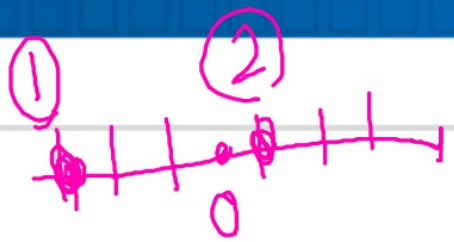
9-3 Rotations



Warm Up

1. The translation image of $P(-3, -1)$ is $P'(1, 3)$. Find the translation image of $Q(2, -4)$.

Rule $x+4, y+4$

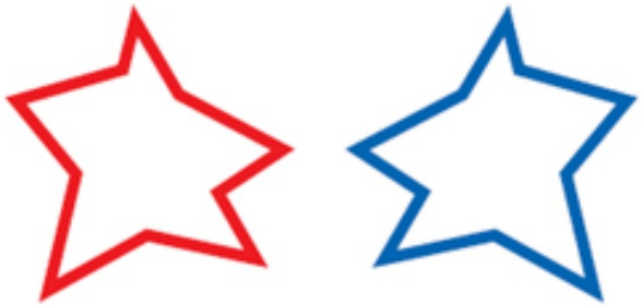
$1-(-3) = +4$

$3-(-1)$

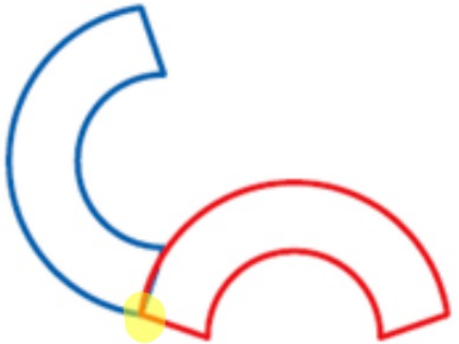
9-3 Rotations

Remember that a rotation is a transformation that turns a figure around a fixed point, called the center of rotation. A rotation is an isometry, so the image of a rotated figure is congruent to the preimage.

Tell whether each transformation appears to be a rotation. Explain.



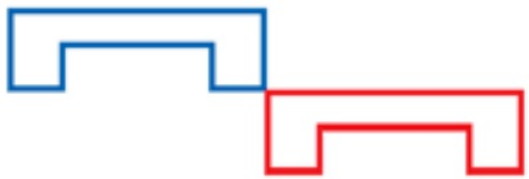
No; the figure appears to be flipped.



Yes; the figure appears to be turned around a point.

Tell whether each transformation appears to be a rotation.

a.



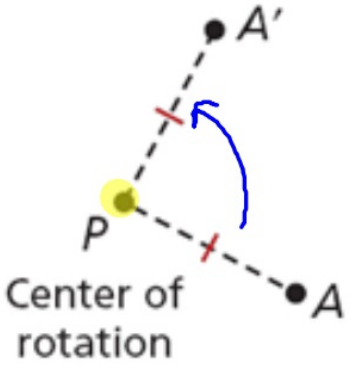
No, the figure appears to be a translation.

b.

Yes, the figure appears to be turned around a point.

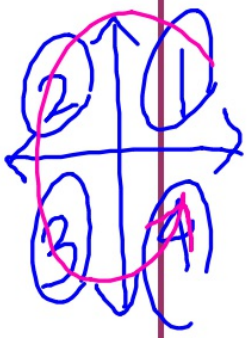
Rotations

A rotation is a transformation about a point P, called the center of rotation, such that each point and its image are the same distance from P, and such that all angles with vertex P formed by a point and its image are congruent. In the figure, $\angle APA'$ is the angle of rotation.

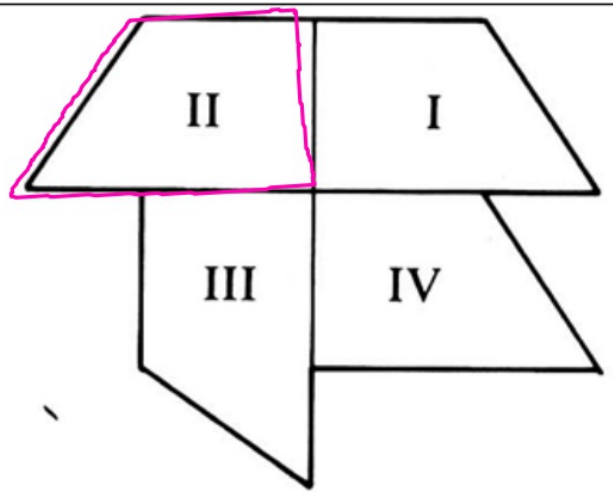


Helpful Hint

Unless otherwise stated, all rotations in this book are counterclockwise.



20-23: State whether the specified trapezoid is mapped to the other trapezoid by a reflection, translation, rotation, or half-turn.



20) I to IV **Translation**

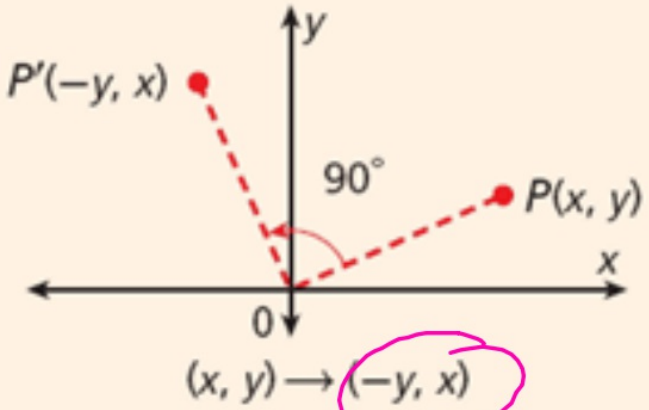
21) II to III **Rotation**

22) III to I **Reflection** & half-turn

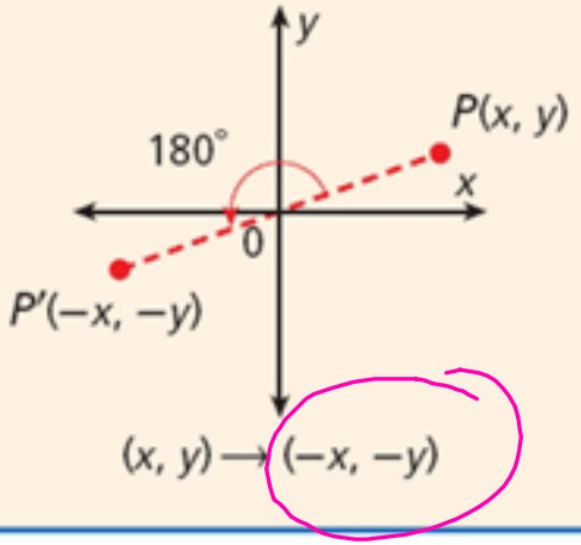
23) II to IV **Half - turn** and reflection

Rotations in the Coordinate Plane

BY 90° ABOUT THE ORIGIN



BY 180° ABOUT THE ORIGIN



Example 3: Drawing Rotations in the Coordinate Plane

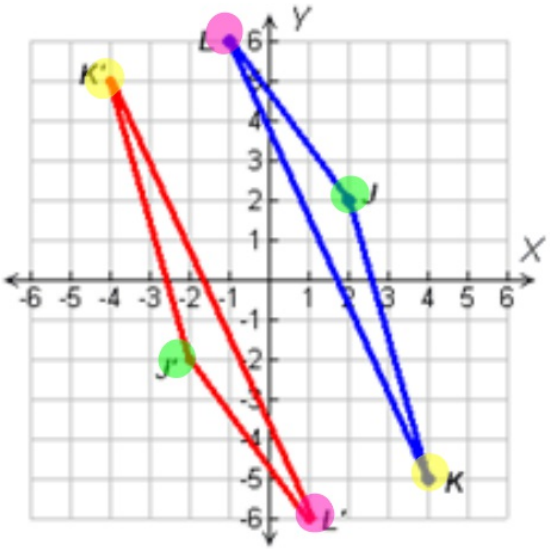
Rotate ΔJKL with vertices $J(2, 2)$, $K(4, -5)$, and $L(-1, 6)$ by 180° about the origin.

The rotation of (x, y) is $(-x, -y)$.

$J(2, 2) \rightarrow$

$K(4, -5) \rightarrow$

$L(-1, 6) \rightarrow$



Graph the preimage and image.

Check It Out! Example 3

Rotate ΔABC by 180° about the origin.

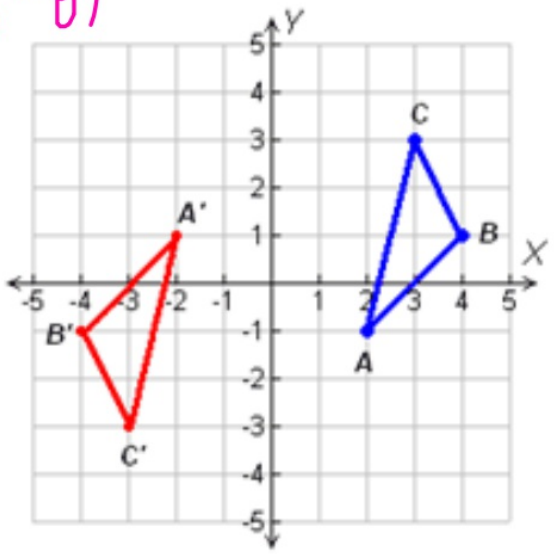
The rotation of (x, y) is change signs $(-x, -y)$

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

$B(4, 1) \rightarrow$ ____

$C(3, 3) \rightarrow$ ____

Graph the preimage and image.



Rotate $\triangle ABC$ with vertices $A(2, -1)$, $B(4, 1)$, and $C(3, 3)$ by 90° about the origin.

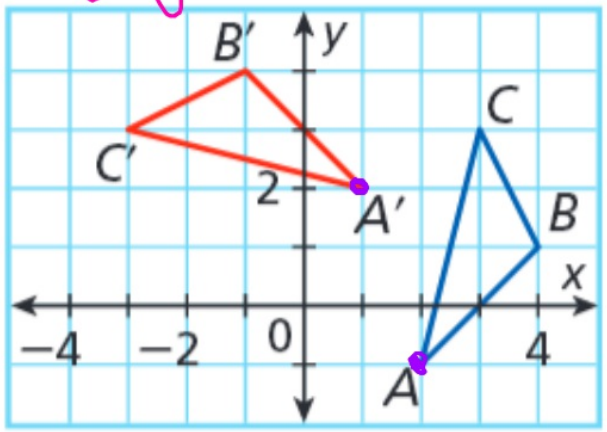
The rotation of (x, y) is $(-y, x)$ switch, only change y

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

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

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

Graph the preimage and image.

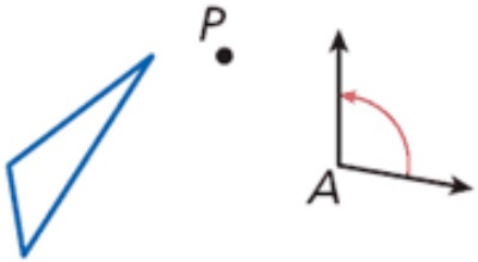


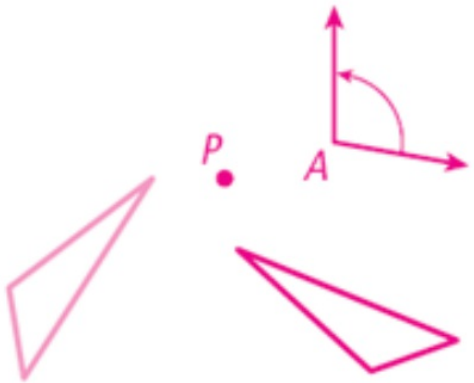
Lesson Quiz: Part I

1. Tell whether the transformation appears to be a rotation.

yes

2. Copy the figure and the angle of rotation. Draw the rotation of the triangle about P by $\square A$.





Lesson Quiz: Part II

Rotate ΔRST with vertices $R(-1, 4)$, $S(2, 1)$, and $T(3, -3)$ about the origin by the given angle.

$(-y, x)$

3. 90° $R'(-4, -1)$, $S'(-1, 2)$, $T'(3, 3)$

4. 180° $R'(1, -4)$, $S'(-2, -1)$, $T'(-3, 3)$

$(-x, -y)$

GUIDED PRACTICE

Tell whether each transformation appears to be a rotation.

1. 

2. 

3. 

4. 

Copy each figure and the angle of rotation. Draw the rotation of the figure about point P by $m\angle A$.

6. 

Rotate the figure with the given vertices about the origin using the given angle of rotation.

7. $A(1, 0), B(3, 2), C(5, 0)$; 90°

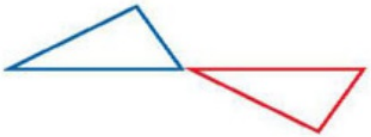
8. $J(2, 1), K(4, 3), L(2, 4), M(-1, 2)$; 90°

9. $D(2, 3), E(-1, 2), F(2, 1)$; 180°

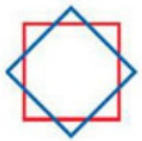
10. $P(-1, -1), Q(-4, -2), R(0, -2)$; 180°

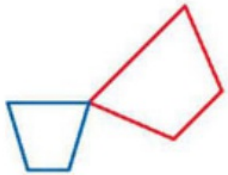
PRACTICE AND PROBLEM SOLVING

Tell whether each transformation appears to be a rotation.

12. 

13. 

14. 

15. 

HW 9.3 Online p622-623

1-4, 6-10, 12-16, 18-21, 23-25

Copy each figure and the angle of rotation. Draw the rotation of the figure about point P by $m\angle A$.

16. 

Rotate the figure with the given vertices about the origin using the given angle of rotation.

18. $E(-1, 2), F(3, 1), G(2, 3)$; 90°

19. $A(-1, 0), B(-1, -3), C(1, -3), D(1, 0)$; 90°

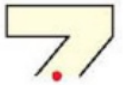
20. $P(0, -2), Q(2, 0), R(3, -3)$; 180°

21. $L(2, 0), M(-1, -2), N(2, -2)$; 180°

Copy each figure. Then draw the rotation of the figure about the red point using the given angle measure.

23. 90°

24. 180°



25. 180°