“Translation” Classroom Activities

Short description: Learn the meaning of the geometric term “translation” and see several examples in this animated “Math Shorts” video.

Long description: In this animated “Math Shorts” video, learn about translation, which describes one way a geometric shape can move on a coordinate plane. Translation occurs when a geometric shape slides from one location to another. The shape itself doesn’t change, just its location. The animation also explains mapping notations, which designate how far and in what direction a shape moves.

Learning Outcomes
Students will be able to

- represent and analyze polygons that are translations of one another
- understand how figures that are translations of one another are congruent to one another
- use translations to move and create figures on coordinate planes

Common Core State Standards: 8.G.A.2

Vocabulary: Transform, transformation, coordinate plane, reflection, rotation, translation, pre-image, image, planes

Materials: For each student: several sheets of tracing (or patty) paper, graph paper

Procedure

1. Introduction (5 minutes, whole group)

Discuss the meaning of the word transform. Explain that in geometry, a transformation changes the position of a shape on a coordinate plane. The shape moves from one place to another. The three basic transformations are reflection (flip), rotation (turn,) and translation (slide.) Tell students that this activity will be about translation.

2. Translations (20 minutes, whole class)

Distribute tracing (or patty) paper to students and instruct them to draw a four- or five-sided polygon. Then have them do the following: Draw a line segment from one vertex toward the edge of the paper and mark a point on the line segment (this is called the pre-image). On the second sheet of paper, trace the first shape

and the line segment (this is called the image). Then, slide the top picture so that the point on the line on the bottom paper and the vertex of the polygon on the top paper coincide, keeping the lines of top of each other. On the third sheet of paper, trace the two shapes and the line segment. Direct students to measure the points between the line segment connecting the two vertices and then to connect the other corresponding vertices. Measure the line segments.

Ask students how the distances between each corresponding pairs of vertices compare. (Answer: They are the same.) How do the lengths of the corresponding sides and the measure of the corresponding angles compare in the image and pre-image? (Answer: All are congruent.) Have students write a statement about the distance between any point and its image in a translation. (Answer: In a translation, the distance between every point in the pre-image and its corresponding point in the image are the same.)

Show students the video. Discuss definitions of vocabulary words as needed.

3. Group practice (15 minutes, small groups)

Have students, in groups of two to three, solve a series of practice translation problems. Encourage teams to explain to one another what they did to solve the problem. Have students use the strategy of sense making, in which students present the solution by being able to convince themselves, a friend, and a skeptic of their answer. Have them use graph paper to aid in their explanations.

- Under the translation $(x + y) \rightarrow (x + 4, y -7)$, what will the point (2, 5) become? Answer: (6, -2)
- A is (-4, -3) and B is a translation of A by 3 units to the right and 5 units downward. What is B? Answer: B (-1, -8)
- A square's coordinates are (-4, 3), (-4, 8), (-9, 3), (-9, 8). What are the coordinate pairs under a translation of (x + 1, y - 1)? Answer: (-3, 2), (-3, 7), (-8, 2), (-8, 7)
- Draw a five-sided polygon on graph paper in the first quadrant and name the coordinates. Translate the shape that is five squares to the left and four squares down. What are the new coordinates? Compare these to the original coordinates. What do you notice about the new coordinates? Place a translation of the shape into the second quadrant. What are the coordinates? What is the translation? What do you notice about the new coordinates?

4. Conclusion (5–10 minutes, whole group)

Review the group work and have students share their findings, discussing solutions and strategies. Talk about how translations can be applied to real-world situations, such as moving furniture in a house or editing objects in graphic layouts or photos, etc. Ask students, If you pick up a pencil and move it from your

desk to the desk next to you, is this a translation? Why or why not? (Answer: It’s a translation—the position of the pencil changes but the size and shape stay the same; you may also have performed a rotation if it’s pointing in a different direction, or a reflection if you've flipped it over.)