

Directions: Write the rule of the transformation.

- 1) A triangle ABC is rotated 360 degrees CW.

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

- 3) A square MNOP is rotated 270 degrees CW.

$$(x, y) \rightarrow (-y, x) \quad (90^\circ \text{CCW})$$

- 2) A line segment  $\overline{DE}$  is rotated 180 degrees.

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

- 4) A line segment  $\overline{XY}$  is rotated 90 degrees CW.

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

Directions: Describe the transformation. (This is a mixed review).

- 5)  $(x, y) \rightarrow (-y, x)$  This rotates a figure  $90^\circ$  CCW about the origin.

- 6)  $(x, y) \rightarrow (y, -x)$  This rotates a figure  $90^\circ$  CW about the origin.

- 7)  $(x, y) \rightarrow (-x, -y)$  This rotates a figure  $180^\circ$  about the origin.

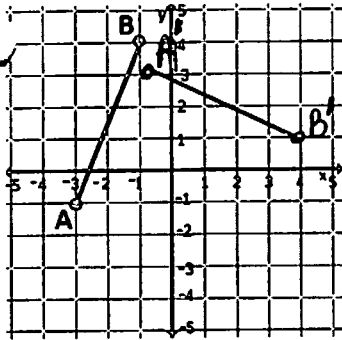
- 8)  $(x, y) \rightarrow (x + 2, y)$  This translates a figure 2 units to the right.

- 9)  $(x, y) \rightarrow (-y, -x)$  This reflects a figure over the line  $y = -x$ .

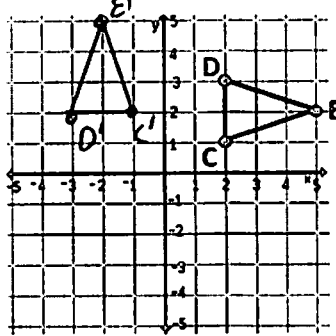
- 10)  $(x, y) \rightarrow (-y, x + 1)$  This rotates a figure  $90^\circ$  CCW about the origin then translates it 1 unit up.

Directions: Complete the transformation of the new image. If the rule was provide, describe the transformation. If the transformation was described, write the rule.

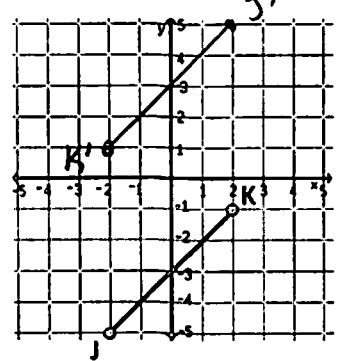
- 11)  $AB(x, y) \rightarrow A'B'(y, -x)$



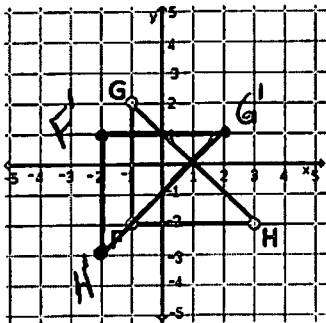
- 12)  $CDE(x, y) \rightarrow C'D'E'(-y, x)$



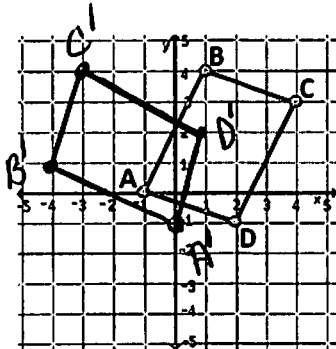
- 13)  $JK(x, y) \rightarrow J'K'(-x, -y)$



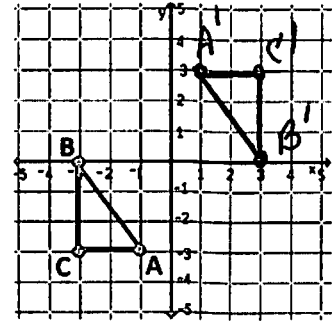
- 14) Rotate  $FGH$  by  $270^\circ$  CCW.



- 15) Rotate  $ABCD$  by  $90^\circ$  CCW.



- 16) Rotate  $ABC$   $180^\circ$



Find the image of  $(-34, 93)$  if it is rotated  $90^\circ$  clockwise about the origin.  $(93, 34)$

18) Find the image of  $(-14, -38)$  if it is rotated  $90^\circ$  counterclockwise about the origin.  $(+38, -14)$

19. Find the image of  $(254, -180)$  if it is rotated  $180^\circ$  about the origin.  $(-254, 180)$

Directions: Explain algebraically how to complete the rotation.

20) A line segment  $\overline{TP}$  is rotated  $90^\circ$  CCW about the fixed point of  $J(3, -2)$ .

- ① Translate the system back to the origin.
- ② Rotate the points on the segment  $90^\circ$  CCW about the origin.
- ③ Translate the system back to  $(3, -2)$ .

$$\begin{aligned} (x, y) &\Rightarrow \\ \left\{ \begin{aligned} (x-3, y+2) &\Rightarrow \\ (-y+2, x-3) &\Rightarrow \\ (-y+2)+3, x-3-2 &= (-y+1, x-5) \end{aligned} \right. \end{aligned}$$

21) A triangle HUG is rotated  $180^\circ$  CW about the fixed point  $K(-5, 0)$ .

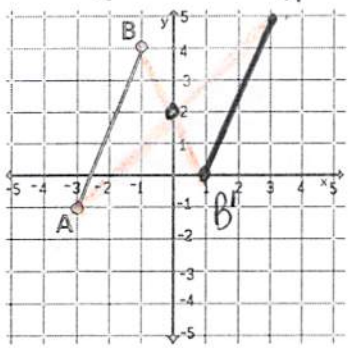
- ① Translate the system back to the origin.
- ② Rotate the  $\Delta$   $180^\circ$  about the origin.
- ③ Translate the system back to  $(-5, 0)$ .

$$\begin{aligned} (x, y) &\Rightarrow \\ \left\{ \begin{aligned} (x+5, y) &\Rightarrow \\ -(x+5), -y &\Rightarrow \\ -(x+5)-5, -y &= (-x-10, -y) \end{aligned} \right. \end{aligned}$$

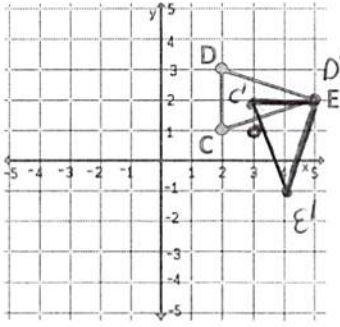
Directions: Complete the rotation.

22) Rotate  $\overline{AB}$   $180^\circ$  about  $(0, 2)$

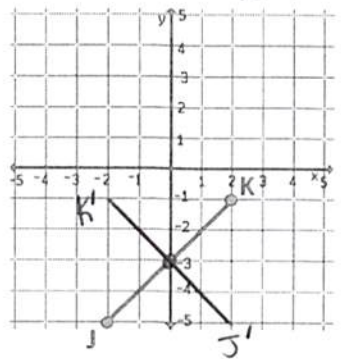
$$(-3, -1) \rightarrow (3, 5) \quad A' \rightarrow (-x, -y+4)$$



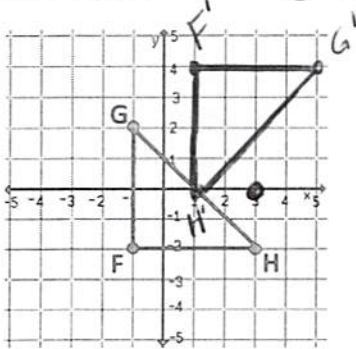
23) Rotate  $\Delta CDE$   $90^\circ$  CW about  $(3, 1)$



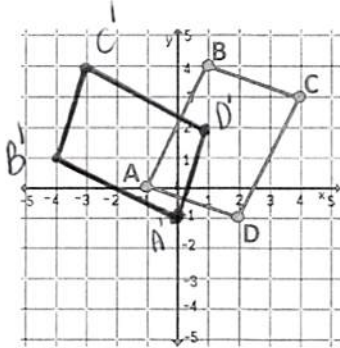
24) Rotate  $\overline{JK}$   $270^\circ$  CW about  $(0, -3)$   $90^\circ$  CCW



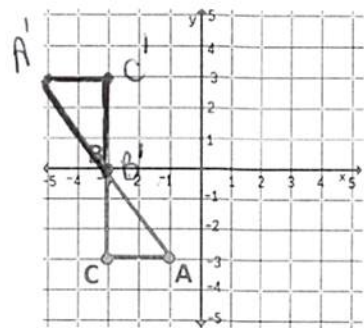
25) Rotate  $\Delta FGH$  by  $270^\circ$  CCW about  $(3, 0)$   $90^\circ$  CW



26) Rotate ABCD by  $90^\circ$  CCW about  $(0, 0)$



27) Rotate  $\Delta ABC$   $180^\circ$  CW about Point B



Directions: Find the specified image coordinate.

28) If  $A(4, 10)$  is rotated  $90^\circ$  CCW about  $M(3, -1)$ , what is  $A'$ ?

- ① Translate  $A$  to origin near  $M$ .  $(4, 10) \rightarrow (4-3, 10-(-1)) = (1, 11)$
- ② Rotate the new point.  $(1, 11) \rightarrow (-11, 1)$
- ③ Translate it back to  $M$ .  $(-11, 1) \rightarrow (-11+3, 1-1) = (-8, 0)$

30) If  $A$  is rotated  $90^\circ$  CCW about  $M(3, -1)$ , the image,  $A'$ , is  $(4, 10)$ . What is  $A$ ?

- Reverse the  $90^\circ$  CCW to  $90^\circ$  CW.
- ①  $(4, 10) \rightarrow (4-3, 10+1) = (1, 11)$
- ②  $(1, 11) \rightarrow (11, -1)$
- ③  $(11, -1) \rightarrow (11+3, -1-1) = (14, -2)$

29) If  $L(-2, -2)$  is rotated  $180^\circ$  CW about  $W(0, 6)$ , what is  $L'$ ?

- ① Translate to origin:  $(-2, -2) \rightarrow (-2-0, -2-6) = (-2, -8)$
- ② Rotate  $180^\circ$ :  $(-2, -8) \rightarrow (2, 8)$
- ③ Translate to  $w$ :  $(2, 8) \rightarrow (2+0, 8+6) = (2, 14)$

31) If  $L$  is rotated  $180^\circ$  CW about  $W(0, 6)$ , its image,  $L'$ , is  $(-2, -2)$ . What is  $L$ ?