Name: **Example of a Well-Written Lab**

Other Group Members: _____

Doll Bungee – **DO NOT WRITE ON THIS COPY**

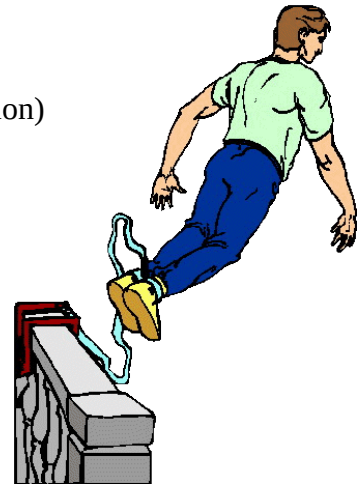
Introduction

SETTING:

Your team has been hired to work for the Rocky Mountain Daredevil Company (RMDC™). Your company provides rock climbing, sky diving, deep sea adventures, and cliff diving to interested customers. In order to boost sagging sales, the company has decided to add bungee jumping to its list of available adventures. As part of the assignment, the board of directors decided that several teams will undertake the task of working out the details of this newest adventure. Because the bungee jumping will take place at several different locations, it will be necessary to find a way to determine how much bungee rope will be needed for any given height. A successful bungee adventure will maximize thrills but still be safe; therefore, the jumper must come as close as possible to the ground without hitting it. This will take some precise planning.

Procedures:

1st/2nd Day:	Collect Bungee Jumping Data (Procedure Section) Analysis Questions Practice Jump
3rd Day:	Final Jump!!

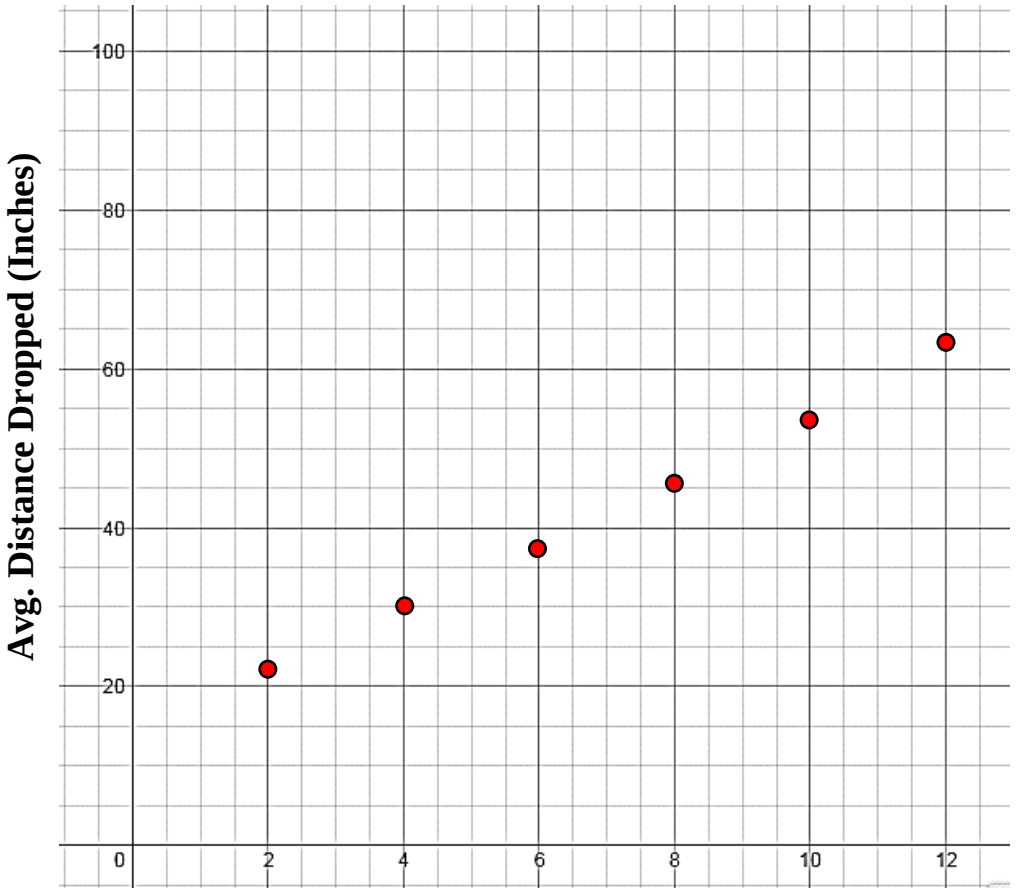


Grading

Your grade is comprised of 3 parts (*Do not fill this in*):

20%	Participation – Behavior - Teamwork	**/ 10**
50%	Procedure (packet)	**/ 25**
30%	Final Jump!	0 - 5 - 7.5 - 10 - 12.5 – 15 **/ 15**
	Final Grade	**/ 50**

Data Gathering Sheet
Title of Graph: Distance Dropped vs. Rubber bands



Number of Rubber Bands (x)	Jump 1 distance in inches	Jump 2 distance in inches	Jump 3 distance in inches	Average Jump Distance in Inches (y)
2	22.25	21.5	22	21.9
4	29.75	30.5	30.25	30.2
6	37	38.25	38.25	37.8
8	46.25	45.75	46	46.0
10	53.25	53.5	54.75	53.8
12	63	63.5	62.75	63

We then plotted average distanced dropped (in inches) vs number of rubber bands to see what type of correlation we had. The scatterplot depicted a very linear positive correlation, so we used linear regression to find a line of best fit. We chose linear regression over by hand because by hand is less precise because it is only a **user** estimate.

The equation for our linear regression was $y = 4.06x + 13.67$ where y was the average distance dropped and x was the number of rubber bands. The slope means on average the distance dropped increases 4.06 inches for every rubber band. The y – intercept says the distance dropped with 0 rubber bands (which would be approximately the height of the doll) is 13.67 inches.

Procedure:

1. Tape a large piece of paper to the wall from a height of about 6-8 ft from the floor.
2. Draw a line near the top to indicate the point that your doll will make each jump (make sure you can reach this line again. You may need to stand on a chair ***CAREFULLY***)
3. Connect two rubber bands with a slipknot. Wrap one of the rubber bands tightly around the dolls feet. (This needs to be able to hold the doll as it falls.)
4. Anchor the first band at the jump point, then release. Record result.
5. Repeat as necessary to collect data.

Analysis

1. Given your setup, answer the following and **clearly justify** to the company how you arrived at your answer.

   a) How far would your person fall safely if you used 19 rubber bands?

   Using our linear regression equation of $y = 4.06x + 13.67$, we substitute 19 in for x and find: $y = 4.06(19) + 13.67 = 77.14 + 13.67 = \mathbf{90.81\ inches}$

   So, with 19 rubber bands we estimate our model would fall 90.81 inches, or ~7 feet 7 inches.

   b) What if you used 150 rubber bands?

   Using our linear regression equation of $y = 4.06x + 13.67$, we substitute 150 in for x and find: $y = 4.06(150) + 13.67 = 77.14 + 13.67 = \mathbf{622.67\ inches}$

   So, with 150 rubber bands we estimate our model would fall 622.67 inches, or ~51 feet, 11 inches.

   c) How many rubber bands would it take to fall 37ft?

   Using our linear regression equation of $y = 4.06x + 13.67$, we substitute 444 in (37 ft) for y and find:

   $$444 = 4.06x + 13.67$$
   $$430.33 = 4.06x$$
   $$105.99 = x$$

   So to fall 37 feet we estimate it would take 105 rubber bands. If we used any more it would hit the ground.

d) How many rubber bands would it take to safely fall from the roof of the Empire State Building (1454 feet)?

Using our linear regression equation of $y = 4.06x + 13.67$, we substitute 17448 in (1454 ft) for y and find:

$$17448 = 4.06x + 13.67$$
$$17434.33 = 4.06x$$
$$4294.17 = x$$

So to fall 1454 feet we estimate it would take 4294 rubber bands.

e) How many bands would it take to fall safely from the roof of the Burj Khalifa?

Using our linear regression equation of $y = 4.06x + 13.67$, we substitute 32664 in (2722 ft) for y and find:

$$32664 = 4.06x + 13.67$$
$$32650.33 = 4.06x$$
$$8041.95 = x$$

So to fall 2722 feet we estimate it would take 8041 rubber bands.

2. Practice Jump: You will receive a height. This height represents a total distance from the jumping platform to the ground. Predict how many rubber bands you will need so that your doll can safely jump and justify below your decision to the company. Set up your doll as such and perform a test jump with your teacher (Get my attention when you are ready!). ***This is only a pre-test***. Your grade will be assigned according to how far the doll falls according the following rubric.

% of Distance Your Doll Falls:	Your Grade:
0% - 49%	5
50% - 64%	7.5
65% - 79%	10
80% - 89%	12.5
90% - 99%	15
100%+	5
No Drop Attempt	0

Practice Height: 72 inches

JUSTIFICATION:

Using our linear regression equation of $y = 4.06x + 13.67$, we substitute 72 in for y and find:

$$72 = 4.06x + 13.67$$
$$58.33 = 4.06x$$
$$14.37 = x$$

So to fall 72 inches safely, we estimate it would take 14 rubber bands. If we used any more it would hit the ground.

----------FINAL DAY----------

3. Now it's time for your graded bungee jump. You will receive another height. You will have 10 minutes to prepare your doll for bungee jumping once you receive the height.

   SHOW YOUR WORK AND JUSTIFICAITON TO THE COMPANY.

   We will then proceed to complete jumps at this height (one attempt per group). Your grade will be assigned as follows:

FINAL DROP HEIGHT: <u>19 ft, 2 inches</u>

% of Distance Your Doll Falls:	Your Grade:
0% - 49%	5
50% - 64%	7.5
65% - 79%	10
80% - 89%	12.5
90% - 99%	15
100%+	5
No Drop Attempt	0

<u>JUSTIFICATION:</u>

First, we converted 19 feet 2 inches to just inches and got 230 inches.

Using our linear regression equation of $y = 4.06x + 13.67$, we substitute 230 in for y and find:

$$230 = 4.06x + 13.67$$
$$216.33 = 4.06x$$
$$53.28 = x$$

Therefore, to fall 230 inches safely, we estimate it would take 53 rubber bands. If we used any more it would hit the ground.

However, if we wanted to be safe, we might consider using 52 rubber bands. This should take approximately 4 inches off the drop distance (this was our slope), so the model would fall to approximately 4 inches above the ground. This way seems the safest while also maximizing the fun of the drop!

<u>Because of this, we elected to use 52 rubber bands.</u>