

Transformation Moves

Use geometric facts to describe plane transformations.

HIGH SCHOOL • GEO-G.CO.4

GEO-G.CO.4 "Develop definitions of rotations, reflections, and translations in terms of points, angles, circles, perpendicular lines, parallel lines, and line segments."

NAME _____

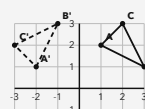
DATE _____

DEFINE THE MOVE

In a translation, directed segments from each point to its image are parallel, equal in length, and point the same way. In a reflection, the mirror line is the perpendicular bisector of each segment joining a point to its image. In a rotation, points stay on circles centered at the rotation center and turn through the same directed angle.

WORKED EXAMPLE

The solid triangle maps to the dashed triangle. Name the transformation.



1. Use the counterclockwise quarter-turn rule: (x, y) maps to $(-y, x)$.
2. $A(1, 2)$ maps to $A'(-2, 1)$.
3. B and C also map to the matching dashed vertices.

Answer: A counterclockwise quarter-turn rotation about the origin.

PRACTICE 4 problems

- 1** Point $P(9, -8)$ is translated by vector $\langle -4, 12 \rangle$. Find P' .

ANSWER _____

- 2** Reflect $Q(-7, 5)$ across the y -axis. Find Q' .

ANSWER _____

- 3** A translation maps A to A' and B to B' . Write two facts about directed segments AA' and BB' .

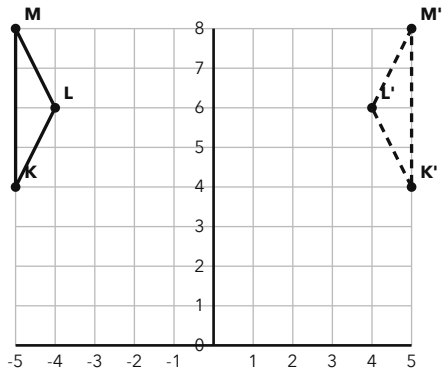
ANSWER _____

- 4** R and R' lie on a circle centered at O with radius 10. Directed angle ROR' is 120° counterclockwise. Name the transformation that maps R to R' .

ANSWER _____

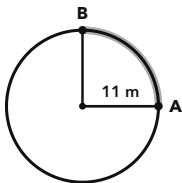
APPLY IT Show your work

- 1** A game club copies a logo on the coordinate grid. The solid logo becomes the dashed logo. What transformation was used?



ANSWER _____

- 2** At a music festival, a spotlight moves from A to B around a circular stage. It travels 90° counterclockwise around center O. Name the transformation.



ANSWER _____

CHALLENGE One step up

A transformation maps A(12, 5) to A'(16, 5), B(12, 9) to B'(16, 9), and C(15, 7) to C'(13, 7). Name the transformation and explain using midpoints and perpendicular lines.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Point P(9, -8) is translated by vector $\langle -4, 12 \rangle$. Find P'.	P'(5, 4)
2	Reflect Q(-7, 5) across the y-axis. Find Q'.	Q'(7, 5)
3	A translation maps A to A' and B to B'. Write two facts about directed segments AA' and BB'.	They are parallel and point in the same direction. They have equal length.
4	R and R' lie on a circle centered at O with radius 10. Directed angle ROR' is 120° counterclockwise. Name the transformation that maps R to R'.	A 120° counterclockwise rotation about O.

PART 2 • APPLY IT

1. **Reflection across the y-axis.** Each image point has the opposite x-coordinate and the same y-coordinate as its original point. The y-axis is the perpendicular bisector of each joining segment.
2. **A 90° counterclockwise rotation about O.** Both positions are on the circle centered at O, so they stay the same distance from O. The stated turn gives the rotation angle and direction.

CHALLENGE

It is a reflection across $x = 14$. Each pair's midpoint lies on $x = 14$, and each horizontal segment joining a point to its image is perpendicular to $x = 14$.

Accept "reflection over the y-axis" for "across the y-axis." For the challenge, accept any correct explanation that identifies $x = 14$ as the perpendicular bisector of all three point-image segments.