**LEWISBURG AREA SCHOOL DISTRICT**

**LESSON PLAN (ANY TECH)**

**Teacher Name: \_Nathaniel Nauman\_\_\_\_\_\_ Class: \_Trigonometry \_\_\_\_\_\_\_\_\_\_**

**Topic: Translate and Reflect Trigonometric Graphs Date of Lesson: \_12/07/2012\_\_\_\_\_\_\_\_\_\_\_\_**

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| **LESSON ESSENTIAL QUESTION**: | How are trigonometric graphs translated and reflected? How can these translations and reflections of trigonometric graphs be applied to real world problems? |
| **STANDARD / LEARNING TARGET:** | Identify, analyze, solve and draw translated and reflected trigonometric graphs. |
| **ACTIVATING STRATEGIES**:  (Anticipatory Set) | After I greet students as they walk into the classroom and I introduce myself to the class, I will split students up into groups of 2-3 students and walk around giving a member of each group a tape measure. While I am doing this I will tell the students that each group should have an empty piece of paper and a pen or pencil. Then I will direct them to, by groups, choose any spot on the floor that they wish and to walk to that point. Then I will tell the students to have one person on their team hold the tip of the tape measure to the floor at this point while another team member takes the tape measure to the bottom of the nearest wall. Then I will tell students to round this distance to the nearest inch and write this distance down. Then I will tell them to have the team member at the wall to pull the tape measure straight up to the ceiling as far as this person can reach and hold, while the team member at the floor uses the protractor to measure the angle created. Finally I will tell the students to have the team member on the ground bring his/her end to where the wall and floor meet directly below the tape measure, and then to measure this distance, once again rounding to the nearest inch. After these values are recorded I will tell the students to go back to their desks and to hold onto this paper so that they can use it later, and to not use this paper to take notes. While students are getting back to their desks I will mention that by the end of the lesson each team will be able to use a tangent function and the information that they have collected to calculate the distance from their high point on the wall to the ceiling. |
| **KEY VOCABULARY**: | Translation, Reflection, Amplitude, and Period. |
| **RESOURCES:** | 12' Tape Measures for every other student, Protractors for every other student, a Computer on the Teacher's Desk with Internet Access, Projector connected to Teacher's Computer, SmartBoard connected to Teacher's Computer, PowerPoint Slide Show, White Board, White Board Markers, White Board Erasers, Laptops with Internet Access for Every Student in the Class, Class Website, and Exit Slips. |
| **TEACHING STRATEGIES**: | Now that I have students interested and invested in the lesson, I will start the lesson by projecting a slide onto the SmartBoard that has the general form for Translations of Sine and Cosine Graphs and the four steps to solve and graph such translations (pg. 915 in textbook). While doing this I will quickly review what the amplitude and period are since they should have learned about this in the last class. I will then ask students if they have any questions, answer any questions I receive, and then move to the next slide that will have a translation problem with a lot of space under the problem. I will then work this first problem out on the SmartBoard while asking for student input/suggestions when reasonable, and then saving what I wrote here so that students can look at this example later when I put this example on the class website. After answering any questions students may have, I will write another problem on an adjoining White Board and ask them to solve it, making sure to tell them that they are welcome to ask their neighbors for help if they wish (for this and all of the other problems). While they are working on this problem I will walk around the room and answer student's questions and give students advice to correct any mistakes students make. I will then work through the problem by asking students to tell me what to write. If some students seemed to struggle with this problem then I will write up a second problem for students to work on, otherwise I will continue. Then I will go to the next slide that will have a word problem involving translations of a sine or cosine function and ask students how comfortable they feel with trying to translate this question into mathematical terms. If I receive a positive response then I will let them do it, otherwise I will translate it while asking students for input. At this point I will have students work on the problem while I walk around and help students like before. I will then work this problem out on the SmartBoard with students telling me what to write, saving the result for later use. Then I will go to the next slide where I will introduce reflections of sine and cosine graphs and the general form that they are written in, making sure to note that this is just the same form as was used for translations but having a < 0, while drawing graphs to visually show what is happening. I will then go to the next slide where a problem that involves both translations and reflections will be shown. I will walk around and help students as before while they are working on this problem. I will then have students direct me as I work this problem out on the SmartBoard, saving this work for later reference. Then I will go to the next slide where I will introduce translations and reflections for tangent graphs, explaining that we do the same things as before, just this time to a tangent graph. Then I will go to the next slide where a tangent translation and reflection problem will be shown on the SmartBoard and ask students to solve it. Then I will walk around and help students as usual, and then have students tell me what to do as I solve it on the SmartBoard, once again saving the problem to be used as a reference by students later. Finally I will tell students to get back into their tape measuring activity groups and to work together to calculate the distance from their high point on the wall to the ceiling, noting that and providing further hints as the need arises. I will also ask that each group turns in a sheet of paper with all of their raw data, their final answers, and the work showing how they got to their final answers. |
| **EXTENDED THINKING ACTIVITY / ASSIGNMENT:** | If there is some extra time then I will have students get laptops and open the following three links that I will post on the class website: (1) <http://www.cs.astate.edu/topics/music.html> , (2) <http://3.bp.blogspot.com/-PcjNgo3u1R4/TkFQhOiVw9I/AAAAAAAACZg/z8ZgZNvWxtg/s1600/soundwaves515x321.png> , and (3) <http://www.clarku.edu/~djoyce/trig/apps.html>  While students are getting on the laptops and into the material I have posted, I will tell them about how Sine and Cosine graphs, and Trigonometry in general, has many applications in the real world. One of the big applications for Sine functions is actually in music, which is what two of the three links I provided is about. At this point I will just let them explore and answer any questions that they may have. |
| **SUMMARIZATION/ CLOSURE:** | Once a few minutes are left before the end of class, I will hand out exit slips that ask students:  (1) What is something that you learned in this class?  (2) What is something that you liked or found to be interesting about this class?  (3) What is something that you did not like or found to be boring about this class?  (4) What might you like to do in this class in the future? |