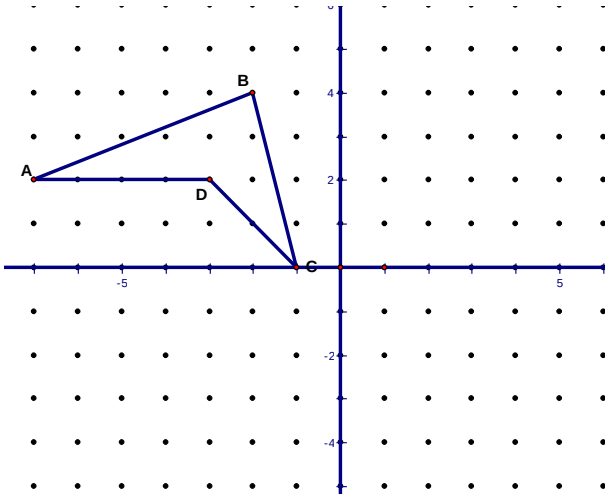
Geometry Name_____ Per___

Date _____

Translations



Coordinate notation: $(a, b) \rightarrow (a + h, b + k)$

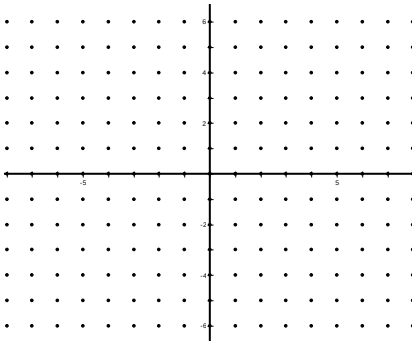
Translation notation: $\boldsymbol{T}_{\langle h,k\rangle}(A)$

slide point *A* ***h*** units in the *x*-direction
slide point *A* ***k*** units in the *y*-direction

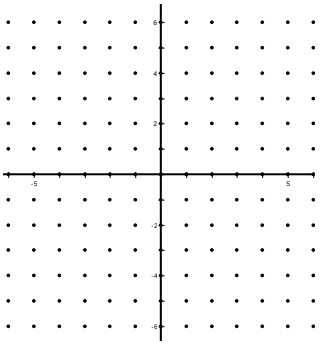
$\langle h, k\rangle$ is the **translation vector**

Copy ABCD from the drawing above and draw its image after each translation.

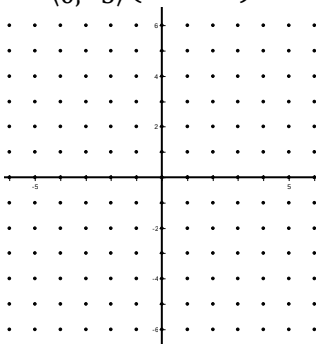
1. $(a, b) \rightarrow (a - 1, b + 2)$



2. $(a, b) \rightarrow (a + 3, b)$



3. $\boldsymbol{T}_{\langle 0,-5\rangle}(ABCD)$



Describe each translation using a) coordinate notation and b) translation notation.

4. Every point moves to the left 2 units and up 6 units.

5. Every point moves to the right 7 units and up 3 units.

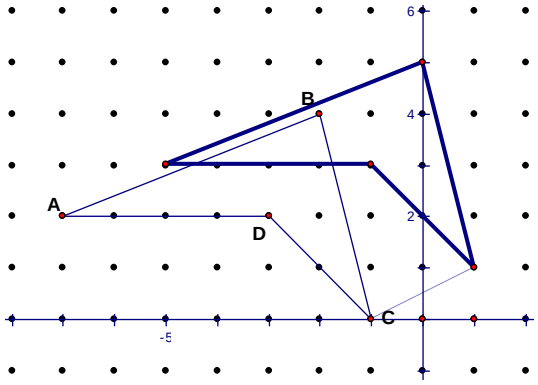
6. Every point moves to the left 8 units.

7. Every point moves up 9 units.

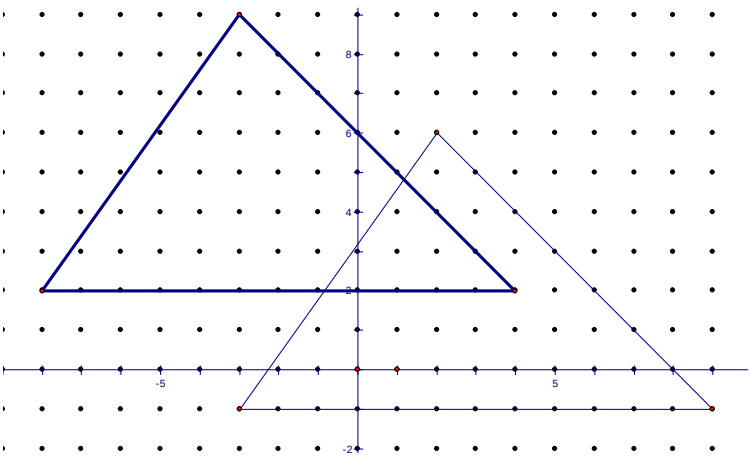
8. Every point moves to the left 10 units and down 4 units.

The image of each polygon after a translation is shown in bold lines. Describe each translation in a) coordinate notation and b) translation notation.

9.



10.



11. Is congruency preserved when translating a polygon?

12. Is orientation preserved when translating a polygon?

Find the distance between a point and its image after the given translation.

13. $(a, b) \rightarrow (a - 1, b + 2)$

14. $\boldsymbol{T}_{\langle 3,4 \rangle}$

15. $\boldsymbol{T}_{\langle 7,-5 \rangle}$

Describe the translation

16. $(4,8) \rightarrow (7,2)$

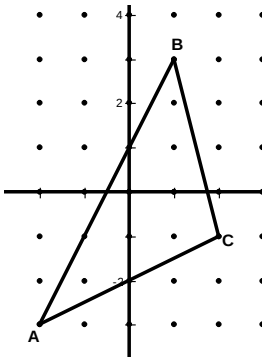
17. $(5,0) \rightarrow (8,5)$

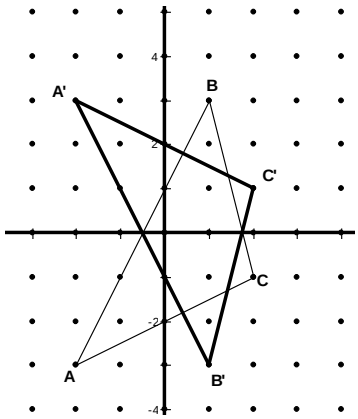
18. $(-8,10) \rightarrow (1,0)$

Reflections

Draw the polygon by graphing the given vertices and connecting with segments.
Reflect the polygon appropriately and give the coordinates of the image.

Example 1 A (-2, -3), B(1, 3) and C(2, -1) reflected over the x-axis $(\boldsymbol{r}_{x-axis})$

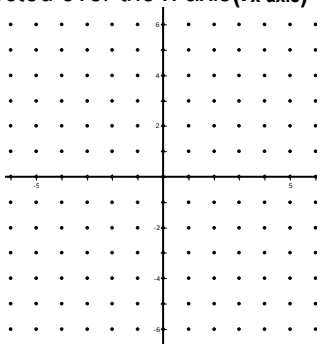




A (-2, -3) → A' (-2, 3)
B (1, 3) → B' (1, -3)
C (2, -1) → C' (2, 1)

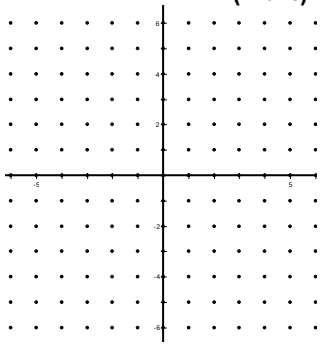
Describe the change in orientation:

1. A(2, 3), B(0, 0), and C(4, 0) reflected over the x-axis**($r_{x\text{-axis}}$)**



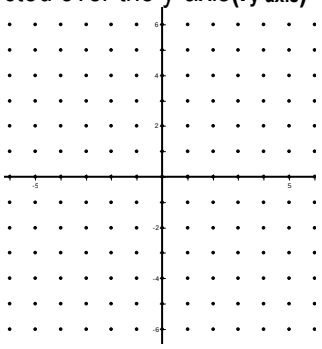
A(2, 3) → A' (
B(0, 0) → B'(
C(4, 0) → C'(

2. D(-1, 3), E(5, 2), and F(3, -4) reflected over the x-axis**($r_{x\text{-axis}}$)**



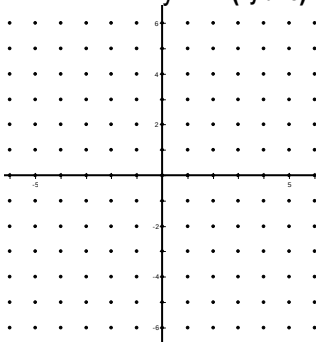
D(-1, 3) → D' (
E(5, 2) → E'(
F(3, -4) → F'(

3. G(0, 2), H(-1, -2), and I(-3, 4) reflected over the y-axis**($r_{y\text{-axis}}$)**



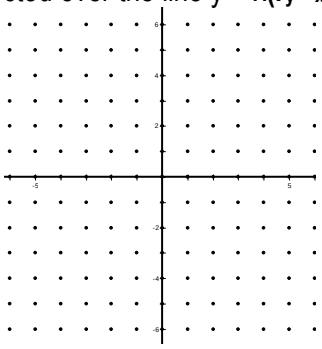
G(0, 2) → G' (
H(-1, -2) → H'(
I(-3, 4) → I'(

4. J(-3, 0), K(2, 1), and L(1, -2) reflected over the y-axis**($r_{y\text{-axis}}$)**



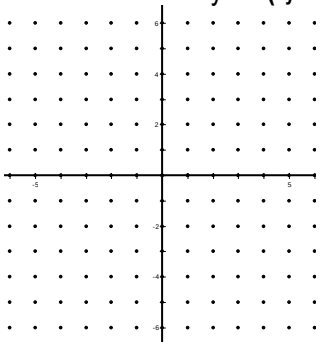
J(-3, 0) → J' (
K(2, 1) → K'(
L(1, -2) → L'(

5. M(2, -3), N(1, 2), and O(-4, -2) reflected over the line y = x**($r_{y=x}$)**



M(2, -3) → M' (
N(1, 2) → N'(
O(-4, -2) → O'(

6. P(2, 3), Q(-3, 4), and R(5, 0) reflected over the line y = x**($r_{y=x}$)**



P(2, 3) → P' (
Q(-3, 4) → Q'(
R(5, 0) → R'(

The rules

Reflecting over the x-axis ($r_{x\text{-axis}}$) (a, b) →

Reflecting over the y-axis ($r_{y\text{-axis}}$) (a, b) →

Reflecting over the line y = x ($r_{y=x}$) (a, b) →

7. Give the coordinates of the vertices of pentagon PQRST after a reflection over the x-axis, y-axis, and the line y = x

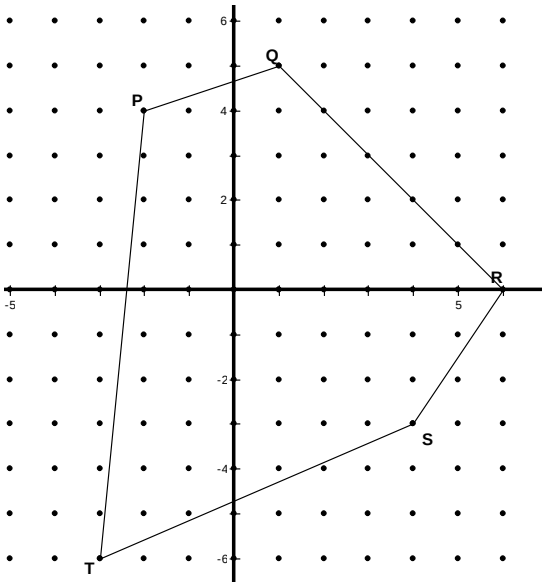


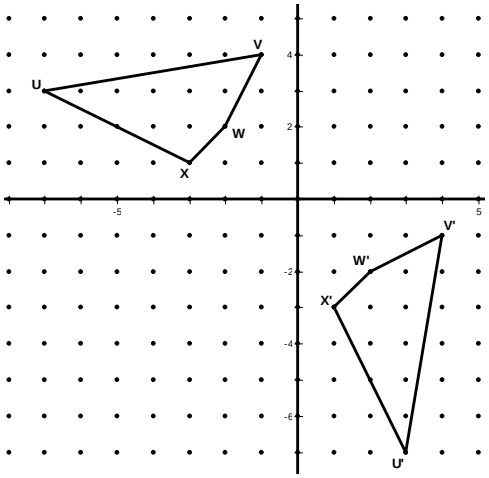
Image points after reflecting over the x-axis:

Image points after reflecting over the y-axis:

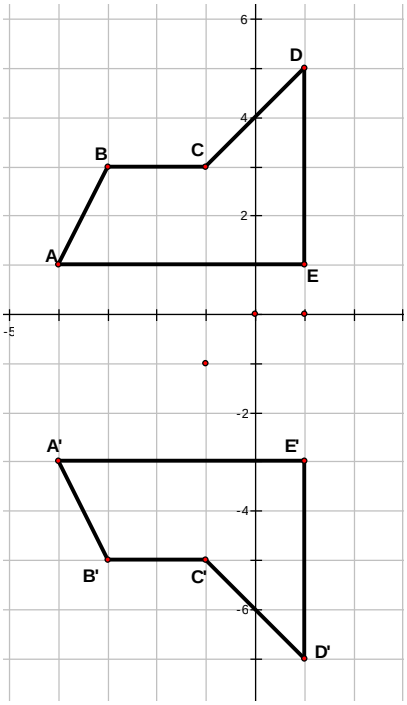
Image points after reflecting over the line y = x:

Draw the line of reflection for each polygon and its image.

8.



9.

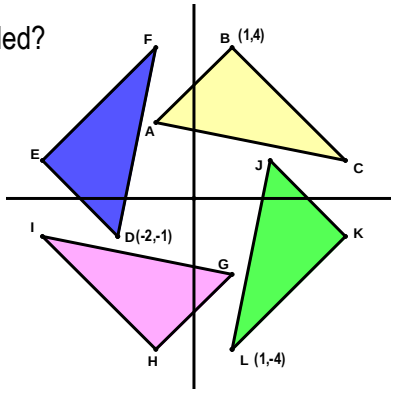


Applying Rotations

The rules

90° rotation ($R_{90°}$) (a, b) →
180° rotation ($R_{180°}$) (a, b) →
270° rotation ($R_{270°}$) (a, b) →
360° rotation ($R_{360°}$) (a, b) →

1. A rotation of 180° is sometimes called a half-turn. What could a 90° rotation be called?



2. **Name the image** of each triangle after the rotation around the origin.

a) $\boldsymbol{R}_{90°}(\Delta ABC)$

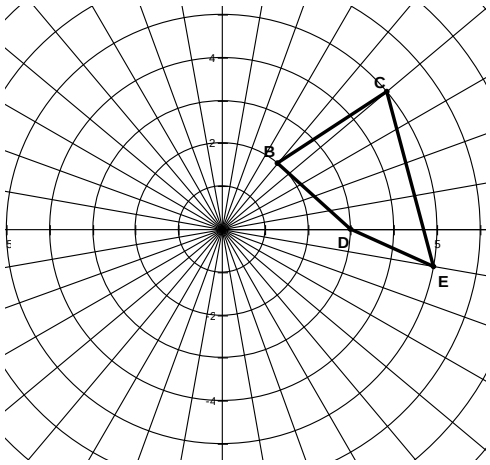
b) $\boldsymbol{R}_{180°}(\Delta DEF)$

c) $\boldsymbol{R}_{270°}(\Delta JKL)$

d) $\boldsymbol{R}_{180°}(\Delta GHI)$

Quadrilateral BCED is shown on polar graph paper. Draw its image after a rotation of 90° $(\boldsymbol{R}_{90°})$ and give the coordinates in polar form (the rays are in 10° increments).

3.



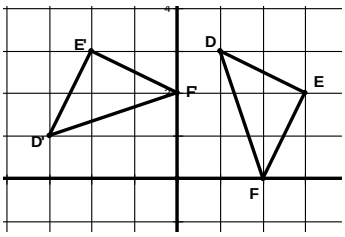
B (2, 50°)
C (
E (
D (

4. Is congruency preserved when rotating a polygon?

5. Is orientation preserved when rotating a polygon?

Example

D (1,3), *E* (3,2), *F* (2,0) rotated 90°



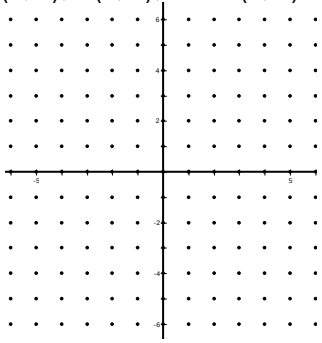
D (1,3) → *D'* (-3, 1)
E (3,2) → *E'* (-2, 3)
F (2,0) → *F'* (0, 2)

****Note**** a rotation is counterclockwise (ccw) unless otherwise noted clockwise (cw)

Draw the polygon by graphing the given vertices and connecting with segments. Give the coordinates of the image.

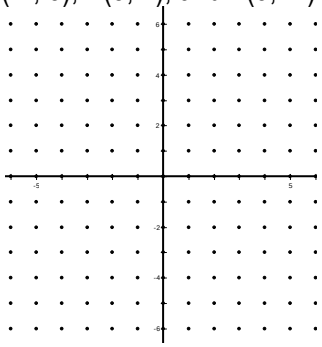
90° rotations ($R_{90°}$)

6. A(2, 3), B(0, 0), and C(4, 0)



A(2, 3) → A' (
B(0, 0) → B'(
C(4, 0) → C'(

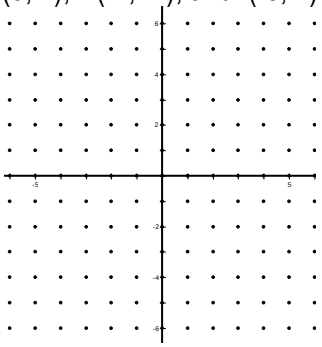
7. D(-1, 3), E(5, 2), and F(3, -4)



D(-1, 3) → D' (
E(5, 2) → E'(
F(3, -4) → F'(

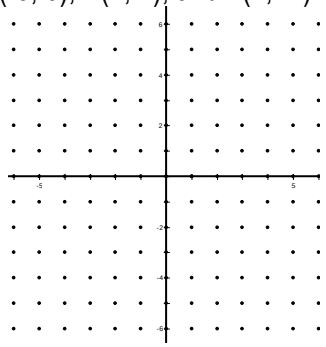
180° rotations ($R_{180°}$)

8. G(0, 2), H(-1, -2), and I(-3, 4)



G(0, 2) → G' (
H(-1, -2) → H'(
I(-3, 4) → I'(

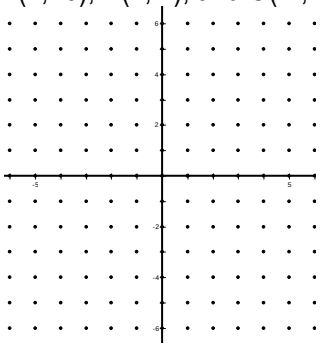
9. J(-3, 0), K(2, 1), and L(1, -2)



J(-3, 0) → J' (
K(2, 1) → K'(
L(1, -2) → L'(

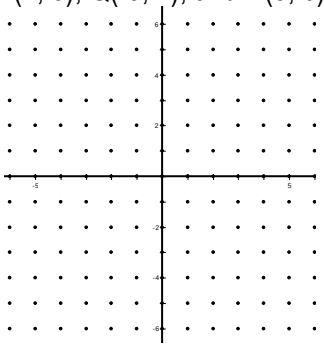
270° rotations ($R_{270°}$)

10. M(2, -3), N(1, 2), and O(-4, -2)



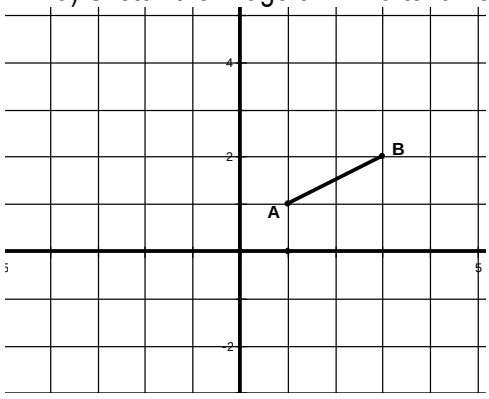
M(2, -3) → M' (
N(1, 2) → N'(
O(-4, -2) → O'(

11. P(2, 3), Q(-3, 4), and R(5, 0)



P(2, 3) → P' (
Q(-3, 4) → Q'(
R(5, 0) → R'(

12. a) Sketch the image of $\overline{AB}$ after a 180° rotation around the origin.



b) Use slopes to show that quadrilateral *ABA'B'* is a parallelogram.