

Geometry · Rigid Transformations · Worksheet

Common Core G-CO.A.2, G-CO.A.3, G-CO.A.4, G-CO.A.5 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

These 25 problems practice standards G-CO.A.2 through G-CO.A.5 with translations, reflections and rotations on the coordinate plane. The set also covers rigid versus non-rigid maps, symmetry and sequences of transformations.

Draw a quick sketch when it helps, and compare distances to decide whether a transformation is rigid. The last six problems are word problems.

GeometryCommon Core: G-CO.A.2 · G-CO.A.3 · G-CO.A.4 · G-CO.A.5

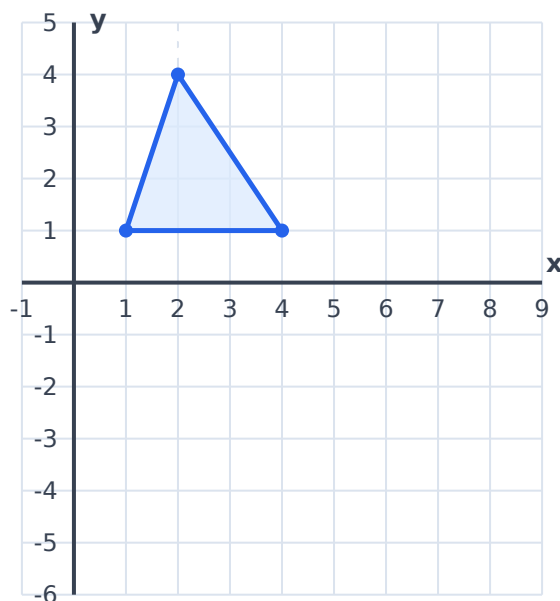
Problem 1: Translate points

Translate each point by the given vector.

- a. $(3, -2)$ by $\langle -5, 4 \rangle$
- b. $(-4, 6)$ by $\langle 7, -9 \rangle$

Problem 2: Translate a triangle

Translate triangle ABC by $\langle 3, -5 \rangle$ and list the vertices of its image.



Triangle ABC.

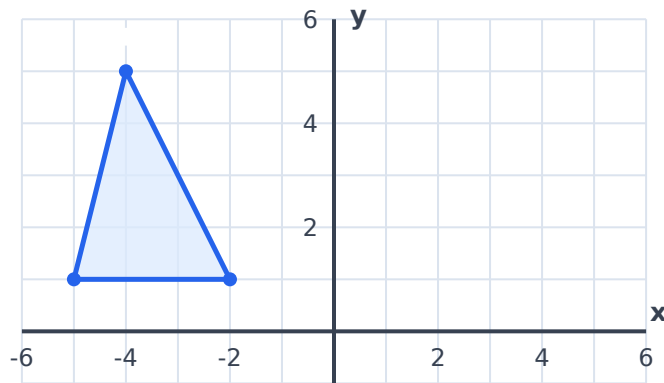
Problem 3: Reflect points over the axes

Find the image of each point.

- a. $(-3, 5)$ reflected over the x-axis
- b. $(-3, 5)$ reflected over the y-axis
- c. $(4, -7)$ reflected over the x-axis

Problem 4: Reflect a triangle over the y-axis

Reflect triangle DEF over the y-axis. Write the coordinates of D' , E' and F' .



Triangle DEF.

Problem 5: Reflect over $y = x$

Reflect each point over the line $y = x$.

- a. $(2, -6)$
- b. $(-4, -1)$
- c. $(0, 5)$

Problem 6: Reflect over a vertical line

Reflect each point over the line $x = 3$.

- a. $(-1, 4)$
- b. $(5, -2)$
- c. $(3, 6)$

Problem 7: Rotate points 90 degrees

Rotate each point 90° counterclockwise about the origin.

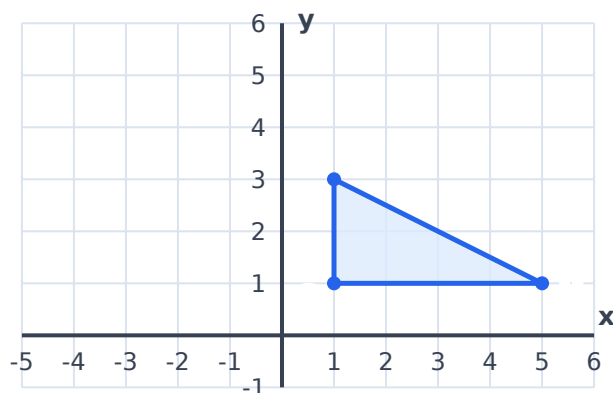
- a. $(4, 1)$
- b. $(-3, 2)$
- c. $(0, -5)$

Problem 8: Rotate 180 degrees and clockwise

(a) Rotate $(-5, 2)$ by 180° about the origin. (b) Rotate $(2, 6)$ by 90° clockwise about the origin.

Problem 9: Rotate a triangle

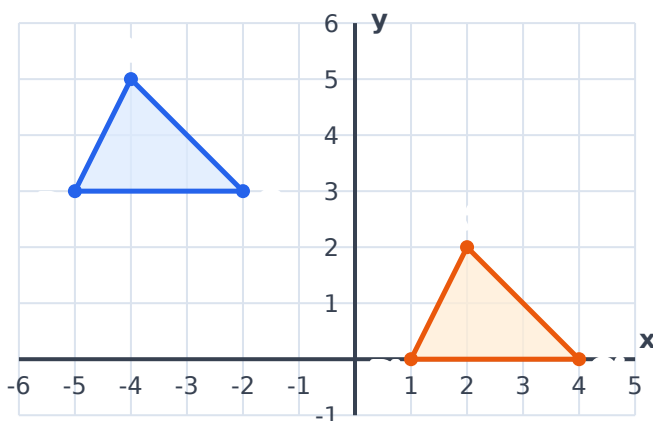
Rotate triangle GHI by 90° counterclockwise about the origin. Find the image of each vertex.



Triangle GHI .

Problem 10: Find the translation vector

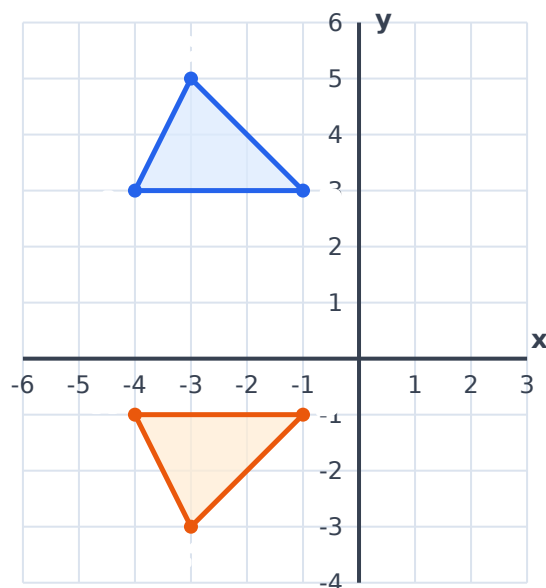
Triangle PQR is translated to triangle $P'Q'R'$. Write the translation as a vector.



Pre-image PQR and image.

Problem 11: Find the line of reflection

Triangle ABC is reflected to triangle $A'B'C'$. Write the equation of the line of reflection.



Pre-image and image.

Problem 12: Rigid or not?

Test each rule on the segment from $(0, 0)$ to $(3, 4)$, which has length 5. State whether the rule could be a rigid transformation.

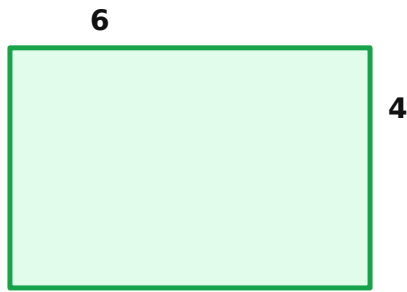
- a. (x, y) to $(x + 4, y - 1)$
- b. (x, y) to $(2x, 2y)$
- c. (x, y) to $(x, -y)$
- d. (x, y) to $(3x, y)$
- e. (x, y) to $(-y, x)$

Problem 13: Compare distances

Segment AB has endpoints $A(1, 2)$ and $B(4, 6)$. (a) Find AB . (b) Find $A'B'$ after the translation (x, y) to $(x-3, y+2)$. (c) Find $A'B'$ after the stretch (x, y) to $(2x, y)$. Which map is rigid?

Problem 14: Symmetry of a rectangle

A rectangle is 6 units long and 4 units wide. (a) How many lines of reflection symmetry does it have? (b) List every rotation about its center, from 0° up to 360° , that maps it onto itself.



Rectangle with length 6 and width 4.

Problem 15: Symmetry of a regular hexagon

A regular hexagon has 6 equal sides and 6 equal angles. How many lines of symmetry does it have, and which rotations about its center, less than 360° , map it onto itself?

Problem 16: Symmetries of other shapes

For each figure, give the number of lines of symmetry and describe its rotational symmetry (other than a full turn).

- a. a parallelogram that is not a rectangle or rhombus
- b. an isosceles trapezoid
- c. a regular pentagon

Problem 17: Translate, then reflect

Apply the sequence to each point: translate by $\langle -4, 1 \rangle$, then reflect over the x-axis.

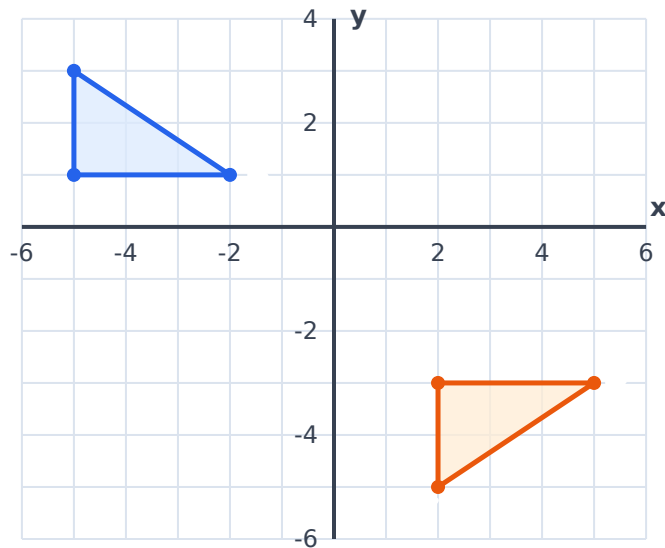
- a. $(2, 3)$
- b. $(0, -2)$

Problem 18: Rotate, then reflect

Triangle KLM has vertices $K(1, 1)$, $L(3, 1)$, $M(1, 4)$. Rotate it 90° counterclockwise about the origin, then reflect over the y-axis. (a) Find the final vertices. (b) Which single transformation gives the same result?

Problem 19: Describe a sequence

Describe a sequence of two rigid transformations that maps triangle ABC onto triangle $A''B''C''$.



Pre-image and final image.

Problem 20: Video game character

In a video game, Noah moves his character from $(3, -4)$ by the vector $\langle -7, 6 \rangle$. Then the game rotates the character 90° counterclockwise about the origin. Find the final position.

Problem 21: Park statues

On a park map, a statue stands at $(-6, 3)$. The city builds a matching statue by reflecting the first one over a straight walkway on the line $x = 1$. Where does the second statue stand?

Problem 22: Logo design

Mei draws a triangular logo with vertices $(2, 1)$, $(5, 1)$ and $(3, 4)$. She rotates it 180° about the origin for the back of a T-shirt. Find the new vertices.

Problem 23: Pinwheel

Sofia designs a pinwheel with 8 identical blades equally spaced around its center. What is the smallest rotation that maps the pinwheel onto itself? List all rotations from 0° to 360° that work.

Problem 24: Perimeter after a sequence

Ethan translates triangle ABC with $A(-4, 1)$, $B(-1, 1)$, $C(-4, 5)$ by $\langle 6, -3 \rangle$, then reflects it over the x-axis. Find the final vertices and compare the perimeters before and after.

Problem 25: Does order matter?

Priya says that translating by $\langle 3, 0 \rangle$ and then reflecting over the y-axis always gives the same result as reflecting first and then translating. Test her claim with the point $(1, 2)$.