Activity Sheet 2: Generating All Magic Squares of Order 3 Using Geometric Transformations

Muhammad found that every possible third order magic square can be obtained by reflecting or rotating one version of the magic square. There are eight different magic squares of order 3. Problems 1-8 demonstrate the various transformations to perform.

1. The first transformation is the identity. The image of this transformation is simply the magic square itself, unchanged.

4	9	2
3	5	7
8	1	6

2. Reflect the square about the vertical line running through the middle of the square. Sketch the vertical line and reflect each number across the line. Remember that if a number lies on the line then its image is itself.

4	9	2
3	5	7
8	1	6

3. Reflect the square about the horizontal line running through the middle of the square. Sketch the horizontal line and reflect each number across the line. Remember that if a number lies on the line then its image is itself.

4	9	2
3	5	7
8	1	6

4. Reflect the square about the main diagonal that runs from top left to bottom right. Sketch the diagonal line and reflect each number across the line. Remember that if a number lies on the line then its image is itself.
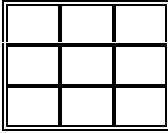
4	9	2
3	5	7
8	1	6

5. Reflect the square about the main diagonal that runs from top right to bottom left. Sketch the diagonal line and reflect each number across the line. Remember that if a number lies on the line then its image is itself.

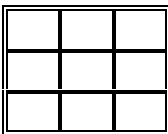| 4	9	2
3	5	7
8	1	6

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6. Rotate the square with the center of rotation as the center of the square and angle measure of 180º counterclockwise. Draw the center of the square and an angle of measure 180º.

4	9	2
3	5	7
8	1	6

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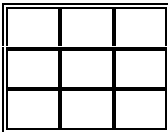
7. Rotate the square with the center of rotation as the center of the square and angle measure of 90º counterclockwise. Draw the center of the square and an angle of measure 90º.

4	9	2
3	5	7
8	1	6

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8. Rotate the square with the center of rotation as the center of the square and angle measure of 270º counterclockwise. Draw the center of the square and an angle of measure 270º.

4	9	2
3	5	7
8	1	6