

Lesson Topic: Functions **Grade level:** 6-9

Length of lesson: 50 min

Stage 1 – Desired Results

Content Standard(s):

Represent and analyze real-world and mathematical problems using numeric, graphic and symbolic methods for a variety of functions.

Understanding (s)/goals

Students will understand:

- How to move between the different function representations.
- How to use functions to solve real world problems.

Essential Question(s):

- Have any of you ever been to a sports game when the crowd starts to do the wave?
- Is there a difference in how long it takes the wave to be completed and the number of people? Why?
- What would you call this relationship and what exactly is the relationship?

Student objectives (outcomes):

Students will be able to:

- Demonstrate that they can take the problem apart and move between the different representations of functions.
- Describe the behavior of the graph or function in their own words.
- Apply their knowledge of functions to other similar problems.
- Compare different functions and their behaviors.

Stage 2 – Assessment Evidence

Performance Task(s):

- Given information students will be able to graph functions on graph paper.
- Students will be able to create tables of information relating to the problem or function.
- Students will be able to find an expression that describes the given function.
- Students will be able to compare the graphs of several different functions.

Other Evidence:

- The students will have completed the given activity.
- They will discuss their results together in groups or as a class.
- They will complete a short homework assignment that gives them more real world problems that they need to solve using functions.

Stage 3 – Learning Plan

Learning Activities:

http://www.learnnc.org/learnnc/lessonp.nsf/Approved_By_Grade/9A96C834FBB3EB4A85256BF200678D88?opendocument

<http://www.pbs.org/teachersource/mathline/concepts/earthday/activity3.shtm> (I used the activity from this lesson plan for my lesson plan so that I could go into more detail about what would take place)

<http://www.shodor.org/interactivate/lessons/fm3.html>

Materials and resources:

- Graphing paper
- M&M's
- Cups
- Population charts
- <http://www.pbs.org/teachersource/mathline/concepts/earthday/activity3.shtm> (for activity instructions)

Introduction: (5-10 minutes)

- Anticipatory Set: I will ask my students whether they have been to a sports game in which the crowd has begun to do the wave. From there we will talk about their observations and reach the conclusion that the length of time it takes to complete the wave and the number

of people involved is a functional relationship. Once they know this I will ask, "Can anyone give me an example of a function and how it may be seen in the real world?" or "Can anyone give me an example of something that is not a function?" From there I will tell the students that we are going to build on yesterday's knowledge and learn more about moving between different functional representations, using functions to solve real world problems, and describing the behavior of different functions.

- Rationale: We will be learning a great deal about functions because they describe different real world phenomena. For example, functions help us understand population growth and decay so we can predict future population levels. This may help us save certain species of animals. Functions can also be used to describe financial situations in the real world. Savings accounts and the interest that is gathered on them deal with functions. So functions are all around us even if you may not notice them. Once the students have learned this they will be more able to talk about the different graphing transformations that take place with functions at a future time.

Body: (40-45 minutes)

- Presentation/Modeling: We will have already talked about functions in general. So the students will work on an activity that furthers their functional knowledge. The students will simulate the population growth and decay that is present in a fish pond. I will place them in already assigned pairs and each pair will get a cup of M&M's and some graphing paper. The M&M's will represent the fish in a pond.
 1. The students will count the fish in their pond and record that number under year 0 in the population decay chart.
 2. Then they will pour the fish onto their desk. Fish that land with an "M" up represent fish that died or were caught during the first year. They will set these dead fish aside and count the number of live fish and record the number below year one. From there they will put the live fish back in the cup, shake them, and pour them out again to record the number of fish that are still alive for year two. They continue to do this until they have completed eight trials.

Population Decay									
Year	0	1	2	3	4	5	6	7	8
Number of Fish									

3. Once the students have finished their trials I will ask them, "What patterns are you beginning to see in your tables?" "Why do you think these patterns are taking place?"
 4. From here the students will have to graph their data on graph paper and describe what they are seeing from the graph. I can ask things like, "What type of behavior are you seeing in your graph?" "Is it increasing, decreasing, or remaining constant?" Why do you think this is happening?"
 5. From their graph the students will attempt to come up with an expression that describes their data. They may have to tweak their original equation to come up with a closer approximation. At this point I will ask them what equations they came up with and how they changed their first guess to closer approximate an equation for their data.
 6. This same situation can be repeated to learn about population growth if there is enough time. Instead, have the students start with only two fish in their pond and when they pour them out they add a fish for each "M" that lands facing up. They repeat this eight times.
- Guided Practice: Much of this activity is guided practice since the students had learned about the basic components of exponential functions the day before. So throughout this activity I would be walking around the room observing student work and answering any questions that they may have. We would also do the first several steps together so that the students would understand their experiment. The class would also discuss the patterns and expressions that they were finding as a group. Students can get into bigger groups

and discuss their equations, graphs, or tables.

- Feedback and Correction: I would give the students feedback and corrections when we first started the activity and when we were having group discussions. I would know if they were ready to move on by the answers they would be giving me and the work that they have shown. For example, if they know that the data they are finding is an exponential function and they can come up with an equation then will know that they are ready to move on.
- Independent Practice: The students would then be given several charts, equations, or graphs and have to move to the other function representations to show that they know how they are related.

Conclusion: (5 minutes)

- Review: So we have learned that functions can describe real world phenomena and help us understand the world around us. We now know how to move between the different representations of functions and describe their behavior. "So what are some of the different function representations?" "What kind of behavior took place in our experiment?" "How does this behavior compare to the behavior of other functions?"
- Preview: Tomorrow we will learn more about function equations and the different transformations that can be obtained. This will further help us understand the behavior of functions.
- Remember that you have 6 problems to finish for tomorrow.