

WAMC Lab Template

Math Concept(s): Exponential Functions

Source / Text: Algebra 1 Cord

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Attach the following documents:

Lab Instructions

(See student handout)

Student Handout(s)

(Attached at bottom)

Rubric and/or Assessment Tool

(Attached at bottom)

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

Students would be able to have some basic applications to physics skills. Students could expand on this to have findings about gravity and force.

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

In partners, students record the initial height the ball is dropped from. (Recommendation is 200cm). Students then drop the ball from initial height and let ball bounce back up. Record the height of the ball at the top of the bounce back (in the table). Be sure to not add force to the release of the ball. Students then drop the ball from the bounce back height and record the new bounce back height. Students repeat this process until the ball no longer bounces. Students graph the data, answer reflective questions, and complete exit ticket.

Lab Plan

Lab Title: The Ball Bounce

Prerequisite skills: Basic understanding and modeling skills of exponential functions.

Lab objective: Students will be able to use data from lab in order to model an exponential function.

Standards:

Mathematics K–12 Learning Standards:

- [CCSS.Math.Content.HSF.LE.A.1.c](#)
Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Standards for Mathematical Practice:

- [CCSS.Math.Practice.MP6](#) Attend to precision.
- [CCSS.Math.Practice.MP1](#) Make sense of problems and persevere in solving them.
- [CCSS.Math.Practice.MP2](#) Reason abstractly and quantitatively.

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

- [CCSS.ELA-Literacy.W.9-10.1](#)

Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

Leadership/21st Century Skills:

| | | | |
|--|--|---|---|
| 21st Century Interdisciplinary themes (Check those that apply to the above activity.) | | | |
| <input type="checkbox"/> Global Awareness | <input checked="" type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy | <input type="checkbox"/> Civic Literacy | |
| <input type="checkbox"/> Health/Safety Literacy | <input type="checkbox"/> Environmental Literacy | | |
| 21st Century Skills (Check those that students will demonstrate in the above activity.) | | | |
| LEARNING AND INNOVATION | INFORMATION, MEDIA & TECHNOLOGY SKILLS | LIFE & CAREER SKILLS | Productivity and Accountability |
| <u>Creativity and Innovation</u> | <u>Information Literacy</u> | <u>Flexibility and Adaptability</u> | <input checked="" type="checkbox"/> Manage Projects |
| <input type="checkbox"/> Think Creatively | <input checked="" type="checkbox"/> Access and Evaluate Information | <input type="checkbox"/> Adapt to Change | <input checked="" type="checkbox"/> Produce Results |
| <input checked="" type="checkbox"/> Work Creatively with Others | <input checked="" type="checkbox"/> Use and manage Information | <input type="checkbox"/> Be Flexible | <u>Leadership and Responsibility</u> |
| <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 checked="" 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 type="checkbox"/> Use Systems Thinking | <u>Information, Communications and Technology (ICT Literacy)</u> | <input checked="" type="checkbox"/> Be Self-Directed Learners | |
| <input checked="" 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 checked="" 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

- Tennis ball (1 per pair)
- Measuring tape (1 per pair)
- Graphic organizer for data recording and modeling
- Exit ticket for student reflection

Set-Up Required:

- Copy Lab handout
- Have materials laid out for students
- Reserve space if classroom ends up being too crowded for students.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

-

Cooperative Learning:

- Students will work with a partner

Expectations:

- Students will complete all of lab effectively and communicate findings effectively

Timeline:

- 55 minutes

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- When playing sports students will know that they must apply more force to an object in order to have that object return to the initial height they dropped it at.

Career Applications

- Sports players, physics of gravity and force

Optional or Extension Activities

- Students could change what types of balls they use to see if certain objects have a constant decay factor.

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Directions:

1. In partners, collect materials. Determine which partner will record and which partner will do the drop.
2. Record the initial height the ball is dropped from. (Recommendation is 200cm)
3. Drop the ball from initial height and let ball bounce back up. Record the height of the ball at the top of the bounce back (in the table). Be sure to not add force to the release of the ball.
4. Now, drop the ball from the bounce back height. Record the new bounce back height (in the table). (Repeat this process until the ball no longer bounces.)
5. Graph Data (Label!!!)
6. Answer reflective questions
7. Complete exit ticket

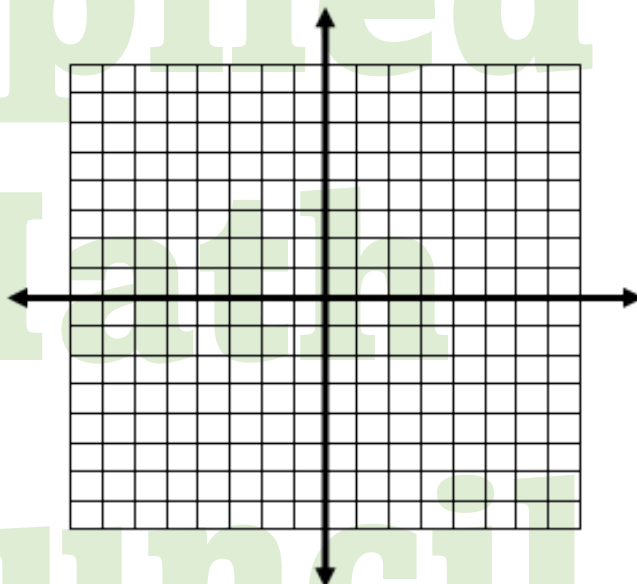
Ball bounce

X= number of drops

Y=height of return bounce

X Y

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1. What do you notice about your data? What type of function does the data represent?

2. Is it a constant rate of change? Constant ratio?

3. Write a function to represent the data.

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Rubric for Lab 2

Math – Ball Bounce Lab

| CATEGORY | 4 | 3 | 2 | 1 |
|-------------------------------|---|---|--|---|
| Mathematical Concepts | Explanation shows complete understanding of the mathematical concepts used to solve the problem(s). | Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s). | Explanation shows some understanding of the mathematical concepts needed to solve the problem(s). | Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written. |
| Mathematical Reasoning | Uses complex and refined mathematical reasoning. | Uses effective mathematical reasoning | Some evidence of mathematical reasoning. | Little evidence of mathematical reasoning. |
| Mathematical Errors | 90-100% of the steps and solutions have no mathematical errors. | Almost all (85-89%) of the steps and solutions have no mathematical errors. | Most (75-84%) of the steps and solutions have no mathematical errors. | More than 75% of the steps and solutions have mathematical errors. |
| Use of Manipulatives | Student always listens and follows directions and only uses manipulatives as instructed. | Student typically listens and follows directions and uses manipulatives as instructed most of the time. | Student sometimes listens and follows directions and uses manipulatives appropriately when reminded. | Student rarely listens and often "plays" with the manipulatives instead of using them as instructed. |
| Working with Others | Student was an engaged partner, listening to suggestions of others and working cooperatively throughout lesson. | Student was an engaged partner but had trouble listening to others and/or working cooperatively. | Student cooperated with others, but needed prompting to stay on-task. | Student did not work effectively with others. |
| Completion | All problems are completed. | All but one of the problems are completed. | All but two of the problems are completed. | Several of the problems are not completed. |
| Explanation | Explanation is detailed and clear. | Explanation is clear. | Explanation is a little difficult to understand, but includes critical components. | Explanation is difficult to understand and is missing several components OR was not included. |