LESSON MAKER PRO

Point Moves

Track points through transformations and compare what stays the same.

HIGH SCHOOL · GDA.GM.D.21

GDA.GM.D.21 "Represent transformations and compositions of transformations in the plane (coordinate and otherwise) using tools such as tracing paper and geometry software. a..."

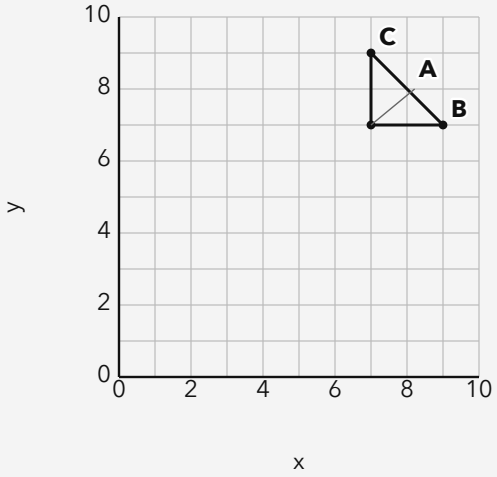
NAME _____ DATE _____

THE BIG IDEA

A transformation is a function: it takes a point as input and gives a point as output. In $(T \circ R)(P)$, apply R to P first, then apply T to the result. Translations, rotations, and reflections preserve distances and angles. A dilation preserves angles but changes distances when its scale factor is not 1.

WORKED EXAMPLE

Reflect triangle ABC across the x-axis, then move it 5 units left. Find the final coordinates. Does this composition preserve distances and angles?

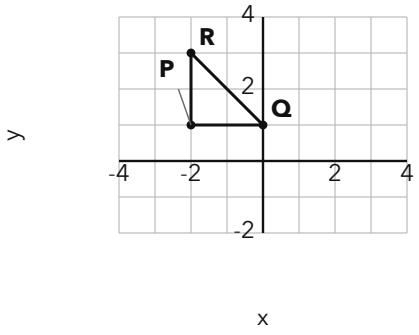


1. Reflect across the x-axis: A → (7, -7), B → (9, -7), C → (7, -9).
2. Subtract 5 from each x-coordinate: A → (2, -7), B → (4, -7), C → (2, -9).
3. Both moves preserve distances and angles, so their composition does too.

Answer: A → (2, -7), B → (4, -7), C → (2, -9). Distances and angles are preserved.

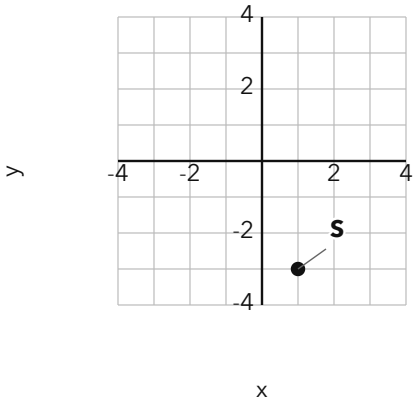
PRACTICE 6 problems

1 Reflect the triangle shown across the y-axis. List the image's vertex coordinates.



ANSWER _____

2 For the point shown, let R be a reflection across the x-axis and T be a translation 2 units right and 1 unit down. Find (T∘R)(S).



ANSWER _____

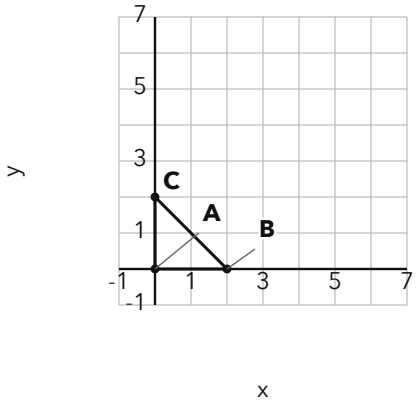
3 Let R rotate points 90° counterclockwise about the origin, and let D dilate points by a factor of 2 about the origin. Find (D∘R)(P) for P = (-1, 2).

ANSWER _____

4 For P = (2, 1), let R reflect points across the y-axis and T translate points 4 units right. Find both (T∘R)(P) and (R∘T)(P).

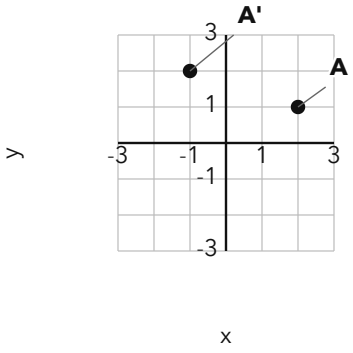
ANSWER _____

5 Dilate the triangle shown by a factor of 3 about the origin. What is the new length of AB? Does the dilation preserve distances and angles?



ANSWER _____

6 The graph shows A and its image A'. Which maps A to A': a reflection across the y-axis or a 90° counterclockwise rotation about the origin? Write the coordinate rule.



ANSWER _____

APPLY IT Show your work

1 In a video-editing app, a sticker's center starts at (-2, -1). You rotate the sticker 90° clockwise about the origin, then move it 3 units right and 2 units up. Where is its center now? Does this edit preserve distances and angles?

WORK SPACE

ANSWER _____

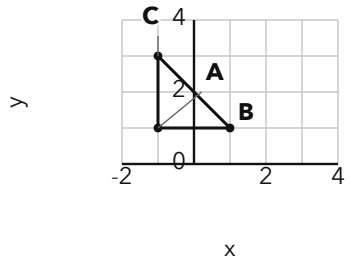
2 A concert poster app enlarges a design by a factor of 2 about the origin, then moves it 1 unit left and 2 units down. A line in the design has endpoints A = (1, 0) and B = (1, 2). Find the final endpoints and the line's final length. Does this edit preserve distances and angles?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Use the triangle shown. Reflect it across the y-axis, then dilate it by a factor of 2 about the origin. Finally, translate it so A' lands at (3, 0). Find the final coordinates of B' and C'. Explain what happens to the triangle's side lengths and angles.



WORK SPACE AND ANSWER

ANSWER KEY # Point Moves

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Reflect the triangle shown across the y-axis. List the image's vertex coordinates.	**P' = (2, 1), Q' = (0, 1), R' = (2, 3)**
2	For the point shown, let R be a reflection across the x-axis and T be a translation 2 units right and 1 unit down. Find $(T \circ R)(S)$.	**(3, 2)**
3	Let R rotate points 90° counterclockwise about the origin, and let D dilate points by a factor of 2 about the origin. Find $(D \circ R)(P)$ for P = (-1, 2).	**(-4, -2)**
4	For P = (2, 1), let R reflect points across the y-axis and T translate points 4 units right. Find both $(T \circ R)(P)$ and $(R \circ T)(P)$.	**$(T \circ R)(P)$ = (2, 1); $(R \circ T)(P)$ = (-6, 1)**
5	Dilate the triangle shown by a factor of 3 about the origin. What is the new length of AB? Does the dilation preserve distances and angles?	**The new length of AB is 6 units. Angles are preserved, but distances are not.**
6	The graph shows A and its image A'. Which maps A to A': a reflection across the y-axis or a 90° counterclockwise rotation about the origin? Write the coordinate rule.	**A 90° counterclockwise rotation; (x, y) → (-y, x)**

PART 2 · APPLY IT

1. **The center is at (2, 4). Distances and angles are preserved.** The rotation sends (-2, -1) to (-1, 2). The translation sends (-1, 2) to (2, 4); both moves preserve distances and angles.
2. **A' = (1, -2), B' = (1, 2), and the final length is 4 units. Angles are preserved, but distances are not.** The dilation sends A and B to (2, 0) and (2, 4); the translation sends them to (1, -2) and (1, 2). The dilation doubles the original 2-unit length and preserves angles.

CHALLENGE

B' = (-1, 0) and C' = (3, 4). After the reflection and dilation, A is at (2, 2), so the final translation is 1 unit right and 2 units down. Every side length doubles, and every angle stays the same.

Accept equivalent coordinate notation, including arrows in place of prime marks. For the challenge, the translation is 1 unit right and 2 units down.