LESSON MAKER PRO

Motion Math Lab

Track what stays the same in rigid motions.

GRADE 8 · 8.G.A.1

CCSS.Math.Content.8.G.A.1 "Verify experimentally the properties of rotations, reflections, and translations:"

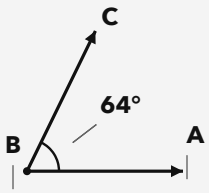
NAME _____ DATE _____

RIGID MOTIONS KEEP SHAPE

A rotation, reflection, or translation is a rigid motion. Rigid motions keep all side lengths and angle measures the same. On a coordinate plane, a 90° counterclockwise rotation about the origin maps (x, y) to (-y, x).

WORKED EXAMPLE

The angle shown is rotated 120° about point B. What is the measure of the rotated angle?



1. Read the angle measure: m∠ABC = 64°.
2. Rotate both rays 120° around point B.
3. A rotation keeps the angle measure the same.

Answer: 64°

PRACTICE 6 problems

1 Point P(-3, 4) is translated 5 units right and 2 units down. What are the coordinates of P'?

ANSWER _____

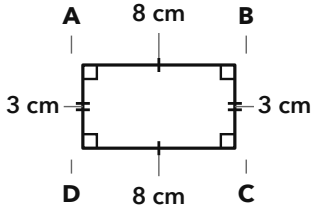
2 Point Q(6, -1) is reflected across the y-axis. What are the coordinates of Q'?

ANSWER _____

3 Point R(2, -5) is rotated 90° counterclockwise about the origin. What are the coordinates of R'?

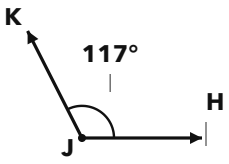
ANSWER _____

4 The shown rectangle has side lengths 8 cm and 3 cm. It is reflected across a line. What is the perimeter of the image?



ANSWER _____

5 The shown angle measures 117°. It is reflected across a line. What is the measure of the image angle?



ANSWER _____

6 Segment AB has endpoints A(-4, 2) and B(-1, 2). Translate the segment 3 units right and 5 units down. Find A' and B'.

ANSWER _____

_____

APPLY IT Show your work

1 In a coding club game, a player's triangular avatar has corners J(-2, 1), K(0, 1), and L(-2, 3). A command translates every corner 4 units right and 2 units down. What are the coordinates of J', K', and L'?

WORK SPACE

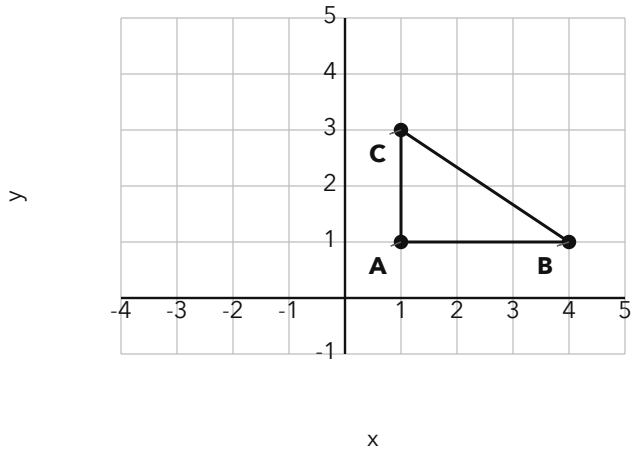
ANSWER _____

2 A student designs a mirrored logo for a club hoodie. The original triangle has vertices M(-3, 2), N(1, 2), and O(1, 5). The printer reflects the design across the y-axis. What are the coordinates of M', N', and O'?

WORK SPACE

ANSWER _____

3 Experiment with the plotted triangle A(1,1), B(4,1), C(1,3). Your teacher supplies tracing paper, a ruler and a protractor. Trace the triangle and coordinate origin. Rotate the tracing 90° counterclockwise around the fixed origin, and mark the image on the grid. Label all three image vertices. Measure AB, AC and angle A before and after the rotation; record both sets of measurements and compare them. Use extra paper for your measurement table. Explain what your observed results support.



ANSWER _____

CHALLENGE One step up

Triangle ABC has vertices A(-2, 1), B(1, 1), and C(-2, 4). First rotate the triangle 90° counterclockwise about the origin. Then translate the image 3 units right and 2 units up. Find A', B', and C'. Explain why the final triangle is congruent to triangle ABC.

WORK SPACE AND ANSWER

ANSWER KEY # Motion Math Lab

GRADE 8 · 8.G.A.1

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Point P(-3, 4) is translated 5 units right and 2 units down. What are the coordinates of P'?	**(2, 2)**
2	Point Q(6, -1) is reflected across the y-axis. What are the coordinates of Q'?	**(-6, -1)**
3	Point R(2, -5) is rotated 90° counterclockwise about the origin. What are the coordinates of R'?	**(5, 2)**
4	The shown rectangle has side lengths 8 cm and 3 cm. It is reflected across a line. What is the perimeter of the image?	**22 cm**
5	The shown angle measures 117°. It is reflected across a line. What is the measure of the image angle?	**117°**
6	Segment AB has endpoints A(-4, 2) and B(-1, 2). Translate the segment 3 units right and 5 units down. Find A' and B'.	**A'(-1, -3), B'(2, -3)**

PART 2 · APPLY IT

1. **J'(2, -1), K'(4, -1), L'(2, 1)** Add 4 to each x-coordinate and subtract 2 from each y-coordinate. A translation moves every point by the same amount.
2. **M'(3, 2), N'(-1, 2), O'(-1, 5)** A reflection across the y-axis changes each x-coordinate to its opposite and keeps each y-coordinate unchanged.
3. **A'(-1,1), B'(-1,4), C'(-3,1); AB and A'B' both 3 grid units, AC and A'C' both 2 grid units, angle A and A' both 90°.** Measure rather than only assert. Grid-unit distances and angle measures remain the same within measurement precision; the actual rotated tracing and recorded comparisons provide experimental evidence for this rigid motion.

CHALLENGE

A'(2, 0), B'(2, 3), C'(-1, 0). Rotations and translations are rigid motions, so they preserve all side lengths and angle measures. Therefore the final triangle is congruent to triangle ABC.

Accept coordinates written with or without spaces. For the challenge, accept any correct explanation that states that rotations and translations preserve lengths and angle measures, so the triangles are congruent. For Apply It 3, supply tracing paper, ruler and protractor and support the fixed-origin rotation. Check the actual tracing/image, labeled vertices and original/image measurement table. Accept reasonable measurement tolerance; printed grid units need not equal centimetres. Do not accept only a predicted invariance assertion.

Apply It 3: original ABC and rotated image; compare measured sides and right angles.

