LESSON MAKER PRO

Parallel Move Mission

Track how transformations keep lines parallel.

GRADE 8 · 8.G.A.1c

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

NAME _____ DATE _____

PARALLEL LINES STAY PARALLEL

A translation, rotation or reflection maps a pair of distinct parallel lines to another pair of distinct parallel lines. Equal slopes show that nonvertical supporting lines are parallel or coincident; check that the lines are distinct. A translated line can coincide with its own original position when the translation follows that line.

WORKED EXAMPLE

Line t passes through (16, 17) and (23, 31). Translate line t by <12, 15>. Show that the image is parallel to line t.

1. Find the slope of t: (31 - 17) / (23 - 16) = 14 / 7 = 2.
2. Translate the points: (16, 17) becomes (28, 32), and (23, 31) becomes (35, 46).
3. Find the image slope: (46 - 32) / (35 - 28) = 14 / 7 = 2.

Answer: The image has slope 2, the same as line t, so the image is parallel to line t.

PRACTICE 6 problems

1 Line p passes through (-4, 1) and (0, 5). It is translated by <3, -6>. What is the slope of the image of line p?

ANSWER _____

2 Reflect the line y = 3x + 4 across the y-axis. Write the equation of the image, then give its slope.

ANSWER _____

_____

3 Point (4, -3) lies on line m. Line m is translated by <5, 8>. What is the image of the point, and is the image of line m parallel to line m?

ANSWER _____

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4 Line r has equation y = -4x + 1. Translate it 3 units right and 8 units down. Write the equation of the image.

ANSWER _____

5 Line a has equation y = 3x + 5, and line b has equation y = 3x + 18. Both lines are rotated 180° about the origin. Are their images parallel? Give the slope of each image.

ANSWER _____

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6 A student says that a line with slope -3/4 will have slope -5/6 after a translation by <8, -1>. Identify the error and state the correct slope.

ANSWER _____

_____

APPLY IT Show your work

1 A game designer uses the boundary line y = -x + 4 for a laser path in a game level. For a new level, every point on the path is shifted 6 units right and 9 units up. Write the equation of the new laser path. Explain why it is parallel to the original path.

WORK SPACE

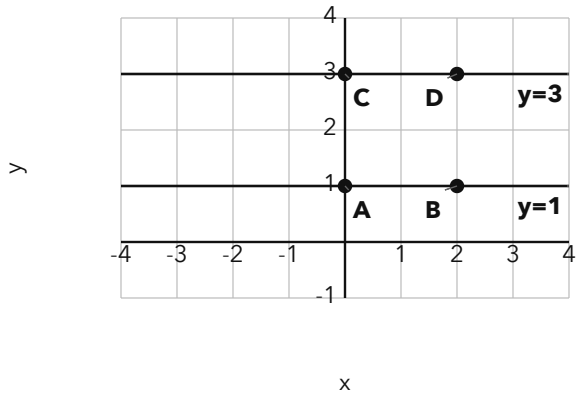
ANSWER

2 A robotics club programs a camera rail along the line y = 4x - 6. The rail is moved 3 units left and 5 units down. Write the equation of the new rail and state whether it is parallel to the original rail.

WORK SPACE

ANSWER

3 Experiment with the two plotted parallel lines y=1 and y=3. Your teacher supplies tracing paper and a ruler. Trace both lines, the origin and marked points (0,1),(2,1),(0,3),(2,3). Rotate the tracing 90° counterclockwise about the fixed origin, and draw both images on the grid. Label the four image points. Use the grid and ruler to compare the directions and perpendicular spacing of the original pair and image pair. Record what you observed and explain whether the image lines are parallel. Use extra paper for your comparison record.



ANSWER

CHALLENGE One step up

Two nonvertical parallel lines both have slope r. Reflect both lines across the y-axis. Explain why their images are parallel. Also explain what happens if the original parallel lines are vertical.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Line p passes through (-4, 1) and (0, 5). It is translated by <3, -6>. What is the slope of the image of line p?	**1**
2	Reflect the line y = 3x + 4 across the y-axis. Write the equation of the image, then give its slope.	**y = -3x + 4; slope -3**
3	Point (4, -3) lies on line m. Line m is translated by <5, 8>. What is the image of the point, and is the image of line m parallel to line m?	**The image point is (9, 5). The image line has the same direction as m. It coincides with m if m has direction (5, 8), and otherwise is a distinct parallel line. The point alone does not determine which case occurs.**
4	Line r has equation y = -4x + 1. Translate it 3 units right and 8 units down. Write the equation of the image.	**y = -4x + 5**
5	Line a has equation y = 3x + 5, and line b has equation y = 3x + 18. Both lines are rotated 180° about the origin. Are their images parallel? Give the slope of each image.	**Yes; both image slopes are 3.**
6	A student says that a line with slope -3/4 will have slope -5/6 after a translation by <8, -1>. Identify the error and state the correct slope.	**A translation does not change slope; the correct slope is -3/4.**

PART 2 · APPLY IT

1. **y = -x + 19; both lines have slope -1, so they are parallel.** Replace the original x-coordinate with x - 6, then add 9 to the y-value. The slope remains -1 after the translation.
2. **y = 4x + 1; yes, it is parallel to the original rail.** A shift left 3 means use x + 3 in the original equation, then subtract 5 from the y-value. The new line still has slope 4.
3. **A'(-1,0), B'(-1,2), C'(-3,0), D'(-3,2); images are x=-1 and x=-3, both vertical and parallel. Original and image pairs each have perpendicular spacing 2 grid units.** Original horizontal lines rotate into distinct vertical lines. Check the actually rotated tracing and recorded direction/spacing comparison as experimental evidence; no finite slope is assigned to a vertical line.

CHALLENGE

For a nonvertical line, reflection across the y-axis changes a slope of r to -r. Both images have slope -r, so they are parallel. Vertical lines reflect to vertical lines, so their images are also parallel.

Accept equivalent equations, such as x + y = 19 for y = -x + 19. For written explanations, accept any correct statement that the same transformation preserves equal slopes, or preserves vertical lines as vertical. For Apply It 3 supply tracing paper/ruler, support the fixed-origin rotation and inspect the actual two-line image and observed direction/perpendicular-spacing record. Accept reasonable measurement tolerance; image slopes are undefined, not zero.

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Apply It 3: original horizontal lines and rotated vertical lines x=-1 and x=-3; spacing 2 grid units for each pair.

