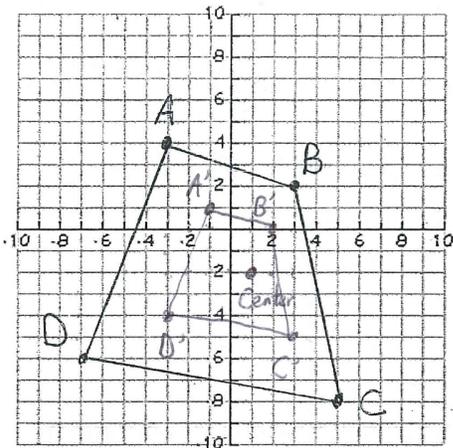


Key

* start count from the center of dilation

1. Graph the dilated image of Quadrilateral ABCD using a scale factor of $\frac{1}{2}$ and center of dilation (1, -2) *



$$A(-4, 6) \xrightarrow{k=1/2} A'(-2, 3)$$

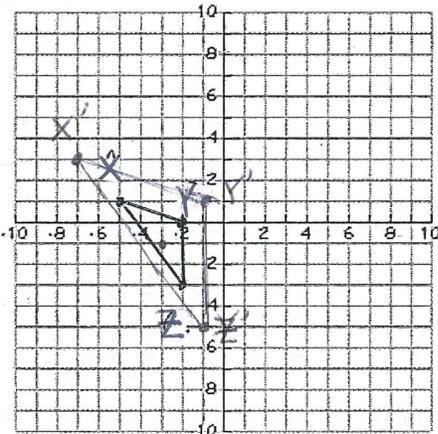
$$B(2, 4) \rightarrow B'(1, 2)$$

$$C(6, -8) \rightarrow C'(3, -5)$$

$$D(-8, -4) \rightarrow D'(-4, -2)$$

$A'(-2, 3)$	$C'(3, -5)$
$B'(1, 2)$	$D'(-4, -2)$

2. Graph the dilated image of Triangle XYZ using a scale factor of 2 and center of dilation (-3, -1)



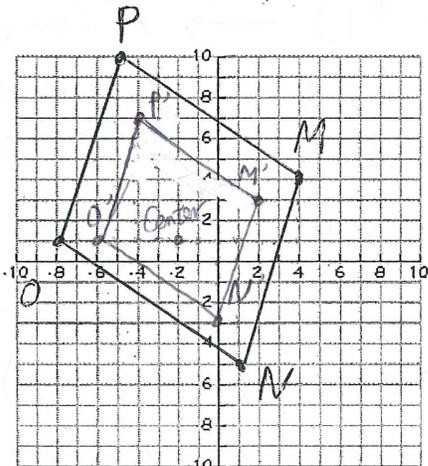
$$X(-2, 2) \xrightarrow{k=2} X'(-4, 4)$$

$$Y(1, 1) \rightarrow Y'(-2, 2)$$

$$Z(1, -2) \rightarrow Z'(-2, -4)$$

$X'(-4, 4)$
$Y'(-2, 2)$
$Z'(-2, -4)$

3. Graph the dilated image of Quadrilateral MNOP using a scale factor of $\frac{2}{3}$ and center of dilation (-2, 1)



$$M(4, 5) \xrightarrow{k=2/3} M'(2, 3)$$

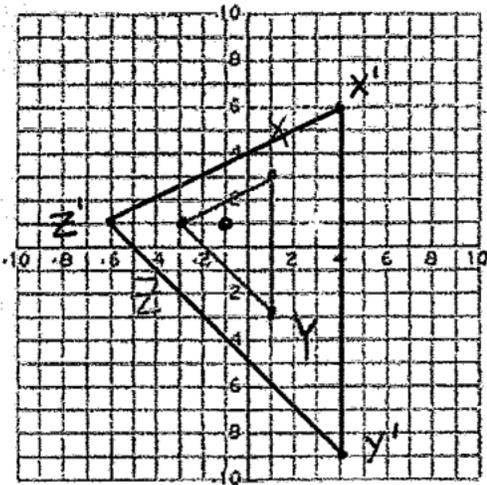
$$N(4, -5) \rightarrow N'(0, -3)$$

$$O(-8, 0) \rightarrow O'(-6, 1)$$

$$P(-4, 9) \rightarrow P'(-4, 7)$$

$M'(2, 3)$
$N'(0, -3)$
$O'(-6, 1)$
$P'(-4, 7)$

4. Graph the dilated image of Triangle XYZ using a scale factor of $\frac{5}{2}$ and a center of dilation $(-1, 1)$.



$X'(4, 6)$
 $Y'(4, -9)$
 $Z'(-6, 1)$

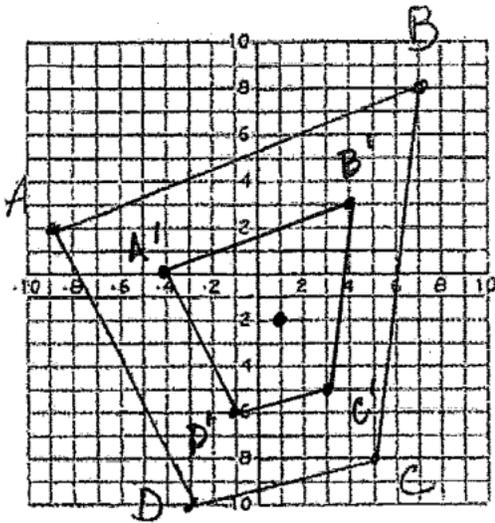
Multiply distances from the Point of Dilation by $\frac{5}{2}$.

Point X: $2 \rightarrow 2 \uparrow \Rightarrow 5 \rightarrow 5 \uparrow$
 Point Y: $2 \rightarrow 4 \downarrow \Rightarrow 5 \rightarrow 10 \downarrow$
 Point Z: $2 \leftarrow \Rightarrow 5 \leftarrow$

Using Rules: 1) Translate Point of Dilation to Origin $(0, 2)$
 Dilate, 3) Translate Point of Dilation back.

$X(1, 3)$ $Y(2, 2)$ $Z(-3, 1)$
 1) $(x, y) \rightarrow (x+1, y-1)$ $(2, 2)$ $(2, -4)$ $(-2, 0)$
 2) $(x, y) \rightarrow (\frac{5}{2}x, \frac{5}{2}y)$ $(5, 5)$ $(5, -10)$ $(-5, 0)$
 3) $(x, y) \rightarrow (x-1, y+1)$ $(4, 6)$ $(4, -9)$ $(-6, 1)$

5. Graph the dilated image of Quadrilateral ABCD using a scale factor of $\frac{1}{2}$ and center of dilation $(1, -2)$.



$A'(-4, 0)$
 $B'(4, 3)$
 $C'(3, -5)$
 $D'(-1, -6)$

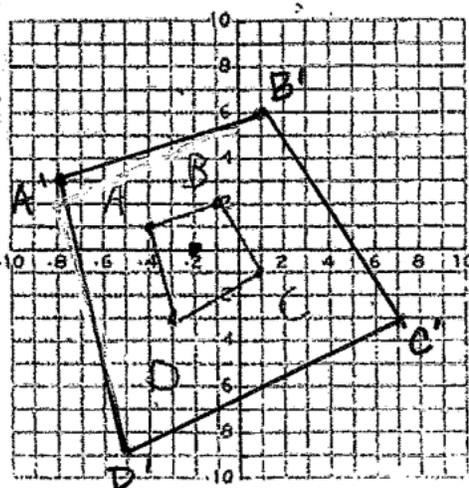
Multiply distances from center of dilation by $\frac{1}{2}$

Point A: $10 \leftarrow 2 \uparrow \Rightarrow 5 \leftarrow 1 \uparrow$
 Point B: $8 \rightarrow 10 \uparrow \Rightarrow 4 \rightarrow 5 \uparrow$
 Point C: $4 \rightarrow 6 \downarrow \Rightarrow 2 \rightarrow 3 \downarrow$
 Point D: $4 \leftarrow 8 \downarrow \Rightarrow 2 \leftarrow 4 \downarrow$

Using Rules:

$A(-9, 2)$ $B(7, 8)$ $C(5, -8)$ $D(-3, -10)$
 1) $(x, y) \rightarrow (x-1, y+2)$ $(-10, 4)$ $(6, 10)$ $(4, -6)$ $(-4, -8)$
 2) $(x, y) \rightarrow (\frac{1}{2}x, \frac{1}{2}y)$ $(-5, 2)$ $(3, 5)$ $(2, -3)$ $(-2, -4)$
 3) $(x, y) \rightarrow (x+1, y-2)$ $(-4, 0)$ $(4, 3)$ $(3, -5)$ $(-1, -6)$

6. Graph the dilated image of Quadrilateral ABCD using a scale factor of 3 and center of dilation $(-2, 0)$.



$A'(-8, 3)$
 $B'(1, 6)$
 $C'(7, -3)$
 $D'(-5, -9)$

Multiply distance from COD by 3:

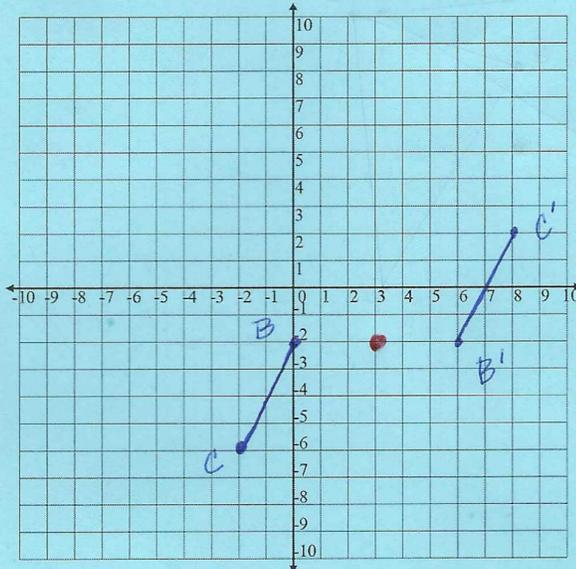
Point A: $2 \leftarrow 1 \uparrow \Rightarrow 6 \leftarrow 3 \uparrow$
 Point B: $1 \rightarrow 2 \uparrow \Rightarrow 3 \rightarrow 6 \uparrow$
 Point C: $3 \rightarrow 1 \downarrow \rightarrow 9 \rightarrow 3 \downarrow$
 Point D: $1 \leftarrow 3 \downarrow \rightarrow 3 \leftarrow 9 \downarrow$

Using Rules:

$A(-4, 1)$ $B(-1, 2)$ $C(1, -1)$ $D(-3, -3)$
 1) $(x, y) \rightarrow (x+2, y)$ $(-2, 1)$ $(1, 2)$ $(3, -1)$ $(-1, -3)$
 2) $(x, y) \rightarrow (3x, 3y)$ $(-6, 3)$ $(3, 6)$ $(9, -3)$ $(-3, -9)$
 3) $(x, y) \rightarrow (x-2, y)$ $(-8, 3)$ $(1, 6)$ $(7, -3)$ $(-5, -9)$

ROTATIONS NOT CENTERED ABOUT THE ORIGIN

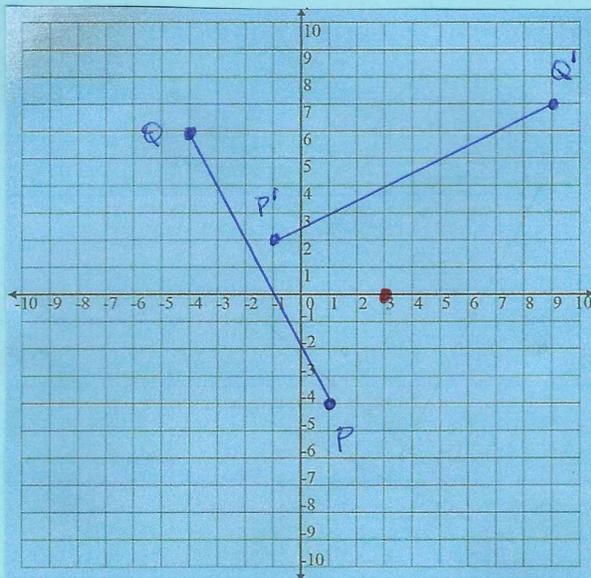
1. Rotate the segment with endpoints B(0, -2) and C(-2, -6) 180° about the point (3, -2).



- 1 Translate rotation point to origin $(x, y) \rightarrow (x-3, y+2)$
- 2 Rotate 180° $(x, y) \rightarrow (-x, -y)$
- 3 Translate rotation point back. $(x, y) \rightarrow (x+3, y-2)$

<u>B</u>	<u>C</u>
(0, -2)	(-2, -6)
1 (-3, 0)	(-5, -4)
2 (3, 0)	(5, 4)
3 (6, -2)	(8, 2)

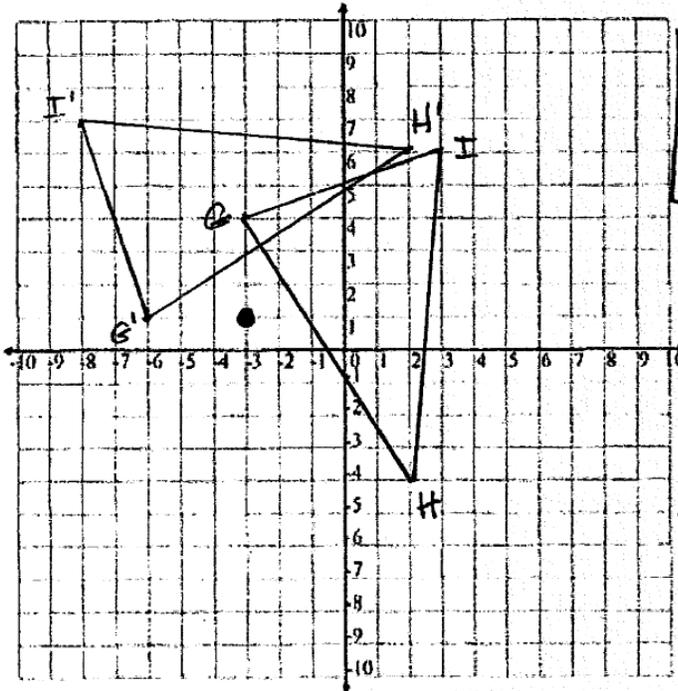
2. Rotate the segment with endpoints at P(1, -4) and Q(-4, 6) 270° counter clockwise about the point (3, 0).



- 1 Translate rotation point to origin $(x, y) \rightarrow (x-3, y)$
- 2 Rotate 270° ccw $(x, y) \rightarrow (y, -x)$
3. Translate back $(x, y) \rightarrow (x+3, y)$

<u>P</u>	<u>Q</u>
(1, -4)	(-4, 6)
1. (-2, -4)	(-7, 6)
2. (+4, 2)	(6, 7)
3. (-1, 2)	(9, 7)

3. Rotate Triangle GHI with G(-3, 4), H(2, -4) and I(3, 6) 270° clockwise about the point (-3, 1).



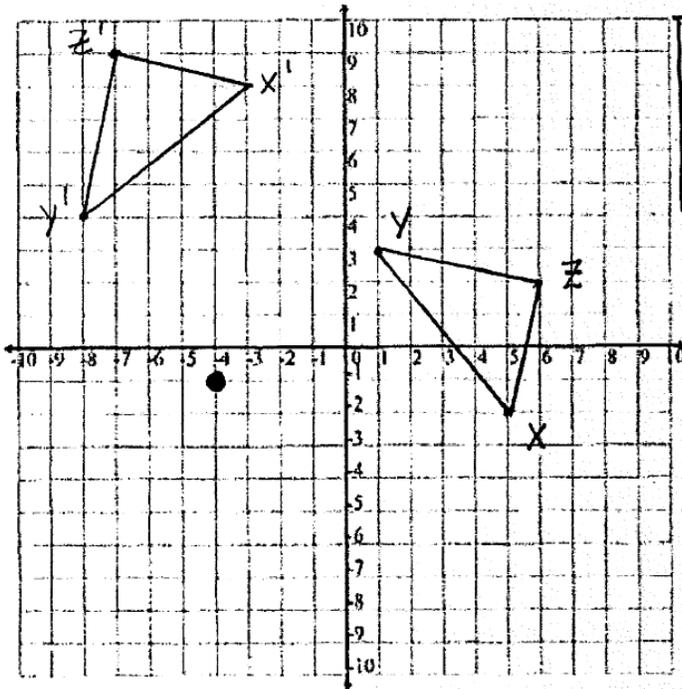
$G'(-6, 1)$
 $H'(2, 6)$
 $I'(-8, 7)$

You can find the image by imagining that the point of rotation is the origin and then use the paper rotation method.

Using Rules: 1) Translate the center of rotation to the origin, 2) Rotate, 3) Translate COB back.

	$G(-3, 4)$	$H(2, -4)$	$I(3, 6)$
1)	$(x, y) \rightarrow (x+3, y-1)$	$(0, 3)$	$(5, 5)$ $(6, 5)$
2)	$(x, y) \rightarrow (-y, x)$	$(-3, 0)$	$(5, 5)$ $(-5, 6)$
3)	$(x, y) \rightarrow (x-3, y+1)$	$(-6, 1)$	$(2, 6)$ $(-8, 7)$

4. Rotate Triangle XYZ with X(5, -2), Y(1, 3) and Z(6, 2) 90° counter clockwise about the point (-4, -1).



$X'(-3, 8)$
 $Y'(-8, 4)$
 $Z'(-7, 9)$

Using Rules:

	$X(5, -2)$	$Y(1, 3)$	$Z(6, 2)$
1)	$(x, y) \rightarrow (x+4, y+1)$	$(9, -1)$	$(5, 4)$ $(10, 3)$
2)	$(x, y) \rightarrow (-y, x)$	$(1, 9)$	$(-4, 5)$ $(-3, 10)$
3)	$(x, y) \rightarrow (x-4, y-1)$	$(-3, 8)$	$(-8, 4)$ $(-7, 9)$