers for the remainder of this chapter.
- For **questions 2** to **5**, consider an alternative solution for each using *The Geometer's Sketchpad*®. Use the template you created while working through the **Example**.
- **Question 8** gives you an opportunity to use the **Transform** menu in *The Geometer's Sketchpad*® to provide some differentiated instruction, especially for visual learners. Create a circle. Then, draw a point on the circumference with a radius to the point. Use rotations from the **Transform** menu to rotate the point and radius about the circle repeatedly.
- For one or more of **questions 9** to **12**, consider asking for an alternative solution using *The Geometer's Sketchpad*®.
- For **question 16**, use *The Geometer's Sketchpad*® to draw a circle to represent the cross section of the sphere. Then, use a slider to control the height, h. Calculate and display the volume using the given formula. Then, demonstrate dynamically the changes in the volume with changes in h.

Mathematical Process Expectations

The table shows questions that provide good opportunities for students to use the mathematical processes.

Process Expectation	Selected Questions
Problem Solving	13, 14
Reasoning and Proving	7, 17
Reflecting	3, 4, 13
Selecting Tools and Computational Strategies	13
Connecting	6, 7
Representing	7
Communicating	7, 8, 15, 17