

Line Shift Lab

Track parallel lines through transformations.

GRADE 8 • 8.G.A.1c

CCSS.Math.Content.8.G.A.1c "Parallel lines are taken to parallel lines."

NAME _____

DATE _____

PARALLEL STAYS PARALLEL

A translation, rotation, reflection, or dilation sends a line to another line. If two starting lines are parallel, their image lines are still parallel, even when their slopes change. Compare the image slopes or equations to check that the lines remain parallel.

WORKED EXAMPLE

Lines $p: y = 4x + 9$ and $q: y = 4x - 6$ are parallel. Translate both lines 8 units right and 5 units down. Write the image equations.

1. New coordinates satisfy $x_{\text{old}} = x - 8$ and $y_{\text{old}} = y + 5$.
2. For p : $y + 5 = 4(x - 8) + 9$.
3. Simplify p' : $y = 4x - 28$.
4. For q , simplify to q' : $y = 4x - 43$.

Answer: $p': y = 4x - 28$ and $q': y = 4x - 43$

PRACTICE 6 problems

- 1** Reflect the parallel lines $y = 2x + 1$ and $y = 2x - 7$ across the y -axis. Write both image equations.

ANSWER _____

- 2** Translate the parallel lines $y = -3x + 10$ and $y = -3x - 12$ by 11 units right and 2 units up. Write both image equations.

ANSWER _____

- 3** Line a passes through $(0, 1)$ and $(2, 3)$. Line b passes through $(10, 12)$ and $(12, 14)$. Reflect both lines across the x -axis. What are the slopes of the image lines? Are they parallel?

ANSWER _____

- 4** The parallel lines $y = 7x + 1$ and $y = 7x - 2$ are dilated from the origin by a scale factor of 2. What is the slope of each image line? What does this show?

ANSWER _____

- 5** Rotate the parallel vertical lines $x = 12$ and $x = 15$ by 90 degrees counterclockwise about the origin. Write both image equations.

ANSWER _____

- 6** Translate the parallel lines $y = -10x + 3$ and $y = -10x + 11$ by 7 units left and 1 unit down. Write both image equations.

ANSWER _____

APPLY IT Show your work

- 1** A game designer draws two parallel laser paths on a coordinate map. Path A passes through (20, 1) and (22, 3). Path B passes through (30, -2) and (32, 0). The designer shifts every map feature 10 units right and 12 units up. Write the equations of the two image paths. Are they parallel?

WORK SPACE

ANSWER _____

- 2** In a sneaker-design app, two parallel stripe edges are $y = 3x + 2$ and $y = 3x - 7$. The app mirrors the design across the y-axis. Write the equations of the mirrored stripe edges. Explain why they are still parallel.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

The parallel lines $y = 2x + 13$ and $y = 2x - 10$ are first reflected across the y-axis. Then both image lines are translated 11 units left and 12 units up. Write the final equations. Explain why the final lines are parallel.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Reflect the parallel lines $y = 2x + 1$ and $y = 2x - 7$ across the y-axis. Write both image equations.	$y = -2x + 1$ and $y = -2x - 7$
2	Translate the parallel lines $y = -3x + 10$ and $y = -3x - 12$ by 11 units right and 2 units up. Write both image equations.	$y = -3x + 45$ and $y = -3x + 23$
3	Line a passes through (0, 1) and (2, 3). Line b passes through (10, 12) and (12, 14). Reflect both lines across the x-axis. What are the slopes of the image lines? Are they parallel?	Both image slopes are -1. Yes, the image lines are parallel.
4	The parallel lines $y = 7x + 1$ and $y = 7x - 2$ are dilated from the origin by a scale factor of 2. What is the slope of each image line? What does this show?	Each image line has slope 7. The image lines are parallel.
5	Rotate the parallel vertical lines $x = 12$ and $x = 15$ by 90 degrees counterclockwise about the origin. Write both image equations.	$y = 12$ and $y = 15$
6	Translate the parallel lines $y = -10x + 3$ and $y = -10x + 11$ by 7 units left and 1 unit down. Write both image equations.	$y = -10x - 68$ and $y = -10x - 60$

PART 2 • APPLY IT

- Path A: $y = x - 17$. Path B: $y = x - 27$. Yes, they are parallel.** The original equations are $y = x - 19$ and $y = x - 29$. The translation changes each y-intercept by 2, so both image lines have slope 1.
- $y = -3x + 2$ and $y = -3x - 7$. They are parallel because both image lines have slope -3.** Reflection across the y-axis changes the sign of each slope but keeps each y-intercept the same. Both image slopes are -3.

CHALLENGE

The final equations are $y = -2x + 3$ and $y = -2x - 20$. The final lines are parallel because both have slope -2.

Accept equivalent equation forms that represent the same lines. For explanation responses, accept reasoning that correctly states that the image lines have equal slopes or that transformations preserve parallel lines.