LAYING THE FOUNDATION
Building Academic Excellence

Barbie® Doll Bungee Jumping
Graphing and Extrapolating Data

Team members have been hired to work for the Psycho Entertainment Company. This company provides rock climbing, sky diving, extreme skateboarding, and hang gliding adventures to the public. The current market research indicates that the company should add bungee jumping to its list of entertainment services.

As part of the preliminary research, the management assigned teams the task of working out the details of the jump that will ensure a safe yet thrilling experience. The company has several sites planned for bungee jumping and each site is at a different height.

Purpose

To ensure a safe and thrilling jump, you will determine the relationship between the jump height and the number of rubber bands used to make the bungee cord. You must allow your doll to come as close to the floor as possible without sustaining any "injuries" or "fatalities."

Materials

Each lab group will need the following:

meter stick
Barbie® doll
rubber bands

SAFETY ALERT!

» Use extreme caution during the "jumps."
» Wear safety goggles throughout this activity.

Procedure

1. Use one rubber band to secure the doll's ankles together and to serve as a point of attachment for the bungee cord. Use a small rubber band to tie back the doll's hair if it is not already in a ponytail.
2. Construct a bungee cord composed of 2 rubber bands and attach it to the band on the doll's ankles. The doll should fall freely from a standing position, plunging head-first throughout this activity.
3. Test drop the doll several times to practice taking readings. Repeat this jump two more times, for a total of three trials.
4. Create a data table to record the trials, the number of rubber bands in the bungee cord, and the drop distance. Remember that you will be adding up to a total of 6 rubber bands, and that you will need to record an average maximum drop distance.
5. Add a rubber band to your attached bungee cord. Drop your doll three times using the new cord, and record the data.
6. Repeat Step 5 until you have used a total of 6 rubber bands. Additional trials may be performed if time permits. You may have to devise a way to take measurements that are longer than 1.0 m.
7. Calculate the averages and record them in your data table.
8. Use the space provided to construct a graph of the average drop distance versus the number of rubber bands. Use a straight edge to draw a line in such a way that an equal number of points lie above and below the line of manual fit.
9. Develop an equation for this line in $y = mx + b$ format and record it on your data sheet. Remember that to calculate the slope of the line, use the equation

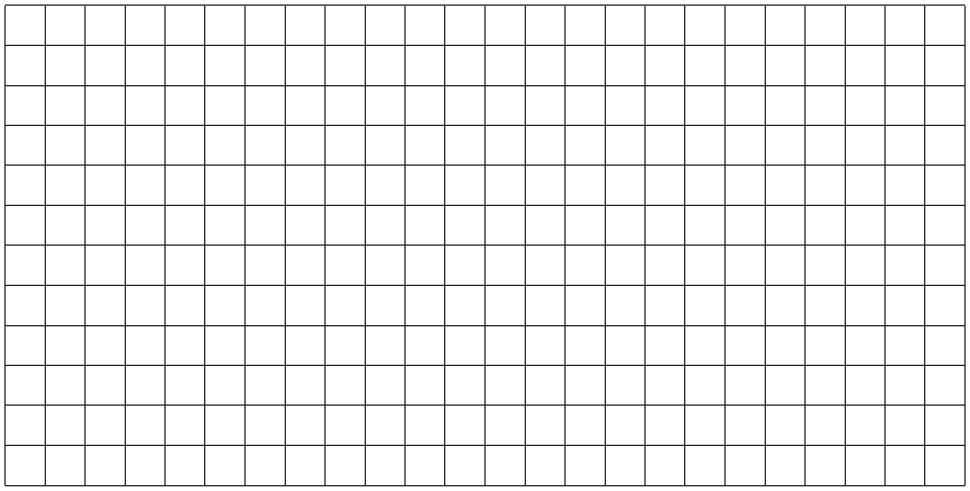
$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

   The *y*-intercept (*b*) can be found by extending this line backward until it crosses the *y*-axis.
10. Use your equation to predict how many rubber bands will be needed for the doll to perform a safe yet thrilling jump from the height of the location that your teacher specifies. Your teacher will set the boundaries for both the doll's safety and her "thrill factor."
11. Create a bungee cord based on the number of rubber bands you predicted in Step 10, and attach it to the doll. When directed by your teacher, proceed to the drop zone and test your prediction.

Data and Observations

Data Table

Graph



Conclusion Questions

1. Write the equation for the line you developed on your graph.

2. What is the significance of the *y*-intercept in your equation?

3. What is the significance of the slope?

4. Use your equation to predict how many of your rubber bands would be needed to allow Barbie® a successful yet thrilling jump from a height of 100.0 ft. Show all calculations in the space provided.