MAIN IDEA

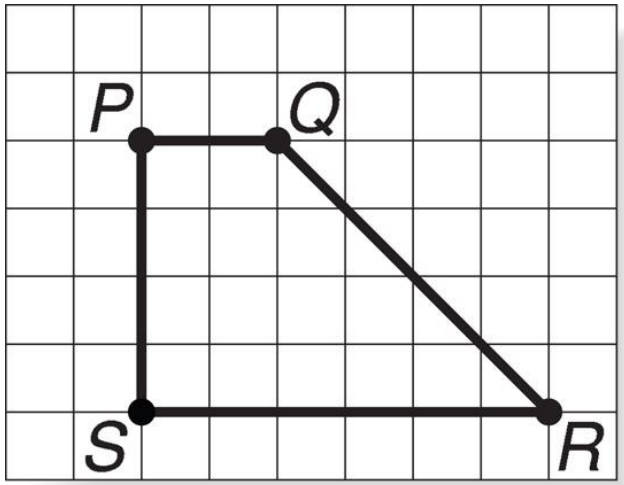
- Graph dilations on a coordinate plane.

New Vocabulary

- dilation
- center
- enlargement
- reduction

EXAMPLE Draw a Dilation

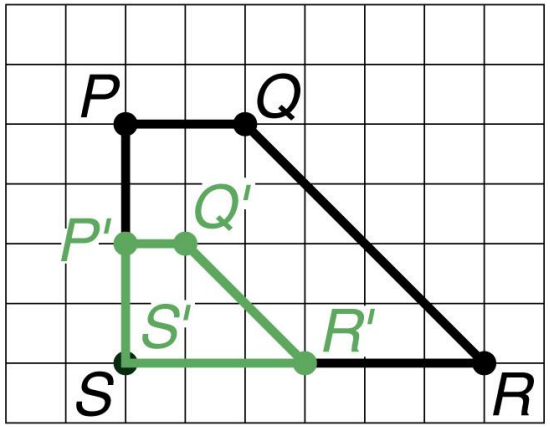
1 Copy polygon *PQRS* on graph paper. Then draw the image of the figure after a dilation with center *S* by a scale factor of $\frac{1}{2}$.



EXAMPLE Draw a Dilation

Step 1 Use segment SP to locate point P'.

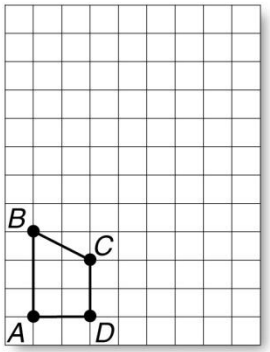
Step 2 Use a ruler to locate point P' on $\overline{SP}$ such that $SP' = \frac{1}{2}(SP)$.



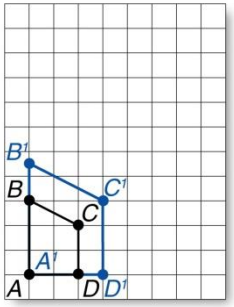
Step 3 Repeat Steps 1 and 2 for points Q' and R'. Be sure to draw segment SQ before locating point Q'. Then draw polygon $P'Q'R'S'$, where $S = S'$.

CHECK Your Progress

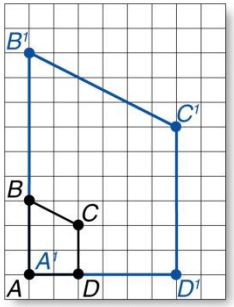
1 Copy polygon *ABCD* on graph paper. Then draw the image of the figure after a dilation with center *A* by a scale factor of 2.



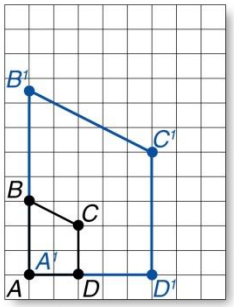
A.



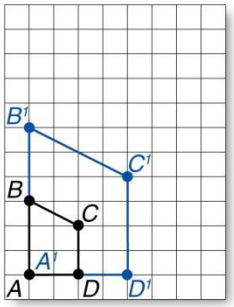
B.

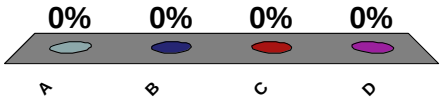


C.



D.





EXAMPLE Graph a Dilation

2 Graph $\triangle MNO$ with vertices $M(3, -1)$, $N(2, -2)$, and $O(0, 4)$. Then graph its image $\triangle M'N'O'$ after a dilation with a scale factor of $\frac{3}{2}$.

To find the vertices of the dilation, multiply each coordinate in the ordered pairs by $\frac{3}{2}$. The graph both images on the same axes.

EXAMPLE 2 Graph a Dilation

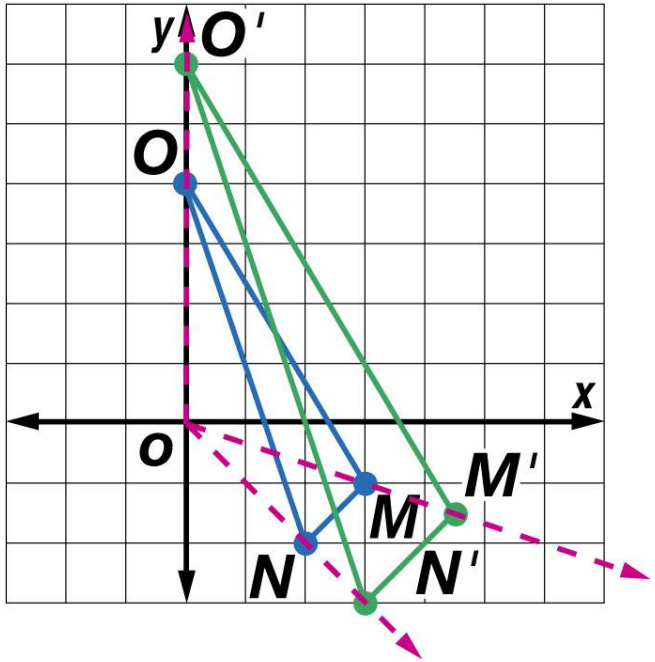
$M(3, -1) \rightarrow \left(3 \bullet \frac{3}{2}, -1 \bullet \frac{3}{2}\right) \rightarrow M'\left(\frac{9}{2}, -\frac{3}{2}\right)$

$N(2, -2) \rightarrow \left(2 \bullet \frac{3}{2}, -2 \bullet \frac{3}{2}\right) \rightarrow N'(3, -3)$

$O(0, 4) \rightarrow \left(0 \bullet \frac{3}{2}, 4 \bullet \frac{3}{2}\right) \rightarrow O'(0, 6)$

EXAMPLE Graph a Dilation

2 Answer:



$M'\left(\frac{9}{2}, -\frac{3}{2}\right)$

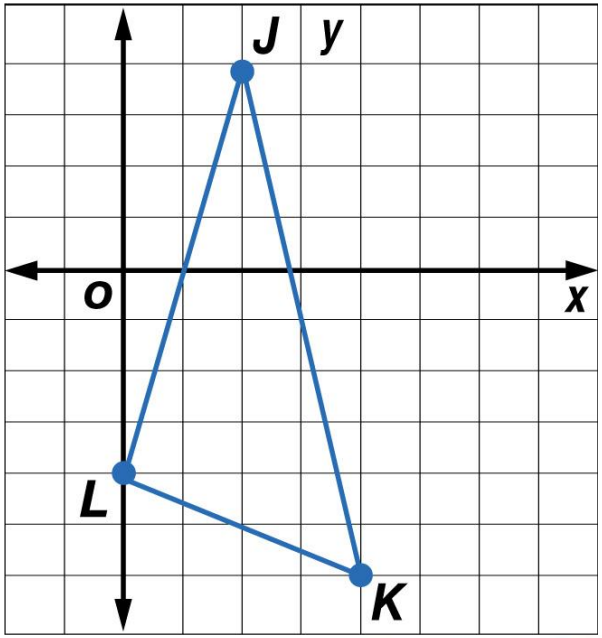
$N'(3, -3)$

$O'(0, 6)$

Check Draw lines through the origin and each of the vertices of the original figure. The vertices of the dilation should lie on those same lines.

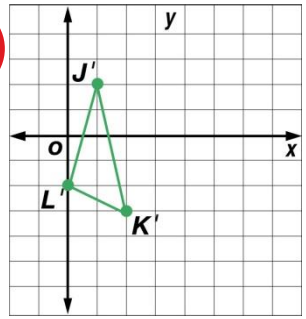
CHECK Your Progress

2 Graph $\triangle JKL$ with vertices $J(2, 4)$, $K(4, -6)$, and $L(0, -4)$. Then graph its image $\triangle J'K'L'$ after a dilation with a scale factor of $\frac{1}{2}$.

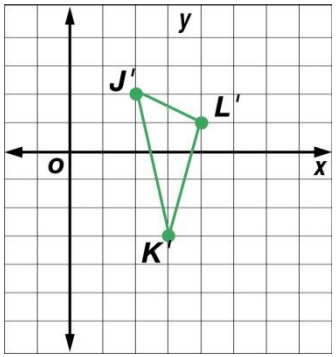


CHECK Your Progress

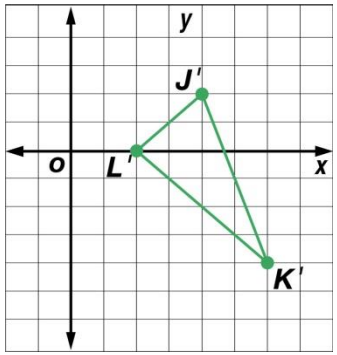
2 **A.**



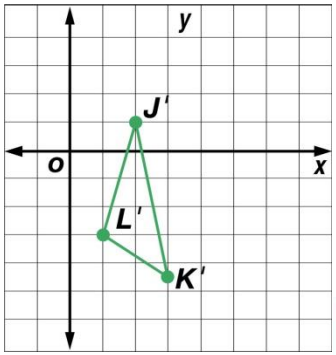
B.

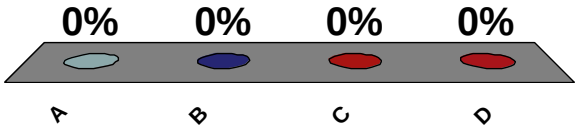


C.



D.





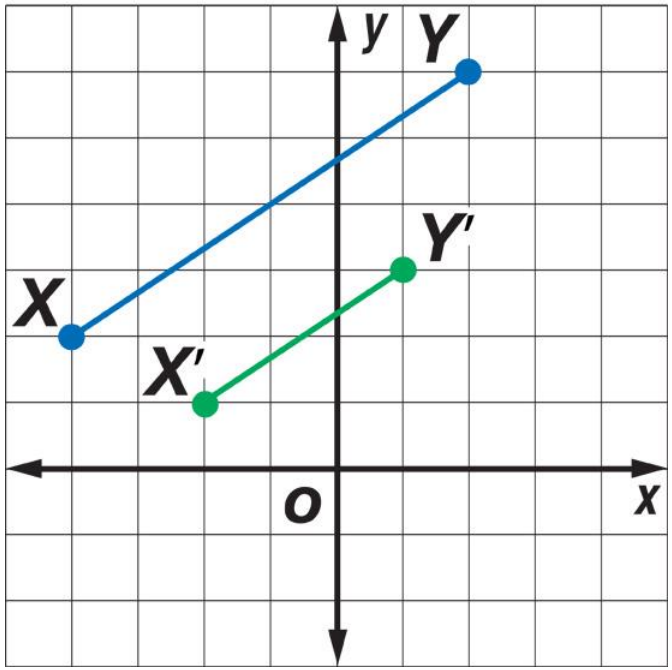
Concepts in MOtion

Interactive Lab: Dilations

Click here to view!

EXAMPLE Find and Classify a Scale Factor

3 **In the figure, segment *X′Y′* is a dilation of segment *XY.* Find the scale factor of the dilation, and classify it as an *enlargement* or as a *reduction.***



EXAMPLE Find and Classify a Scale Factor

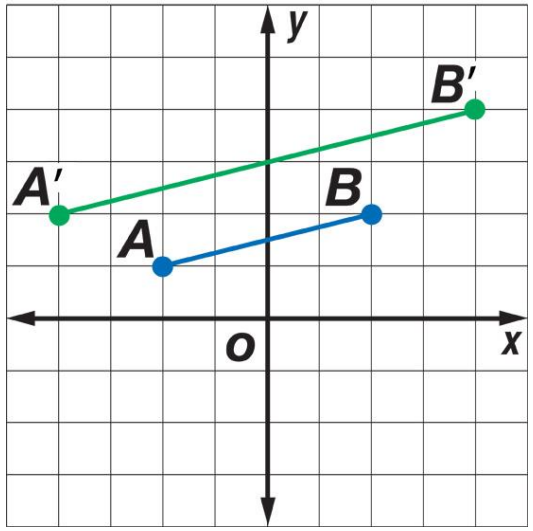
3 Write a ratio of the *x*- or *y*-coordinate of one vertex of the dilation to the *x*- or *y*-coordinate of the corresponding vertex of the original figure. Use the *y*-coordinates of $X(-4, 2)$ and $X'(-2, 1)$.

$$\frac{y\text{-coordinate of } X'}{y\text{-coordinate of } X} = \frac{1}{2}$$

Answer: The scale factor is $\frac{1}{2}$. Since the image is smaller than the original figure, the dilation is a reduction.

CHECK Your Progress

3 **In the figure, segment *A′B′* is a dilation of segment *AB*. Find the scale factor of the dilation, and classify it as an *enlargement* or as a *reduction*.**

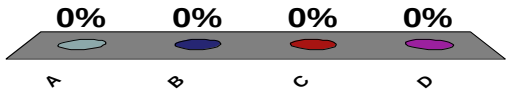


A. 3; enlargement

B. 2; enlargement

C. $\frac{1}{3}$; reduction

D. $\frac{1}{3}$; reduction



Real-World EXAMPLE

4 **EYES** The pupil of Josh's eye is 6 millimeters in diameter. His doctor uses medicine to dilate his pupils by a factor of $\frac{3}{2}$. Find the new diameter once his pupil is dilated.

Real-World EXAMPLE

4

Words The size of the pupil after dilating is $\frac{3}{2}$ the size of the pupil before dilation.

Variable Let a represent the size of the pupil after dilation.

Equation $a = \frac{3}{2} \cdot 6$

Real-World EXAMPLE

4 $a = \frac{3}{2} \cdot 6$ Write the equation.

$a = 9$ Multiply.

Answer: His pupil will be 9 millimeters in diameter once dilated.

CHECK Your Progress

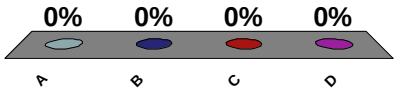
4 **EYES** The pupil of Laden's eye is 8 millimeters in diameter. Her doctor uses medicine to dilate his pupils by a factor of $\frac{3}{2}$. Find the new diameter once his pupil is dilated.

A. 10 mm

B. 11 mm

C. 12 mm

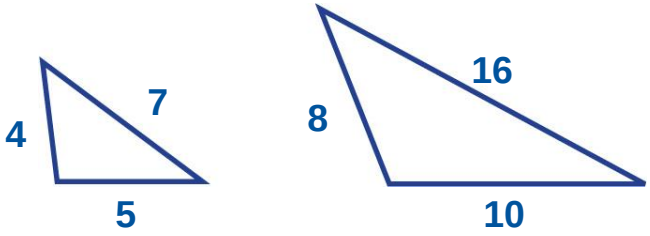
D. 14 mm



CheckPoint

Five-Minute CHECK (over Lesson 4-7)

1 Determine whether the pair of polygons is similar. Explain your reasoning.



A. Yes; corresponding sides are not proportional.

B. Yes; corresponding sides are proportional.

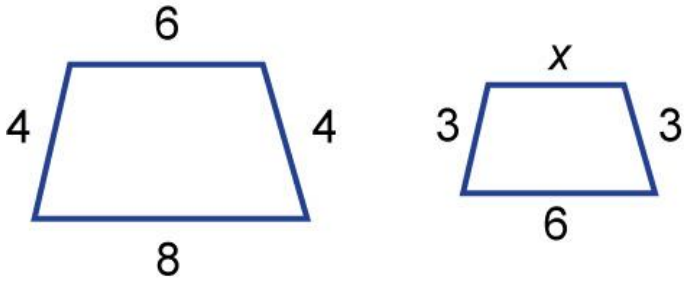
C. No; corresponding sides are not proportional.

D. No; corresponding sides are proportional.

CheckPoint

Five-Minute CHECK (over Lesson 4-7)

2 The pair of polygons is similar. Write a proportion to find the missing measure and solve.

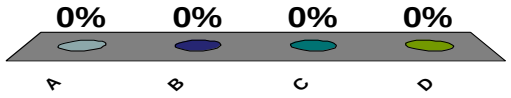


A. $\frac{8}{4} = \frac{6}{x}; x = 3$

B. $\frac{3}{4} = \frac{x}{6}; x = 4.5$

C. $\frac{4}{3} = \frac{x}{6}; x = 8$

D. $\frac{4}{8} = \frac{6}{x}; x = 12$



CheckPoint

Five-Minute CHECK (over Lesson 4-7)

Standardized Test Practice

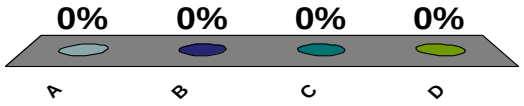
3 A greeting card is 8 inches by 6 inches, but it will have to be cut to fit in an envelope. The scale factor from the original card to the smaller card is 5:4. Find the dimensions of the smaller card.

A. $3 \text{ in.} \times 3\frac{3}{4} \text{ in.}$

B. $10 \text{ in.} \times 7\frac{2}{4} \text{ in.}$

C. $6\frac{2}{3} \text{ in.} \times 5\frac{1}{3} \text{ in.}$

D. $6\frac{2}{5} \text{ in.} \times 4\frac{4}{5} \text{ in.}$



CheckPoint