

Transform It Right

Use rules, coordinates, and scale factors to track a shape.

GRADE 8 • TEKS 8.10

8.10 "Two-dimensional shapes. The student applies mathematical process standards to develop transformational geometry concepts. The student is expected to: generalize the properties of orientation and congruence of rotations, reflections..."

NAME _____

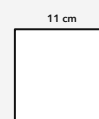
DATE _____

COORDINATE MOVE RULES

A translation follows $(x, y) \rightarrow (x + a, y + b)$. Reflections use $(x, y) \rightarrow (x, -y)$ over the x-axis and $(x, y) \rightarrow (-x, y)$ over the y-axis, while rotations about the origin use 90° CCW: $(-y, x)$, 180° : $(-x, -y)$, 270° CCW: $(y, -x)$, and 360° : (x, y) . Translations, rotations, and reflections preserve congruence, but a dilation multiplies lengths by k and area by k^2 , so it is congruent only when $k = 1$.

WORKED EXAMPLE

A stage crew enlarges the square sign in the figure by a scale factor of 7. Find the image side length and area.



1. Multiply the side length: $11 \times 7 = 77$ cm.
2. Find the original area: $11 \times 11 = 121$ cm^2 .
3. Multiply area by 7^2 : $121 \times 49 = 5929$ cm^2 .

Answer: Image side length: 77 cm; image area: 5929 cm^2 .

PRACTICE 4 problems

- 1** A game designer moves a character marker at $(2, -1)$ using $(x, y) \rightarrow (x + 5, y - 6)$. What is the new coordinate?

ANSWER _____

- 2** A skateboard company reflects a logo point at $(-5, 8)$ over the x-axis. What is the image coordinate?

ANSWER _____

- 3** A drone-camera app rotates a triangular sticker 90° counterclockwise about the origin. One vertex is at $(1, -9)$. What is its image coordinate, and does the rotation preserve congruence?

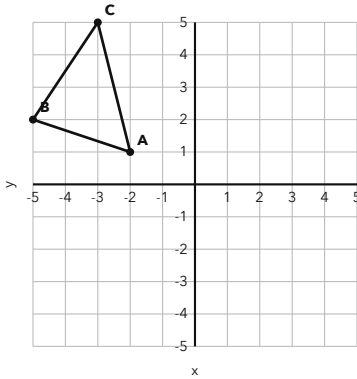
ANSWER _____

- 4** A band shrinks an 18 cm by 10 cm poster by a scale factor of $1/2$. What are the image dimensions, and is the image congruent to the original?

ANSWER _____

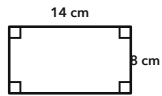
APPLY IT Show your work

- 1** A game artist reflects the solid triangle in the grid over the y-axis. List A', B', and C'. State what happens to orientation and congruence.



ANSWER _____

- 2** The rectangle in the figure is a club banner. A printer makes a scale-factor $\frac{1}{2}$ copy. Find the new perimeter and area. State the multiplier for each measurement.



ANSWER _____

CHALLENGE One step up

A dance-animation team translates triangle $P(1, 2)$, $Q(5, 2)$, $R(2, 6)$ using $(x, y) \rightarrow (x - 2, y + 4)$, then rotates it 90° counterclockwise about the origin. Write one rule for both moves, list the final vertices, and explain congruence and orientation.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A game designer moves a character marker at (2, -1) using $(x, y) \rightarrow (x + 5, y - 6)$. What is the new coordinate?	(7, -7)
2	A skateboard company reflects a logo point at (-5, 8) over the x-axis. What is the image coordinate?	(-5, -8)
3	A drone-camera app rotates a triangular sticker 90° counterclockwise about the origin. One vertex is at (1, -9). What is its image coordinate, and does the rotation preserve congruence?	(9, 1); yes, a rotation preserves congruence.
4	A band shrinks an 18 cm by 10 cm poster by a scale factor of $1/2$. What are the image dimensions, and is the image congruent to the original?	9 cm by 5 cm; no, the scale factor is not 1.

PART 2 • APPLY IT

- A'(2, 1), B'(5, 2), C'(3, 5); orientation reverses, and congruence is preserved.** Change each x-coordinate to its opposite and keep each y-coordinate. A reflection preserves lengths and angles but reverses orientation.
- Perimeter: 22 cm; area: 28 cm². Perimeter is multiplied by $1/2$, and area is multiplied by $1/4$.** The copy measures 7 cm by 4 cm. Its perimeter is $2(7 + 4)$, and its area is 7×4 .

CHALLENGE

Rule: $(x, y) \rightarrow (-y - 4, x - 2)$. P'(-6, -1), Q'(-6, 3), R'(-10, 0). The image is congruent, and orientation is preserved because both a translation and a rotation preserve them.

Accept equivalent coordinate notation and equivalent descriptions of the combined rule. For area, require square units and the k^2 area multiplier.