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## 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
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Aaron is drawing some designs for greetings cards.

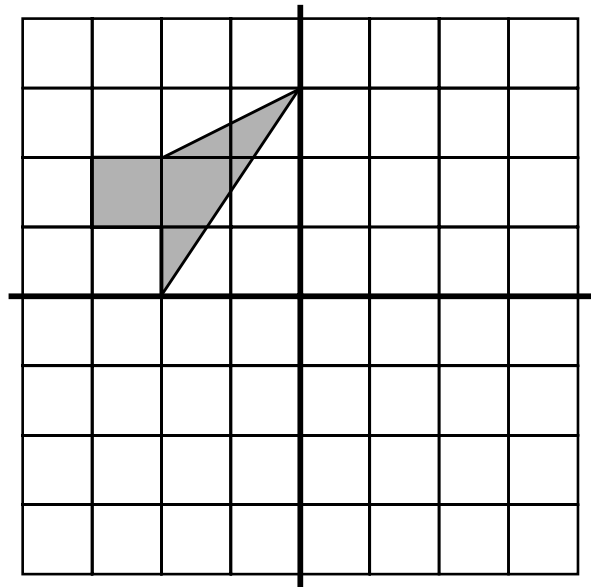
He divides a grid into 4 quadrants and starts by drawing a shape in one quadrant.

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.

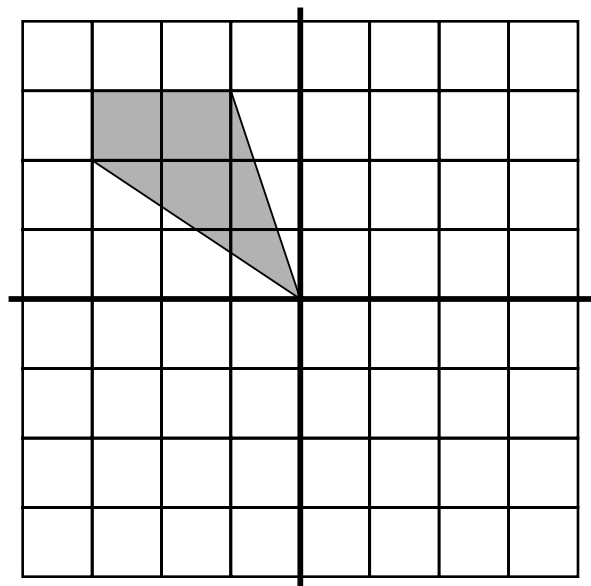


2. To finish drawing Aaron's second design, rotate the gray shape  $\frac{1}{4}$  of a turn in a clockwise direction about the origin. Then draw the second shape.

Rotate the second shape  $\frac{1}{4}$  of a turn in a clockwise direction about the origin. Then draw the third shape.

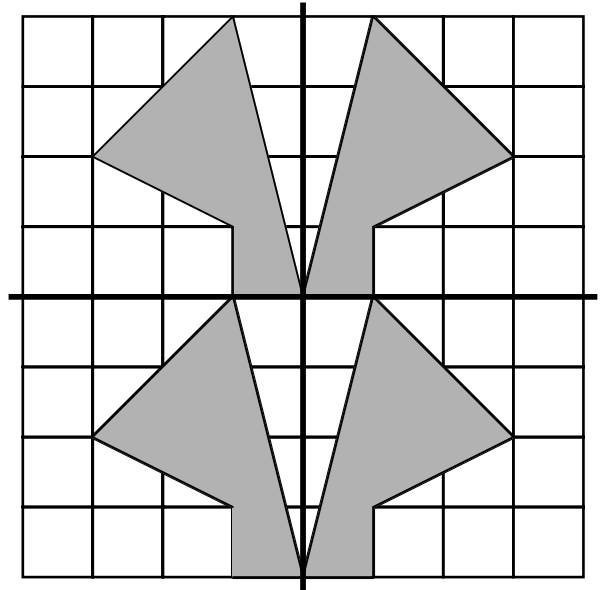
Rotate the third shape  $\frac{1}{4}$  of a turn in a clockwise direction about the origin. Then draw the fourth shape.

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.

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