A transformation is a change in size or position of a figure. The transformations below change only the position of the figure, not the size.

- A translation will slide the figure horizontally and/or vertically.
- A reflection will flip the figure across an axis.
- A rotation will turn the figure around the origin.

This table shows how the coordinates change with each transformation.

<table>
<thead>
<tr>
<th>Transformation</th>
<th>Coordinate Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation</td>
<td>((x, y) \rightarrow (x + a, y + b)) translates left or right (a) units and up or down (b) units</td>
</tr>
<tr>
<td>Reflection</td>
<td>((x, y) \rightarrow (x, -y)) reflects across the (x)-axis</td>
</tr>
<tr>
<td>(x, y) \rightarrow (-x, -y)) rotates 180° around origin</td>
<td></td>
</tr>
<tr>
<td>((x, y) \rightarrow (y, -x)) rotates 90° clockwise around origin</td>
<td></td>
</tr>
<tr>
<td>((x, y) \rightarrow (-y, x)) rotates 90° counterclockwise around origin</td>
<td></td>
</tr>
</tbody>
</table>

A triangle with coordinates of \((0, 0)\), \((1, 4)\), and \((3, -2)\) is transformed so the coordinates are \((0, 0)\), \((-4, 1)\), and \((2, 3)\). What transformation was performed?

Analyze each corresponding pairs of coordinates:

- \((0, 0)\) to \((0, 0)\)  Think: Could be reflection or rotation since \(0 = -0\).
- \((1, 4)\) to \((-4, 1)\)  Think: Since \(x\) and \(y\) are interchanged, it is a rotation and \(y\) changes sign, so it is a 90° counterclockwise rotation around origin.
- \((3, -2)\) to \((2, 3)\)  

Identify the transformation from the original figure to the image.

1. Original: \(A(-2, -4), B(5, 1), C(5, -4)\)  
   Image: \(A'(2, -4), B'(-5, 1), C'(-5, -4)\)

2. Original: \(A(-8, 2), B(-4, 7), C(-7, 2)\)  
   Image: \(A'(-2, -8), B'(-7, -4), C'(-2, -7)\)

3. Original: \(A(3, 4), B(-1, 2), C(-3, -5)\)  
   Image: \(A'(3, 8), B'(-1, 6), C'(-3, -1)\)

4. Original: \(A(1, 1), B(2, -2), C(4, 3)\)  
   Image: \(A'(-1, -1), B'(-2, 2), C'(-4, -3)\)

5. Original: \(A(-5, -6), B(-2, 4), C(3, 0)\)  
   Image: \(A'(-5, 6), B'(-2, -4), C(3, 0)\)
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\[(x, y) \rightarrow (x + a, y + b)\]
Analysis: Each value of \(x\) and/or \(y\) changes by a certain amount, \(a\) for \(x\) and \(b\) for \(y\).

Transformation:
Translation over \(a\) units and/or up or down \(b\) units

\[(x, y) \rightarrow (-x, -y)\]
Analysis: The sign of both \(x\) and \(y\) change.

Transformation:
Rotation of 180° around origin

\[(x, y) \rightarrow (-y, x) \text{ and } (x, y) \rightarrow (-x, -y)\]
Analysis: The coordinates are switched and the sign of one changes.

Transformation:
Rotation of 90° clockwise if the sign of \(x\) changes
Rotation of 90° counterclockwise if the sign of \(y\) changes

**Identify the transformation from the original figure to the image.**

1. Original: \(A(-1, -4), B(5, 1), C(5, -4)\)
   Image: \(A'(1, -4), B'(7, 1), C'(7, -4)\)

2. Original: \(A(6, 2), B(-4, 2), C(-1, -4)\)
   Image: \(A'(2, -6), B'(2, 4), C'(-4, 1)\)

3. Original: \(A(3, -4), B(-1, 2), C(3, -5)\)
   Image: \(A'(-3, 4), B'(1, -2), C'(-3, 5)\)

4. Original: \(A(1, 1), B(2, -2), C(4, 3)\)
   Image: \(A'(-1, 1), B'(-2, -2), C'(-4, 3)\)