

Barbie Bungee

In this experiment, you will collect data and come up with a linear equation to model the relationship between the number of rubber bands and the distance that Barbie falls when you release her from a height. You will then use the linear model to figure out how many rubber bands Barbie needs in order to get an exciting but safe bungee jump from the top of the rail of the walkway in the math building.

Materials: Barbie, rubber bands, measuring tape. Collect your materials and take pictures of them for your report.

Procedure:

Tie two rubber bands to Barbie's legs. Mark a line on the whiteboard as a starting point and hold the end of your bungee cord to this line. Then drop Barbie. **Measure the furthest distance that Barbie's head reaches during the drop, not where she eventually ends up. All measurements should be recorded in inches.**

Repeat the process while adding two rubber bands at a time to the bungee cord, until the table below is completely filled out. You should have 14 rubber bands on your last measurement. Make sure you take a picture of your group gathering the data.

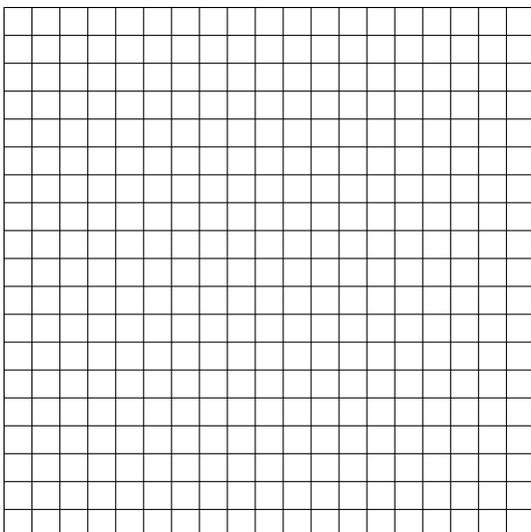
x	y

Analysis:

1. What should your x-variable represent? Remember, the x-variable is your input, which you control.
2. What should your y-variable represent? Remember, the y-variable is your output, which is what you measure.
3. Do you think this will be a linear relationship? Why?

This section should take approximately 15-20 minutes to complete. Check with your instructor when you are finished before moving on to the next section.

4. Graph: Make a scatter plot of your data and draw **one** line that best fits through the points. Label your axes appropriately. Remember a line of best-fit should have approximately the same number of points above and below it, and every point should not be on the line.



Equation:

5. Pick two points that are on the line of best-fit and find the slope of the line.
6. What meaning does the slope have in terms of distance and rubber bands?
7. Remember the y-intercept is the value of y when x=0. Where does Barbie end up when she hangs with zero rubber bands. What is the meaning of the y-intercept in terms of this information?
8. Write the equation of the line of best-fit in slope-intercept form. Interpret this equation in terms of distance and rubber bands.

- This section should take you 10-15 minutes to complete. Check with your instructor when you are finished before moving on to the next section.

Test your model

9. Use this equation to find how many rubber bands you need so Barbie bungee jumps from the walkway safely but still gets a thrill. The distance from the ground to the top of the rail in the walkway is 225 inches.

10. Given the results from your table, do you think this is a reasonable prediction? What problems do you see with the number of rubber bands that your equation predicts?

- This section should take you 5-10 minutes to complete. Check with your instructor when you are finished before moving on to the next section.

11. Tie the predicted number of rubber bands to Barbie. Test your prediction by launching Barbie from the top of the walkway rail. Make sure one group member is downstairs to check that it is safe to drop Barbie, and to take a picture of your result. What happened?

The worksheet you completed in class is a rough draft of your report. Use it to write a typed report using complete sentences that answers the 7 items below:

What to turn in: (one report per group)

Your report should include the following:

1. **Introduction:** explain the purpose of this activity
2. **Describe** the procedure for the experiment. Did you run into any problems?
3. **Data, Analysis, Graph and Equation of your model:** Include your answers to questions 1-8, written in complete sentences. Also include the data table, the graph showing the equation of the line of best fit, and your calculations in finding the equation of the line.
4. **Prediction:** Include your answers to questions 9-11, written in complete sentences. Show all work for finding the number of rubber bands that Barbie needs for a thrilling but safe jump.
5. **The Jump:** Discuss the outcome of testing your model. Did Barbie survive? How close did she get to the floor? What changes would you have made in the procedure for your data collection or in your calculations to improve the outcome?
6. Include **pictures** of the experimental materials, your group members gathering the data and of the final jump.
7. **Conclusions:** Explain in a few sentences what math you learned here and what particular concepts or problem solving strategies helped you solve these problems. Connect this to something outside the classroom.