Mathematics I – Geometry Supertask

Shapes and Structures, Building with Triangles, & Transformations and Congruence

Option #1 Performance Task | Student Document

Authors: Initiative Team

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Directions

Please review the task below and answer the various questions within the task to the best of your ability. If needed, you may have an adult or peer read the task out loud to aid your understanding. You may use tools and embedded resources such as word walls, notebooks, word banks, and a glossary to support your understanding. These tools must be used independently without the support of a peer or teacher. Additionally, feel free to use the following resources in answering each item:

- using graph paper,[1] pen or pencil, colored pencils or highlighters, straight edge, compass, and/or protractor
- using scientific or graphing calculators
- using graphing technology such as GeoGebra or Desmos
- annotating a paper or digital copy of a geometry image
- using verbal expression or text-to-speech software to describe the results
- dictating to a scribe[2]

[1] The use of graph paper and pen or pencil is demonstrated in the figures.

[2] In this situation, it is important for the scribe to be careful to record **only** what the student explicitly communicates, rather than making interpretations and "filling in the blanks" based on what they think the student meant.

Word Bank. Here are some words that might help you in explaining your thinking for the questions in this task. (You will probably not use every word for every question, so pick and choose the words that make sense for each question.)

coordinate points	square	parallel lines	perpendicular lines	distance formula
Pythagorean Theorem	transformation	rigid transformations	perimeter	slope
translation	reflection	line of reflection	rotation	center of rotation
congruence	polygon	hypotenuse	angle of rotation	pre-image
image	corresponding points	line segments		

PART 1. Using Coordinates to Prove Theorems and Solve Problems

Item 1. Directions

Item 1 has two tasks.

Item 1 Tasks

The following coordinate points are three vertices of a square:

(-5, 4)

(-7, -1)

(0, 2)

Use this knowledge to complete the following items.

(A) What are the coordinates (*x*, *y*) of the fourth vertex of this square? Without using a ruler or protractor to measure, prove that this shape is a square.

(B) Find the perimeter of the square. Show all calculations.

PART 2. Congruence, Rigid Motion, and Constructions

The diagram below shows three polygons you will use as you construct your responses.

Item 1. Directions

Item 1 has two tasks. Use figure 1 to answer each task.

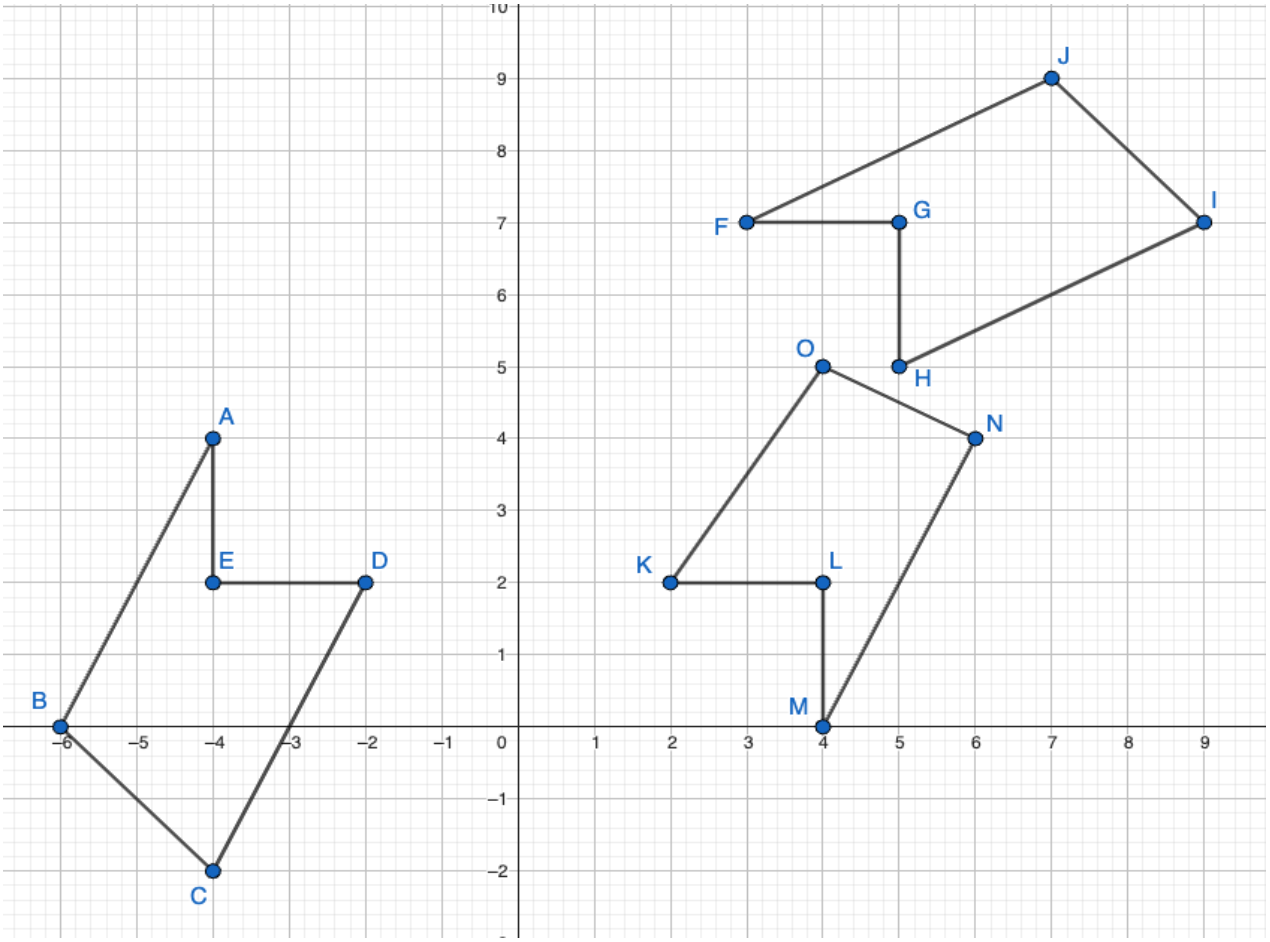
Item 1 Tasks

(A) Which of the three polygons are congruent in figure 1? Show how you know using your understanding of congruence and rigid transformations. (Be sure to name the polygons in order of corresponding vertices.)

(B) For the polygon that is not congruent to the other two in figure 1, explain how to modify only the not congruent polygon to make it congruent to the other two polygons.

- Change one or two of the vertices in the not congruent polygon
- List the new vertex or vertices with the new coordinate points, (x, y)
- State why this now makes all three polygons congruent.

Figure 1. Diagram of Three Polygons for Part 2, Item 1



PART 3. Transformations in the Plane

For the various tasks in Part 3, a triangle in the upper left quadrant is labeled △*ABC*. This triangle is then transformed by either a translation, a reflection, and/or a rotation, to produce three images in the other quadrants. Read each item and complete the tasks.

Item 1. Directions

Item 1 is broken into two tasks. Use figure 2 to answer each task.

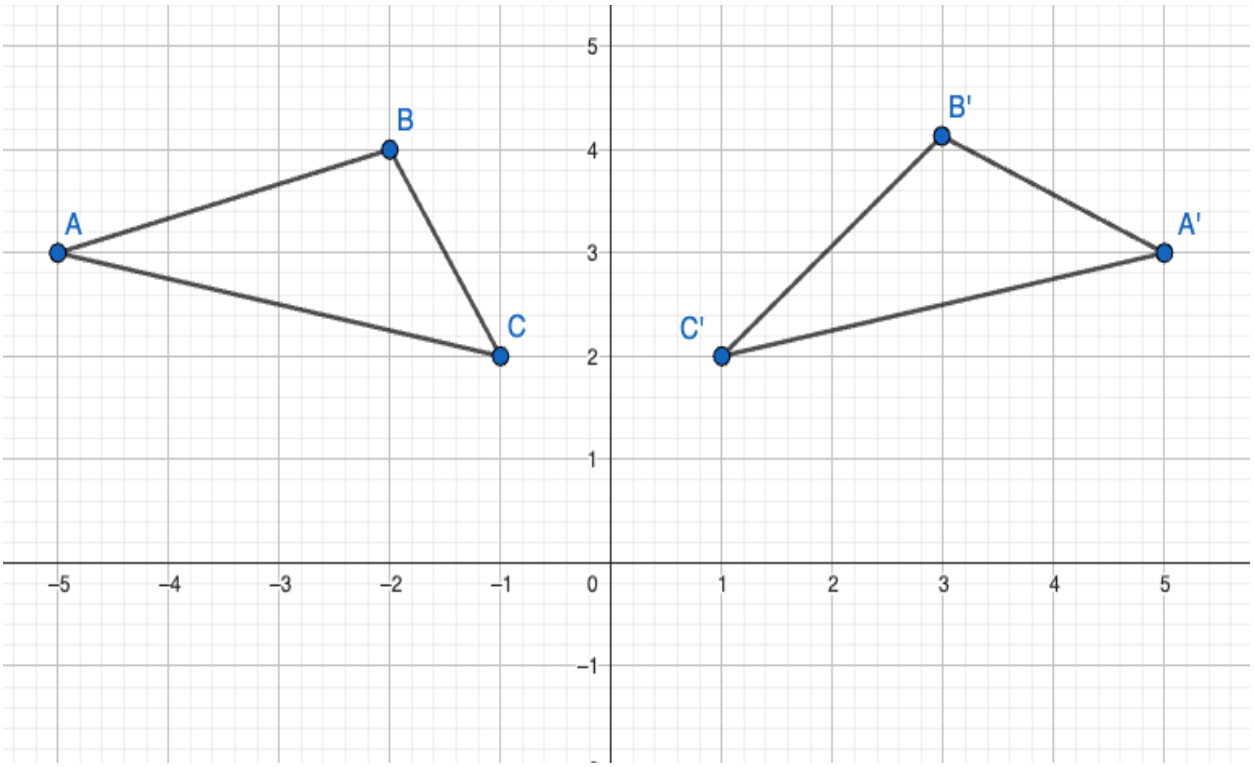
Item 1 Tasks

(A) Describe the transformation of △ABC that results in △A′B′C′ in figure 2. Be specific. (Include when appropriate: distance, direction, line of reflection, center of rotation, or angle of rotation.)

(B) For the transformation from △ABC to △A′B′C′ in figure 2, explain the properties of this transformation, using line segments between the pre-image and image points and other reference parts on the coordinate plane.

(C)

Figure 2. Triangle Images for Part 3, Item 1



Item 2. Directions

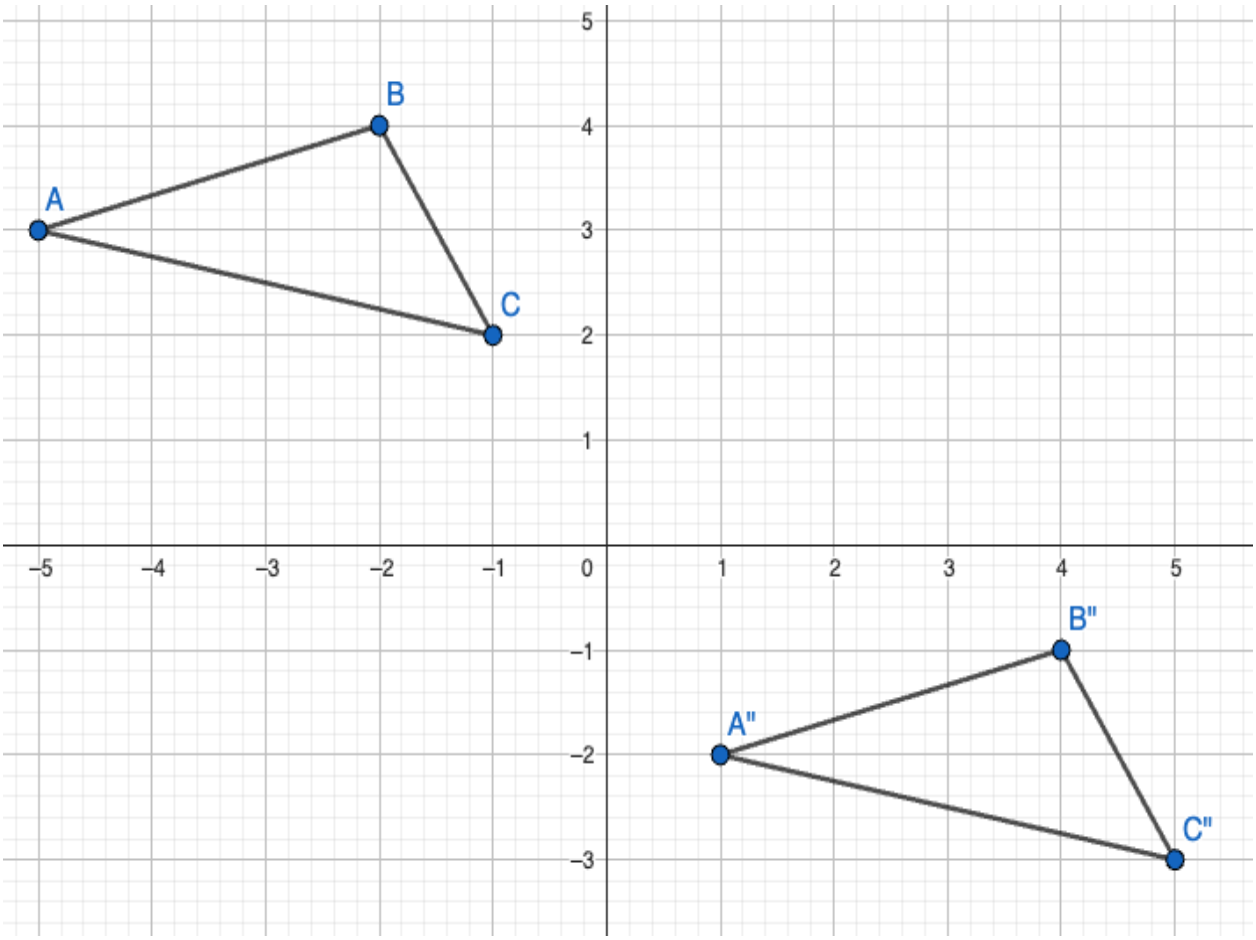
Item 2 has two tasks. Use figure 3 to answer each task.

Item 2 Tasks

(A) Describe the transformation of $\triangle ABC$ that results in $\triangle A''B''C''$ in figure 3. Be specific (include when appropriate: distance, direction, line of reflection, center of rotation, or angle of rotation).

(B) For the transformation from $\triangle ABC$ to $\triangle A''B''C''$ in figure 3, explain the properties of this transformation, using line segments between the pre-image and image points and other reference parts on the coordinate plane.

Figure 3. Triangle Images for Part 3, Item 2



Item 3. Directions

Item 3 has two tasks. Use figure 4 to answer each task.

Item 3 Tasks

(A) Describe the transformation of △ABC that results in △A‴ B‴ C‴ in figure 4. Be specific (include when appropriate: distance, direction, line of reflection, center of rotation, or angle of rotation).

(B) For the transformation from △ABC to △A‴ B‴ C‴, explain the properties of the transformation in figure 4, using line segments between the pre-image and image points and other reference parts on the coordinate plane.

(C)

Figure 4. Triangle Images for Part 3, Item 3