Constructing Similar Triangles
ID: 16160

Activity Overview
In this activity, students will investigate three different methods of constructing similar triangles.

Topic: Ratio, Proportion & Similarity
- *Use inductive reasoning to classify each set of conditions as necessary and/or sufficient for similarity:*
    a) *the side lengths of one triangle are proportional to the corresponding side lengths of another triangle.*
    b) *two angles of one triangle are congruent to two angles of another triangle.*

Teacher Preparation and Notes

- *This activity is designed to be used in a high school geometry classroom. This activity is intended to be mainly* **student-centered** *with the teacher acting as a facilitator. Use the following pages to present the material to the class and encourage discussion. Students will follow along using their calculators.*

- *Before beginning this activity, students should be familiar with the terms dilation and scale factor.*

- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to education.ti.com/exchange and enter "16160" in the quick search box.***

Associated Materials
- *ConstructingSimilarTriangles_Student.doc*
- *ConstructingSimilarTriangles.tns*

Similar triangles are those that have the same shape but not necessarily the same size. Congruent triangles are a special type of similar triangle where corresponding sides are congruent. In similar triangles, corresponding angles are congruent but corresponding sides are proportional. In this activity, students will look at three methods of constructing similar triangles and will test their properties.

Problem 1 – Using Dilations

Step 1: On page 1.3, students will see triangle *PQR*. The first person in the group should measure ∠*P* and side *PQ* using the **Angle** and **Length** tools in the Measurement menu. The second person should measure ∠*Q* and side *QR*. The third person should measure ∠*R* and side *PR*.

Note: Students can change the number of decimal digits displayed for a particular measurement by moving the cursor over the value and pressing ⊕ to display additional digits or ⊖ to hide digits.
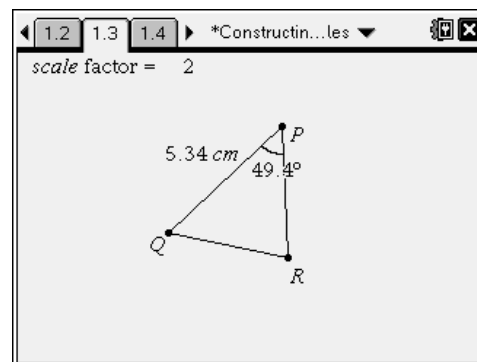
Step 2: All students in the group should construct a point *C* in or near the center of the triangle. The point *C* will be the center of the dilation and the digit "2" will be the scale factor.
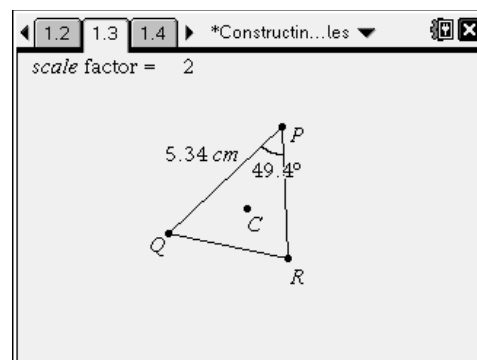
Step 3: Students will use the **Dilation** tool (**MENU > Transformation > Dilation**) to dilate △*PQR* around center *C* with scale factor 2.

Note: To complete the dilation, press the **Click key** (📖) or **Enter** ((enter)) on the center of dilation, the scale factor, and then the object to be dilated.

A new, larger triangle will appear outside of △*PQR*. Students should label it so that *X* corresponds to *P*, *Y* to *Q* and *Z* to *R*.
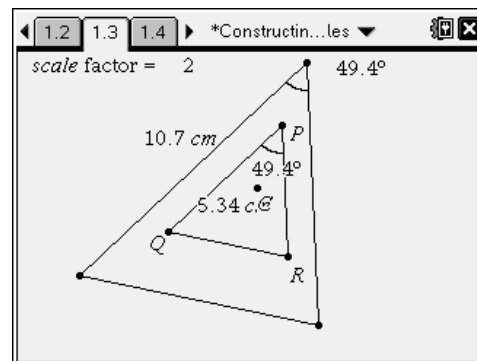
Each person in the group should select and measure their appropriate angle and side in the new triangle.

Record results on the worksheet.

Step 4: Students are to drag the vertex in the original △*PQR*. Ask them: *Do the relationships you observed between corresponding parts remain the same?*

They can then drag the center point, *C*. Ask them: *Are the relationships preserved under this change?* Students should compare his/her results to others in the group. Ask them: *Does it make any difference that each person may have constructed a different center point?*

Step 5: Students should now change the scale factor to 3 and then to 0.5. They need to record their observations after each change.

Note: to edit text, move the cursor to the text and press [⊞] (or (enter)) twice so an edit box appears.

Students will see that the angle measurements remain the same, but the side lengths change.
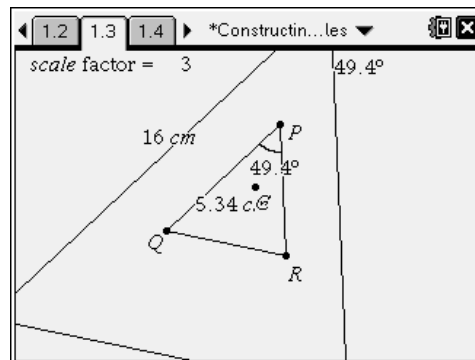
Problem 2 – Using A Negative Scale Factor

**Step 1:** On page 2.2, a small triangle *PQR* is shown with center of dilation *C* and scale factor –2.

Students should perform a dilation on △*PQR*. They need to label the new triangle as *XYZ* so that *X* corresponds to *P*, *Y* to *Q* and *Z* to *R*.

Record observations on the worksheet.
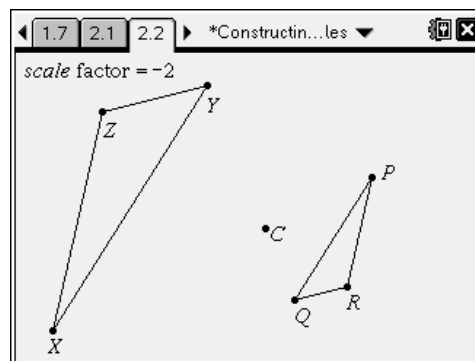
Step 2: Students should measure their side and angle as before, and measure the corresponding side and angle in the new triangle.

They can drag a vertex of △*PQR* to see if the properties they noted above still hold true.
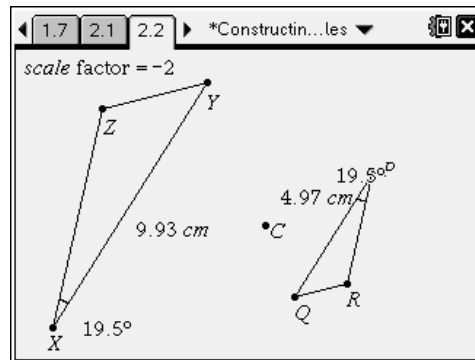
Problem 3 – Constructing with a Parallel Line

Step 1: On page 3.3, students should measure their angle and side as before. Then they need to use the **Point On** tool to construct a point on $\overline{PQ}$ and label it *S*.

Students are to construct a line through *S* that is parallel to $\overline{QR}$ using the **Parallel** tool. It is okay if the parallel line does not intersect side *PR*.
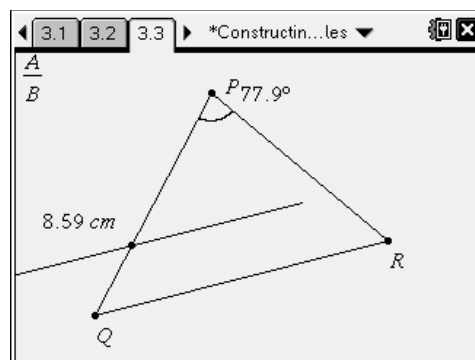
Step 2: Student will then need to create the point of intersection of $\overline{PR}$ and the parallel line, labeling it *T*, using the **Intersection Point(s)** tool.

They should hide the parallel line and construct line segment *ST*.

Students will determine if they can prove that all three pairs of corresponding angles are congruent. If so, then $\triangle PST$ is similar to $\triangle PQR$.
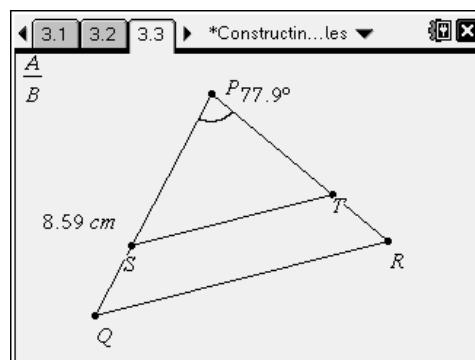
Step 3: Students are to measure lengths of all sides of $\triangle PQR$ and the corresponding sides of $\triangle PST$.

Note: They may need to select both endpoints to measure the segment instead of the whole perimeter of the triangle.
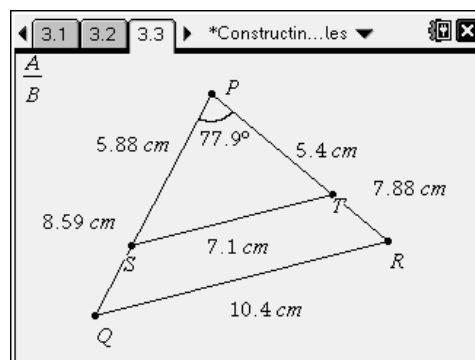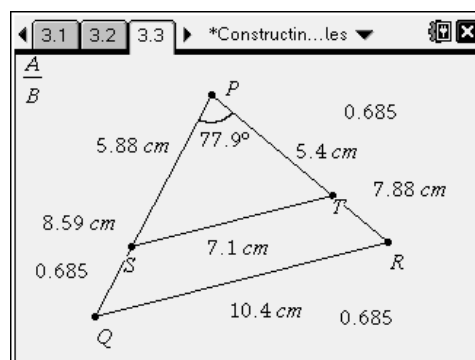
Step 4: Students can use the **Calculate** tool to calculate the ratio *PS*/*PQ*.

Note: To calculate a formula, press 📸 (or (enter)) once on the text of the formula, then additional times to select the values of each variable in the formula.

Repeat this for the ratios *PT*/*PR* and *ST*/*QR*.

Record results on the worksheet.

Step 5: Students should now drag point *S* to a new location and record the ratios again. Ask: *What relationship is true of corresponding sides of $\triangle PST$ and $\triangle PQR$? Does the location of point S affect this relationship?*