

Motion Keeps Length

Test what stays the same after a transformation.

GRADE 8 • NY-8.G.1.a

NY-8.G.1.a "Verify experimentally lines are mapped to lines, and line segments to line segments of the same length."

NAME _____

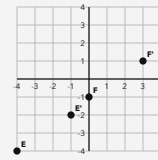
DATE _____

WHAT TO CHECK

A translation, reflection, or rotation sends every point of a line to points on another line. To test a segment, compare its horizontal and vertical changes before and after the move. The length stays the same.

WORKED EXAMPLE

On the grid, compare segment EF with its image E'F'.



1. From E to F, move 4 right and 3 up.
2. $EF = \sqrt{4^2 + 3^2} = 5$.
3. From E' to F', move 4 right and 3 up.
4. $E'F' = 5$, so the lengths match.

Answer: $EF = 5$ units; $E'F' = 5$ units.

PRACTICE 4 problems

- 1** A translation maps $M(-1, 4)$ to M' and $N(5, 4)$ to N' . Find $M'N'$.

ANSWER _____

- 2** Line $y = -2x + 7$ is reflected across the y -axis. Write the image line's equation.

ANSWER _____

- 3** Segment AB has endpoints $A(-6, 2)$ and $B(2, 2)$. It is rotated 180 degrees about the origin. Give A' , B' , and $A'B'$.

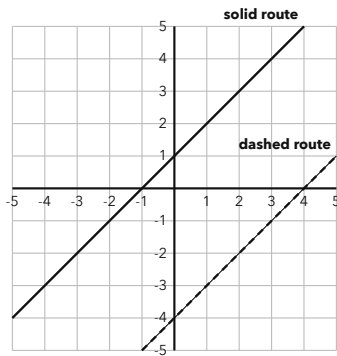
ANSWER _____

- 4** Segment QR has endpoints $Q(-3, 5)$ and $R(1, 8)$. Reflect it across the x -axis. Give Q' , R' , and $Q'R'$.

ANSWER _____

APPLY IT Show your work

- 1** In a game design club, the solid laser route is translated 2 units right and 3 units down to the dashed route. Use the grid. Write the dashed route's equation. What shows it is still a line?



ANSWER _____

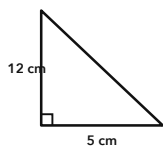
- 2** A robotics team shifts a sensor path with endpoints $(2, -1)$ and $(8, 7)$. How long is the path before and after the shift?

WORK SPACE

ANSWER _____

CHALLENGE One step up

The triangular patch in the figure is rotated 90 degrees. A student says its image hypotenuse is 13 cm. Is the student correct? Explain.



WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A translation maps $M(-1, 4)$ to M' and $N(5, 4)$ to N' . Find $M'N'$.	6 units
2	Line $y = -2x + 7$ is reflected across the y -axis. Write the image line's equation.	$y = 2x + 7$
3	Segment AB has endpoints $A(-6, 2)$ and $B(2, 2)$. It is rotated 180 degrees about the origin. Give A' , B' , and $A'B'$.	$A'(6, -2)$, $B'(-2, -2)$; $A'B' = 8$ units
4	Segment QR has endpoints $Q(-3, 5)$ and $R(1, 8)$. Reflect it across the x -axis. Give Q' , R' , and $Q'R'$.	$Q'(-3, -5)$, $R'(1, -8)$; $Q'R' = 5$ units

PART 2 • APPLY IT

- $y = x - 4$; both routes have slope 1.** A right 2, down 3 translation changes $y = x + 1$ to $y = x - 4$. Equal slopes show that the image is also a line.
- 10 units before; 10 units after.** The changes are 6 horizontally and 8 vertically, so the length is $\sqrt{6^2 + 8^2} = 10$. A shift is a translation, so the image path is also 10 units.

CHALLENGE

Yes. The original hypotenuse is $\sqrt{5^2 + 12^2} = 13$ cm, and a rotation preserves segment length.

Accept equivalent equations for the reflected and translated lines. For written explanations, require that the student identifies the preserved length or equal slopes for a line image.