

Toward Congruence and Similarity

Short-answer problems about transformations.

Question 1 *What is your name?*

Free Response:

Question 2 *What is required to specify a translation?*

Free Response: **Hint:** A vector. Or (equivalently) a magnitude and a direction.

Question 3 *What is required to specify a rotation?*

Free Response: **Hint:** A center and an angle (assuming an agreement about the direction of rotation).

Question 4 *What is required to specify a reflection?*

Free Response: **Hint:** A line.

Sometimes a sequence of transformations can be described as a single translation, rotation, or reflection.

Question 5 *What kind of transformation is a translation followed by a translation? Explain. Be sure to consider any special cases.*

Free Response: **Hint:** Usually a translation. If the vectors are opposites of each other, the result is the identity transformation (which can be thought of as a translation by a vector of magnitude 0).

Author(s): Bart Snapp and Brad Findell

Question 6 What kind of transformation is a rotation followed by a rotation? Explain. Be sure to consider any special cases.

Free Response: **Hint:** Usually a rotation. If the angles sum to a multiple of 360° , then the result is a translation. If the centers of rotation are also the same, the result is the identity transformation (which can be thought of as a rotation of 0°).

Question 7 What kind of transformation is a reflection followed by another reflection? Explain. Be sure to consider any special cases.

Free Response: **Hint:** You are doing this for homework.

Question 8 Will the letter *F* look like an *F* after a reflection? What about after a sequence of two reflections? What about after a sequence of 73 or 124 reflections? Explain your reasoning.

Free Response: **Hint:** Ignoring which side is up, after a reflection (or more generally an odd number of reflections), the *F* will look like a “backwards *F*”. After an even number of reflections, the *F* will look like a typical *F*.

Question 9 How will your answer to the previous problem change if you use a capital *D*? Explain.

Free Response: **Hint:** Ignoring which side is up, the *D* will always look like a *D*. Because of its line symmetry, a reflection doesn’t appear to reverse its “orientation.”

Question 10 Given a figure and its image after a translation, how do you find the direction and distance of the translation? How many points and images do you need?

Free Response: **Hint:** Draw a vector from any point to its image. The vector provides both the direction and the distance. Any point and its image will do.

Question 11 Given a figure and its image after a reflection, how do you find the line of reflection? How many points and images do you need?

Free Response: *Hint:* Draw a segment from a point to its image. The perpendicular bisector of that segment is the line of reflection. Any point and its image will do.

Question 12 Given a figure and its image after a rotation, how do you find the center and the angle of the rotation? How many points and images do you need?

Free Response: *Hint:* Draw a segment from a point P to its image P' . The center of rotation is somewhere on the perpendicular bisector of that segment. Draw a segment from a second point Q to its image Q' . The center of rotation is also somewhere on the perpendicular bisector of that segment. As long as the segments $\overline{PP'}$ and $\overline{QQ'}$ are not parallel, the two perpendicular bisectors will intersect at a point C , which is the unique center of the rotation.

To find the angle of rotation, measure $\angle PCP'$ or $\angle QCQ'$.
