Aaron's Designs

This problem gives you the chance to:
- draw reflections and rotations of a given figure on a grid
- describe transformations needed to make a given pattern

Aaron is drawing some designs for greeting cards. He divides a grid into 4 quadrants and starts by drawing a shape in one quadrant. He then reflects, rotates or translates the shape into the other three quadrants.

1. Finish Aaron's first design by reflecting the gray shape over the vertical line.

   Then reflect both of the shapes over the horizontal line.

   This will make a design in all four quadrants.

2. To finish drawing Aaron's second design, rotate the gray shape 1/4 of a turn in a clockwise direction about the origin. Then draw the second shape.

   Rotate the second shape 1/4 of a turn in a clockwise direction about the origin. Then draw the third shape.

   Rotate the third shape 1/4 of a turn in a clockwise direction about the origin. Then draw the fourth shape.

   This will make a design in all four quadrants.
3. This is Aaron’s third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

He translated the first shape 4 units downward, and then reflected both shapes across the bold vertical line. 

[Diagram of the design is shown]
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   This will make a design in all four quadrants.
3. This is Aaron's third design.

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Rotate the third shape 1/4 of a turn in a clockwise direction about the origin. Then draw the fourth shape.

This will make a design in all four quadrants.
3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

Aaron tilted his page ¼ to the left to get his 3rd shape and ¼ to the right to get his 2nd and 4th.
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Rotate the second shape 1/4 of a turn in a clockwise direction about the origin.

Then draw the third shape.

Rotate the third shape 1/4 of a turn in a clockwise direction about the origin.

Then draw the fourth shape.

This will make a design in all four quadrants.
3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

Reflected it across the vertical axis, then slid it across the horizontal axis, then reflected back to the other side.
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Rotate the third shape 1/4 of a turn in a clockwise direction about the origin.
Then draw the fourth shape.

This will make a design in all four quadrants.
3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

He took the top left corner and flipped it to top right \( \checkmark \) then he slid the top left & right down to bottom left & right \( \checkmark \)

\[
\begin{array}{c}
\text{He took the top left corner and} \\
\text{flipped it to top right} \checkmark \text{ then he} \\
\text{slid the top left & right down to} \\
\text{bottom left & right} \checkmark
\end{array}
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3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

He reflected the shape over the vertical line, translated the shape down 4 units and again, reflected it over the vertical line.
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   Rotate the third shape 1/4 of a turn in a clockwise direction about the origin. Then draw the fourth shape.

   This will make a design in all four quadrants.
3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

Aaron flipped the shape horizontally from the left-right quadrants, and copied the figure exactly as it is for the up-down quadrants.
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Rotate the second shape 1/4 of a turn in a clockwise direction about the origin.
Then draw the third shape.

Rotate the third shape 1/4 of a turn in a clockwise direction about the origin.
Then draw the fourth shape.

This will make a design in all four quadrants.
3. This is Aaron’s third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

He just used the same design both times.

0

0

0

0
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Rotate the third shape 1/4 of a turn in a clockwise direction about the origin.
Then draw the fourth shape.

This will make a design in all four quadrants.
3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

He reflected the first design about the vertical line that he transformed that one over the horizontal line and reflected that one over the vertical line.
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   Rotate the second shape 1/4 of a turn in a clockwise direction about the origin.

   Then draw the third shape.

   Rotate the third shape 1/4 of a turn in a clockwise direction about the origin.

   Then draw the fourth shape.

   This will make a design in all four quadrants.
3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

1. Mirror original shape

2. Reflected image on bottom half
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   Rotate the second shape 1/4 of a turn in a clockwise direction about the origin.
   Then draw the third shape.

   Rotate the third shape 1/4 of a turn in a clockwise direction about the origin.
   Then draw the fourth shape.

   This will make a design in all four quadrants.
3. This is Aaron’s third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

Aaron’s first design, all of the shapes are facing inward. In his second design, the shapes are facing outward. His third design, the shapes are facing out but the top one is facing up and not down.
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   Then draw the second shape.
   Rotate the second shape $1/4$ of a turn in a clockwise direction about the origin.
   Then draw the third shape.
   Rotate the third shape $1/4$ of a turn in a clockwise direction about the origin.
   Then draw the fourth shape.
   This will make a design in all four quadrants.
3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

At first he reflected the design over the vertical line. ✓

Then he transferred this new design 4 measures down.
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3. This is Aaron's third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

Aaron copied the design down and reflected it across.

BOD reflected it across.
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3. This is Aaron’s third design.

He started with one gray shape in the top left hand quadrant of the grid and transformed it to make the design.

Describe the transformations that Aaron may have used to draw this design.

He reflected the shape in quadrant 2 over the ____________ line. Then he slid the shape down to quadrant 4 and reflected the shape about the ____________ line.

_________________________
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Describe the transformations that Aaron may have used to draw this design.

He slid the shape down then flipped it and then he slid it up.