Standards INSTITUTE

Rigor

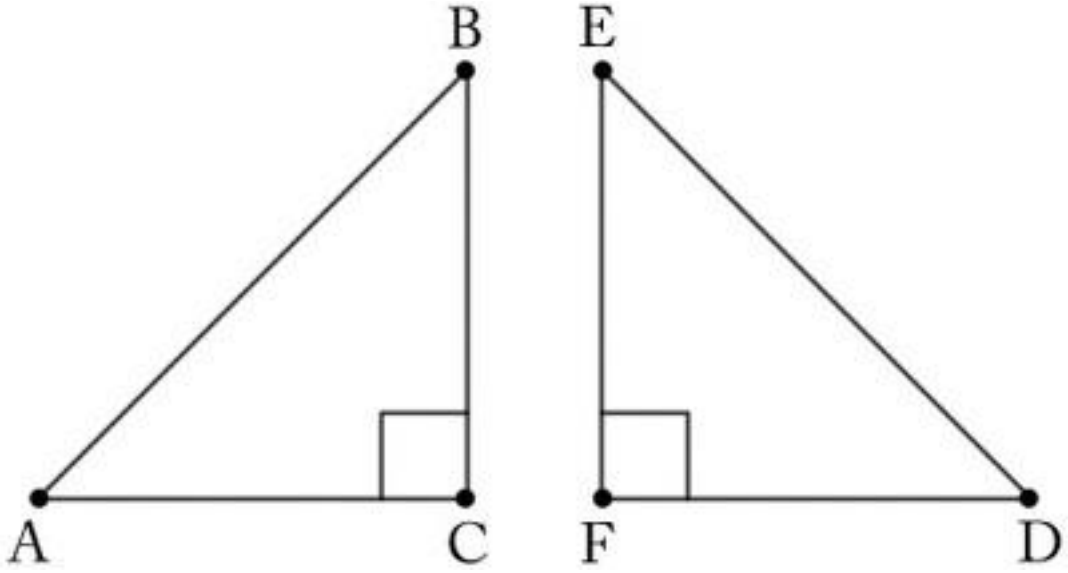
Task Handout, Geometry

"A social justice priority in mathematics education is to openly challenge deficit thinking and the institutional tools and practices that perpetuate static views about children and their mathematics competencies. Eliminating the deficit discourse by focusing on learning rather than labels is a key step toward a more just and equitable mathematics education." —*National Council of Supervisors of Mathematics and TODOS: Mathematics for All*

Conceptual Understanding Task #1

Task

Josh is told that two triangles *ABC* and *DEF* share two sets of congruent sides and one pair of congruent angles: *AB* is congruent to *DE*, *BC* congruent to *EF*, and angle *C* is congruent to angle *F*. He is asked if these two triangles must be congruent. Josh draws the two triangles below and says, "They are definitely congruent because they share all three side lengths!''



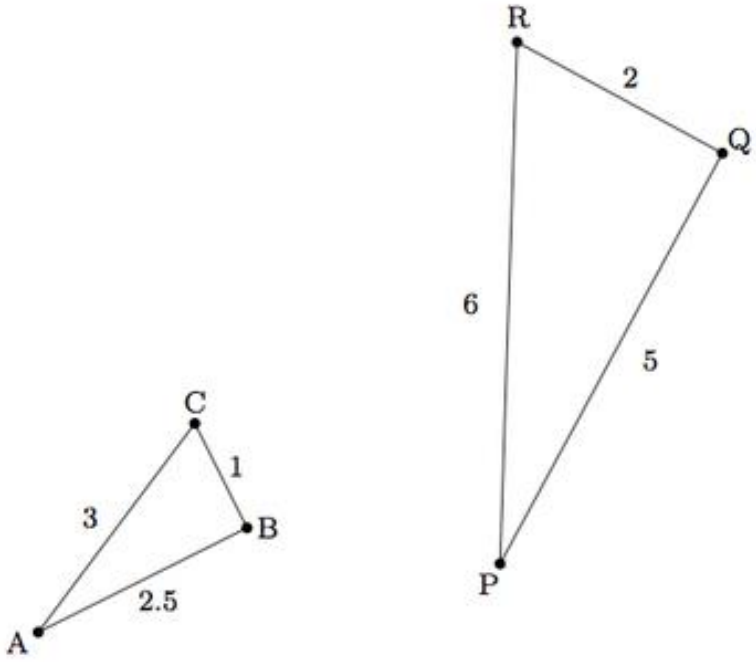
a. Explain Josh's reasoning using one of the triangle congruence criteria: ASA, SSS, SAS.

b. Give an example of two triangles *ABC* and *DEF*, fitting the criteria of this problem, which are not congruent.

Conceptual Understanding Task #2

Task

Alicia has two triangles *ABC* and *PQR* whose corresponding sides are proportional as pictured below:



Alicia says:

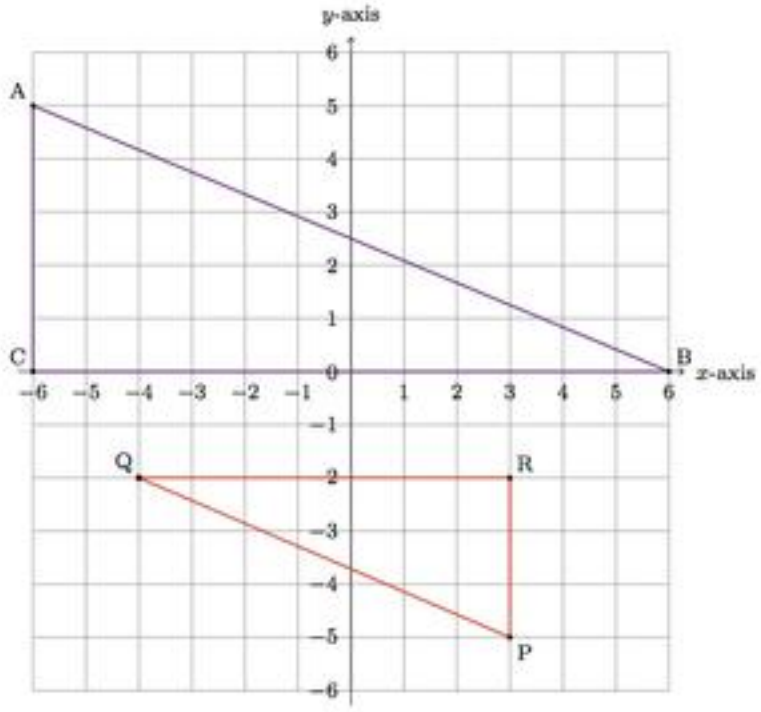
I wonder if they are similar because I don't have any information about the angles?

What is the answer to Alicia's question? Explain.

Procedural Skills and Fluency Task #1

Task

Below is a picture of two triangles with vertices on coordinate grid points:



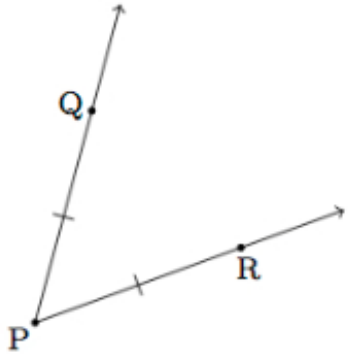
a. What are the perimeters of $\triangle ABC$ and $\triangle PQR$?

b. What is the smallest perimeter possible for a triangle with vertices on grid points and with whole number side lengths? Explain.

Procedural Skills and Fluency Task #2

Task

Suppose P is the vertex of an angle and Q and R are points on the two angle rays so that $\overline{PQ}$ and $\overline{PR}$ are congruent:



a. If M is the midpoint of $\overline{QR}$ show that $\overrightarrow{PM}$ bisects $\angle QPR$.

b. If ray $\overrightarrow{PS}$ bisects $\angle QPR$ show that $\overrightarrow{PS}$ meets $\overline{QR}$ at its midpoint.

Application Task #1

Task

Milong and her friends are at the beach looking out onto the ocean on a clear day and they wonder how far away the horizon is.

a. About how far can Milong see out on the ocean?

b. If Milong climbs up onto a lifeguard tower, how far is the horizon in Milong's view?

c. Mount Shishaldin lies on a narrow peninsula in Alaska and is pictured here:

If Milong were to stand atop Mount Shishaldin and look out over the ocean, how far would the horizon be?

d. Based on the answers to the questions above, is the distance of Milong's visual horizon proportional to her elevation above the surface of the earth? Explain.

Application Task #2

Task

Jerry and Ashley are trying to find out if it is possible to see the lowest point in the USA from the highest point in the USA. It turns out that the highest point in the United States, the peak of Mount Whitney, is only 85 miles from the lowest area, a large flat stretch of land in Death Valley called Badwater Basin.

Jerry thinks that the curvature of the earth will block the view of Badwater Basin from the peak of Mount Whitney. Ashley doesn't think that this is an issue and that they can neglect the curvature of the earth in their investigation.

As it turns out, it is not possible to see Badwater Basin from Mt. Whitney because the Panamint Range blocks the view. But what if there were no obstacles in the way? More precisely:

Standing on top of Mt. Whitney, is it possible to see a point on the surface of the earth 85 miles away, or would the curvature of the earth prevent this?