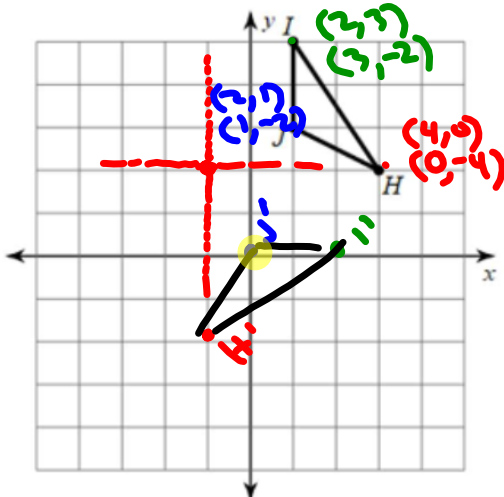


p.33, #9

Warm-up

15 January 2020

9) rotation 270° ccw about the point $(-1, 2)$ $(x, y) \rightarrow (y, -x)$



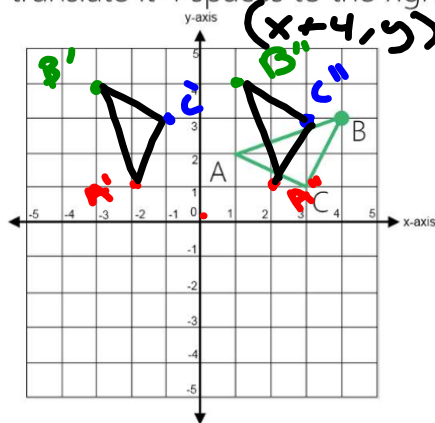
$I'(2, 0)$
 $J'(0, 0)$
 $H'(-1, -2)$

SEQUENCE OF TRANSFORMATIONS



SEQUENCE OF TRANSFORMATIONS EX. 1

- 1. Rotate the following figure 270 degrees clockwise, $(x,y) \rightarrow (-y,x)$
- 2. translate it 4 spaces to the right.



90° ccw

$(x,y) \rightarrow (-y,x)$

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

$B(4,3) \rightarrow B'(-3,4) \rightarrow B''(1,4)$

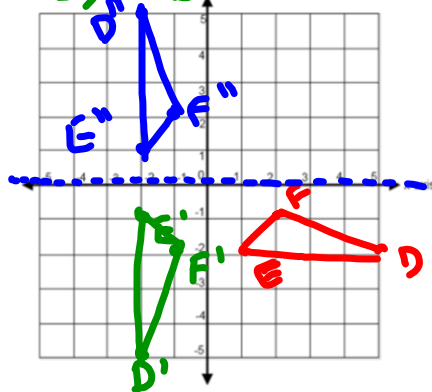
$C(3,1) \rightarrow C'(-1,3) \rightarrow C''(3,3)$



SEQUENCE OF TRANSFORMATIONS EX. 2

$\triangle DEF$ has vertices $D(5, -2)$, $E(1, -2)$, and $F(2, -1)$. Rotate $\triangle DEF$ 270° CCW about the origin and then reflect it across the x-axis.

$(x, y) \rightarrow (y, -x)$



$(x, y) \rightarrow (y, -x)$

$D(5, -2) \rightarrow D'(-2, -5) \rightarrow D''(-2, 5)$

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

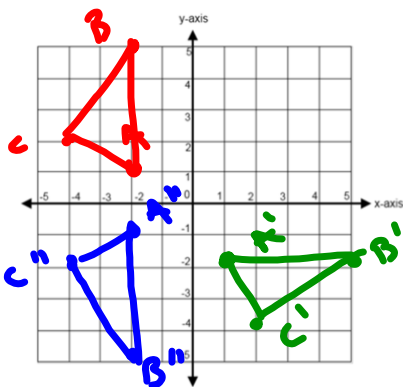
$F(2, -1) \rightarrow F'(-1, -2) \rightarrow F''(-1, 2)$



SEQUENCE OF TRANSFORMATIONS EX. 3

$(x, y) \rightarrow (y, x)$ ∴ Reflect $\triangle ABC$ over $y=x$ then rotate it 90 degrees clockwise about the origin.
 $(x, y) \rightarrow (y, -x)$

A(-2, 1) B(-2, 5) C(-4, 2)

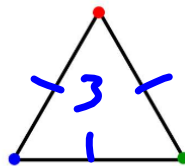
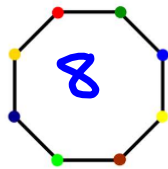
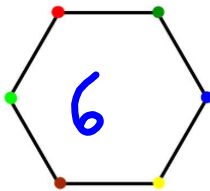
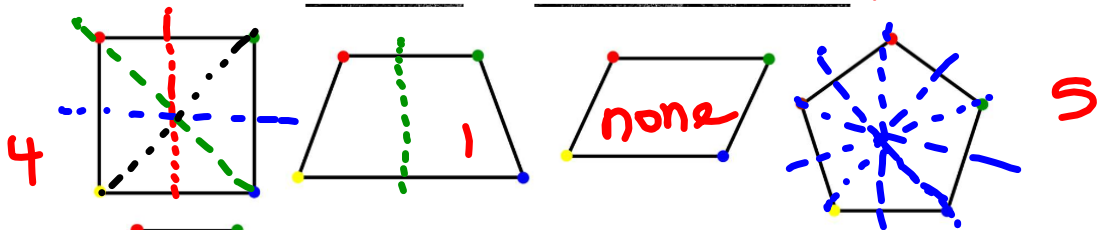


$$\begin{aligned}
 A(-2, 1) &\rightarrow A'(1, -2) \rightarrow A''(-2, -1) \\
 B(-2, 5) &\rightarrow B'(5, -2) \rightarrow B''(-2, -5) \\
 C(-4, 2) &\rightarrow C'(2, -4) \rightarrow C''(-4, -2)
 \end{aligned}$$



REFLECTIONAL SYMMETRY-

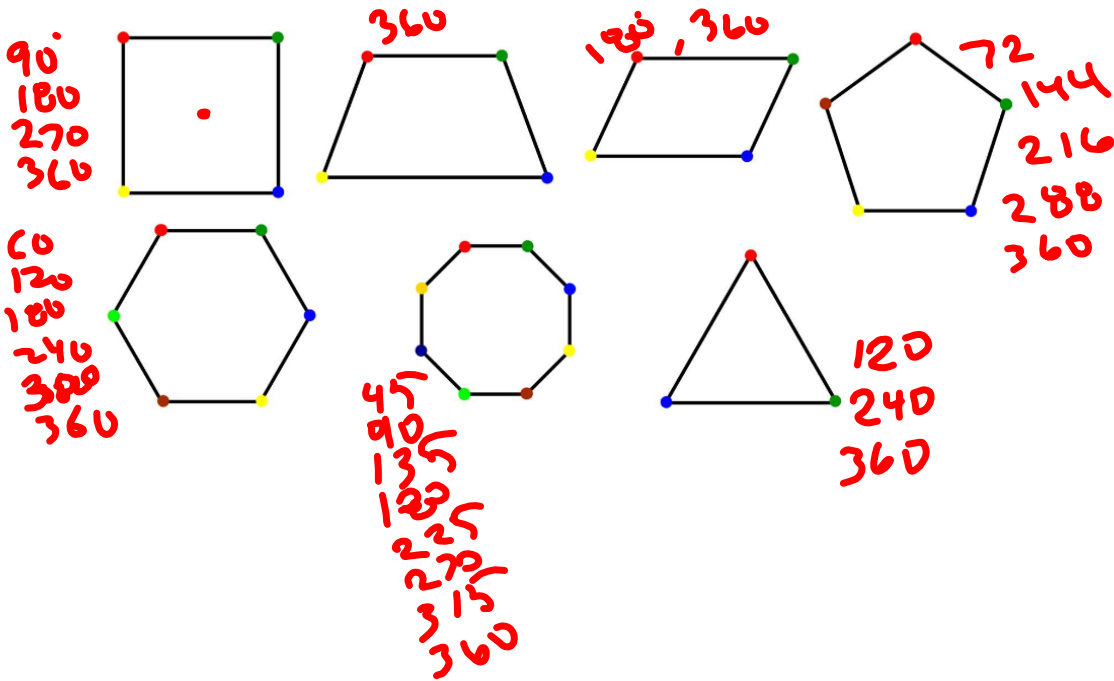
WHEN A FIGURE CAN BE mapped ONTO ITSELF BY A line of reflection.



Sides of regular polygon
= lines of reflection

regular polygon: $\frac{360}{n}$

ROTATIONAL SYMMETRY-
 MAPPING A FIGURE onto itself THROUGH A
 ROTATION ABOUT THE center OF THE OBJECT.

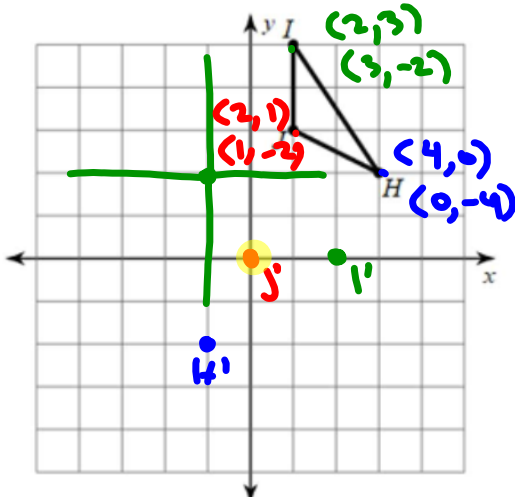


p.33, #9

Warm-up

15 January 2020

9) rotation 90° clockwise about the point $(-1, 2)$ $(x, y) \rightarrow (y, -x)$



$$I'(2, 0)$$

$$J'(0, 0)$$

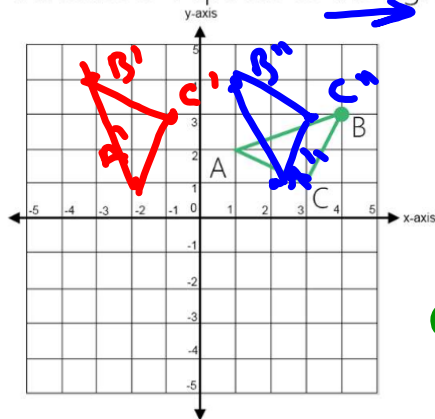
$$H'(-1, -2)$$

SEQUENCE OF TRANSFORMATIONS



SEQUENCE OF TRANSFORMATIONS EX. 1

- / Rotate the following figure 270 degrees clockwise,
- // translate it 4 spaces to the right.



90 ccw

$$(x, y) \rightarrow (-y, x)$$

$$(x, y) \rightarrow (x+4, y)$$

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

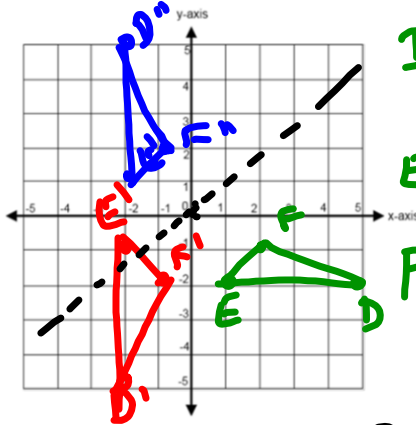
$$B(4, 3) \rightarrow B'(-3, 4) \rightarrow B''(1, 4)$$

$$C(3, 1) \rightarrow C'(-1, 3) \rightarrow C''(3, 3)$$



SEQUENCE OF TRANSFORMATIONS EX. 2

$\triangle DEF$ has vertices $D(5, -2)$, $E(1, -2)$, and $F(2, -1)$. Rotate $\triangle DEF$ 270° CCW about the origin and then reflect it across the x-axis.



$$\begin{aligned}
 & (x, y) \rightarrow (y, -x) \\
 & (x, y) \rightarrow (x, -y) \\
 & D(5, -2) \rightarrow D'(-2, -5) \rightarrow D''(-2, 5) \\
 & E(1, -2) \rightarrow E'(-2, -1) \rightarrow E''(-2, 1) \\
 & F(2, -1) \rightarrow F'(-1, -2) \rightarrow F''(-1, 2)
 \end{aligned}$$

reflect over $y = x$
 $(x, y) \rightarrow (y, x)$

$$(x, y) \rightarrow (y, x) \rightarrow (y, x)$$

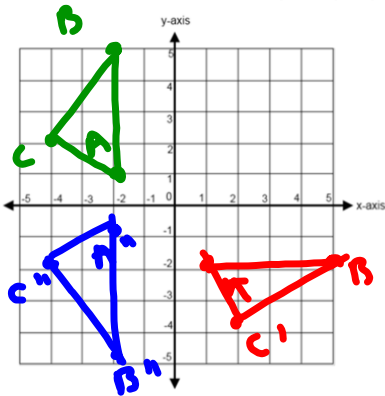
$$(x, y) \rightarrow (y, x)$$

SEQUENCE OF TRANSFORMATIONS EX. 3

$(x, y) \rightarrow (y, x)$
Reflect $\triangle ABC$ over $y=x$ then rotate it 90 degrees clockwise about the origin.

$270^\circ \text{ CCW } (x, y) \rightarrow (y, -x)$

$A(-2, 1) \quad B(-2, 5) \quad C(-4, 2)$



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

$$B(-2, 5) \rightarrow B'(5, -2) \rightarrow B''(-2, -5)$$

$$C(-4, 2) \rightarrow C'(2, -4) \rightarrow C''(-4, -2)$$

REFLECTIONAL SYMMETRY-

WHEN A FIGURE CAN BE MAPPED ONTO ITSELF BY A LINE OF REFLECTION

4

6

1

none

5

8

3

Sides of regular Polygon = # of lines of reflective symm.

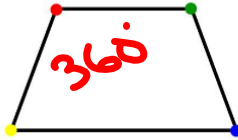
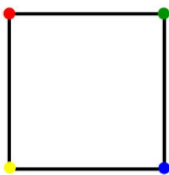
Detailed description: The image shows seven polygons with their lines of reflection drawn as dashed lines. A square has 4 lines of reflection (2 diagonals and 2 midlines). A trapezoid has 1 line of reflection (the vertical midline). A parallelogram has no lines of reflection. A regular pentagon has 5 lines of reflection (all medians). A regular hexagon has 6 lines of reflection (3 medians and 3 lines connecting opposite vertices). A regular octagon has 8 lines of reflection (4 medians and 4 lines connecting opposite vertices). An equilateral triangle has 3 lines of reflection (all medians). A handwritten note states: 'Sides of regular Polygon = # of lines of reflective symm.'

$$\frac{360^\circ}{7} = 0$$

ROTATIONAL SYMMETRY-
 MAPPING A FIGURE **ONTO ITSELF** THROUGH A
 ROTATION ABOUT THE **CENTER** OF THE OBJECT.

$$\frac{360^\circ}{5} = 72^\circ$$

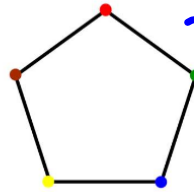
90°
180°
270°
360°



360°

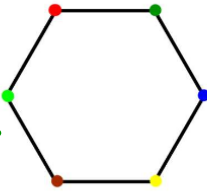


180°
360°

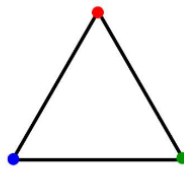
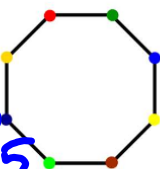


72°
144°
216°
288°
360°

60°
120°
180°
240°
300°
360°



45°
90°
135°
180°
225°
270°
315°
360°



120°
240°
360°

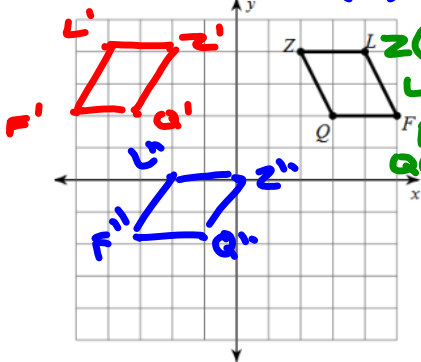


Sequence of Transformations

Name _____

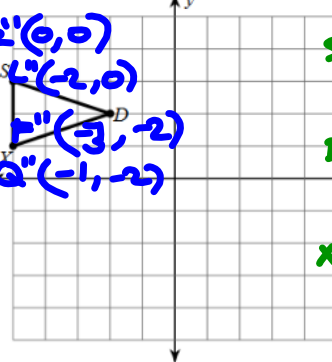
Graph the image of the figure using the sequence of transformations given.

- 1) Reflect across the y-axis. $(x, y) \rightarrow (-x, y)$
 Translate it 2 right and 4 down. $(x, y) \rightarrow (x+2, y-4)$



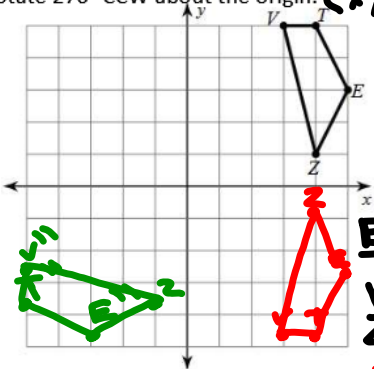
$Z(2,4) \rightarrow Z'(-2,4) \rightarrow Z''(0,0)$
 $L(4,4) \rightarrow L'(-4,4) \rightarrow L''(-2,0)$
 $F(5,2) \rightarrow F'(-5,2) \rightarrow F''(-3,-2)$
 $Q(3,2) \rightarrow Q'(-3,2) \rightarrow Q''(-1,-2)$

- 2) Translate right 3 and up 1. $(x, y) \rightarrow (x+3, y+1)$
 Rotate 90° CCW about the origin. $(x, y) \rightarrow (-y, x)$



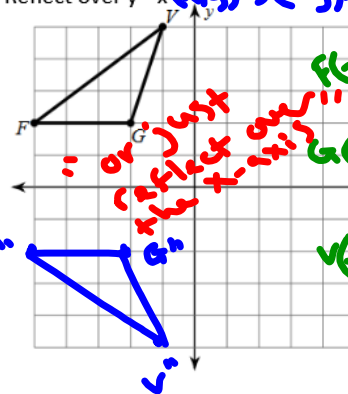
$S(-5,3) \rightarrow S'(-2,4)$
 $\rightarrow S''(-4,5)$
 $D(2,2) \rightarrow D'(-1,3)$
 $\rightarrow D''(-3,1)$
 $x(-5,1) \rightarrow x'(-2,2)$
 $\rightarrow x''(-2,-2)$

- 3) Reflect across the x-axis. $(x, y) \rightarrow (x, -y)$
 Rotate 270° CCW about the origin. $(x, y) \rightarrow (y, x)$



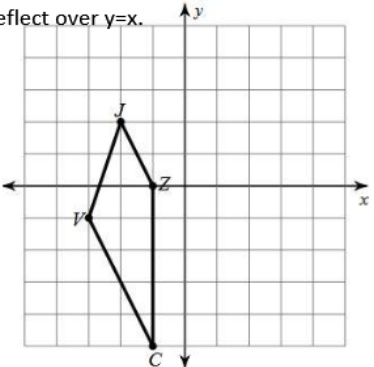
$E(5,3) \rightarrow E'(-3,-5)$
 $T(4,5) \rightarrow T'(-5,-4)$
 $V(3,5) \rightarrow V'(-5,-3)$
 $Z(4,1) \rightarrow Z'(-1,-2)$
 $E'(5,-3)$
 $T'(4,-5)$
 $V'(3,-5)$
 $Z'(4,-1)$

- 4) Rotate 90° CW about the origin. $(x, y) \rightarrow (y, -x)$
 Reflect over $y=-x$. $(x, y) \rightarrow (-y, -x)$

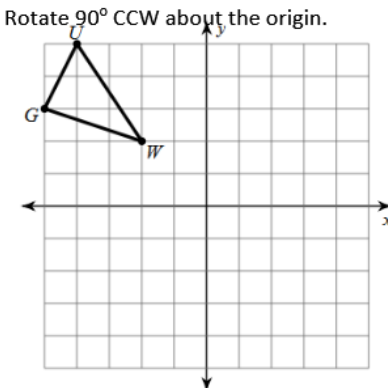


$F(-5,2) \rightarrow F'(2,5)$
 $F''(-3,-2)$
 $G(-4,2) \rightarrow G'(2,5)$
 $G''(-2,-2)$
 $V(-1,5) \rightarrow V'(5,1)$
 $V''(1,4)$

- 5) Rotate 180° about the origin.
 Translate $(x, y) \rightarrow (x-6, y-2)$.
 Reflect over $y=x$.



- 6) Reflect across $y=x$.
 Translate left 4 and up 2.
 Rotate 90° CCW about the origin.



$$\textcircled{4} \quad (x, y) \rightarrow (y, -x) \rightarrow (x, -y)$$

$$\underline{(x, y)} \rightarrow \underline{(x, -y)}$$

Identify the transformation shown. For a challenge, also find a sequence of transformations for 7, 8, 10, 11.

