

Moving Shapes with Translations, Reflections, Rotations

Grade 8 math · Worksheet Answer Key · Standards: 8.G.A.1, 8.G.A.3

Each solution shows the rule used, the work for every vertex, and the image in bold. Compare each step, not only the final answer, and redraw any figure that disagrees with your result before moving on.

Standards: 8.G.A.1, 8.G.A.3 · **Level:** Grade 8

Problem 1 Slide a point

Add 9 to x and 3 to y : $(6 + 9, -7 + 3)$.

Image: **$(15, -4)$**

Problem 2 Reflect over the x-axis

The rule is $(x, y) \rightarrow (x, -y)$.

Image: **$(-4, -6)$**

Problem 3 Reflect over the y-axis

The rule is $(x, y) \rightarrow (-x, y)$.

Image: **$(-7, -3)$**

Problem 4 Quarter turn

The rule is $(x, y) \rightarrow (-y, x)$, so $(7, 3) \rightarrow (-3, 7)$.

Image: **$(-3, 7)$**

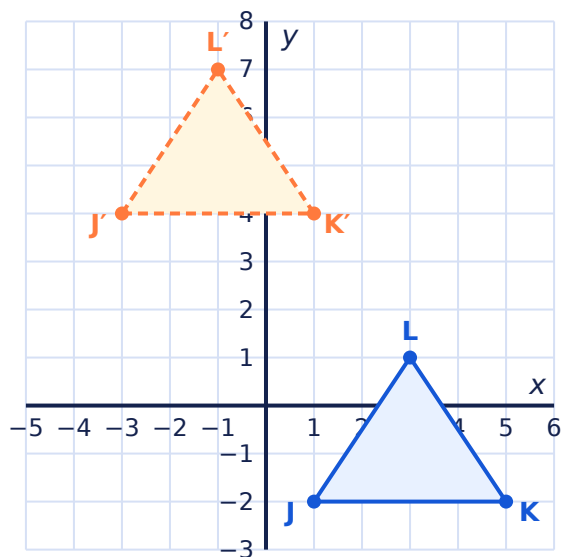
Problem 5 Half turn

The rule is $(x, y) \rightarrow (-x, -y)$.

Image: **$(6, -1)$**

Problem 6 Translate a triangle

Apply the rule to each vertex: $J(1, -2) \rightarrow (-3, 4)$; $K(5, -2) \rightarrow (1, 4)$; $L(3, 1) \rightarrow (-1, 7)$.

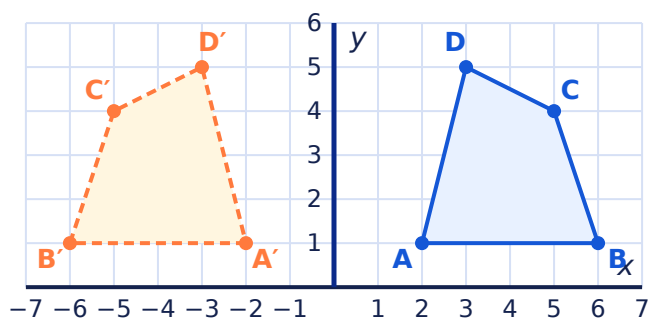


Triangle JKL (blue) and its translated image (orange, dashed).

Image: $J'(-3, 4)$, $K'(1, 4)$, $L'(-1, 7)$

Problem 7 Mirror a quadrilateral

Change the sign of each x-coordinate: $A(2, 1) \rightarrow (-2, 1)$; $B(6, 1) \rightarrow (-6, 1)$; $C(5, 4) \rightarrow (-5, 4)$; $D(3, 5) \rightarrow (-3, 5)$.



Quadrilateral ABCD and its mirror image across the y-axis.

Image: $A'(-2, 1)$, $B'(-6, 1)$, $C'(-5, 4)$, $D'(-3, 5)$

Problem 8 Three-quarter turn

The rule is $(x, y) \rightarrow (y, -x)$, so $(4, -3) \rightarrow (-3, -4)$.

Check: a 90° counterclockwise turn gives $(3, 4)$, and three such turns give the same result as turning 270° .

Image: **$(-3, -4)$**

Problem 9 Clockwise turn

A 90° clockwise rotation equals a 270° counterclockwise rotation, with rule $(x, y) \rightarrow (y, -x)$.

$(-5, 2) \rightarrow (2, 5)$.

Image: **$(2, 5)$**

Problem 10 Name the reflection

Each x -coordinate stays the same and each y -coordinate changes sign.

Reflection across the x -axis; $(x, y) \rightarrow (x, -y)$

Problem 11 Name the rotation

Test $(x, y) \rightarrow (-y, x)$: $P(1, 4) \rightarrow (-4, 1)$ and $Q(3, -2) \rightarrow (2, 3)$. Both match.

Rotation of 90° counterclockwise about the origin; $(x, y) \rightarrow (-y, x)$

Problem 12 What stays the same?

A reflection is a rigid motion, so lengths and angle measures are preserved.

Sides: **7 cm, 9 cm, 12 cm; the angle is 48°**

Problem 13 Describe the slide

Compare $X(-6, 3)$ with $X'(1, -1)$: the x -coordinate increases by 7 and the y -coordinate decreases by 4. Y and Z follow the same change.

7 units right and 4 units down; $(x, y) \rightarrow (x + 7, y - 4)$

Problem 14 Parallel lines survive

Slope of m : $(4 - 1) \div (2 - 0) = 3/2$. Slope of n : $(3 - 0) \div (5 - 3) = 3/2$, so the lines are parallel.

Image points: $(0, -1)$ and $(2, -4)$ for m' ; $(3, 0)$ and $(5, -3)$ for n' .

Slope of m' : $(-4 - (-1)) \div 2 = -3/2$. Slope of n' : $(-3 - 0) \div 2 = -3/2$.

Both image lines have slope $-3/2$, so they are parallel.

Problem 15 Robot on a grid

East adds to x ; south subtracts from y : $(-4 + 7, 3 - 5) = (3, -2)$.

Reflect across the y -axis: $(3, -2) \rightarrow (-3, -2)$.

The robot ends at **$(-3, -2)$** .

Problem 16 Order matters

Program 1: $(2, 3) \rightarrow (-2, 3) \rightarrow (-3, -2)$.

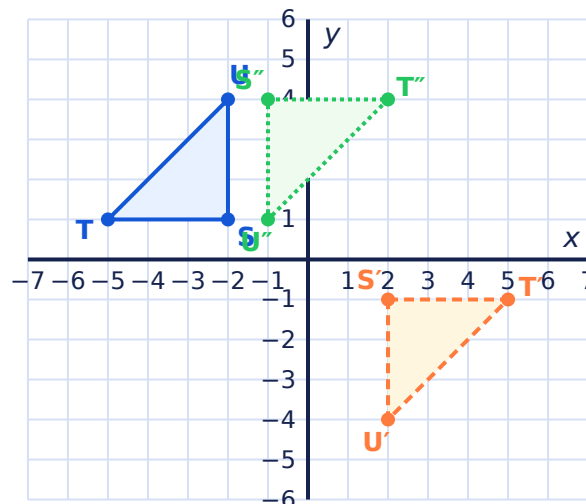
Program 2: $(2, 3) \rightarrow (-3, 2) \rightarrow (3, 2)$.

The final points $(-3, -2)$ and $(3, 2)$ are different, so the order matters.

Problem 17 Sprite in motion

Rotate 180° : $S(-2, 1) \rightarrow (2, -1)$; $T(-5, 1) \rightarrow (5, -1)$; $U(-2, 4) \rightarrow (2, -4)$.

Slide $(x - 3, y + 5)$: $(2, -1) \rightarrow (-1, 4)$; $(5, -1) \rightarrow (2, 4)$; $(2, -4) \rightarrow (-1, 1)$.



Original (blue), after the half turn (orange), and after the slide (green).

Final image: **$S''(-1, 4)$, $T''(2, 4)$, $U''(-1, 1)$**

Problem 18 Table turn

Rule $(x, y) \rightarrow (-y, x)$: $(1, 2) \rightarrow (-2, 1)$; $(5, 2) \rightarrow (-2, 5)$; $(5, 4) \rightarrow (-4, 5)$; $(1, 4) \rightarrow (-4, 1)$.

Original: 4 by 2, area 8. Image: width from -4 to -2 is 2, height from 1 to 5 is 4, area $2 \cdot 4 = 8$.

New corners $(-2, 1)$, $(-2, 5)$, $(-4, 5)$, $(-4, 1)$; area 8 square units in both

Problem 19 Logo in three steps

Rotate: $(2, 2) \rightarrow (-2, 2)$; $(6, 3) \rightarrow (-3, 6)$; $(3, 6) \rightarrow (-6, 3)$.

Reflect across the x-axis: $(-2, -2)$; $(-3, -6)$; $(-6, -3)$.

Translate $(x + 2, y - 1)$: $(0, -3)$; $(-1, -7)$; $(-4, -4)$.

Final vertices $(0, -3)$, $(-1, -7)$, $(-4, -4)$

Problem 20 Two mirrors, one turn

$(6, -1) \rightarrow (6, 1) \rightarrow (-6, 1)$. $(-7, 2) \rightarrow (-7, -2) \rightarrow (7, -2)$.

The rule overall is $(x, y) \rightarrow (-x, -y)$, which is the 180° rotation: $(6, -1) \rightarrow (-6, 1)$ and $(-7, 2) \rightarrow (7, -2)$.

A 180° rotation about the origin