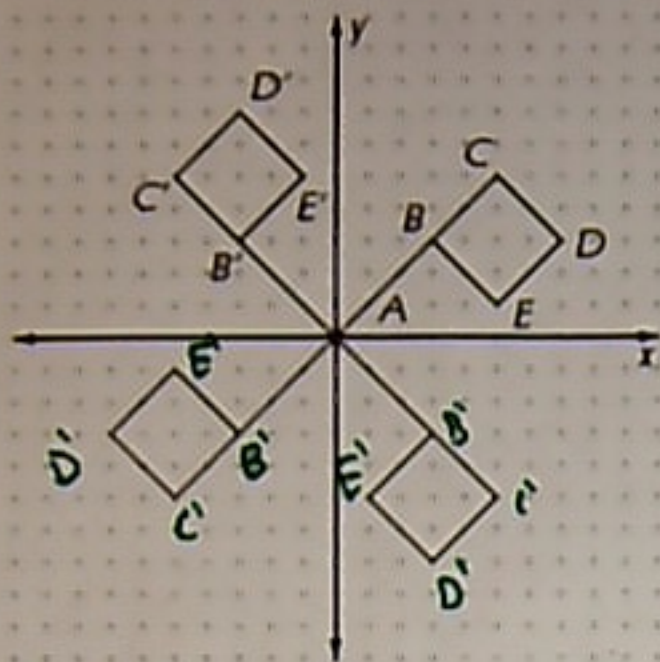


1. Consider flag $ABCDE$ and its image under a 90° counterclockwise rotation about the origin.

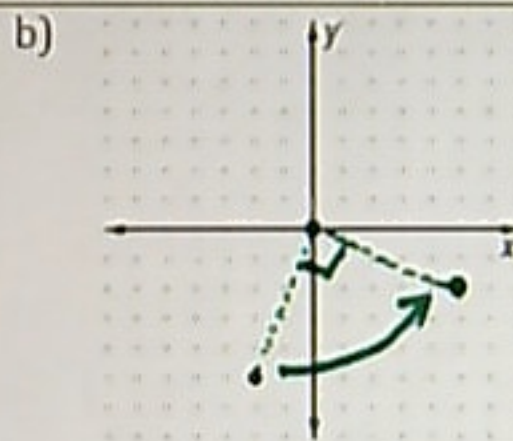


Preimage	90° Counterclockwise Rotated Image
$A(0, 0)$	$A' (0, 0)$
$B(3, 3)$	$B' (-3, 3)$
$C(5, 5)$	$C' (-5, 5)$
$D(7, 3)$	$D' (-3, 7)$
$E(5, 1)$	$E' (-1, 5)$

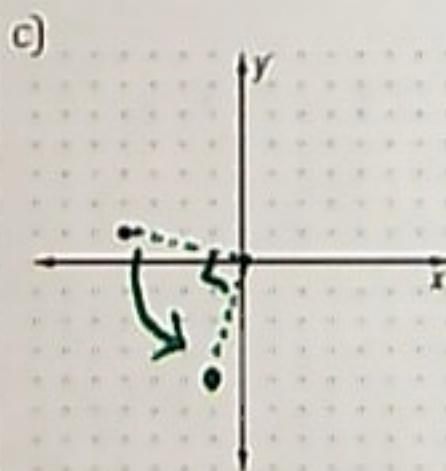
a) Record the coordinates of the images of the five points on the flag under a 90° counterclockwise rotation about the origin.

b) Use any patterns you see above to plot the image of point $(-2, -5)$ under a 90° counterclockwise rotation about the origin.

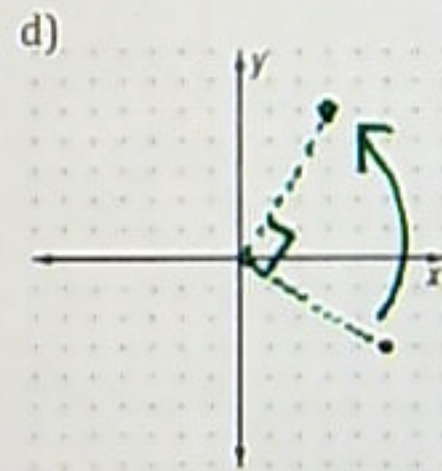
Switch x and y
but use $-y$



c) Plot the image of point $(-4, 1)$ under a 90° counterclockwise rotation about the origin.



d) Plot the image of point $(5, -3)$ under a 90° counterclockwise rotation about the origin.



e) For problems b - d, draw a dashed segment connecting the preimage to the origin. Then draw another dashed line connecting the image point to the origin.

f) Connect each preimage segment to its image segment with a "turn" arrow that shows the direction of the rotation.

g) Write a rule you could use to rotate any point (x, y) under a 90° CCW rotation about the origin. State the rule in words and in symbolic form.

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

2. Counterclockwise rotations of 180° and 270° about the origin also have predictable coordinate patterns.

<p>a) Using the diagram of flag $ABCDE$ in problem 1, investigate the patterns in the coordinates of the preimage and image pairs when rotated 180° CCW about the origin.</p>	<table border="1"> <thead> <tr> <th>Preimage</th> <th>180° Counterclockwise Rotated Image</th> </tr> </thead> <tbody> <tr> <td>$A(0,0)$</td> <td>$A'(0,0)$</td> </tr> <tr> <td>$B(3,3)$</td> <td>$B'(-3,-3)$</td> </tr> <tr> <td>$C(5,5)$</td> <td>$C'(-5,-5)$</td> </tr> <tr> <td>$D(7,3)$</td> <td>$D'(-7,-3)$</td> </tr> <tr> <td>$E(5,1)$</td> <td>$E'(-5,-1)$</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Preimage	180° Counterclockwise Rotated Image	$A(0,0)$	$A'(0,0)$	$B(3,3)$	$B'(-3,-3)$	$C(5,5)$	$C'(-5,-5)$	$D(7,3)$	$D'(-7,-3)$	$E(5,1)$	$E'(-5,-1)$						
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<p>b) Write a rule you could use to rotate any point (x, y) under a 180° CCW rotation about the origin. State the rule in words and in symbolic form</p>	<p>Change the sign of both x and y</p> $(x, y) \rightarrow (-x, -y)$																		
<p>c) Similarly, investigate the patterns in the coordinates of the preimage and image pairs when rotated 270° CCW about the origin.</p>	<table border="1"> <thead> <tr> <th>Preimage</th> <th>270° Counterclockwise Rotated Image</th> </tr> </thead> <tbody> <tr> <td>$A(0,0)$</td> <td>$A'(0,0)$</td> </tr> <tr> <td>$B(3,3)$</td> <td>$B'(3,-3)$</td> </tr> <tr> <td>$C(5,5)$</td> <td>$C'(5,-5)$</td> </tr> <tr> <td>$D(7,3)$</td> <td>$D'(3,-7)$</td> </tr> <tr> <td>$E(5,1)$</td> <td>$E'(1,-5)$</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Preimage	270° Counterclockwise Rotated Image	$A(0,0)$	$A'(0,0)$	$B(3,3)$	$B'(3,-3)$	$C(5,5)$	$C'(5,-5)$	$D(7,3)$	$D'(3,-7)$	$E(5,1)$	$E'(1,-5)$						
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