

## Lab Framework

**Text:** CORD

**Unit number and title:** Unit 24 – Patterns and Functions

**Short Description:** This lab is focused on collecting data and creating a line of best fit to show understanding of the linear pattern related to the stretch of a bungee cord and the weight of a bungee jumper.

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### Lab Title

## Bungee Jumper Lab

### LAB PLAN

**TEACHER:** Teacher Prep/ Lesson Plan

- **Lab Objective**

Students will be collecting data to create a scatterplot of data and creating a line of best fit to identify a linear pattern.

- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

Understand measurement techniques in either metric or standard units  
Be able to create a scatter plot of their data  
Draw a line of best fit

- **Vocabulary**

Function  
Scatterplot  
Line of best fit

- **Materials List**

Eye-Bolt  
Washers  
2 nuts  
Strong rubber bands  
Measuring tapes

- **State Standards addressed**

Math:

A1.1.A – Select and justify functions and equations to model and solve problems.

A1.3.B – Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.

Reading:

2.3.4 – Synthesize information from a variety of sources.

Writing:

2.2 – Write for different purposes, such as telling stories, presenting analytical responses to literature, persuading, conveying technical information, completing a team project, and explaining concepts and procedures

- **Leadership Skills**

Group roles

- Data collector – responsible to ensure that data is accurately collected

- Measurement Specialist – responsible to ensure that the bungee jumper is modified correctly each trial; responsible to ensure that data is accurately collected (2 sets of eyes helps on this one!)
- Bungee Jump Monitor – responsible to repeatedly drop bungee apparatus in the same way each trial
- Recorder – responsible to record the data accurately for the group

- **SCAN Skills/Workplace Skills**

Writing – A, C  
 Arithmetic – A, D  
 Mathematics – B, C  
 Speaking – A, B, E

- **Set-up information**

Before students arrive, the following setup can be done, but isn't necessary.

- Tape measuring tapes to the wall for data collection
- Tie rubber bands onto the eye bolts
- Thread one nut onto the eye bolt
- Put all materials (eye bolt with rubber band tied to it, one nut screwed onto it, extra nut, approximately 20 washers) into a Ziploc bag or a box for organization

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -Timeline required)

Students can work in groups of 3 or 4 (2 can work, but is more work for each student). Students will work together to compile aggregate data for the dropping of bungee jumpers of different weights with the same rubber bands.

- **Teacher Assessment of student learning** (scoring guide, rubric)

Student presentation of the data  
 Correctly drawn line of best fit  
 Correctly derived equation of line of best fit

- **Summary of learning** (to be finished after student completes lab)

- discuss real world application of learning from lab
- opportunity for students to share/present learning
- provide students with an opportunity to use algebra to make a prediction about a real-world situation
- allow students to demonstrate understanding of linear patterns

- **Optional activities**

- Use multiple different lengths of rubber bands to see their effect on amount of stretch for different weighted bungee jumpers
- Use washers of different weights to provide more incremental data

- **Career Applications**

- starting a bungee jumping business
- data collection for statistical analysis

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## **LAB TITLE: Bungee Jumper Lab**

### **STUDENT INSTRUCTIONS:**

- **Statement of problem addressed by lab**

What happens when two different people want to bungee jump, but they have very different weights? What effect does that have on the bungee cord?
- **Grouping instructions and roles**

Students optimally should be in groups of 3, but groups of 2 or 4 work well. One student can be in charge of the measurement piece; One student can be in charge of manipulating and dropping the bungee jumper apparatus; a third student can be in charge of recording data for the group. A way to add a fourth student is to have that student present the data or assist the data collector.
- **Procedures** – steps to follow/instructions
  1. The bungee jumper apparatus should be empty of weights with the rubber bands tied to the eye bolt. One nut should be screwed onto the eye bolt near the top of the eye bolt.
  2. The measurement person should a measuring tape or two to the wall, starting with the zero end of the tape where the bungee jumper is dropped from.
  3. The measurement person should watch the tape as the bungee jumper is dropped to see the distance the bungee apparatus drops. This should be verbalized to the recorder who will list the number of washers used (for weight) and the distance of the drop.
  4. Repeat the process for different weights by adding washers and the second nut back onto the bottom. Record the results to collect data to graph on the scatterplot.
- **Outcome instructions**

Students should grasp that the heavier the person bungee jumping, the more the bungee cord should stretch. This should be intuitive, but students will have a set of data that models this scenario.

Students should be able to demonstrate the skill and take it with them that they can create a scatterplot, graph a line of best fit, and make predictions from this line.
- **Assessment instructions** (peer-teacher)
  - ensure that students' data is graphed correctly
  - check to see that the line of best fit is accurate and equation matches the line
  - check for accurate data collection by asking about their procedure for collecting the data
  - look for students to use appropriate mathematical language during their presentation of findings

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## Lab Data Collection

**Student:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Unit:** Unit 24 – Patterns and Functions

**Lab Title:** Bungee Jumper Lab

**Criteria:** Have you ever wondered what the effect of different bungee jumpers is on the bungee cord? Do you wonder how they know that the jumper won't hit the ground? Explain why you think this happens.

**Data Collection:** Record your data of bungee tests below. At least 10 trials are required for a reasonable set of data. If you have time to compile 20 or more, please do so. Your line of best fit will be more accurate!

Number of Weights	Stretch	Number of Weights	Stretch

**Calculations:** Use the slope formula to determine your slope for your line of best fit. Write the equation of your line in slope-intercept ( $y = mx + b$ ) form.

**Summary Statement:**

Prepare a presentation to answer some of the questions posed in the criteria section. What conclusions can you draw that are shown by your data?

**Other Assessment(s)**

Your presentation should include:

- A well drawn graph, completely labeled using TAILS, with line of best fit
- The equation of your line of best fit written neatly on your paper
- Thoughtful answers to the questions above
- Each member of the team should participate equally in the presentation

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