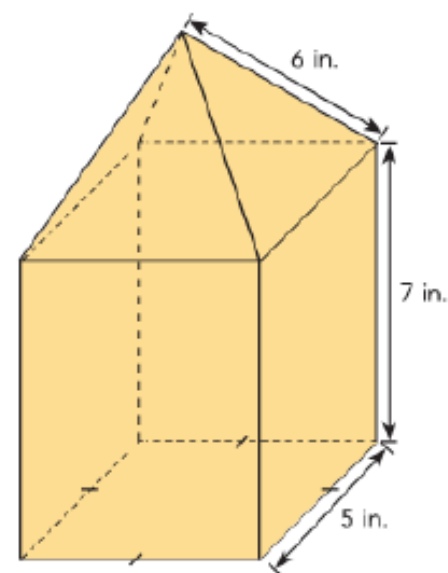


Week 8 Friday Course 3 Warm-up

find the combined volume of the composite solid



## Week 8 Friday Course 3 Warm-up



find the combined volume of the composite solid

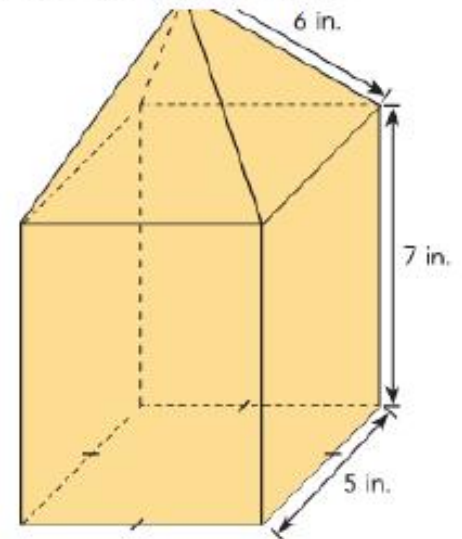
Volume of space inside birdhouse

= Volume of square prism + Volume of square pyramid

$$\approx 175 + 40.4$$

$$= 215.4 \text{ in}^3$$

So, the volume of space inside the birdhouse is approximately 215.4 cubic inches.



## Lesson 8.4 Dilations Day 3

### Objective

TSW understand concept of dilation

\*drawing images after dilation

\*find coordinates of points after dilation

**\*find the center of dilation**



► Geometric transformations move figures about on a plane. Each type of transformation changes some properties of a figure, but leaves other properties unchanged.

### Common Core State Standards

8G1 Verify experimentally the properties of rotations, reflections, and translations.

8G1 c Parallel lines are taken to parallel lines

**Mathematical Practices** *MP3 Construct arguments MP 4 Model Mathematics MP5 Use tools strategically*

## Find the Center of a Dilation.

You have learned how to find the scale factor of a dilation from a figure and its image. You can also find the center of the dilation from the same information.

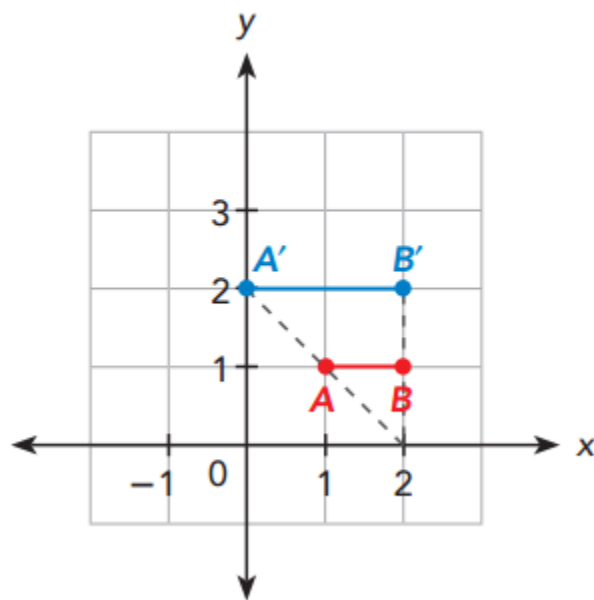
In two figures related by a dilation, suppose you are given two points  $A$  and  $B$  of the figure and their images  $A'$  and  $B'$ . Use these steps to find the center of the dilation.

**STEP 1** Draw a line through  $A$  and  $A'$ . Draw another line through  $B$  and  $B'$ .

**STEP 2** Find where the two lines intersect. This is the center of the dilation.

The following examples that map  $\overline{AB}$  onto its image by a dilation illustrate this.

A dilation in which  $k > 0$



The intersection of lines  $AA'$  and  $BB'$  is at (2, 0).  
So, the center of this dilation is (2, 0).

## Find the Center of a Dilation.

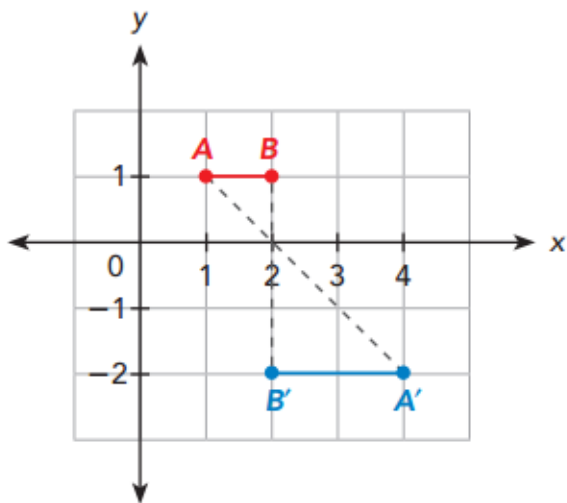
You have learned how to find the scale factor of a dilation from a figure and its image. You can also find the center of the dilation from the same information.

In two figures related by a dilation, suppose you are given two points  $A$  and  $B$  of the figure and their images  $A'$  and  $B'$ . Use these steps to find the center of the dilation.

**STEP 1** Draw a line through  $A$  and  $A'$ . Draw another line through  $B$  and  $B'$ .

**STEP 2** Find where the two lines intersect. This is the center of the dilation.

A dilation in which  $k < 0$



The intersection of lines  $AA'$  and  $BB'$  is at  $(2, 0)$ .  
So, the center of this dilation is  $(2, 0)$ .

The magnitude of the scale factor can be found by either of the following:

$$\text{Scale factor's magnitude} = \frac{\text{Distance from center of dilation to image}}{\text{Distance from center of dilation to original point}}$$

$$\text{Scale factor's magnitude} = \frac{\text{Length of image segment}}{\text{Length of original segment}}$$

### Math Note

The scale factor of a dilation depends not only on its magnitude but also on whether it is positive or negative, that is, whether the image of each point is on the same side of the center as the original point or not.

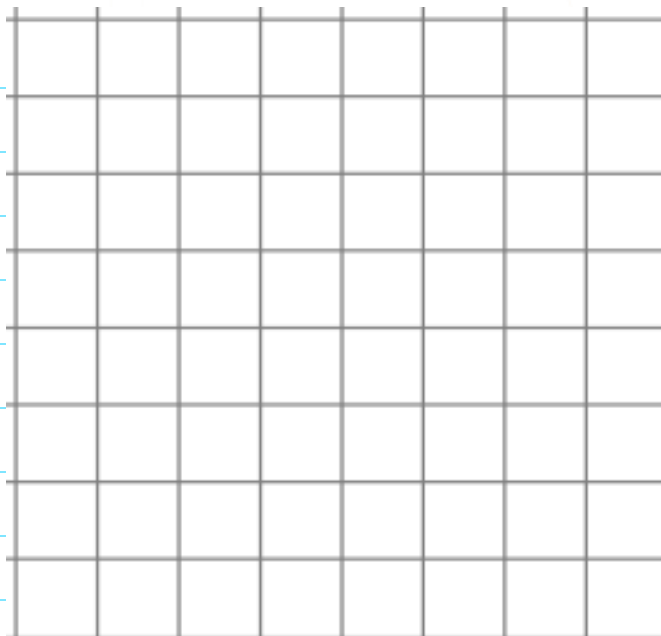
### Example 17 Find the center of a dilation.

**Describe the transformation.**

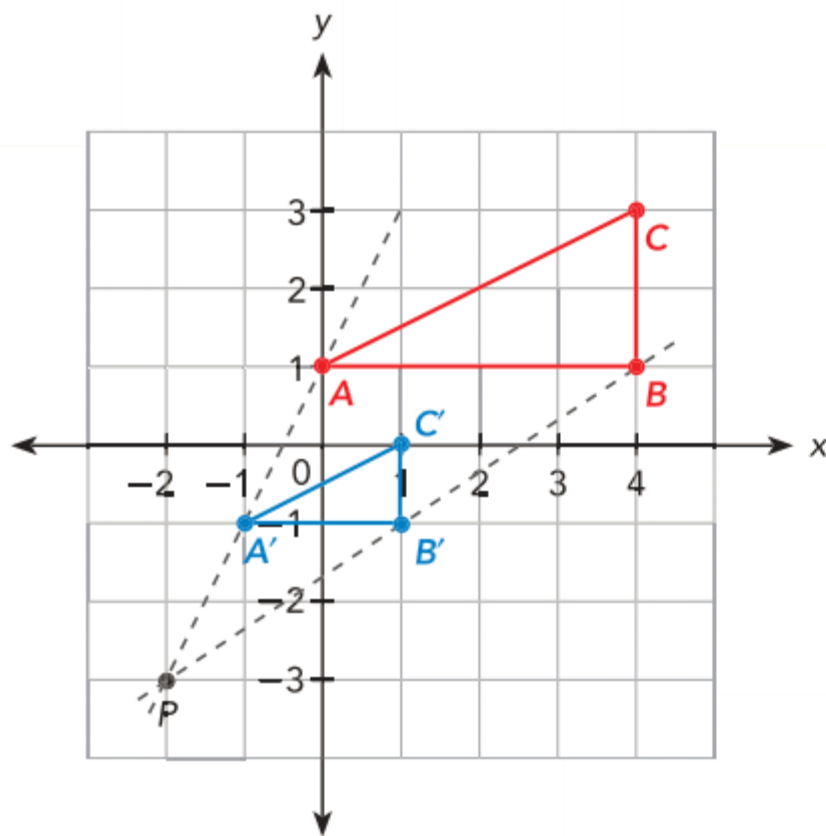
The tables show the coordinates for each triangle and their corresponding images. The triangles are each mapped onto their images by a dilation. Draw each triangle and its image on a coordinate plane. Then mark and label  $P$  as the center of dilation. Find the scale factor for each triangle. Then describe the transformation.

a)

Original Point	$A(0, 1)$	$B(4, 1)$	$C(4, 3)$
Is Mapped Onto	$A'(-1, -1)$	$B'(1, -1)$	$C'(1, 0)$

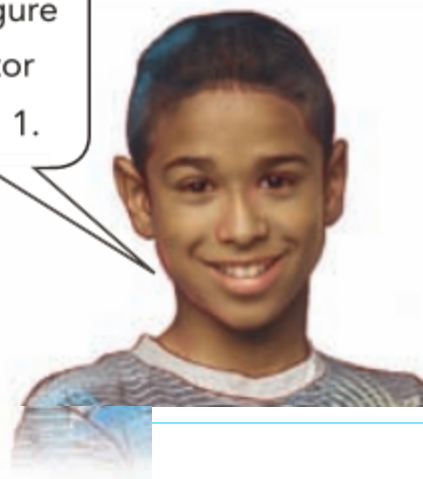


## Solution



You can also join  $C$  to  $C'$  and find the point of intersection with another line to locate the center of dilation.

The image is smaller than the original figure when the scale factor is between  $-1$  and  $1$ .



$A$  is joined to  $A'$  and  $B$  is joined to  $B'$ . Both lines intersect at the center of dilation, which is at  $(-2, -3)$ .

$$\text{Scale factor} = \frac{A'B'}{AB} = \frac{2}{4} = \frac{1}{2}$$

So,  $\triangle ABC$  is mapped onto  $\triangle A'B'C'$  by a dilation with center  $P, (-2, -3)$  and scale factor  $\frac{1}{2}$ .

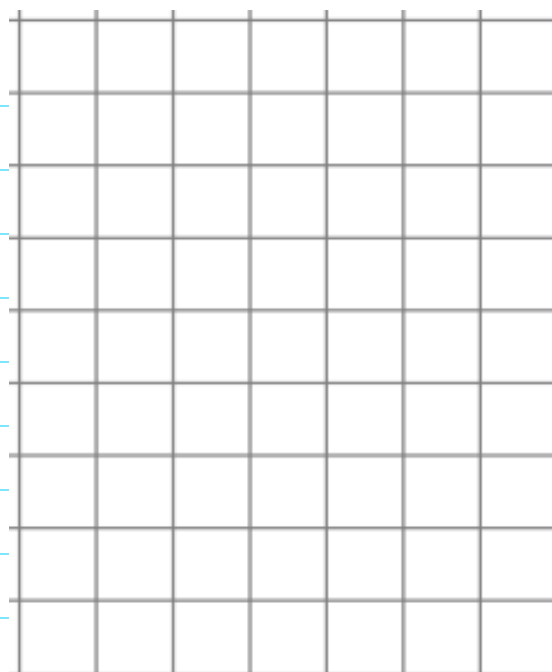
**Example 17** Find the center of a dilation.

**Describe the transformation.**

The tables show the coordinates for each triangle and their corresponding images. The triangles are each mapped onto their images by a dilation. Draw each triangle and its image on a coordinate plane. Then mark and label  $P$  as the center of dilation. Find the scale factor for each triangle. Then describe the transformation.

**b)**

Original Point	$D(-1, 7)$	$E(-1, 3)$	$F(-3, 5)$
Is Mapped Onto	$D'(2, 1)$	$E'(2, 3)$	$F'(3, 2)$

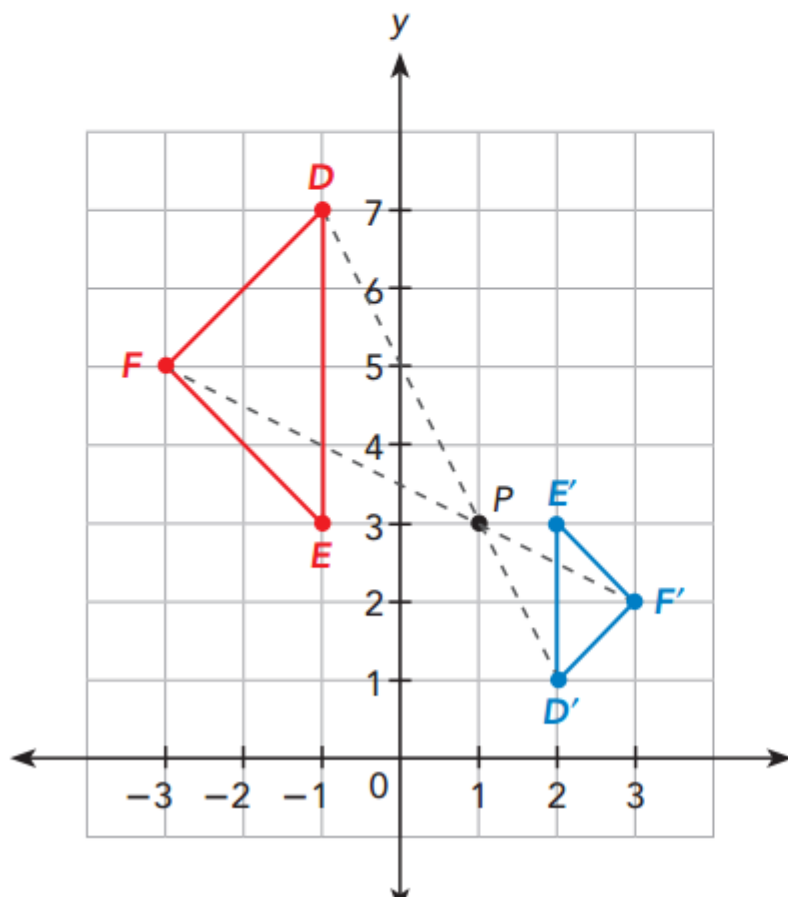




b)

Original Point	$D(-1, 7)$	$E(-1, 3)$	$F(-3, 5)$
Is Mapped Onto	$D'(2, 1)$	$E'(2, 3)$	$F'(3, 2)$

## Solution



Since  $\triangle DEF$  and its image are on opposite sides of the center of dilation, the scale factor will be negative.



$D$  is joined to  $D'$  and  $F$  is joined to  $F'$ . The lines intersect at the center of dilation which is at  $(1, 3)$ .

$$\text{Scale factor} = -\frac{D'E'}{DE} = -\frac{2}{4} = -\frac{1}{2}$$

So,  $\triangle DEF$  is mapped onto  $\triangle D'E'F'$  by a dilation with center  $P(1, 3)$  and scale factor  $-\frac{1}{2}$ .

## Guided Practice

Use graph paper. Use 1 grid square on both axes to represent 1 unit for the interval from  $-7$  to  $4$ .

- 4 The triangles are each mapped onto their images by a dilation. Draw each triangle and its image on a coordinate plane. Then mark and label  $C$  as the center of dilation. Find the scale factor for each triangle.

a)

<b>Original Point</b>	$S (1, 3)$	$T (0, 1)$	$U (2, 0)$
<b>Is Mapped Onto</b>	$S' (-5, -3)$	$T' (-3, 1)$	$U' (-7, 3)$

b)

<b>Original Point</b>	$P (1, 3)$	$Q (1, 2)$	$R (2, 1)$
<b>Is Mapped Onto</b>	$P' (-3, 1)$	$Q' (-3, -2)$	$R' (0, -5)$

## Lesson 8.4 Dilations Day 3

### Guided Practice

Use graph paper. Use 1 grid square on both axes to represent 1 unit for the interval from  $-7$  to  $4$ .

- 4 The triangles are each mapped onto their images by a dilation. Draw each triangle and its image on a coordinate plane. Then mark and label  $C$  as the center of dilation. Find the scale factor for each triangle. **a) – b) See margin for graphs.**

a)

Original Point	$S (1, 3)$	$T (0, 1)$	$U (2, 0)$
Is Mapped Onto	$S' (-5, -3)$	$T' (-3, 1)$	$U' (-7, 3)$

$C (-1, 1)$ ; Scale factor =  $-2$

b)

Original Point	$P (1, 3)$	$Q (1, 2)$	$R (2, 1)$
Is Mapped Onto	$P' (-3, 1)$	$Q' (-3, -2)$	$R' (0, -5)$

$C (3, 4)$ ; Scale factor =  $3$

# Lesson 8.4 Dilations Day 2

## Practice 8.4 #6-8

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Practice 8.4

Tell whether each transformation is a dilation. Explain.

1

2

Solve. Show your work.

3 Nikita wants to make a mosaic for a T-shirt's design. She makes some dilated copies of a drawing with a photocopier. The drawing is 6 inches by 4 inches. Find the length and width of each copy with the scale factor given in a) to d). State whether each copy is an enlargement or reduction of the drawing.

a) 1.5                      b) 2  
c)  $\frac{1}{4}$                       d) 140%

Copy and complete on graph paper.

4 Timothy uses a lens to view a 2-inch pencil that is represented by  $\overline{AB}$  on the coordinate plane.  $\overline{AB}$  is mapped onto  $\overline{A'B'}$  by a dilation with center at the origin,  $O$ . Draw each image for the given scale factor.

a) Scale factor  $-0.5$                       b) Scale factor  $0.5$

Course 3

## Challenge-

\*Solve created equations

“Pick a Snowflake”

\*BuzzMath



 **Lesson Check #8-** can draw image after dilation AND find the center of dilation and the scale factor of a dilation

# Ticket Out the Door- Connect, Extend, Challenge

1. How are the ideas and information presented **CONNECTED** to what you already knew?
2. What new ideas did you get that **EXTENDED** or pushed your thinking in new directions?
3. What is still **CHALLENGING** or confusing for you to get your mind around? What questions, wonderings or puzzles do you now have?