Triangle Sides & Angles

ID: 8792

Activity Overview

In this activity, students will explore side and angle relationships in a triangle. First, students will discover where the longest (and shortest) side is located relative to the largest (and smallest) angle. Then, students will explore the Isosceles Triangle Theorem and its converse. Finally, students will determine the number of acute, right, or obtuse angles that can exist in any one triangle.

Topic: Triangles & Congruence

- *Classify triangles by angle measure.*
- *Prove and apply the Isosceles Triangle Theorem.*
- *Prove and apply the converse of the Isosceles Triangle Theorem.*
- *Recognize the relationship between the side lengths and angle measures of a triangle.*

Teacher Preparation and Notes

This activity is designed to be used in a high school or middle school geometry classroom.

- *This activity is designed to be **student-centered** with the teacher acting as a facilitator while students work cooperatively. Use the following pages as a framework as to how the activity will progress.*

- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to education.ti.com/exchange and enter "8792" in the keyword search box.***

Associated Materials

- *TriangleSidesAngles_Student.doc*
- *TriangleSidesAngles.tns*

Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Application of Angle-Side Relationships (TI-Nspire technology) — 13365*
- *Is it A Triangle (TI-73 Explorer with TI-Navigator) — 13581*
- *Exterior & Remote Interior Angles (TI-Nspire technology) — 13378*

Problem 1 – Size and Location of Sides and Angles

Have students open the file and use the slider to step through the directions on page 1.2.

On page 1.2, students will construct a triangle (**MENU > Shapes > Triangle**) and label the vertices *A*, *B*, and *C*. The vertices may be labeled by typing a letter after placing each point or after the triangle is complete by using the **Text** tool (**MENU > Action > Text**).
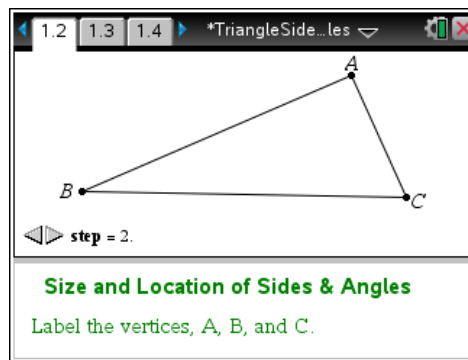
Next, have students measure the three interior angles of the triangle using the **Angle** tool from the Measurement menu. To measure an angle, press ▣ (or enter) three times to select the vertices of the triangle, such that the vertex of the <u>angle</u> you are measuring is the second point chosen; i.e., to measure ∠*A*, you can click *B*, *A*, *C* or *C*, *A*, *B*. Then press ▣ (or enter) again to anchor the measurement in the desired place.
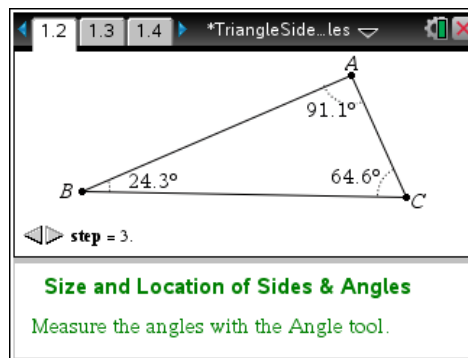
Direct students to measure the three side lengths of the triangle using the **Length** tool from the Measurement menu.

Note: To measure a side of the triangle, you must click on the endpoints of the segment. If you click on the side itself, the tool will return the *perimeter* of the triangle. Or press tab when the cursor is on the side of the triangle and then click the side.
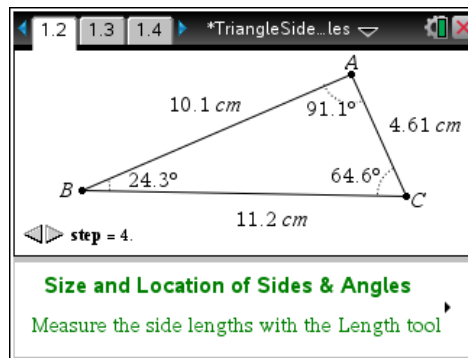
TI-Nspire Navigator Opportunity*: Live Presenter*
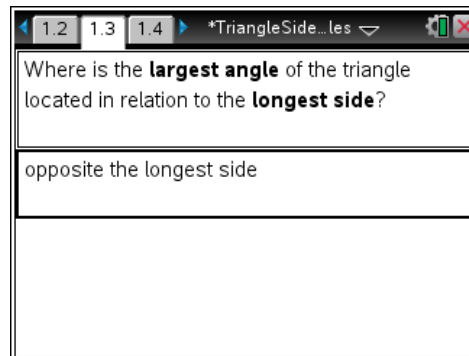
See Note 1 at the end of this lesson

Now students should drag a vertex of the triangle to change the angle measures and side lengths.

Encourage them to make a conjecture about the sizes and locations of the angles and sides in a triangle.
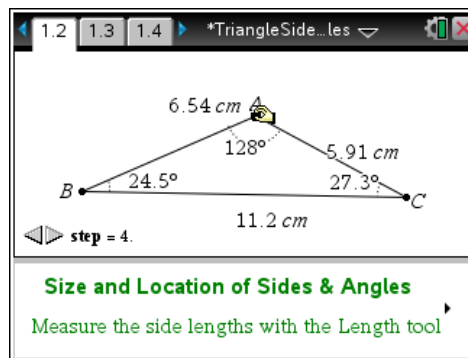
TI-Nspire Navigator Opportunity*: Class Capture*

See Note 2 at the end of this lesson

Students should be able to answer the question on pages 1.3 and 1.4 based on their observations, concluding that the largest angle is opposite the longest side, and the smallest angle is opposite the shortest side.

Student Worksheet Solutions

1. opposite the longest side

2. opposite the shortest side

3. a. *A, B, C*   b. *A, C, B*

4. a. $\overline{BC}, \overline{AC}, \overline{AB}$ b. $\overline{BC}, \overline{AB}, \overline{AC}$
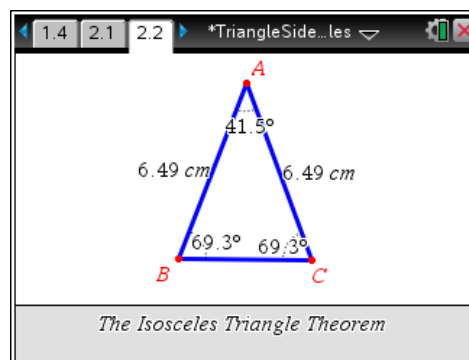

TI-Nspire Navigator Opportunity*: Quick Poll* and *Live Presenter*

See Note 3 at the end of this lesson

Problem 2 –The Isosceles Triangle Theorem

Have students to advance to page 2.1 and read the directions.

On page 2.2, an isosceles triangle (two sides with equal lengths) has been constructed.
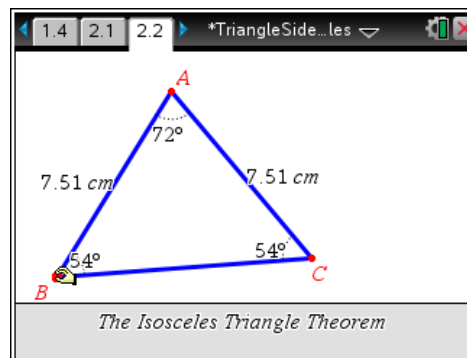
Students should measure all three angles using the **Angle** tool, as before.

TI-Nspire Navigator Opportunity*: Class Capture*

**See Note 4 at the end of this lesson**

Direct students to drag a vertex of the triangle and observe what happens to the angle measures.

Advancing to page 2.3, they should conclude that a triangle with two congruent sides also has two congruent angles. This is known as the Isosceles Triangle Theorem.

The converse of the Isosceles Triangle Theorem may be explored on page 2.5. Students should measure all three sides using the **Length** tool, and drag a vertex to explore.

On page 2.6, students should make the conclusion that a triangle with two congruent angles also has two congruent sides.
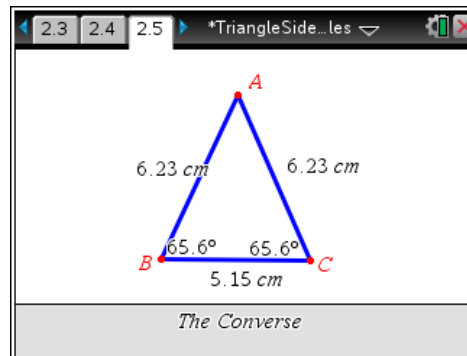
Student Worksheet Solutions

5. Check students' work. Sketches will vary.

6. two congruent angles

7. two congruent sides

**Problem 3 – Types of Angles in a Triangle**

Have students to advance to page 3.1 and read the directions.

On page 3.2, triangle *ABC* is drawn with its angle measures displayed.

Students should drag a vertex and notice how many angles of each type can exist in a triangle. They should conclude that a triangle:

- • can have three acute angles
- • cannot have three right angles
- • cannot have three obtuse angles

Challenge them to observe that a triangle can have, at most, one right or one obtuse angle and that a triangle cannot have both a right and obtuse angle.
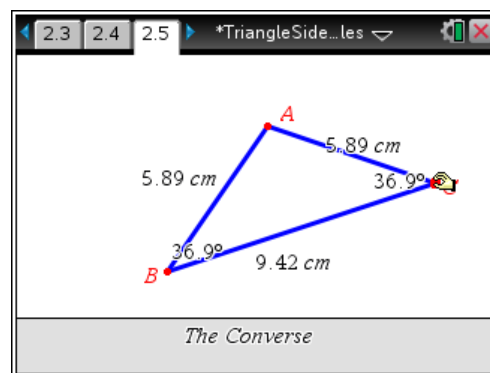
Student Worksheet Solutions

8.

∠*A*	∠*B*	∠*C*
acute	acute	acute
acute	acute	obtuse
acute	acute	right

9. Yes; Check students' work. Sketches will vary.

10. No; Check students' work. Sketches will vary.

11. No; Check students' work. Sketches will vary.

12. Answers will vary.

TI-Nspire Navigator Opportunities

Note 1
Question 1, *Live Presenter*
Use Live Presenter to demonstrate to students how to measure the side lengths and angle measures of the triangle.

Note 2
Question 1, *Class Capture*
Use Class Capture to display the entire classes' triangle drawings to aide in the discussion of the location of longest side and largest angle measurement in a triangle.

Note 3
Problem1, *Quick Poll* **and** *Live Presenter*
You may choose to use Quick Poll. to gather the student responses for the question, for students not obtaining the correct answer, Use Live Presenter on the previous page to further illustrate the concept.

Note 4
Problem2, *Class Capture*
You may choose to use Class Capture to monitor student progress as they work through the remaining activity