

Linear Functions

Lesson 6 of 7

Description:

In this lesson, students will be able to apply what they have learned about linear functions by simulating a bungee jump. Students will use balloons filled with water and rubber bands to collect data and will then use that data to write the equation of a line of best fit. This equation will be used to predict the number of rubber bands needed to provide a safe, yet thrill-seeking jump for the jumper (i.e., the balloon). Not only will students need to write an equation from two points, but will again be asked to explain the slope and y -intercept in the context of the problem. They will conclude by completing an activity report describing the activity in its entirety. This will allow the teacher to determine not only if the student understands the mathematics but also if the student can adequately explain the process of the activity.

Common Core State Standards Addressed:

- S-ID.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
 - b. Fit a linear function for a scatter plot that suggests a linear association.

Mathematical Practice Standard(s) Emphasized:

- MP 1: Make sense of problems and persevere in solving them.
- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 4: Model with mathematics.

Sequence of
Instruction

Activities and Materials

Engage



As a hook to the lesson, show a short video clip of a bungee jumper to illustrate the importance of making accurate predictions. A sample video can be found at: <http://www.youtube.com/watch?v=zG22qQydPVQ>.

This lesson is designed to give students the experience of finding a line of best fit and allows them to use and apply their knowledge of linear functions in preparation for the culminating task where less guidance will be provided.

Explore

Explain the activity to students as follows:

You will use rubber bands and a balloon (your “jumper”) to simulate a bungee jump. The data you collect will be used to write an equation that models an actual jump from some specified location. Your job will be to estimate the height of the building in which the jump will take place and to then determine the number of rubber bands needed to make a safe but “thrill-seeking” jump coming as close as possible to the ground without touching.

The balloons should have varying amounts of water in them so that each “jumper” is unique. The balloons should NOT be water balloons but regular balloons as water balloons are designed to burst upon impact.

For this lesson, students will use the “eyeball” method (choosing two points) to find a line of best fit. They do not need to use linear regression; they should simply choose two points that appear representative of a good linear model and use those two points to write a linear equation.

After the equation is written, a graphing calculator should be used to plot the data and their linear model in order to make adjustments, if necessary. If students have not recently used a graphing calculator to plot data, a short mini-lesson may be necessary to remind them how to edit a list and use statistical plots.

After all groups have made a prediction and attached their rubber bands, the class will gather at the jump site for the “final jump.” Each group will have an opportunity to perform their jump while the other groups observe and measure the accuracy of the jump. The class should determine which group provided the most thrill-seeking jump by using mathematical relationships to draw conclusions. Throughout this activity, students should be exercising Mathematical Practice 1 as they continue to make sense of the problem and monitor their progress.

Practice Together in Small Groups/Individually



After the final jump, students will individually complete the *Water Balloon Bungee*

Activity Report. This is an opportunity for students to demonstrate their own understanding of the activity and linear equations, in general. Most importantly, this activity report will assess each student’s use of Mathematical Practice 3, specifically, their ability to construct viable arguments and communicate them in written form using mathematical language. Students should be given ample time to complete this activity report, as this will also serve to informally assess their understanding of the concept. If this formative assessment reveals gaps in students’ understanding, a differentiated lesson may be necessary prior to the next lesson.

Task #14: Water Balloon Bungee Activity Report

Follow this outline to produce a neat, organized, thorough, and accurate report, with at least one paragraph for each section. Any reader of your report should be able to understand the activity without having participated in it.

A. Overview

Tell what the investigation was about by explaining its purpose or objective.

B. Data collection

Describe the data you collected and how you collected it.

C. Model

Provide your equation for the line of best fit. Tell how you found this equation and how your group chose this equation to represent your data.

D. Calculations

Explain how you determined how many rubber bands to use in the final jump. Show any calculations used to find the result.

E. Results

Describe what happened on the final jump. How did your water balloon compare with the others?

F. Conclusion

What problems did you have in this activity? What worked well? If you could repeat the whole experiment, what would you do to improve your results?