

Line Shift Lab

Track how dilations move lines on a coordinate plane.

HIGH SCHOOL • HSG-SRT.A.1a

CCSS.Math.Content.HSG-SRT.A.1a "A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged."

NAME _____

DATE _____

CHECK THE CENTER

First, check whether the line passes through the center of dilation. A line through the center stays on the same line. A line that does not pass through the center maps to a parallel line, and its distance from the center is multiplied by the scale factor.

WORKED EXAMPLE

A dilation centered at the origin has scale factor 5. Find the image of line $y = 2x + 3$.

1. Write image coordinates as (X, Y) , where $X = 5x$ and $Y = 5y$.
2. Substitute $x = X/5$ and $y = Y/5$ into $y = 2x + 3$.
3. $Y/5 = 2(X/5) + 3$, so $Y = 2X + 15$.

Answer: $y = 2x + 15$; the image is parallel to the original line.

PRACTICE 6 problems

- 1** A dilation centered at the origin has scale factor 4. Line m is $y = -x + 7$. Write the equation of the image of m . Is the image parallel to m or unchanged?

ANSWER _____

- 2** A dilation centered at the origin has scale factor 8. It maps line n : $x = 6$. Write the equation of the image of n . Is the image parallel to n or unchanged?

ANSWER _____

- 3** Line p has equation $y = 4x$ and passes through the origin. A dilation centered at the origin has scale factor 7. What is the equation of the image of p ?

ANSWER _____

- 4** A dilation has center $C = (4, -1)$ and scale factor 6. It maps the vertical line $x = 7$. Write the equation of the image. Is the image parallel to the original line or unchanged?

ANSWER _____

- 5** A dilation centered at the origin has scale factor 4 and maps line q : $y = 9$. Is the image unchanged or parallel to q ? Write its equation.

ANSWER _____

- 6** A dilation centered at the origin has scale factor 8. The image of a horizontal line is $y = 56$. What was the equation of the original line? How are the lines related?

ANSWER _____

APPLY IT Show your work

- 1** A student is enlarging a coordinate-grid background for a video game. The dilation is centered at the origin with scale factor 4. A road lies on $y = 9$. What equation describes the enlarged road, and how is it related to the original road?

WORK SPACE

ANSWER _____

- 2** For a school mural, a designer uses a dilation centered at $C = (8, 1)$ with scale factor 4. A horizontal border lies on $y = 10$. What equation describes the image of the border, and how is it related to the original border?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A dilation centered at the origin maps line r : $y = 4x + 6$ to line r' : $y = 4x + 42$. Find the scale factor. Then explain why r' is parallel to r instead of unchanged.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A dilation centered at the origin has scale factor 4. Line m is $y = -x + 7$. Write the equation of the image of m . Is the image parallel to m or unchanged?	$y = -x + 28$; parallel to m
2	A dilation centered at the origin has scale factor 8. It maps line n : $x = 6$. Write the equation of the image of n . Is the image parallel to n or unchanged?	$x = 48$; parallel to n
3	Line p has equation $y = 4x$ and passes through the origin. A dilation centered at the origin has scale factor 7. What is the equation of the image of p ?	$y = 4x$; unchanged
4	A dilation has center $C = (4, -1)$ and scale factor 6. It maps the vertical line $x = 7$. Write the equation of the image. Is the image parallel to the original line or unchanged?	$x = 22$; parallel to the original line
5	A dilation centered at the origin has scale factor 4 and maps line q : $y = 9$. Is the image unchanged or parallel to q ? Write its equation.	$y = 36$; parallel to q
6	A dilation centered at the origin has scale factor 8. The image of a horizontal line is $y = 56$. What was the equation of the original line? How are the lines related?	$y = 7$; the image is parallel to the original line

PART 2 • APPLY IT

- $y = 36$; the enlarged road is parallel to the original road** The road does not pass through the origin, so its image is parallel. Multiply its y -value by 4: $4(9) = 36$.
- $y = 37$; the image border is parallel to the original border** The border is 9 units above the center because $10 - 1 = 9$. Its image is $4(9) = 36$ units above the center, so its y -value is $1 + 36 = 37$.

CHALLENGE

The scale factor is 7. Line r does not pass through the origin because its y -intercept is 6. The dilation multiplies the intercept by 7, changing it to 42, while the slope stays 4, so r' is parallel to r .

Accept equivalent equations, including equations written with variables other than x and y . Require students to identify a line through the center as unchanged and a line not through the center as parallel to its image.