Triangle Moves Keep Their Shape

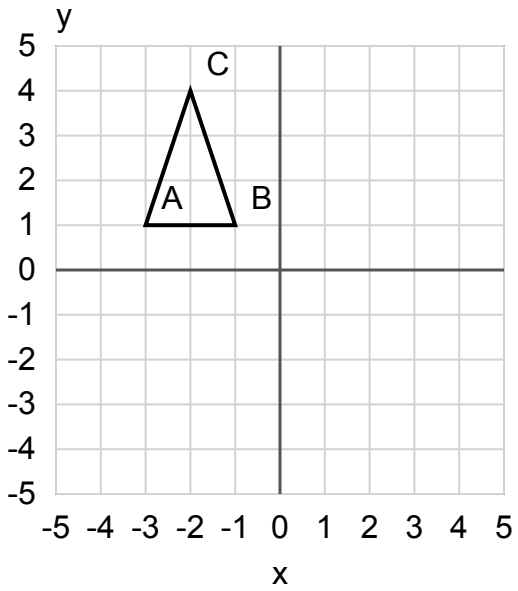
Translate, reflect, and rotate a triangle while checking lengths and angles

Name: _____ Date: _____

Part 1: Perform the three moves

Materials: grid below, tracing paper, pencil, ruler, and protractor. The triangle is a classroom-created figure, not data from an outside source.

Trace triangle ABC. Make each move on your tracing paper, one at a time. Record the image coordinates in the table. Use a prime mark: A', B', C'.



1. Translation: Move every point 4 units right and 2 units down: (x, y) -> (x + 4, y - 2).

Point	Original coordinate	Translated coordinate
A	(-3, 1)	
B	(-1, 1)	
C	(-2, 4)	

2. Reflection: Reflect ABC across the y-axis. **3. Rotation:** Rotate ABC 90 degrees counterclockwise about the origin. Record both image coordinates on Part 2.

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Part 2: Check what stays unchanged

4. Coordinate records. Complete the coordinates from your tracing-paper moves.

Point	Reflection across y-axis	90 degree counterclockwise rotation
A		
B		
C		

5. Measure and compare. Use your ruler and protractor. Round lengths to the nearest tenth unit and angles to the nearest degree. Measure the original first. Then check each traced image.

Feature	ABC	Translation	Reflection	Rotation
AB length				
AC length				
BC length				
angle A				
angle B				
angle C				

6. Evidence statement. Which measurements stayed unchanged in all three moves? Use one coordinate fact and one measurement fact as evidence.

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Answer key and teaching notes

Materials and setup: Print and supply all student pages, keeping teacher-key pages separate. Provide each student with a pencil, ruler, protractor, and one sheet of tracing paper. Students use the printed coordinate grid as the reference grid. Have students label each tracing-paper image clearly before beginning the next move.

Teacher script: “Today you will move the same triangle three different ways. Trace the original triangle first. For a translation, slide every point the stated number of units. For a reflection, flip the tracing over the y-axis. For a rotation, keep the origin fixed and turn the tracing paper 90 degrees counterclockwise. Then use both coordinates and measurements as evidence.”

Observation method: During Part 1, check that each student (1) traces all three vertices, (2) applies the stated move to every vertex, and (3) labels image points. During Part 2, inspect whether measurements are reasonably close to the expected values and whether the evidence statement names preserved lengths and angles. Accept small ruler/protractor variation; coordinate entries provide the exact check.

Answers:
1. Translation: A'(1, -1), B'(3, -1), C'(2, 2).
2. Reflection across y-axis: A'(3, 1), B'(1, 1), C'(2, 4).
3. Rotation 90 degrees counterclockwise, using (x, y) -> (-y, x): A'(-1, -3), B'(-1, -1), C'(-4, -2).
4. Original side lengths: AB = 2; AC = sqrt(10), about 3.2; BC = sqrt(10), about 3.2. These same lengths occur in every image.
5. Original angles: angle A about 72 degrees, angle B about 72 degrees, angle C about 37 degrees. These same angle measures occur in every image, allowing normal measurement rounding.

6. Sample evidence statement: “All three side lengths and all three angle measures stayed the same. For example, AB measured 2 units before and after each move. The translation coordinate A changed from (-3, 1) to (1, -1), but the triangle kept its side lengths and angles.”

Rubric: Full credit: correct coordinate records, reasonable measurement comparisons, and an evidence statement identifying unchanged lengths and angles with one coordinate fact and one measurement fact. Partial credit: correct move work with incomplete measurements or explanation. Reteach if a student changes only one vertex or treats a reflection as a translation.

Source credit: New York Next Generation Mathematics Learning Standards, NY-8.G.1, “Verify experimentally the properties of rotations, reflections, and translations.” https://lessonmakerpro.com/standards/ny-nextgen-math/ny-8-g-1