

## 9-5 Dilations

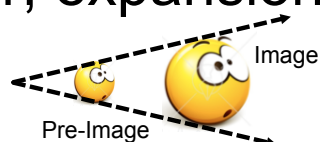
Dilations:

- \* A transformation that may change the size of the figure.
- \* You will need a center point and a scale factor.

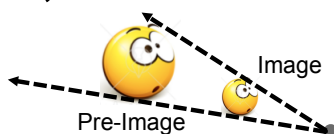


Scale factors with the following will result in a dilation:

\_\_\_ If  $|r| > 1$ , expansion (enlargement)



If  $|r| < 1$ , contraction (reduction)



If  $|r| = 1$ , congruence transformation (no size change)

## Similarity Transformation:

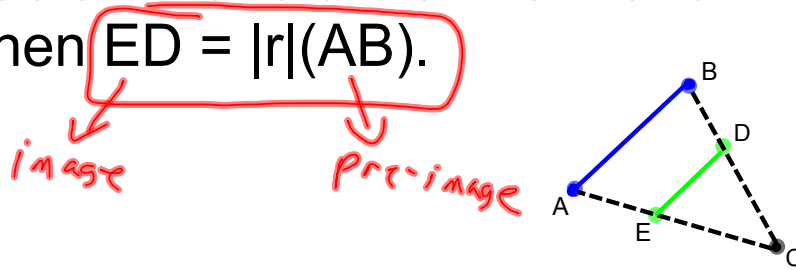
- \_\_\_ \* Dilations will preserve:
  - angle measure, betweenness,
  - and collinearity.
  
- \* Distance is not preserved.
  
- \* Produce figures that look similar.

Draw a dilation image of triangle ABC with center  $X$  and  $r = 2$ .

Handwritten calculations for the dilation:

- Blue:  $XA = 3.4 \text{ cm}$   
 $\times 2$   
 $XA' = 6.8 \text{ cm}$
- Red:  $XB = 2.8 \text{ cm}$   
 $\times 2$   
 $XB' = 5.6 \text{ cm}$
- Green:  $XC = 4.5 \text{ cm}$   
 $\times 2$   
 $XC' = 9 \text{ cm}$

If a dilation with center C and a scale factor  $r$  transforms A to E and B to D, then  $ED = |r|(AB)$ .



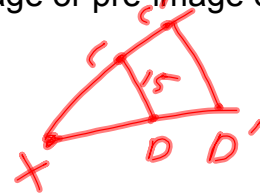
The distance of segment ED is the distance of segment AB times  $r$  (the scale factor).

Ex 1) Find the measure of the dilation image or pre-image of CD using the given scale factor:

a)  $CD = 15$ ,  $r = 3$  find  $C'D'$

$$C'D' = |r|CD$$

$$C'D' = |3| \cdot 15 = 45$$



b)  $C'D' = 7$ ,  $r = -2/3$  find  $CD$

$$C'D' = |r|CD$$

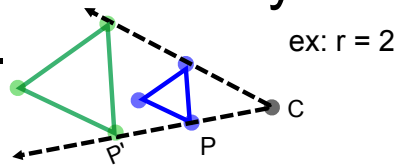
$$7 = \left|-\frac{2}{3}\right|CD$$

$$\left(\frac{3}{2}\right)7 = \frac{3}{2} \left(CD \left(\frac{3}{2}\right)\right)$$

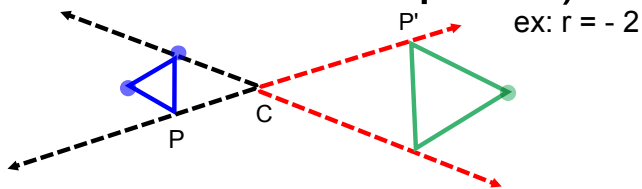
$$\frac{21}{2} = CD$$

$$10.5 = CD$$

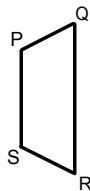
If  $r > 0$ ,  $P'$  will be on the ray  $CP$  and  $CP' = r(CP)$ .



If  $r < 0$ ,  $P'$  lies on ray  $CP'$ , the ray opposite ray  $CP$ , and  $CP' = |r|(CP)$ .  
(This means it will go to the opposite side of the center point.)



Ex 2) Draw the dilation image of trapezoid PQRS with center C and  $r = -3$ .

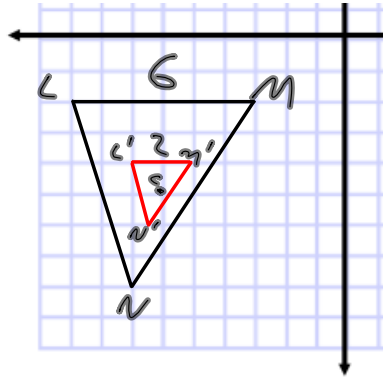


Ex 3) Determine the scale factor used for the dilation with center C. Determine whether the dilation is an enlargement, reduction, or congruence transformation.

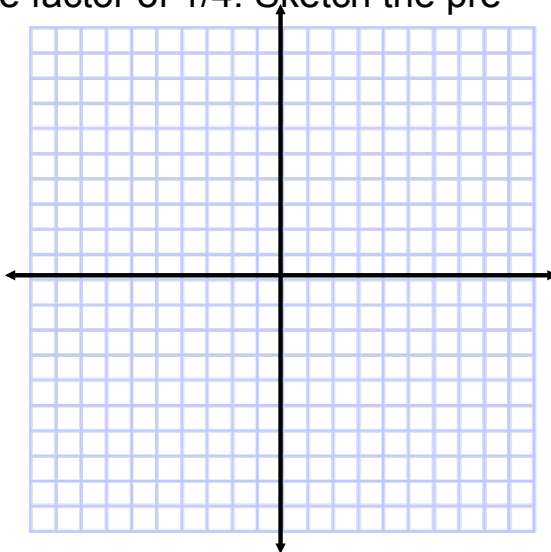
$$L'M' = r(LM)$$

$$\frac{2}{6} = r \left( \frac{6}{6} \right)$$

$$\frac{1}{3} = r$$



Ex 4) Trapezoid EFGH has vertices E(-8,4), F(-4,8), G(8,4) and H(-4,-8). Find the image of trapezoid EFGH after a dilation centered at the origin with a scale factor of 1/4. Sketch the pre-image and the image.



**Homework: skip 33-35**