

## **WAMC Lab – Algebra 1 – Exponential Modeling**

Math Concept(s): Modeling Exponential Decay Graphically

Source / Text: Discovering Algebra

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Date: Summer Conference 2016

### **Attach the following documents:**

#### Lab Instructions

Students will be given Skittles. Each team will count the Skittles and create a table to organize the data. Before the activity begins, students will make predictions regarding how long it will take until all Skittles are removed.

Each “year” students will drop the Skittles onto the table and then remove any candy with an “S” showing. They will record the skittles that are still radioactive (no S) in the table and repeat the process until there are no more radioactive skittles. Students will then graph the results and answer questions that help to analyze the exponential decay. After completion, students will reflect on additional applications of this model and how it relates to the real world.

#### Student Handout(s)

Radio Active Decay Handout

#### Rubric and/or Assessment Tool

Students will trade papers with another group and they will grade each other’s work.

### **Indicate “SPECIFIC” relationship to Science, Technology, or Engineering**

Science – radioactive decay

### **Short Description (Be sure to include where in your instruction this lab takes place):**

#### **Lab Plan**

Lab Title: Radioactive Decay (Modeling with Skittles)

#### Prerequisite skills:

- Geometric Sequences
- Identify Exponential Curves
- Able to write an Exponential Equation given a starting value and rate.

#### Lab objective:

- Understand the real world context of exponential decay, and how half-life can be represented experimentally.

### **Standards:**

Mathematics K–12 Learning Standards:

- F-LE.A.2 Construct and compare linear, quadratic, and exponential models and solve problems.
- F-LE.B.5 Interpret expressions for functions in terms of the situation they model

Standards for Mathematical Practice:

- MP1 – Make sense of problems and persevere in solving them.
- MP4 – Model with mathematics
- MP8 – Look for and express regularity in repeated reasoning

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- L.11-12.3 Knowledge of Language

Leadership/21st Century Skills:

<u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)			
<input checked="" type="checkbox"/> Global Awareness	<input type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input checked="" type="checkbox"/> Environmental Literacy		
<u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)			
<b>LEARNING AND INNOVATION</b>	<b>INFORMATION, MEDIA &amp; TECHNOLOGY SKILLS</b>	<b>LIFE &amp; CAREER SKILLS</b>	<b>Productivity and Accountability</b>
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<input type="checkbox"/> Manage Projects
<input checked="" type="checkbox"/> Think Creatively	<input type="checkbox"/> Access and Evaluate Information	<input type="checkbox"/> Adapt to Change	<input type="checkbox"/> Produce Results
<input type="checkbox"/> Work Creatively with Others	<input type="checkbox"/> Use and manage Information	<input type="checkbox"/> Be Flexible	<b>Leadership and Responsibility</b>
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<input type="checkbox"/> Guide and Lead Others
<u>Critical Thinking and Problem Solving</u>	<input type="checkbox"/> Analyze Media	<input type="checkbox"/> Manage Goals and Time	<input type="checkbox"/> Be Responsible to Others
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input type="checkbox"/> Work Independently	
<input checked="" type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<input type="checkbox"/> Be Self-Directed Learners	
<input type="checkbox"/> Make Judgments and Decisions	<input type="checkbox"/> Apply Technology Effectively	<u>Social and Cross-Cultural</u>	
<input checked="" type="checkbox"/> Solve Problems		<input checked="" type="checkbox"/> Interact Effectively with Others	
<u>Communication and Collaboration</u>		<input checked="" type="checkbox"/> Work Effectively in Diverse Teams	
<input type="checkbox"/> Communicate Clearly			
<input checked="" type="checkbox"/> Collaborate with Others			

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## **Teacher Preparation: (What materials and set-up are required for this lab?)**

### Materials

- Pencil
- Skittles
- Container for skittles to fall into (optional)
- Gloves (optional)
- Calculator (Graphing calculator to check graph)

### Set-Up Required:

- Prepare enough skittles for each group
- Print the student handout
- Have students check that all Skittles have the letter "S"

### **Lab Organization Strategies:**

#### Leadership (Connect to 21<sup>st</sup> Century Skills selected):

- Global awareness and Environmental Literacy are addressed through the topic of Nuclear Waste linked to the Manhattan Project.
- Students will think creatively and reason effectively by making predictions and extending their learning to real world contexts.

#### Cooperative Learning:

- Students work in teams to make predictions, complete the activity and analyze the implications of the exponential model. Students should have assigned roles within their group.

#### Expectations:

- Students will effectively use time and resources to complete their activity. Students should not eat Skittles until the data is recorded accurately.

#### Timeline:

- 5 min count skittles and make predictions
- 10 minutes dropping skittles and recording in a table
- 15 minutes graphing
- 20 minutes answering follow up and reflection questions
- 5 summary of learning, check if students wrote appropriate equations

### **Post Lab Follow-Up/Conclusions:**

#### Discuss real world application of learning from lab

- Students will think about the implication of half-life radioactive decay
- Students can

#### Career Applications

- Chemist
- Ecology
- Urban Development

### Optional or Extension Activities

- Students research other linear relationships that apply to their life
- Study exponential growth of bacteria
- Students bring in examples from media related to exponential growth or decay

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