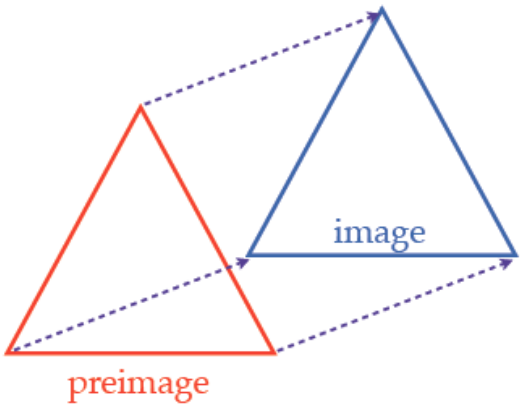
Unit 19 Facts: Transformations

Topic #1: Translations (Rigid)

A transformation that moves every point of a figure the same distance and in the same direction.



General Translation

$P(x,y) \rightarrow P'(x + a, y + b)$

NOTE: The image is congruent to the preimage, so a translation is an isometry.

Translate the following figure along the translation rule $(x - 4, y + 5)$.

$A(-1,-7)$

$B(9,-7)$

$C(4,2)$

Topic #2: Reflections (Rigid)

Reflecting over x-axis
$P(x,y) \rightarrow P'(x,-y)$

Reflecting over y-axis
$P(x,y) \rightarrow P'(-x,y)$

Reflecting across origin
$P(x,y) \rightarrow P'(-x,-y)$

Reflecting over line $y = x$
$P(x,y) \rightarrow P'(y,x)$

Reflecting over line $y = -x$
$P(x,y) \rightarrow P'(-y,-x)$

$(2,5)$

Reflecting over x-axis
$P(2,5) \rightarrow$

Reflecting over y-axis
$P(2,5) \rightarrow$

Reflecting across origin
$P(2,5) \rightarrow$

Reflecting over line $y = x$
$P(2,5) \rightarrow$

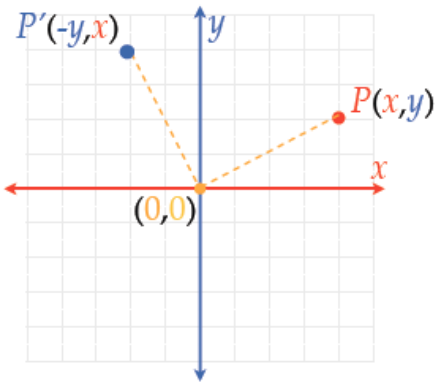
Reflecting over line $y = -x$
$P(2,5) \rightarrow$

Topic #3: Rotations (Rigid)

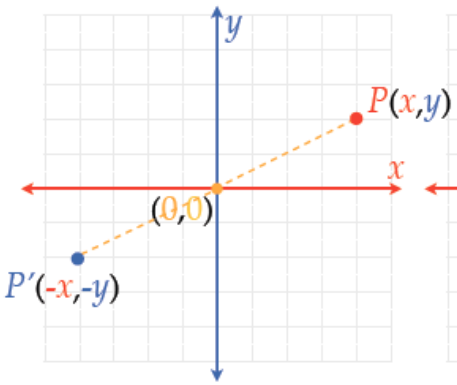
If a problem does not specify which direction to rotate, assume it's a counterclockwise rotation.

Within the coordinate plane, counterclockwise around the origin

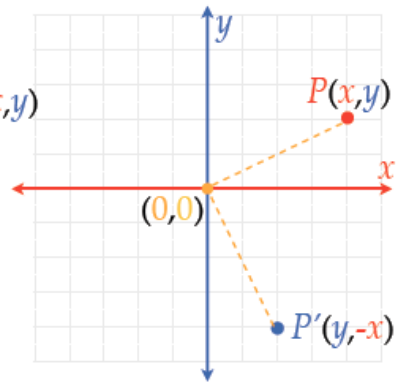
90° counterclockwise



180° counterclockwise



270° counterclockwise



(2,5)

90° counterclockwise
270° clockwise
$P(2,5) \rightarrow$

180° counterclockwise
180° clockwise
$P(2,5) \rightarrow$

270° counterclockwise
90° clockwise
$P(2,5) \rightarrow$

Topic #4: Dilations (Non-Rigid)

A transformation whose preimage and image are similar.

Scale Factor, k

How much the object grows or shrinks

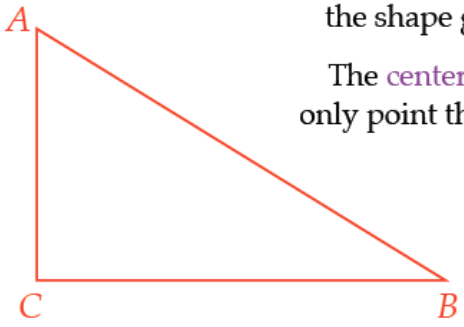
If $k > 1$, enlargement

If $0 < k < 1$, reduction

Center

The fixed point around which the shape grows or shrinks

The center of dilation is the only point that does not change



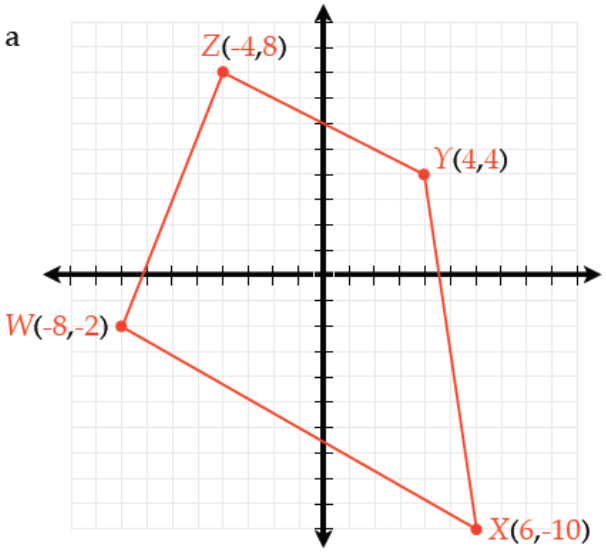
Find the image of the following figure with a scale factor of 0.5 and center at origin (0,0).

$W(-8,-2) \rightarrow$

$X(6,-10) \rightarrow$

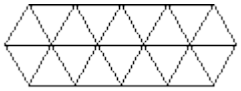
$Y(4,4) \rightarrow$

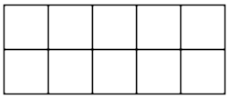
$Z(-4,8) \rightarrow$



Topic #5: Tessellations (Rigid)

Only three regular polygons tessellate in the Euclidean plane: triangles, squares or hexagons because their interior angles must divide into 360 degrees evenly.

a tessellation of triangles 

a tessellation of squares 

a tessellation of hexagons