Exponential Functions – Holy Moldy Bread

Objective:

The students will be able to make tables, graphs, and write equations for exponential functions. In addition, they will be able to understand the difference between linear and exponential functions. The goal is to for the student to understand that the table, graph and equation of a function are representing the same thing.

Vocabulary:

Exponents

Exponential Functions

Exponential Growth

Exponential Decay

Base

Power

Growth factor

Initial amount

Scientific Notation

Main Math Concepts Covered

1. Organizing Data and Data Collection

2. Creating Tables

3. Creating Graphs

4. Exponential functions and their equations

5. Independent and Dependent Variables

6. Analyzing Data

Materials needed:

Bread – white and wheat

\*This needs to be bakery bread as wonder bread will not mold. This could lead into further inquiry about preservatives.

\* It will take a couple of days to start molding.

Markers

Large graph paper – or access to excel

**Holy Moldy Bread**

First Period:

Start the students out with the penny toss. Have them perform the experiment in groups.

1. Give the students 100 pennies.

2. They toss the pennies and remove all the odds.

3. Repeat this until there are no more pennies.

4. Make a table of the data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| # of Tosses |  |  |  |  |  |  |
| # of Pennies Remaining |  |  |  |  |  |  |

5. Graph the data

Post the graphs around the room and discuss the various aspects of the graph. Is the graph linear? Why or why not? What do you notice about the graphs shapes? This is the time to bring up exponential functions and how they differ from linear graphs. After this, present the students with the project.

Pose the question: Which bread will mold first, white or wheat? How fast will the mold grow? Will the white bread or the wheat bread have more mold? Does mold grow linearly or exponentially?

Have the students work in groups of four for this assignment. Start by having them hypothesis which one will get moldy first and why they think it will.

The students are going to need some way of recording the specific amount of mold that is on each slice of bread. The students should create grid lines on the slices of bread so that they can identify the number of squares that are covered with mold. This will help with more accurate data collecting. This should be done on the first day. Help the students create a table to record their data. You need to decide how often they need to record the data. My suggestion that once a day until is starts to mold, and then three – four times a day for the next 10 days. You might want to start this project on a Friday so that the bread takes the weekend to start molding, then they can record in school.

The students should record how many squares are covered for the amount of mold.

Second Period:

The students will be collecting the data. After a week (of collecting data, the students should begin to analyze their data. This is where the teacher will need to be observing the students to give extra help when it is needed. They need to make a table of their data, graph their data which includes a title, labeling the x-axis and y-axis, proper scaling, and a key to the graphs. The next step includes writing an equation for both sets of data. This is where there will be more frustration with the students. You may need to do a direct instruction lesson that covers what an exponential function is and how it is different from a linear function. If this takes over two weeks time, the students should be doing other problems in class that lead to the discovery of exponential function rules, but if this has not been addressed before, then the students are going to need more help to come to this equation. The final aspect of the project is to write a paper that details the conclusions of the data.

Third Period:

The students will post their graphs up around the room. Each group will give a short presentation of their findings.

* This is the time where the teacher needs to be observing to see if the objective was reached. The students should be able to see that the table, graph, and equation are the different ways of showing the same information. If this does not happen there needs to be a discussion, led by the teacher.
* If the students are not coming up with the correct equations, then the teacher either needs to give the students more practice, or discuss and come up with the equation as a whole class.

After the end of the unit, the students should create a poster that shows what they know and have learned about exponential functions. These can be posted around the room as reference materials for the students.

Extensions:

1. What difference in the rate of growth might have occurred if you had set up different environments? Colder, drier, etc.
2. Investigate other sources of mold and fungus in the natural environment.
3. What other things grow exponentially?

4. Would other materials produce mold more quickly, less quickly?