

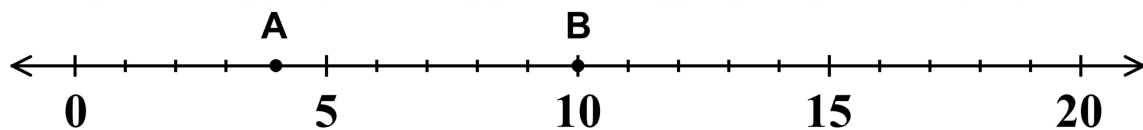
INTRODUCTION TO DILATIONS

N-GEN MATH[®] 8



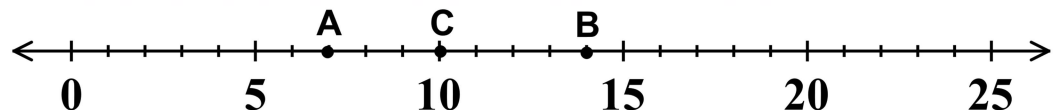
In the last unit we examined a variety of transformations, such as reflections, translations, and rotations. In this unit we will concentrate on a new transformation known as a **dilation**. A **dilation maps** all points to locations so that their new distances from a fixed point, known as the **center of dilation**, are all **proportional** to their old distances from the same point. The constant of proportionality is known as the **dilation constant** or **scaling factor** (often represented by k).

Exercise #1: Points A and B have been plotted on the number line below at 4 and 10. Use the origin (zero) as the **center of dilation**.



- (a) Map points A and B after a dilation with a dilation constant of $k = 2$. Mark the image points as A' and B' .
- (b) Map points A and B after a dilation with a dilation constant of $k = \frac{1}{2}$. Mark the image points as A'' and B'' .
- (c) What was the original distance between points A and B?
- (d) Find the distances between the image points after each dilation.
 Distance between A' and B' = _____
 Distance between A'' and B'' = _____
- (e) What appears to be true about the distance between two points that have been dilated using a certain constant of dilation?

Exercise #2: Find and plot the images of points A and B after a dilation with a center at C and a scaling factor of 3.

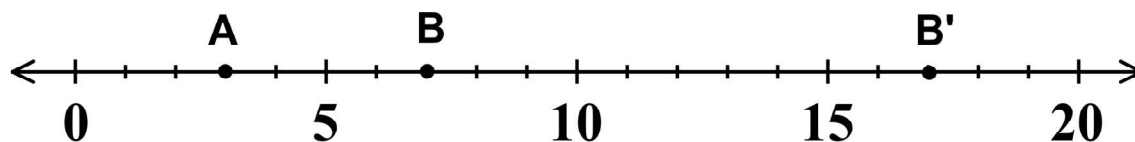


How does the distance between A' and B' compare to the distance between A and B?



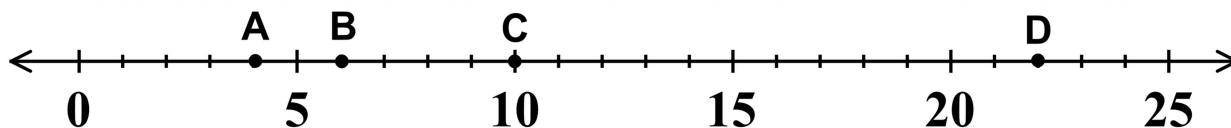
When we scale two points by the same **dilation constant** (scaling factor) then the distance between them gets scaled by the same factor.

Exercise #3: Point B below was mapped to B' using a dilation centered at A.



- (a) What was the constant of dilation, k ? Show how you found your answer. (b) If point A was dilated using itself as the center and the scaling constant from (a), where would its image point lie? Explain.

Exercise #4: On the number line below, point B is the image of point A after a dilation with a center at point C.



- (a) What is the scaling constant, k , of this dilation? Show how you found your value. (b) Point E is the image of D after a dilation with a center at C and the same scaling constant as (a). Plot point E.

The value of the scaling constant (or constant of dilation) is important because it tells us if the points being mapped are moving farther from the center or closer to the center.

Exercise #5: Complete the following with what must be true about the scaling constant, k .

- (a) If the image point lies **farther from the center** than the original point then the scaling constant must be (b) If the image point lies **closer to the center** than the original point then the scaling constant must be



Name: _____

Date: _____

INTRODUCTION TO DILATIONS
N-GEN MATH® 8 HOMEWORK

FLUENCY

1. Which of the following is another name for the constant of dilation?

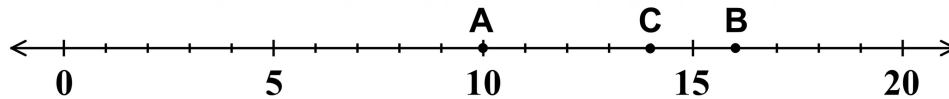
- (1) enlargement factor (3) shifting vector
(2) scaling constant (4) multiplicative factor

2. Point A lies at 6 on a number line and is dilated using the origin as the center with a scaling factor of $\frac{5}{2}$. At what location does its image lie on the number line?

- (1) 15 (3) 22
(2) 18 (4) 25

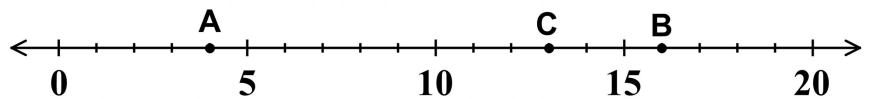
3. If points A and B are both dilated using a center of C and a scaling factor of 3, then which of the following will be the distance between the images of A and B?

- (1) 9
(2) 12
(3) 18
(4) 24



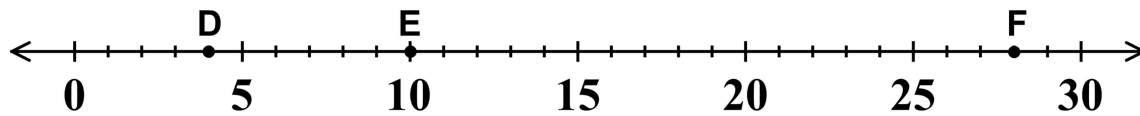
4. Point C is the image of point B after a dilation centered at point A. Which of the following is the scaling constant for this dilation?

- (1) $\frac{3}{4}$ (3) $\frac{13}{16}$
(2) $\frac{4}{3}$ (4) $\frac{16}{13}$



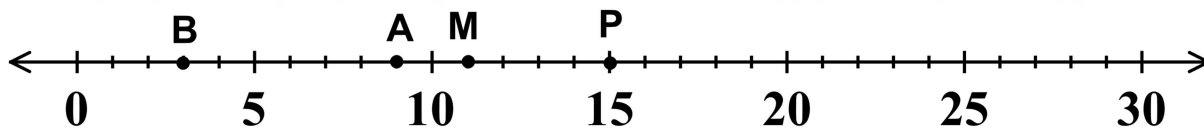


5. Plot the images of points E and F after a dilation centered at D with a scale factor of $\frac{1}{3}$. Label the image points E' and F'.



6. Using the points from the previous problem, answer the following.
- (a) What is the distance between points E and F? (b) What is the distance between points E' and F'?
- (c) How do these two distances relate to the scaling factor of $\frac{1}{3}$?

7. On the number line below, point B is the image of point A after a dilation with a center at M.



Find and plot the image of point P using M as the center and the same dilation constant.

8. A dilation with a center of A maps point B to point C. Where would point C be mapped using the same center and dilation constant? Be careful, fractional answer!

