7.5 Investigating Properties of Circles

Teaching Suggestions

Key Concepts

• Have students note that the distance a chord is from the centre of a circle is measured as a perpendicular distance.
• Revisit the concept of a midpoint with students.
• Revisit with students the terminology learned in section 7.4.
• Some students will be overwhelmed by the amount of terminology in the **Key Concepts**. It cannot be expected that students simply read the **Key Concepts** and understand the wording and the diagrams. Have students copy out each diagram and explain the meaning of each diagram in their own words.
• Have students add each diagram to their chapter reference sheets. They should be able to describe what is true about each diagram.
• For the second- and third-last bullets in the **Key Concepts,** discuss why the phrase "and are on the same side of the chord" is important.

Example

• You may wish to demonstrate to the whole class how to complete the **Example** using *The Geometer's Sketchpad*®.
• Show how to measure AC and BC.

Questions

• Remind students of the difference between a central angle and an inscribed angle.
• Students could be divided into groups, with each group being responsible for becoming an "expert" on one of the circle properties. Each group could make a presentation to the class about their circle property.
• Encourage students to draw diagrams when working through the questions.
• In **question 1,** some students may want to "prove" the circle property to themselves by using a protractor to measure the two angles.
• In **question 2**, remind students that the radius hits the tangent at a right angle. Remind students of the Pythagorean theorem.
• Have students apply the Pythagorean theorem in **question 4**.
• Ask students to describe the difference between **questions 5** and **6**.
• The technology questions in this section will help students become familiar with the terminology and memorize the circle properties.
• In **question 7,** ask students to investigate what the measures of two angles are if they are inscribed on different sides of the same chord.
• In **question 11,** you can help students show that if two angles are inscribed on the same side of the same chord, the measures of the angles are equal. Ask students to investigate what the measures of two angles are that are inscribed on different sides of the same chord.
• **Question 14** combines knowledge of trigonometry and the concepts in sections 7.4 and 7.5. Assign it to students who require a challenge. Students will have difficulty finding the missing sector angle. Help them to use primary trigonometric ratios to find the central angles of the two right triangles, and to subtract them from 180°.

- For **question 15**, review the term *supplementary*. Assign this problem to students who need a challenge. Students might need a hint to get started. They can join the vertices to the centre and join one pair of opposite vertices. Students might be able to accomplish this proof using variables, such as x and $2x$, y and $2y$, etc., together with the circle property that asserts that the central angle is twice the size as the inscribed angle.
- For **question 15**, ask students, "What is the simplest type of cyclic quadrilateral that can be drawn in a circle for which it is obvious that the opposite angles are supplementary?"
- For **question 16,** help students to apply the cosine law to find the missing central angle. As long as this hint is provided, all students should be able to complete this question.
- Encourage students to research cyclic quadrilaterals and their properties.
- Encourage students to research circle properties on the Internet and see if they are presented in the same way as they have learned.
- You may wish to create a Jeopardy-type game, or have students create one, to review all terminology learned in sections 7.4 and 7.5.

Technology Suggestions

- You can demonstrate each of the **Key Concepts** very quickly using *The Geometer's Sketchpad*®, including the one used in the **Example**. Alternatively, have groups of students work through each one, and then demonstrate their methods to the class.
- Having students demonstrate each of the **Key Concepts** using *The Geometer's Sketchpad*® will develop their skills sufficiently to tackle **questions 7** to **12** using technology.
- For **question 13**, three-dimensional dynamic models of the Platonic solids are available for download from a number of web sites. These can be used to introduce the research project and will allow students to gain familiarity with the solids. For a sample web site for Platonic solids, go to **www.mcgrawhill.ca/books/mct12** and follow the links.
- **Question 14** is an excellent candidate for finding a solution using *The Geometer's Sketchpad*®. Consider assigning this as an alternative method after students have worked through the solution manually and with a calculator. Refer to **T7–5 How to Do Section 7.5 #14 Using *The Geometer's Sketchpad*®** for more details.

Mathematical Process Expectations

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

Process Expectation	Selected Questions
Problem Solving	14, 15
Reasoning and Proving	15
Reflecting	12
Selecting Tools and Computational Strategies	14, 15
Connecting	2, 4–6
Representing	7–12
Communicating	12, 13

ONGOING ASSESSMENT

- To assess student understanding of this section, you may wish to present students with unlabelled diagrams of the circle properties and have them explain in their own words which properties are illustrated in each diagram.