Day 4 Investigation - Rotations Name: Answer Key

On the front and back of two full pieces of graph paper, Use a straightedge to draw and label the x and y axis.

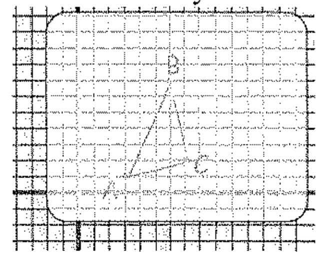

Figure 1

PART 1

Step 1. Plot and label points A (3, 1), B (6,7), and C (8,2) and construct ΔABC using a straightedge in blue pencil.

Step 2. Label a piece of patty paper Part 1. Place this piece of patty paper in the first quadrant so it is covering points A, B, and C and overlapping the origin. See Figure 1.

Step 3. On the patty paper in regular or black pencil, redraw the x and y axis up, right, down, and left one two units to create a small plus sign. Also, redraw ΔABC and label the points. See figure 2.

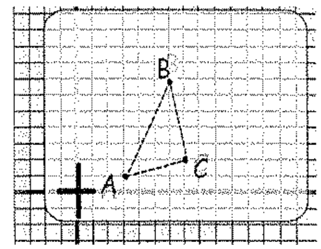

Figure 2

Step 4. Put your pencil on the origin and turn the patty paper a **quarter of a turn counter clockwise.** This is a +90° rotation or a 90° ccw rotation.

Step 5. Mark the location of A', B', and C' after the rotation.

Step 6. Remove the patty paper and plot and label points A', B', and C' and construct ΔA'B'C' using a straight edge in green.

Step 7. Put coordinates of A, B, C, A', B', and C' in the chart below make an observation as to the changes in the x and y coordinates.

Pre-Image Coordinates	Image Coordinates	Observations
A(3 , 1)	A'(−1 , 3)	
B(6 , 7)	B'(−7 , 6)	
C(8 , 2)	C'(−2 , 8)	

The general rule for a rotation is $(x, y) \xrightarrow[\pm degrees^{\circ}]{Ro} (x', y')$

Step 8. Based on the general rule and the data collected by rotating ΔABC a quarter turn counter clockwise, state the rule for a +90° rotation or a 90° ccw rotation.

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

PART 2

Step 9. On the back of the graph paper, re-plot and re-label points A (3, 1), B (6,7), and C (8,2) and reconstruct ΔABC using a straightedge in blue pencil.

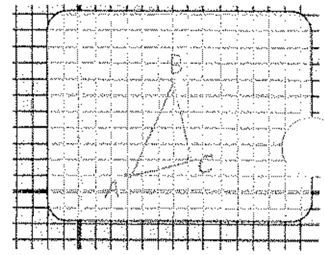

Figure 3

Step 10. Label a piece of patty paper Part 2. Place this piece of patty paper in the first quadrant so it is covering points A, B, and C and overlapping the origin. See Figure 1.

Step 11. On the patty paper in regular or black pencil, redraw the x and y axis up, right, down, and left one two units to create a small plus sign. Also, redraw ΔABC and label the points. See figure 2.

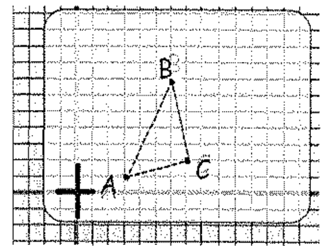

Figure 4

Step 12. Put your pencil on the origin and turn the patty paper a **half of a turn counter clockwise.** This is a +180° rotation or a 180° ccw rotation.

Step 13. Mark the location of A', B', and C' after the rotation.

Step 14. Remove the patty paper and plot and label points A', B', and C' and construct ΔA'B'C' using a straight edge in green.

Step 15. Put coordinates of A, B, C, A', B', and C' in the chart below make an observation as to the changes in the x and y coordinates.

Pre-Image Coordinates	Image Coordinates	Observations
A(3 , 1)	A'(−3 , −1)	
B(6 , 7)	B'(−6 , −7)	
C(8 , 2)	C'(−8 , −2)	

The general rule for a rotation is $(x, y) \xrightarrow[\pm degrees^{\circ}]{Ro} (x', y')$

Step 16. Based on the general rule and the data collected by rotating ΔABC a half turn counter clockwise, state the rule for a +180° rotation or a 180° ccw rotation.

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

PART 3

Step 17. On the front of a new piece of graph paper, once again re-plot and re-label points A (3, 1), B (6,7), and C (8,2) and reconstruct ΔABC using a straightedge in blue pencil.

Step 18. Prepare the patty paper for a rotation like in Part 1 and Part 2. Label this piece of patty paper Part 3.

Step 19. Put your pencil on the origin and turn the patty paper **three-fourths of a turn counter clockwise.** This is a +270° rotation or a 270° ccw rotation.

Step 20. Perform the rotation, mark A', B', and C' and construct ΔA'B'C' in green similar to Part 1 and Part 2. Complete chart below make an observation as to the changes in the x and y coordinates.

Pre-Image Coordinates	Image Coordinates	Observations
A(3 , 1)	A'(1 , -3)	
B(6 , 7)	B'(7 , -6)	
C(8 , 2)	C'(2 , -8)	

The general rule for a rotation is $(x, y) \xrightarrow[\pm degrees^{\circ}]{Ro} (x', y')$

Step 21. Based on the general rule and the data collected by rotating ΔABC three-fourths of a turn counter clockwise, state the rule for a +270° rotation or a 270° ccw rotation.

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

Thoughts to Ponder

- What would be the result of making a full rotation with ΔABC? NO CHANGE
- What would be the algebraic rule of transformation be for a full rotation? $(x, y) \rightarrow (x, y)$

PART 4

Return to the pre-image and image of ΔABC from Part 3.

Step 22. Using a red pencil, draw a line from the origin thru point A **AND** draw a line from the origin thru point A'.

Step 23. Using only the patty paper from Part 3, discover the measure of the angle created in Step 22. 90°

Step 24. Rotate ΔABC 90° in a clockwise direction. This is a -90° rotation or a 90° cw rotation.

Step 25. What do you notice?

SAME AS THE 270° CCW ROTATION

PART 5

Return to the pre-image and image of $\triangle ABC$ from Part 2

Step 26. Using a red pencil, draw a line from the origin thru point A **AND** draw a line from the origin thru point A'.

Step 27. Using only the patty paper from Part 2, discover the measure of the angle created in Step 26. 180°

Step 28. Rotate $\triangle ABC$ 180° in a clockwise direction. This is a -180° rotation or a 180° cw rotation.

Step 29. What do you notice?

SAME. DOES NOT MATTER IF ITS CCW OR CW.

PART 6

Return to the pre-image and image of $\triangle ABC$ from Part 1

Step 30. Using a red pencil, draw a line from the origin thru point A **AND** draw a line from the origin thru point A'.

Step 31. Using only the patty paper from Part 1, discover the measure of the angle created in Step 30. 90°

Step 32. Rotate $\triangle ABC$ 270° in a clockwise direction. This is a -270° rotation or a 270° cw rotation.

Step 33. What do you notice?

SAME AS THE 90° CCW ROTATION

Summarize Mathematics Unit 1A #3 - Write your answers in your notebook

Summarize the coordinate rules for these rotations about the origin.

i. For a rotation of 90° counterclockwise: $(x, y) \rightarrow (\_\_, \_\_)$

ii. For a rotation of 180° counterclockwise: $(x, y) \rightarrow (\_\_, \_\_)$

iii. For a rotation of 270° counterclockwise: $(x, y) \rightarrow (\_\_, \_\_)$

iv. For a rotation of 270° clockwise: $(x, y) \rightarrow (\_\_, \_\_)$