Graphing and Describing 180° Rotations about the Origin (0, 0)

Lesson: Day 5 – Supplement Lesson
Graphing and Describing 180° Rotations about the Origin (0, 0)

CC Standards
8.G.3  Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Objective
TSW... Graph and Describe 180° rotations about the origin.

Mathematical Practices
#1  Make sense of problems and persevere in solving them.
#6  Attend to precision.
#7  Look for and make use of structure.
#8  Look for and express regularity in repeated reasoning.

Note to teachers:
Be sure to teach this lesson from the PowerPoint, not the student notes. You will be missing part of the lesson otherwise.

Teacher Input
Bellwork: Review bellwork.
Homework: Review important problems assigned the previous night.
Introduction: Introduce as directed on the PowerPoint.
Lesson: Teach as directed in the PowerPoint. Be sure to look at the notes on each slide for additional instruction and answers.

Practice
Homework

Click on each link below to watch a YouTube video that explains how to graph using rules (around origin).

180 degree rotations (3:58)  https://www.youtube.com/watch?v=8ZeeDYIINFk
90 degree clockwise rotations (13:33)  https://www.youtube.com/watch?v=LwGmA9F3hbw
90 degree CCW rotations (12:57)  https://www.youtube.com/watch?v=4Q70ZHVFKePc

Note... The above videos are included in the PowerPoint so that you can show them to your students if you are able to.
The last two videos are longer. There is a portion at the end of the video that you can skip if necessary.

All 3 rotations:  https://www.youtube.com/watch?v=9dSn66CSOss
Note... This video can be shown on a Review Day.
Section 1: Describing Rotations

You Try #1 ☺
Describe the given rotation.
Give both the CW and CCW description.

You Try #2 ☺
Which of the following could map the Blue square onto the Green?
A) Reflection across the x-axis.
B) 180° rotation around the origin.
C) A translation 6 left and 6 down.
D) Both B and C.

You Try #3 ☺
Describe the given rotation.
Give both the CW and CCW description.

You Try #4 ☺
Which describes the rotation of the cell phone?
Select ALL that apply.
A. 90° clockwise
B. 180° clockwise
C. 270° clockwise
D. 90° counter clockwise
E. 180° counter clockwise
F. 270° counter clockwise
Section 2: Rotating 180° about the Origin

Guided Practice

Rotate ΔABC 180° clockwise.

You Try 😊

Rotate ΔABCD 180° clockwise.
Using RULES to Rotate 180° about the Origin

RULE:

- Keep the same coordinates;
- Change both signs to the opposite.

\((x, y) \rightarrow (-x, -y)\)

EXAMPLE:

<table>
<thead>
<tr>
<th>Pre-image</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>X(1, 2)</td>
<td>X'(-1, -2)</td>
</tr>
<tr>
<td>Y(3, 5)</td>
<td>Y'(-3, -5)</td>
</tr>
<tr>
<td>Z(-3, 4)</td>
<td>Z'(3, -4)</td>
</tr>
</tbody>
</table>

Guided Practice

Rotate ΔEFG 180° clockwise using RULES.

You Try 😊

Rotate ΔQRS 180° clockwise using RULES.
180° Rotations

Rotate each pre-image below 180 degrees. Name the coordinates after each rotation.

1) 

2) 

3) 

4)
Graphing and Describing 180° Rotations about the Origin (0, 0)

1) Use the coordinate plane given below to answer the following:

Part A: Graph a triangle with the points: A(3, 7) B(8, 5) C(9, -4)

Part B: Take the triangle from Part A and rotate it 180° counter-clockwise.

Part C: What are the coordinates of the new image?

Describe each rotation by its clockwise rotation and its counter-clockwise rotation.

2) Clockwise: ______°
   Counter-clockwise: ______°

3) Clockwise: ______°
   Counter-clockwise: ______°
4) Describe each transformation as a translation, reflection, or rotation. If it is a reflection, name the line of reflection. If it is a rotation, name the direction as clockwise or counter-clockwise.
Graphing and Describing 180° Rotations about the Origin (0, 0)

Answer Key
Section 1: Describing Rotations

You Try #1
Describe the given rotation. Give both the CW and CCW description.

90 degrees clockwise or 270 degrees counter-clockwise

You Try #2

Which of the following could map the Blue square onto the Green?

A) Reflection across the x-axis.
B) 180° rotation around the origin.
C) A translation 6 left and 6 down.
D) Both B and C.

You Try #3
Describe the rotation from A to B. Give both the CW and CCW description.

90 degrees counter-clockwise or 270 degrees clockwise

You Try #4
Which describes the rotation of the cell phone?

Select ALL that apply.

A. 90° clockwise
B. 180° clockwise
C. 270° clockwise
D. 90° counter-clockwise
E. 180° counter-clockwise
F. 270° counter-clockwise
Section 2: Rotating 180° about the Origin

Guided Practice

Preimage | Image
--------|--------
A(7, -2) | A'(7, 2)
B(11, -5) | B'(-11, 5)
C(3, -5) | C'(-3, 5)

You Try

Preimage | Image
--------|--------
A(-4, 1) | A'(4, -1)
B(1, 3) | B'(-1, -3)
C(-2, 5) | C'(2, -5)
D(-5, 3) | D'(5, -3)
Graphing and Describing 180° Rotations about the Origin (0, 0)

Using RULES to Rotate 180° about the Origin

RULE:
- Keep the same coordinates;
- Change both signs to the opposite.

\[(x, y) \rightarrow (-x, -y)\]

EXAMPLE:

<table>
<thead>
<tr>
<th>Pre-image</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>X(1, 2)</td>
<td>X'(-1, -2)</td>
</tr>
<tr>
<td>Y(3, 5)</td>
<td>Y'(-3, -5)</td>
</tr>
<tr>
<td>Z(-3, 4)</td>
<td>Z'(3, -4)</td>
</tr>
</tbody>
</table>

Guided Practice

Rotate ΔEFG 180° clockwise using RULES.

You Try 😊

Rotate ΔQRS 180° clockwise using RULES.

<table>
<thead>
<tr>
<th>Pre-image</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>E(-3, 7)</td>
<td>E'(3, -7)</td>
</tr>
<tr>
<td>F(-7, 3)</td>
<td>F'(7, -3)</td>
</tr>
<tr>
<td>G(-9, 6)</td>
<td>G'(9, -6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-image</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q(2, -2)</td>
<td>Q'(-2, 2)</td>
</tr>
<tr>
<td>R(9, -2)</td>
<td>R'(-9, 2)</td>
</tr>
<tr>
<td>S(9, -6)</td>
<td>S'(-9, 6)</td>
</tr>
</tbody>
</table>
Graphing and Describing 180° Rotations about the Origin (0, 0)

180° Rotations

Rotate each pre-image below 180 degrees. Name the coordinates after each rotation.

1) H(3, 5)  
   J'(5, 3)  
   Q(0, 1)

2) F'(1, 5)  
   H'(2, 3)  
   U'(4, 5)

3) T(-3, -1)  
   V(-1, 1)  
   Z(0, -3)

4) H'(4, -1)  
   T'(1, 0)  
   Y'(4, -4)
Graphing and Describing 180° Rotations about the Origin (0, 0)

5) Figure A

6) Figure A

(-1, -1)
(-2, -1)
(-3, 1)
(-1, 2)

(1, 4)
(4, 4)
(3, 2)
(-1, 2)
1) Use the coordinate plane given below to answer the following:

Part A: Graph a triangle with the points: A(3, 7) B(8, 5) C(9, -4)

Part B: Take the triangle from Part A and rotate it 180° counter-clockwise.

Part C: What are the coordinates of the new image?

New Image
A'(-3, -7)
B'(-8, -5)
C'(-9, 4)

Describe each rotation by its clockwise rotation and its counter-clockwise rotation.

Clockwise: 270°
Counter-clockwise: 90°
3) Describe each transformation as a translation, reflection, or rotation. If it is a reflection, name the line of reflection. If it is a rotation, name the direction as clockwise or counter-clockwise.