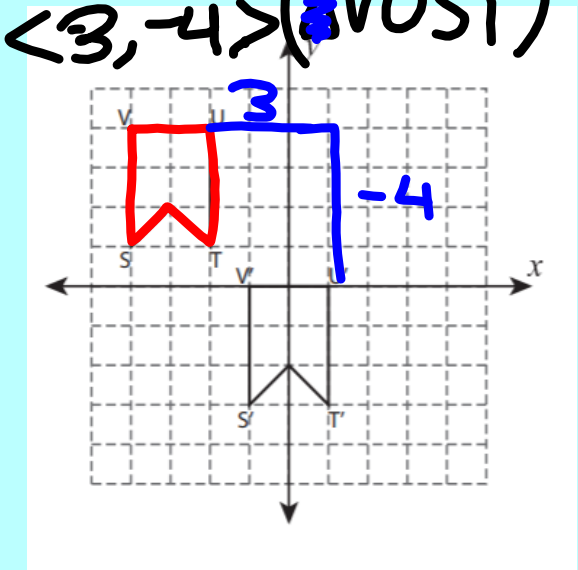
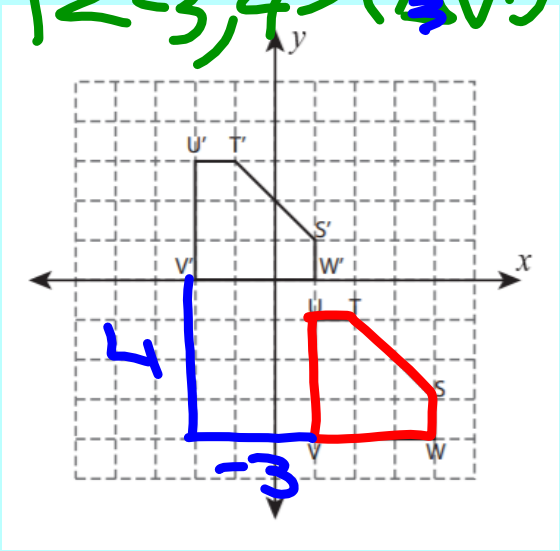
2/20/2020 - Warm Up Problem

Write a rule in function notation for each translation.

$T\langle 3,-4\rangle(VUST)$



$T\langle -3,4\rangle(VUTSW)$

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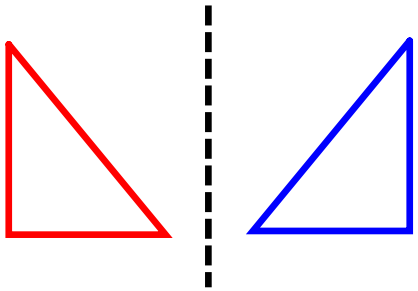
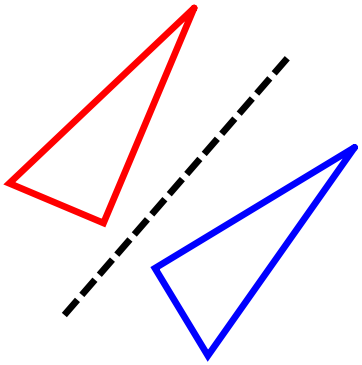
Concept 21 - Reflections and Rotations

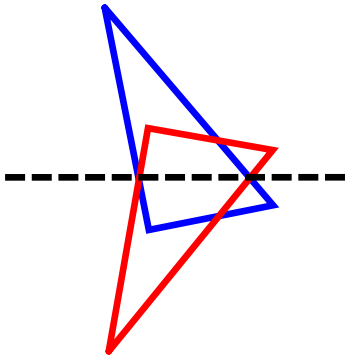
Goal: Use function notation to describe reflections and rotations and draw graphs of reflections and rotations

Reflection: (flip) a rigid motion where each point is mapped to the other side of a line

- the preimage and image are congruent but have opposite orientations

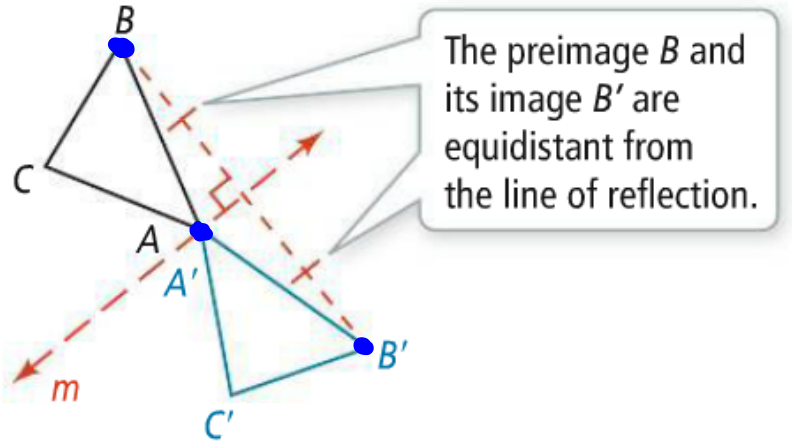






Properties of Reflections

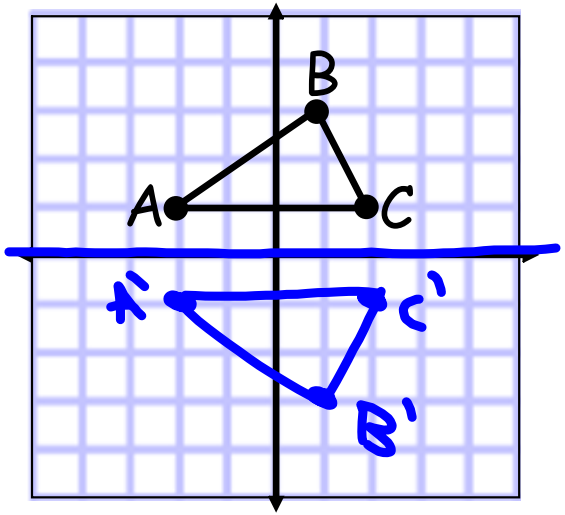
- If point A is on the line of reflection, then point A does not move. (A = A')
- If point B is not on the line of reflection, then its image B' is located directly opposite B and the same distance away from the line of reflection that B is.



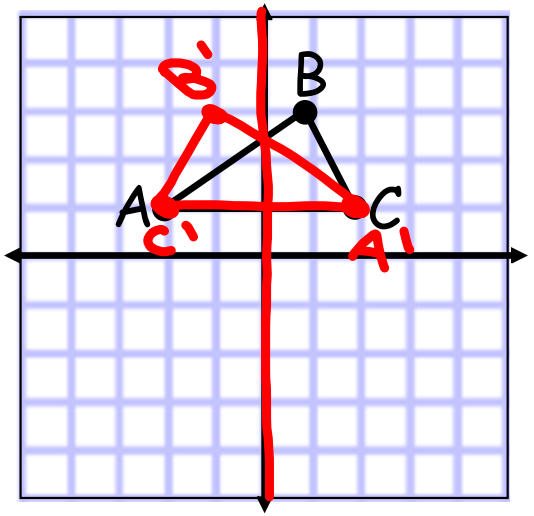
Function Notation for Reflections

$R_m(\mathrm{A}) = \mathrm{A}'$ means point A is reflected over line m

$R_{x\text{-axis}}(\Delta ABC)$



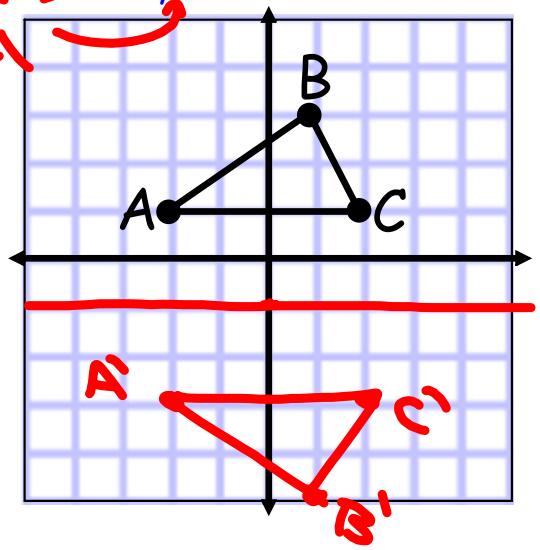
$R_{y\text{-axis}}(\Delta ABC)$



Other Vertical and Horizontal Lines

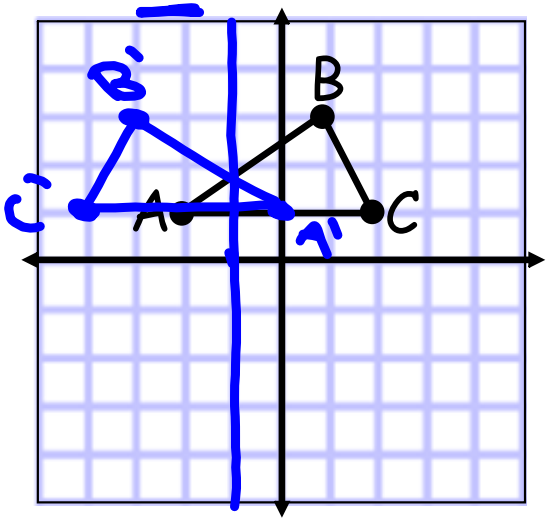
crosses y-axis at -1

$R_{y=-1}(\Delta ABC)$

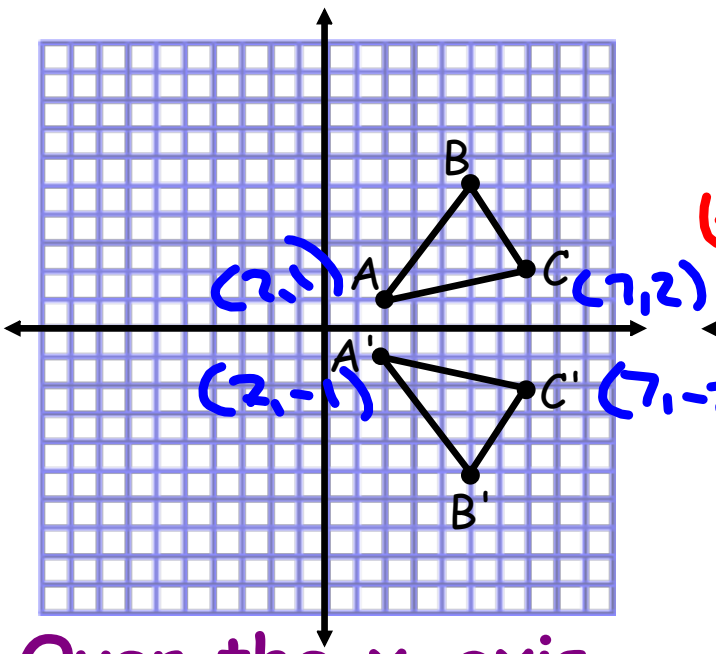


crosses x-axis at -1

$R_{x=-1}(\Delta ABC)$

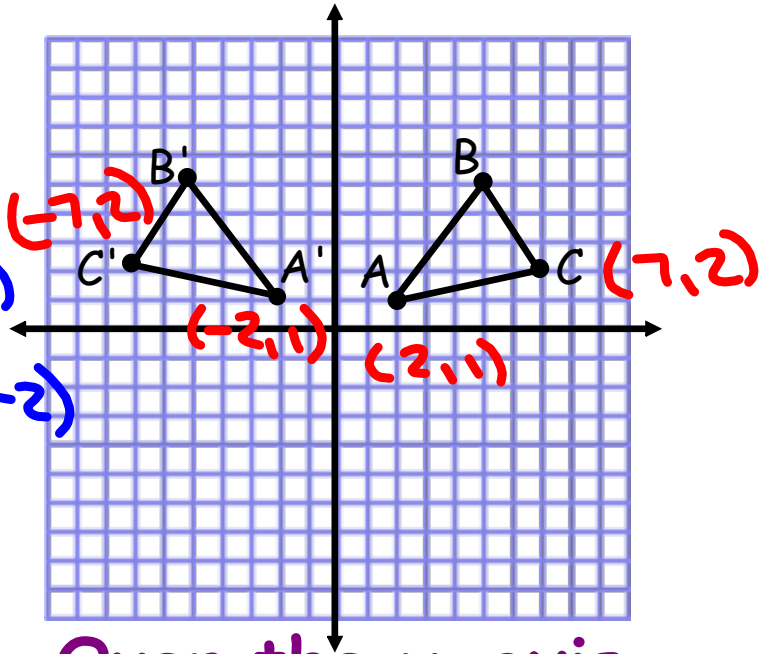


Coordinate Rules for Reflections



Over the x-axis

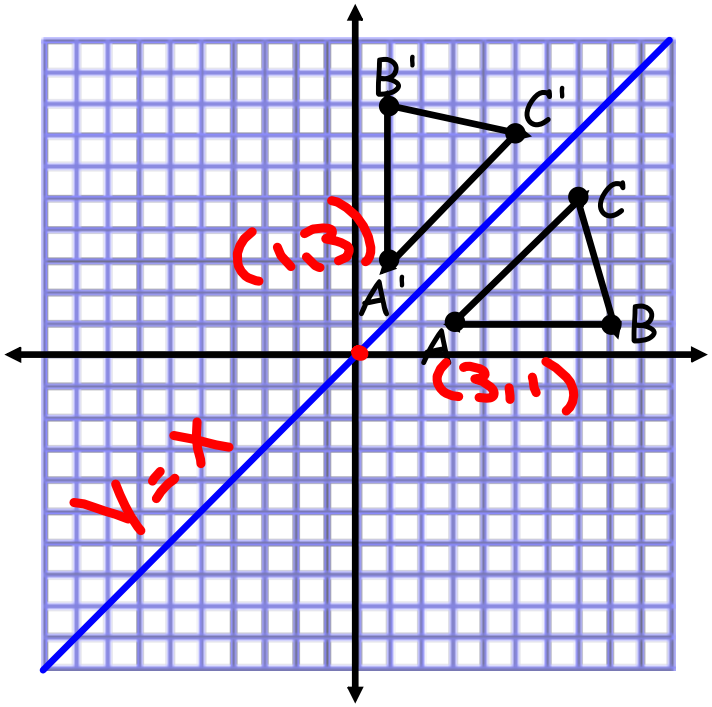
$R_{x\text{-axis}}(x,y) = (x,-y)$



Over the y-axis

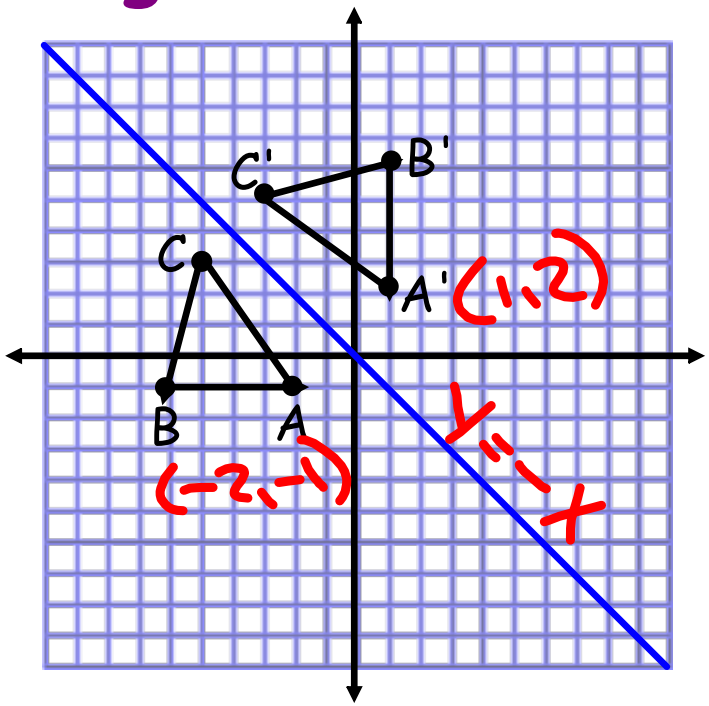
$R_{y\text{-axis}}(x,y) = (-x,y)$

Reflection over Diagonal Lines



Over the line y = x

$R_{y=x}(x,y) =$ (y, x)



Over the line y = -x

$R_{y=-x}(x,y) =$ (-y, -x)

Reflections in the Coordinate Plane

Over the x-axis

$R_{x\text{-axis}}(x,y) = (x, -y)$

Over the y-axis

$R_{y\text{-axis}}(x,y) = (-x, y)$

Over the line y = x

$R_{y=x}(x,y) = (y, x)$

Over the line y = -x

$R_{y=-x}(x,y) = (-y, -x)$

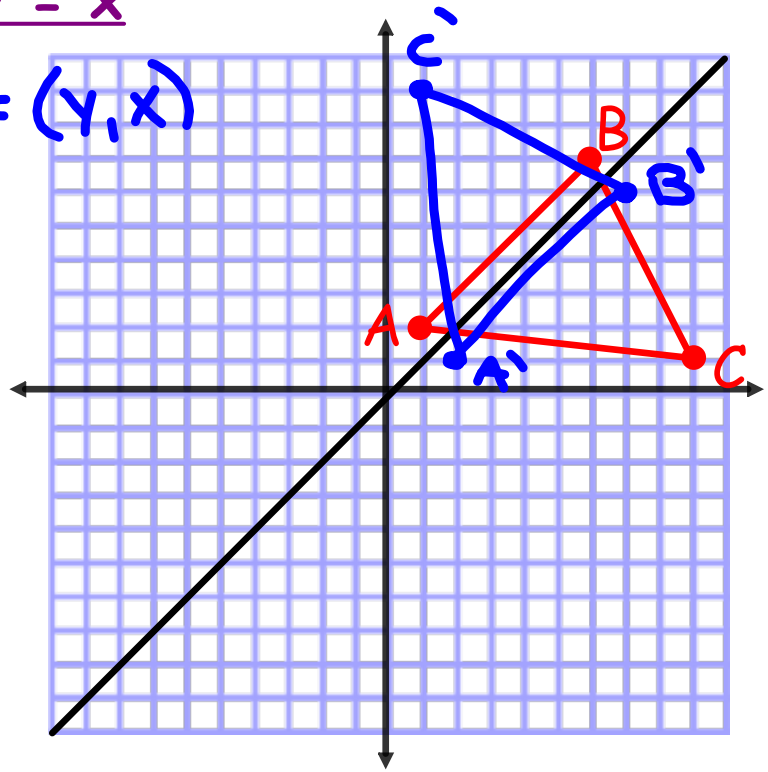
Graphing a Reflection over y = x

$R_{y=x}(\Delta ABC)$ $(x, y) = (y, x)$

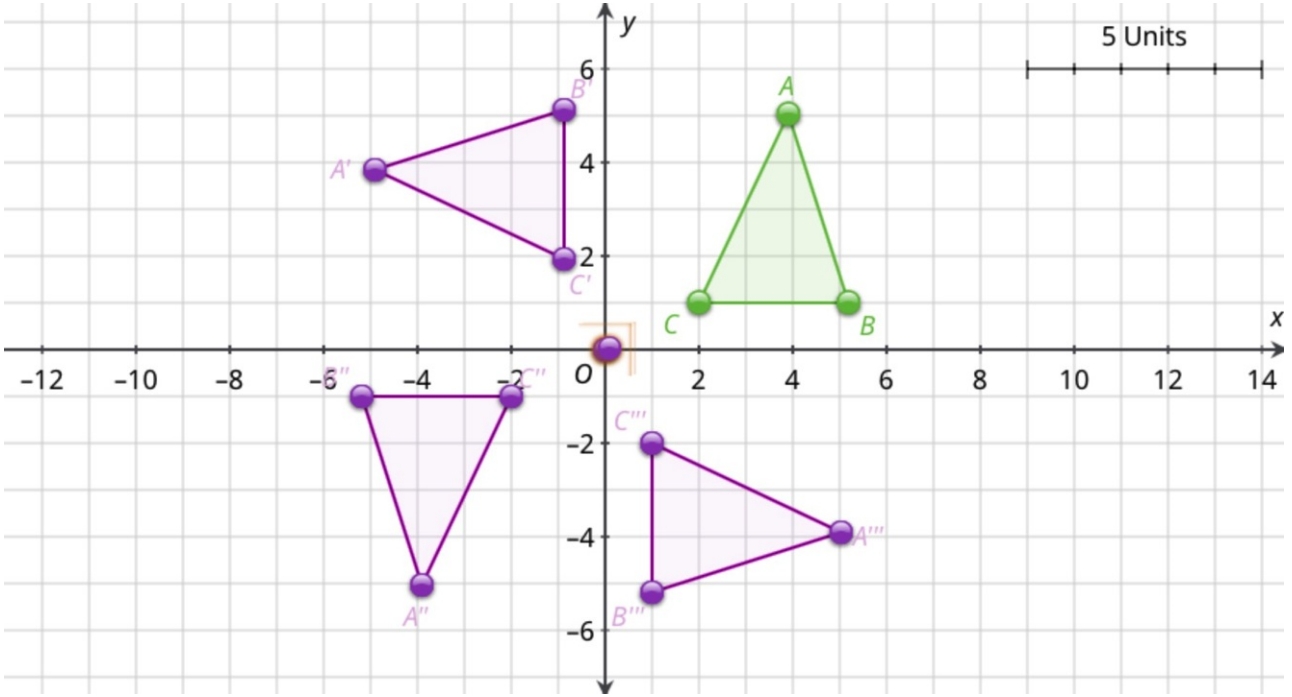
A(1,2) → (2,1)

B(6,7) → (7,6)

C(9,1) → (1,9)



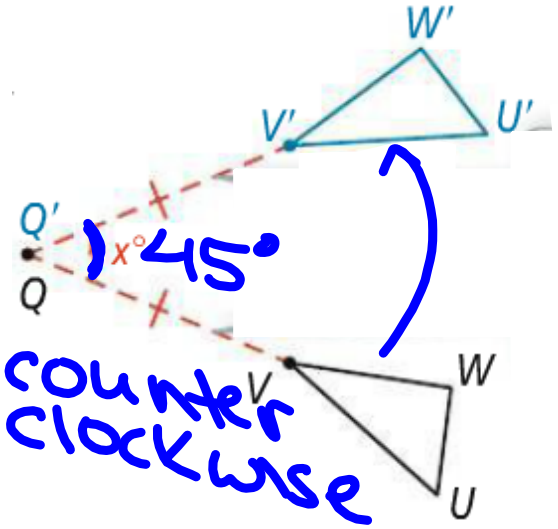
Name that Transformation!



Rotation: a rigid motion where the figure **turns** around a point called the center of rotation

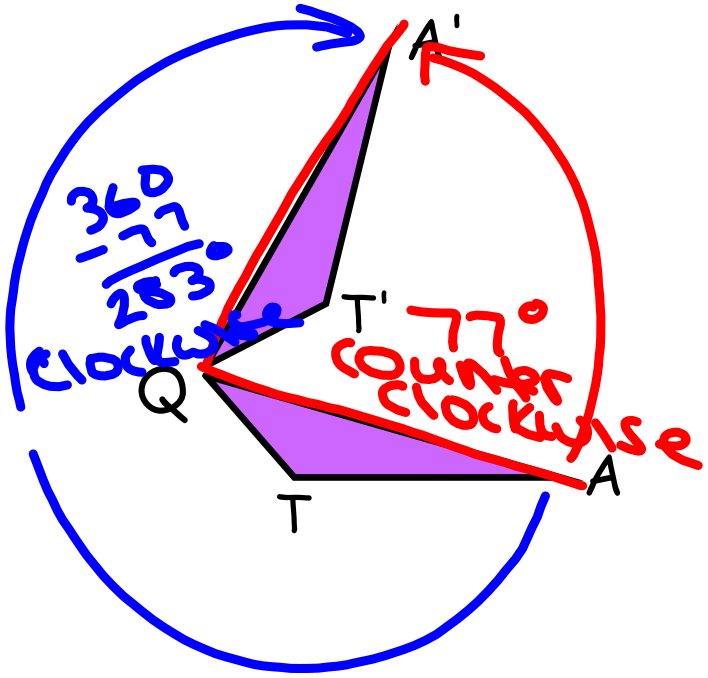
Properties of Rotations

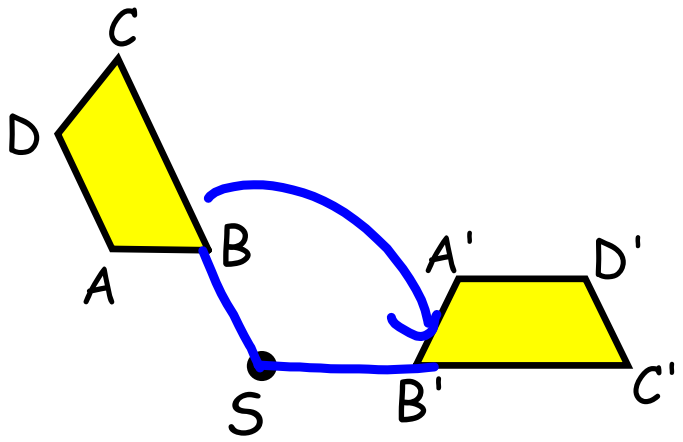
1) The center of the rotation (point Q) does not move. (Q = Q')
2) For any other point, the distance from the center of the rotation stays the same. (QV = QV')
3) If a point and its image are connected to the center of the rotation, the angle formed is the angle of rotation.
4) Rotations can be clockwise or counterclockwise.



Finding the Angle of Rotation

- connect a pair of corresponding points to the center of rotation, then measure the angle formed
- state if the rotation is clockwise or counterclockwise



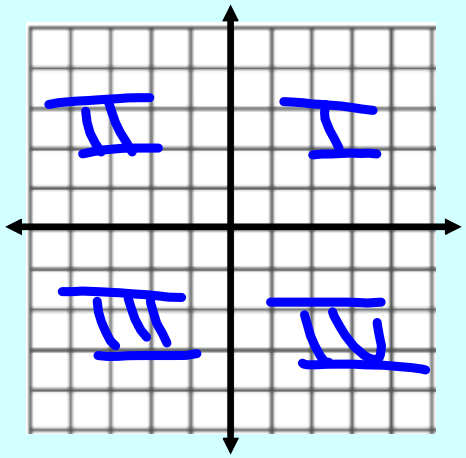


115°
clockwise

Function Notation

$r_{(x^\circ, Q)}(A) = A'$ means Point A rotates x degrees **counterclockwise** around point Q

- rotations in the coordinate plane are always measured counterclockwise because that is the way the quadrants are numbered



Rules for Rotations around the Origin

Certain rotations around the origin have helpful rules for how the coordinates change.

90° Rotation

$r_{(90°,O)}(x,y) =$ $(-y, x)$

180° Rotation

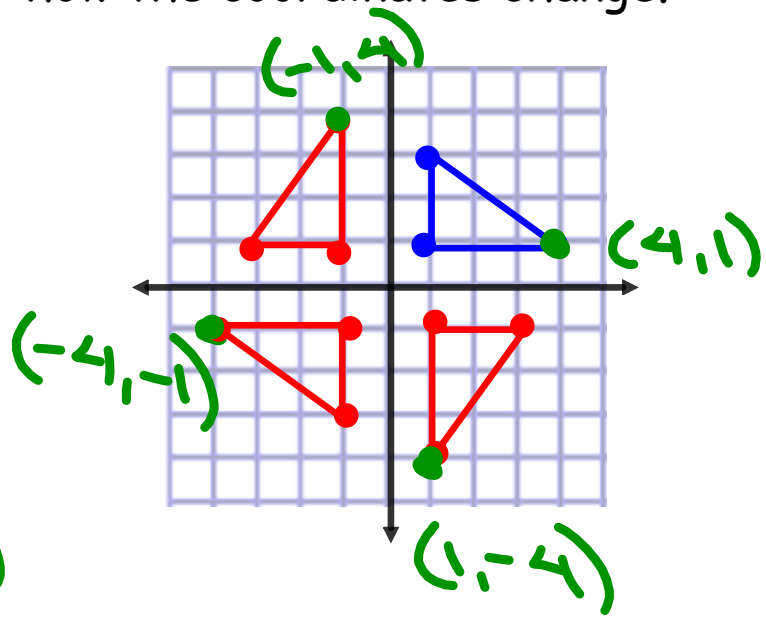
$r_{(180°,O)}(x,y) =$ $(-x, -y)$

270° Rotation

$r_{(270°,O)}(x,y) =$ $(y, -x)$

360° rotation

$r_{(360°,O)}(x,y) =$ (x, y)



Graphing a Rotation

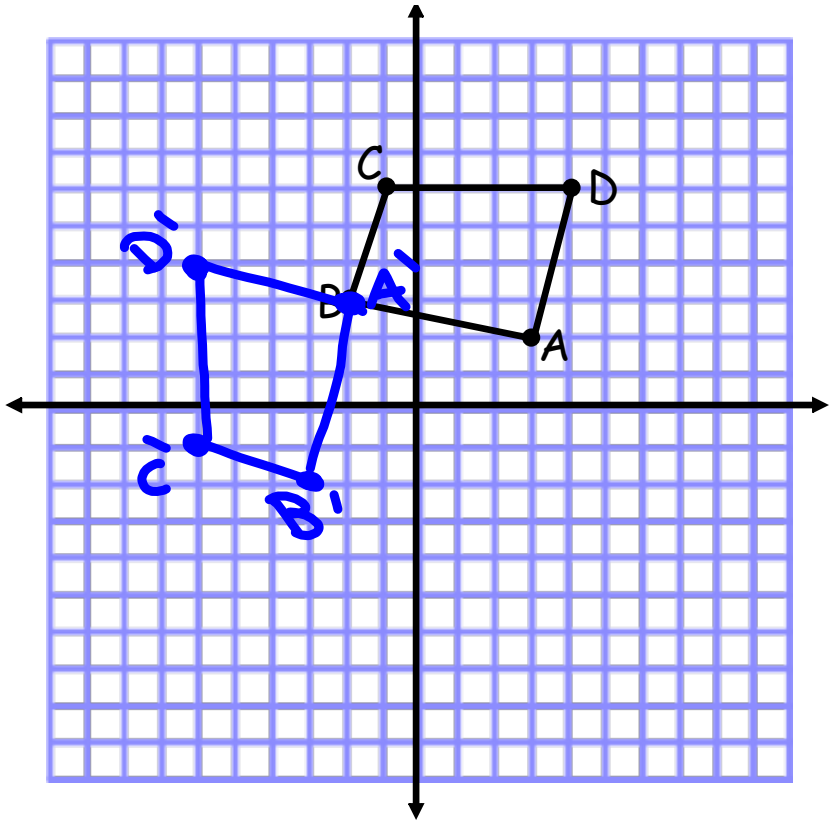
$$r_{(90°,O)}(x,y) = (-y,x)$$

A (3,2) = (-2,3)

B (-2,3) = (-3,-2)

C (-1,6) = (-6,-1)

D (4,6) = (-6,4)



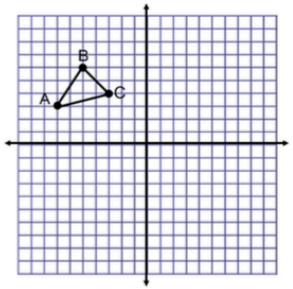
Assignment:

Concept 21 Worksheet (10-30)

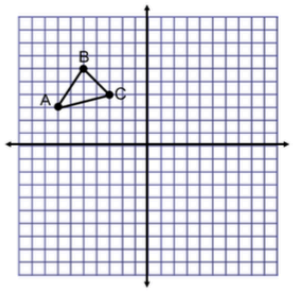
REFLECTIONS

Reflect each figure across the given line of reflection.

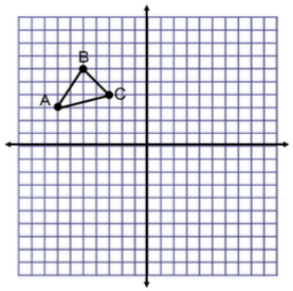
10. $R_{x-axis}(\Delta ABC)$



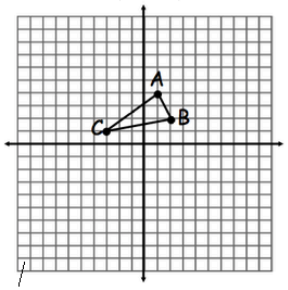
11. $R_{y-axis}(\Delta ABC)$



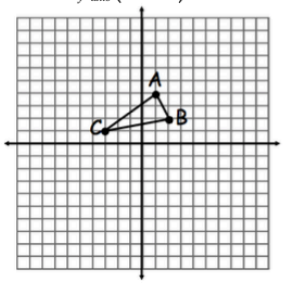
12. $R_{y=4}(\Delta ABC)$



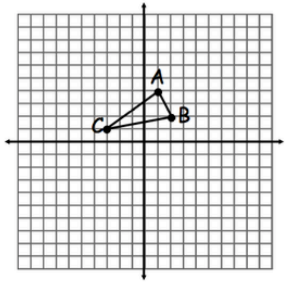
13. $R_{x-axis}(\Delta ABC)$



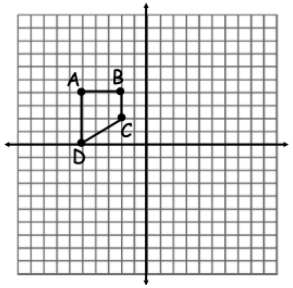
14. $R_{y-axis}(\Delta ABC)$



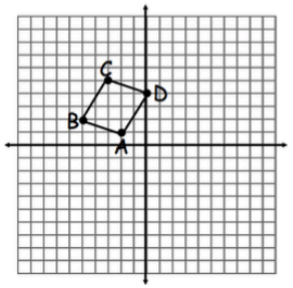
15. $R_{x=-3}(\Delta ABC)$



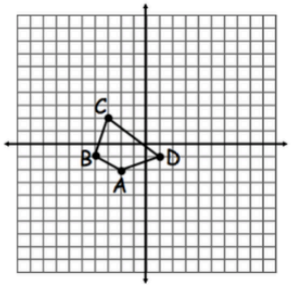
16. $R_{y=x}(ABCD)$



17. $R_{y=x}(ABCD)$



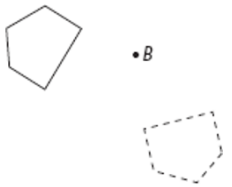
18. $R_{y=-x}(ABCD)$



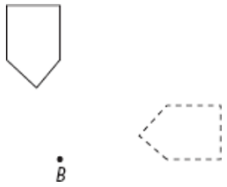
ROTATIONS

Find the angle of rotation about B that maps the solid-line figure to the dashed-line figure. Also, state if it is a clockwise or counterclockwise rotation.

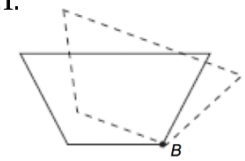
19.



20.

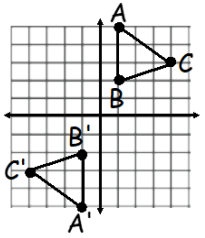


21.

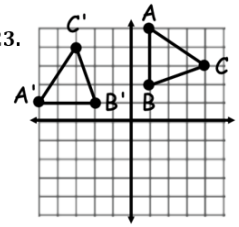


Choose the angle of rotation that maps ΔABC onto ΔA'B'C'. Is it 90°, 180°, or 270°? Remember: It should be a counter-clockwise rotation.

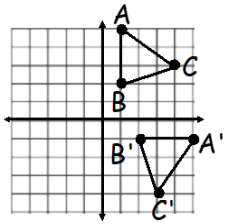
22.



23.

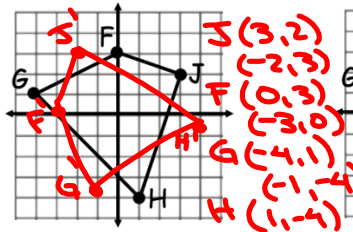


24.

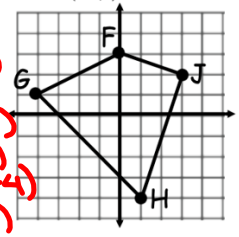


$(x,y) = (-y,x)$

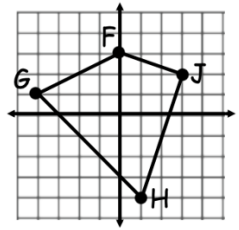
25. $r_{(90°,O)}(FGHJ)$



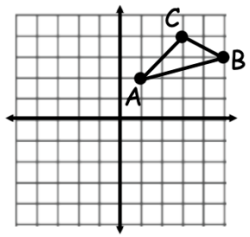
26. $r_{(180°,O)}(FGHJ)$



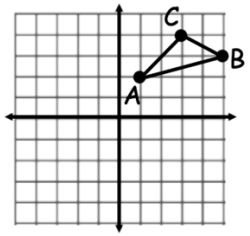
27. $r_{(270°,O)}(FGHJ)$



28. $r_{(90°,O)}(\Delta ABC)$



29. $r_{(180°,O)}(\Delta ABC)$



30. $r_{(270°,O)}(\Delta ABC)$