

7.1

Investigate Properties of Similar Triangles

Student Text Pages

330–335

Suggested Timing

80 min

Tools

- copy of shed drawing
- ruler
- protractor
- tracing paper

Technology Tools

- Internet access

Related Resources

- G–4 Protractor
- BLM 7–4 Shed Drawing
- BLM 7–5 Truss Bridge
- BLM 7–6 Section 7.1 Practice Master
- A–4 Presentation Checklist
- A–23 News Report Checklist

TI-Navigator™

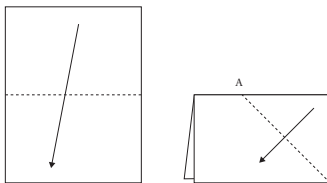
Go to www.mcgrawhill.ca/books/principles10 and follow the links to the file for this section.

Teaching Suggestions

- The purpose of this section is to have students explore the properties of congruent and similar figures. Proportional reasoning applied to similar triangles is the cornerstone of trigonometry, which is one of the most important branches of secondary and post-secondary mathematics.
- Discuss the opening photo of the shed. Have students identify any geometric shapes they recognize. (5 min)

Investigate

- The goal of the **Investigate** is for students to develop an understanding of the side and angle relationships of congruent and similar figures: (10–15 min)
 - corresponding sides and angles of congruent figures are equal
 - corresponding angles of similar figures are equal
 - ratios of corresponding sides of similar figures are equal
- Use **BLM 7–4 Shed Drawing** to support this activity.
- Another approach to developing and exploring congruent and similar triangles is paper folding:
 - Take a legal size sheet of paper and fold it in half so that the length is cut in half. Then fold along a line from the bottom right-hand corner to a point over halfway at point A.



- Fold again along a line from point A until the top edge meets in the middle with the last section.



- Have students use a ruler to measure the lengths of the sides of the small and large triangles as the paper is folded, and draw out the properties of similar triangles. Students can examine properties with congruent triangles by unfolding the paper. There will be two small and two large triangles that are identical.

Examples

- Discuss the **Examples**, which serve to illustrate the minimum sufficient conditions for establishing that two triangles are similar. (10–15 min)
- **Example 1** gives a context in which the two triangles are overlapping. Some students may have difficulty visualizing the two triangles. Use an overhead with two layers. On the main acetate layer, show just $\triangle XTE$. Then overlay $\triangle XPN$ using a second acetate. Then apply geometric reasoning to show that the two triangles share three equal angles, which is sufficient evidence to verify that $\triangle XTE \sim \triangle XPN$.

- Use **Example 1** to highlight mathematical conventions such as use of the symbol \sim to denote “is similar to,” and the three-letter method of naming angles in complicated diagrams. The Literacy Connections can be useful in this regard.
- At the end of **Example 1**, explain why it is sufficient to show that two angles in any pair of triangles are equal to establish similarity. Geometric reasoning implies that if two pairs of angles are correspondingly equal, then the third pair must be equal as well.
- **Example 2** shows another way to establish similarity by showing that the ratios of all three pairs of corresponding sides are equal. Some students may have difficulty visualizing the corresponding pairs of sides and angles for this configuration. One option to help with this is to have students trace the diagram onto a sheet of paper, cut the smaller triangle out, and rotate it and translate it so that it sits on top of the larger triangle. By sliding the triangle, students can easily see which pairs of angles are equal.

Communicate Your Understanding

- Emphasize the importance of writing the letters representing the vertices of each triangle in corresponding order, as this order implies which sides are equal in the corresponding diagram.
- Review the vocabulary in this section (congruent figures, similar figures) before discussing the **Communicate Your Understanding** questions as a class or in small groups. (5 min)
- It is important for students to recognize that you can establish similarity of two triangles by showing that either
 - two pairs of corresponding angles are equal, or
 - the ratios of three pairs of corresponding sides are equal
- Use **BLM 7–6 Section 7.1 Practice Master** for remediation or extra practice.

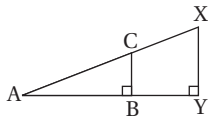
Investigate Answers (page 330)

- Answers may vary. For example: congruent rectangles, congruent triangles.
 - Diagrams may vary. The corresponding sides and angles of congruent triangles are equal.
- Answers will vary.
- Answers may vary. For example: A pair of similar rectangles can be found.
 - Diagrams may vary. The ratios of corresponding sides are equal and the corresponding angles are equal.
- The corresponding angles in two congruent figures are equal. The corresponding angles in two similar figures are equal.
 - The corresponding side lengths in two congruent figures are equal. The ratios of corresponding sides in two similar figures are equal.

	Corresponding Angles Are ...	Corresponding Side Lengths Are ...
Congruent Figures	equal	equal
Similar Figures	equal	equal in ratio

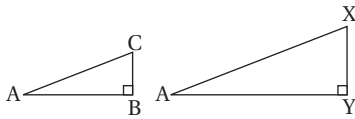
Common Errors

- Some students may incorrectly identify overlapping triangles. For example,



Students may call the two triangles $\triangle ABC$ and $\triangle BYX$.

- R_x** Have students redraw the diagram as two separate triangles.



- When writing that two triangles are similar, some students may write the order of the vertices in non-corresponding order.

- R_x** Remind students that the order of the letters in a similarity statement provides information regarding which angles are correspondingly equal and which pairs of sides are in equal ratios.

Accommodations

Gifted and Enrichment—Challenge students to use the Internet to find several real-life applications of congruent and similar figures.

Motor—Encourage students to work with a classmate when completing the questions in this section that require the drawing of diagrams.

Language—Let students work with a reading buddy who will read the questions to them.

ESL—Allow students to use dictionaries or translators to understand the meanings of the new words in this section.

Communicate Your Understanding Responses (page 333)

- C1. a)** Congruent figures have the same size and shape. Corresponding angles are equal and corresponding side lengths are equal in congruent figures. Similar figures have the same shape, but different sizes. Corresponding angles are equal in similar figures and ratios of corresponding side lengths are equal.
- b)** Answers will vary.
- C2. a)** Corresponding angles of similar figures are equal.
- b)** Ratios of corresponding sides of similar figures are equal.
- c)** Answers may vary. For example: For congruent figures, corresponding angles are also equal, but ratios of corresponding side lengths are always equal to 1, so the corresponding side lengths are equal.
- C3.** You can show that corresponding angles are equal, or that the ratios of corresponding side lengths are equal.
- C4.** If two pairs of corresponding angles are equal in two triangles, then the third pair of corresponding angles are also equal since the three angles in a triangle have a sum of 180° . So, it is only necessary to show that two pairs of corresponding angles are equal in order to show that two triangles are similar.

Practise

- In **question 5**, it is important to write the letters of the vertices in correct corresponding order. Students should realize that this enhances mathematical communication of information about each pair of triangles.
- For **question 7**, students need to recall various geometric relationships (i.e., parallel lines, triangle interiors, etc.).
- For **question 8**, if students are not sure which sides to compare using ratios, advise them to rank the lengths of sides in each triangle to identify corresponding pairs.
- Use **BLM 7–5 Truss Bridge** for **questions 10** through **12**. Students can trace parts of the figure to create cutouts, allowing them to more easily explore transformations and compare angles. Advise students who may be overwhelmed by the complexity of the diagram to simplify it using symmetry.
- For **question 14**, prompt students to consider what is true about the angles of equilateral triangles.
- For **question 15**, encourage students to consider using the technique of counter-example.
- Questions 17** and **18** challenge students to reason in three dimensions.

Literacy Connections

Draw attention to the two marginal definitions, which define congruent figures and similar figures and show the difference between them.

Discuss the Literacy Connections on page 331, which cover naming angles and a new symbol for students to recognize.

Create a Word Wall for this chapter. From this section, add “congruent” and “similar” to the list. In addition, from the Get Ready add “opposite angles,” “supplementary angles,” “complementary angles,” “alternate angles,” “corresponding angles,” “co-interior angles,” and “slope” to the list.

Discuss the Making Connections on page 335. Then, have students write a paragraph to explain the property in their own words. Alternatively, have them create a news report based on the Making Connections information and the photo presented. Use **A–23 News Report Checklist** to support this activity.

Student Success

Use a timed retell strategy to have students outline properties of similar triangles to each other.

Have pairs of students make brief oral presentations of the properties of similar triangles.

Use **A-4 Presentation Checklist** to support this activity.

Refer to the introduction of this Teacher's Resource for more information about how to use a timed retell strategy.

Mathematical Processes Integration

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

Process Expectations	Selected Questions
Problem Solving	18–20
Reasoning and Proving	4, 7, 8, 10, 14, 15
Reflecting	3
Selecting Tools and Computational Strategies	14, 15
Connecting	1, 2, 11, 12, 16–20
Representing	3, 10, 13
Communicating	4, 7, 8, 14, 15

Ongoing Assessment

- Communicate Your Understanding questions can be used as quizzes to assess students' communication skills.