Corresponding Parts of Congruent Triangles

TEACHER NOTES

MATH NSPIRED

Math Objectives

- Students will identify corresponding parts of congruent triangles.
- Students will use appropriate notation to describe two congruent triangles.
- Students will reason abstractly and quantitatively (CCSS Mathematical Practice).

Vocabulary

- corresponding parts
- congruent triangles

About the Lesson

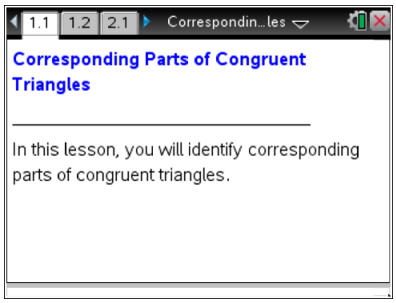
- In this lesson, students will investigate corresponding parts of congruent triangles.
- As a result, students will:
  - Manipulate given segments and angles to form a triangle that is congruent to a given triangle.
  - Identify the corresponding parts for the triangle they formed and the given triangle.
  - Manipulate two triangles to visually map the corresponding parts to each other.
  - Write and interpret congruence statements using notation that designates the corresponding parts.

TI-Nspire™ Navigator™ System

- Send out the *Corresponding_Parts_of_Congruent_Triangles.tns* file.
- Monitor student progress using Class Capture.
- Use Live Presenter to spotlight student answers.

Activity Materials

Compatible TI Technologies: TI-Nspire™ CX Handhelds, TI-Nspire™ Apps for iPad®, TI-Nspire™ Software



Tech Tips:

- This activity includes screen captures taken from the TI-Nspire CX handheld. It is also appropriate for use with the TI-Nspire family of products including TI-Nspire software and TI-Nspire App. Slight variations to these directions may be required if using other technologies besides the handheld.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials

Lesson Materials:

Student Activity

- Corresponding_Parts_of_Congruent_Triangles_Student.pdf
- Corresponding_Parts_of_Congruent_Triangles_Student.doc

TI-Nspire document

- Corresponding_Parts_of_Congruent_Triangles.tns

Discussion Points and Possible Answers

Tech Tip: If students experience difficulty dragging a point, make sure they have not selected more than one point. Press esc to release points. Check to make sure that they have moved the cursor (arrow) until it becomes a hand (☜) getting ready to grab the point. Also, be sure that the word *point* appears. Then select ctrl to grab the point and close the hand (☜). When finished moving the point, select esc to release the point.

Tech Tip: If several points coincide, students may have to use tab to find the point they want to move.

Tech Tip: If several point coincide, students should tap once on the point to display the "select object" menu and then select a point they want to move.

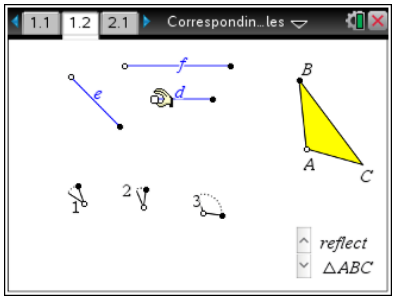
Students might find it easier to place the open end at the vertex where they want the segment and then rotate the segment using the closed end. When a segment is attached to a vertex, the vertex point will become a larger dark circle.

Teacher Tip: Page 1.2 is optimized for use on the software. If TI-Nspire™ Student Software is available to your students, consider assigning the questions for page 1.2 as an exploration the night before you plan to use the activity in class. If not, consider using TI-Nspire™ Teacher Software with the questions for page 1.2 as a whole-class exploration.

Move to page 1.2.

1. You have three angles and three segments. Move the angles and segments by grabbing the open and closed circles on each.
   a. What happens when you grab and move the open circle?

   Answer: The segments and angles move.



b. What happens when you grab and move the closed circle?

Answer: The segments and angles rotate.

Teacher Tip: If you grab the middle of a segment, it does not move. Be sure students understand that the size of the angle and the lengths of the segments remain constant regardless of the orientation or location.

2. Drag and rotate the segments and angles to create a triangle.
   a. Which parts did you use?

Sample Answer: Students may use the three sides or they may build a triangle from the figure they created for question 1.

Teacher Tip: Manipulating the objects is critical to forming triangles. Be sure students are overlaying segment endpoints and angle vertices. You may wish to demonstrate for the whole class how to put the objects together and take them apart. When endpoints "snap" to each other or to an angle vertex, the vertex point will become a larger dark circle.

TI-Nspire Navigator Opportunity: *Live Presenter*
See Note 1 at the end of this lesson.

Teacher Tip: Since students are asked to create a triangle with the parts they have, they eventually must use the three sides to enclose the triangle. Some students may use two sides with an included angle, but the triangle will not be enclosed until the third side is placed. If students start from the figure they built in question 1, they may discover that not all arrangements of sides and angles work to build a triangle. This is addressed in the lesson Angle Side Relationships, but it would be good to start the discussion here if the situation comes up in the student work.

b. Which parts were left unused? How do the unused parts relate to the triangle you created?

Sample Answer: Depending on how students created their triangle, they may have up to three parts unused. For example, students may create the triangle using the three segments, leaving the three angles unused. Students should drag and rotate their unused parts to see how they fit in the triangle they created.

3. a. Use the up and down arrow at the bottom of the screen. Describe what happens.

Answer: $\triangle ABC$ reflects over $\overline{AB}$.

b. Move $\triangle ABC$ on top of the triangle you built. What relationship between the two triangles do you observe?

Answer: The two triangles seem to be congruent; $\triangle ABC$ fits exactly on top of the triangle made from the given angles and segments.

Teacher Tip: Tell students they can move and rotate the triangle in the same way they moved the segments and angles in questions 1 and 2.

The orientation of the triangles that students build may be different, but the corresponding parts will be the same.

TI-Nspire Navigator Opportunity: *Class Capture*
See Note 2 at the end of this lesson.

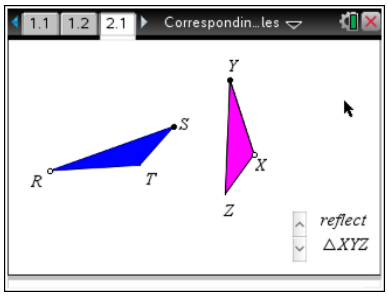
4. Describe how the six parts of the triangle you made relate to the parts of $\triangle ABC$.

Answer:

Corresponding Sides	Corresponding Angles
side $e \cong \overline{AB}$	$\angle 3 \cong \angle A$
side $f \cong \overline{BC}$	$\angle 2 \cong \angle B$
side $d \cong \overline{AC}$	$\angle 1 \cong \angle C$

Teacher Tip: Students need to not only identify the corresponding parts but also realize that the corresponding parts are congruent.

Move to page 2.1.



5. Grab the open circle and move the triangles.
   a. About which segment is $\triangle XYZ$ reflected when use the up and down arrow?

Answer: $\overline{XY}$

TI-Nspire Navigator Opportunity: *Quick Poll*
See Note 3 at the end of this lesson.

b. What is the relationship between the two triangles? How do you know?

Answer: They are congruent. When I lay them on top of each other they match, and the screen says "congruent."

c. Identify the corresponding parts of the two triangles.

Answer:

Corresponding Sides	Corresponding Angles
$\overline{XY}$ and $\overline{TR}$	$\angle X$ and $\angle T$
$\overline{YZ}$ and $\overline{RS}$	$\angle Z$ and $\angle S$
$\overline{ZX}$ and $\overline{ST}$	$\angle Y$ and $\angle R$

Teacher Tip: Be sure to discuss the notation used in your textbook for corresponding parts.

d. Mark the triangles shown in the picture in some way to show which parts are congruent.

Sample Answer: Students may create a scheme of their own.

Teacher Tip: This presents an opportunity to discuss the convention used in the textbook (i.e., using tick marks on the sides and angles, and so on).

6. When two triangles are congruent, the congruence statement is $\triangle ANR \cong \triangle DBC$ where $\angle A$ corresponds to $\angle D$, $\angle N$ corresponds to $\angle B$, and $\angle R$ corresponds to $\angle C$.
   a. Write a congruence statement for the two congruent triangles in question 5.

Sample Answer: Students could write any one of these six statements:

$\triangle XYZ \cong \triangle TRS$	$\triangle XZY \cong \triangle TSR$
$\triangle YZX \cong \triangle RST$	$\triangle YXZ \cong \triangle RTS$
$\triangle ZYX \cong \triangle STR$	$\triangle ZYX \cong \triangle SRT$

Teacher Tip: It is important to discuss why each of these six statements is valid.

b. Is this a valid statement for these two triangles? $\triangle XYZ \cong \triangle RST$. Explain why or why not.

Answer: No. The corresponding vertices are not in order.

TI-Nspire Navigator Opportunity: *Quick Poll*
See Note 4 at the end of this lesson.

Teacher Tip: A common misconception is to state that triangles with vertices written in alphabetical order are congruent. This is true only if the corresponding parts match in alphabetical order.

7. Given $\triangle SLY \cong \triangle FOX$.
   a. Identify all of the corresponding parts of the two triangles.

Answer:

Corresponding Sides	Corresponding Angles
$\overline{SL}$ and $\overline{FO}$	$\angle S$ and $\angle F$
$\overline{LY}$ and $\overline{OX}$	$\angle L$ and $\angle O$
$\overline{YS}$ and $\overline{XF}$	$\angle Y$ and $\angle X$

Teacher Tip: It might be helpful for students to draw a diagram of the two triangles.

   b. Write all other possible congruence statements for these triangles.

Answer: $\triangle SYL \cong \triangle FXO$, $\triangle LYS \cong \triangle OXF$, $\triangle LSY \cong \triangle OFX$, $\triangle YSL \cong \triangle XFO$, $\triangle YLS \cong \triangle XOF$

8. You have identified corresponding parts of congruent triangles. How would you explain the importance of corresponding parts of congruent triangles to someone who has missed the class?

Answer: Corresponding parts are the segments and angles in two congruent triangles that "match" when one triangle is placed on top of the other. If two sides are corresponding, they have the same length. If two angles are corresponding, they have the same measure.

Teacher Tip: CPCTC is often used as an acronym for Corresponding Parts of Congruent Triangles are Congruent.

Extension: This lesson emphasizes the identification of corresponding parts of congruent triangles. You may want to lead a discussion about which corresponding parts are necessary to form congruent triangles.

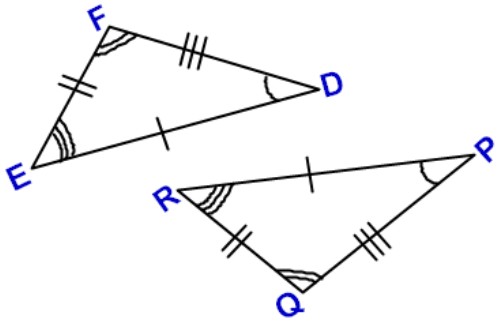
Wrap Up

Upon completion of the discussion, the teacher should ensure that students understand:

- How to identify corresponding parts of congruent triangles.
- How to write congruence statements for congruent triangles.
- How to write the corresponding parts for congruent triangles given a congruence statement.

Assessment

The two triangles below are congruent. Write a congruence statement relating the two triangles and name the corresponding parts.



Sample Answer: $\triangle DFE \cong \triangle PQR$, $\triangle DEF \cong \triangle PRQ$, $\triangle FED \cong \triangle QRP$, $\triangle FDE \cong \triangle QPR$, $\triangle EDF \cong RPQ$, or $\triangle EFD \cong \triangle RQP$

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Note 1

Question 2a, *Live Presenter:* Use *Live Presenter* to have a student demonstrate how to put the objects together and take them apart.

Note 2

Question 3b, *Class Capture:* Use *Class Capture* so that students can see that all of the triangles that they built are congruent to $\triangle ABC$, no matter the orientation.

Note 3

Question 5a, *Quick Poll:* Use an *Open Response Quick Poll* to collect students' responses to question 5a.

Note 4

Question 6b, *Quick Poll:* Use a *Yes/No Quick Poll* to collect students' responses to question 6b.