Transformations on the Coordinate Plane

Coordinate transformations: Applications and decisions

Name _____ **Date** _____ **Score** _____ / 6

QUICK REVIEW

A translation by (a, b) changes (x, y) to $(x + a, y + b)$. A reflection across the horizontal axis gives $(x, -y)$; across the vertical axis it gives $(-x, y)$. Translations and reflections preserve lengths. Label image points with primes, such as A'.

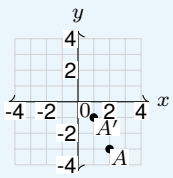
Worked example

Point A is at $(2, -3)$. Move it 1 unit left and 2 units up. Plot the original and label the image A'.

1. A: $(2 + (-1), -3 + (2)) = (1, -1)$.

2. Undo the translation: $(1 - (-1), -1 - (2)) = (2, -3)$.

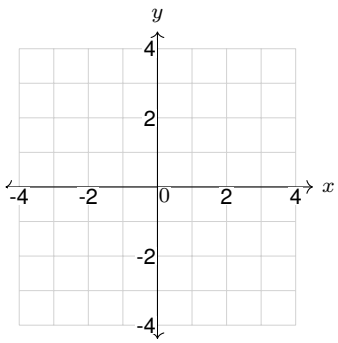
Answer: A′$(1, -1)$.



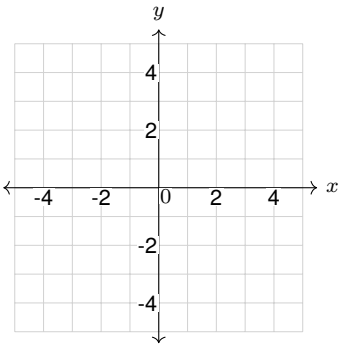
Practice Problems

Show your thinking.

1. A trail marker is moved 4 units east and 2 north. Start with T$(-3, -1)$; translate by $(4, 2)$. Plot the original and image, labeling image points with primes.

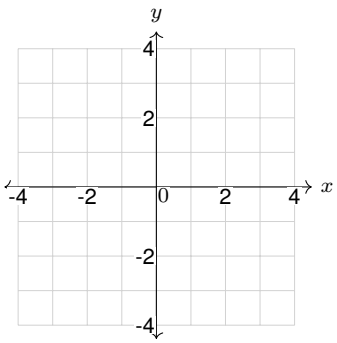


2. Design a mirrored triangular logo. Start with A$(1, 2)$, B$(3, 2)$, C$(1, 4)$; reflect across the horizontal axis. Plot the original and image, labeling image points with primes.

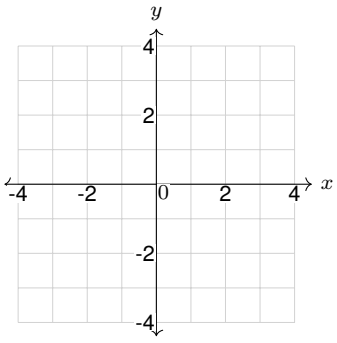


3. A map marker is reflected across a vertical river modeled by the vertical axis. Start with L$(-3, 1)$; reflect across the vertical axis. Give the image coordinates.

4. Recover a robot destination after a west-and-north move. Start with R$(2, -2)$; translate by $(-4, 3)$. Plot the original and image, labeling image points with primes.



5. A sign designer changes x instead of y in a horizontal mirror. Repair it. Start with P$(2, 3)$; reflect across the horizontal axis. Plot the original and image, labeling image points with primes.



6. Reflect a fence segment and explain how its length stays 2 units. Start with S$(-2, 0)$, T$(-2, 2)$; reflect across the vertical axis. Give the image coordinates.

Answer Key

1. T′$(1, 1)$.
2. A′$(1, -2)$; B′$(3, -2)$; C′$(1, -4)$.
3. L′$(3, 1)$.
4. R′$(-2, 1)$.
5. P′$(2, -3)$.
6. S′$(2, 0)$; T′$(2, 2)$. Both segments are 2 units long.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. T: $(-3 + (4), -1 + (2)) = (1, 1)$.
2. Undo the translation: $(1 - (4), 1 - (2)) = (-3, -1)$.

Problem 2

1. A: keep $x = 1$ and change y to $-(2) = -2$, giving $(1, -2)$.
2. B: keep $x = 3$ and change y to $-(2) = -2$, giving $(3, -2)$.
3. C: keep $x = 1$ and change y to $-(4) = -4$, giving $(1, -4)$.

Problem 3

1. L: change x to $-(-3) = 3$ and keep $y = 1$, giving $(3, 1)$.
2. The perpendicular distance to the mirror stays 3 units on both sides.

Problem 4

1. R: $(2 + (-4), -2 + (3)) = (-2, 1)$.
2. Undo the translation: $(-2 - (-4), 1 - (3)) = (2, -2)$.

Problem 5

1. P: keep $x = 2$ and change y to $-(3) = -3$, giving $(2, -3)$.
2. The perpendicular distance to the mirror stays 3 units on both sides.

Problem 6

1. S: change x to $-(-2) = 2$ and keep $y = 0$, giving $(2, 0)$.
2. T: change x to $-(-2) = 2$ and keep $y = 2$, giving $(2, 2)$.
3. Reflection keeps the y values 0 and 2. Both vertical segments have length $2 - 0 = 2$ units.

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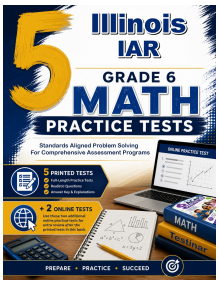

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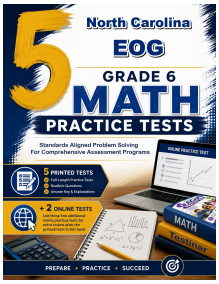

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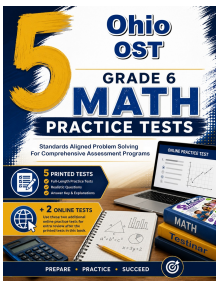

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