Lesson Plan Transformational Geometry Shae Yeates

Extension for Rotation and Reflection SMI Honors:

Standards:

**HONORS - Standard N.VM.8**Add, subtract, and multiply matrices of appropriate dimensions.

**Standard G.CO.5**  
Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, for example, graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. Point out the basis of rigid motions in geometric concepts, for example, translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle.

Prior Knowledge: Students already know matrices, vectors, rotations and reflections. Have a basic understanding of the unit circle and sin, cos, and tan.

Objective: students will be able to use the rotation matrices to rotate points on a graph.

Starter: Please apply the following transformations to the triangle

1. Rotate
2. Rotate

Have students work on this starter.

Lesson:

* Give a few more examples that are easily found by rotating their plane. (270, 0)
* Now give them 30 and 45.
* Let them try for a few minutes and walk around and see what they are doing.
* NOTES:

We are limited when we just memorize the coordinates when we rotate . We are going to use a new matrix so that we can rotate any point any degrees around the origin!!

In order to use this matrix to find new points what can we do to? \*hint it has something to do with vectors\*

Change the following points into vectors:

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

We are going to multiply these three points to rotate our triangle so we can see if this works. (since we know the answers from the starter.)

\*walk students through this first problem and then have them practice on their own. The next two\*

Have students now practice with rotating it

Now have students rotate those same points around different angles: .

Finish by having students draw a figure with 3 or more points and rotate around a degree that is not or.

Hand out homework and have student ask questions before the end of class.

SM1 Honors Notes Rotation Matrix

Right now, we can rotate any figure: (put the degree and the rule):

|  |  |
| --- | --- |
|  |  |
|  |  |

We are going to be using a matrix to now rotate our point any degree value we want using the following matrix: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In order to use this matrix to find the new points we must first remember how to change a point into a vector: change the following points into vectors.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

Use this matrix to find the following:

|  |
| --- |
| Rotate |
| Rotate |
| Rotate |

Does that follow the rule we had earlier? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use the matrix to double check the rules:

|  |
| --- |
| Rotate |
| Rotate |
| Rotate |

Did this follow the rule? \_\_\_\_\_\_\_\_\_\_\_\_\_

Since we have found that this matrix works lets try new angles:

Find the new points for the triangle and for the following rotations:

|  |
| --- |
| Rotate |
| Rotate |
| Rotate |

Create your own shape of 3 or more points and rotate it any amount (other than or). Show your work with the rotation matrix.

|  |  |
| --- | --- |
| Original: | Rotated image: |

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Due \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rotation Matrix Homework

Directions: Please rotate at least three points using the rotation matrix and write the new points rounded to the nearest hundredth. SHOW ALL YOUR WORK.

|  |
| --- |
| 1. Rotation : |
| 1. Rotation |
| 1. Rotate : |
| 1. Rotate : |
| 1. Rotate : |
| 1. Rotate : |