

TI-Nspire™ Activity: *Tootsie Pops™ & Hand Span*
Adapted to TI-Nspire™ from an activity by Mary Mortlock

Activity Overview

Students will collect data, find the linear regression model of the data, and address aspects of the data that affect regression.

Concepts

Students will:

- decide on data collection methodology and collect data.
- plot data on a scatter plot.
- find and interpret the correlation coefficient, coefficient of determination, and the equation of the least-squares regression line.
- add the least-squares regression line to their scatter plot and make a residual plot.
- identify outliers and influential points.
- use their model to make predictions.
- discuss sources of error in the data collection, and discuss causation.

Teacher Preparation

- At least 34 Tootsie Pops™ (you might need more if you want students to each have one) and a wide bowl or bucket (a children's plastic beach bucket works well)
- One or more rulers with both inches and centimeters

Required Materials

- *Tootsie_Pops_Handspan.tns*
- *Tootsie_Pops_Handspan_quickpoll.tns* (for Navigator data collection)
- Tootsie Pops Hand Span Worksheet (optional—all student directions are included in the .tns file)

Teacher Note: Open both the *Tootsie_Pops_Handspan.tns* and the *Tootsie_Pop_quickpoll.tns* files in Navigator. Send the *Tootsie_Pop_Handspan_Navigator.tns* file to students.

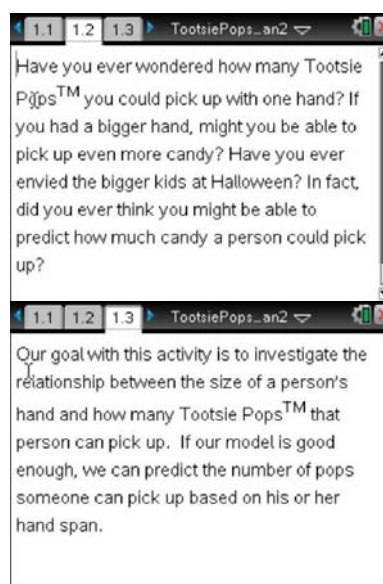
Instructions from .tns file

Move to page 1.2

Have you ever wondered how many Tootsie Pops™ you could pick up with one hand? If you had a bigger hand, might you be able to pick up even more candy? Have you ever envied the bigger kids at Halloween? In fact, did you ever think you might be able to predict how much candy a person could pick up?

Move to page 1.3

Our goal with this activity is to investigate the relationship between the size of a person's hand and how many Tootsie Pops™ that person can pick up. If our model is good enough, we can predict the number of pops someone can pick up based on his or her hand span.



Move to page 1.4

Some people have a larger and/or stronger dominant hand. You must decide as a class, which hand will each person use: the left, the right, the dominant hand, or the weak hand?

Will students get a “practice grab” or just one chance?

Move to page 1.5

Hand span refers to the distance between the tip of your thumb and the tip of your pinkie. You must agree as a class, how will you measure hand span: with all five fingers outstretched, or with the middle three fingers tucked in?

Will you measure in the air or pushing your hand down on a table or other surface?

Move to page 1.6

What units will you use to measure hand span: inches, centimeters, or something else?

Why are these questions important? What would happen if everyone used his or her own system for conducting this study?

Move to page 1.7

We want to use hand span to predict the number of Tootsie Pops™ a person can pick up. Which is the explanatory (predictor) variable, and which is the response variable?

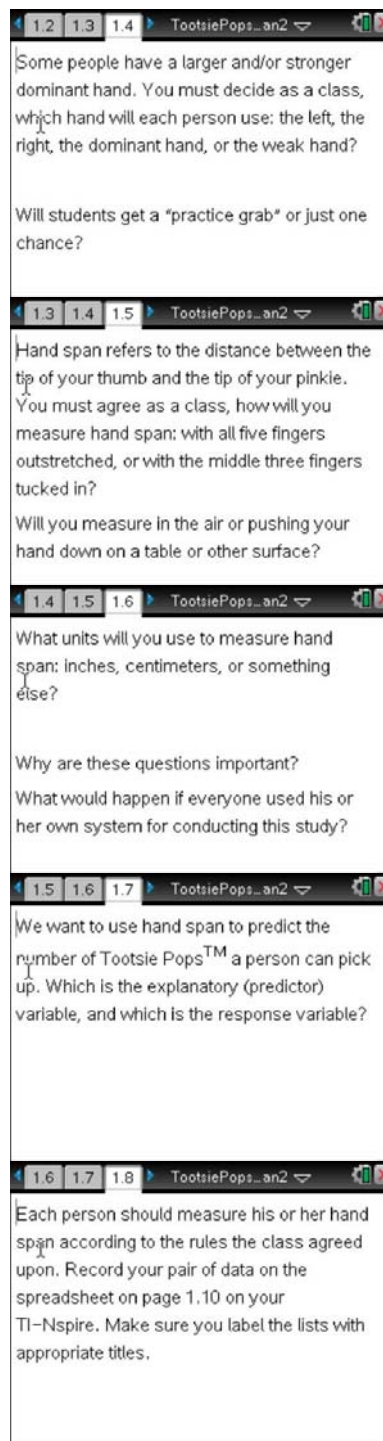
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Each person should measure his or her hand span according to the rules the class agreed upon. Record your pair of data on the spreadsheet on page 1.10 on your TI-Nspire. Make sure you label the lists with appropriate titles.

Tootsie Pops™ _____ Handspan _____ Number of

Teacher Tip

Have some students measure and record their hand span on the board while others are grabbing as many Tootsie Pops® as possible using the agreed-upon guidelines.



Move to page 1.9

Your teacher will collect the individual data and send it back to you on page 1.10. Look at the class data and then move to page 1.11 and create a scatter plot of the data. Describe all the features you see.

Teacher Note: Use Quick Poll to collect the data from the class. Send *Tootsie_Pop_quickpoll.tns* to the class. Students will enter their data, and use *Doc-Submit* to submit their data.

Once they have submitted their data individually, click on the Review tab and the “Student Results Icon” to display the data. Click on the Lists icon next to “Data View”. Press *Ctrl-A* to highlight all the values in both columns, and press *Ctrl-C* to copy the data (data only, not titles).

Return to the “Documents Workspace”. Go to Page 1.10 in *Tootsie_Pops_Handspan_Navigator.tns*. Click on the first empty cell in the first column—do NOT double-click on this cell. Press *Ctrl-V* to paste the data onto the Lists and Spreadsheet page. Press *Ctrl-S* to save the document. Press the “Send to Class” icon to send the document to the class. All students will now have all of the data. The students will create the graph on Page 1.11.

If you are not using TI-Nspire Navigator, students can write their values on the board for the class to copy into their lists.

Teacher Tip

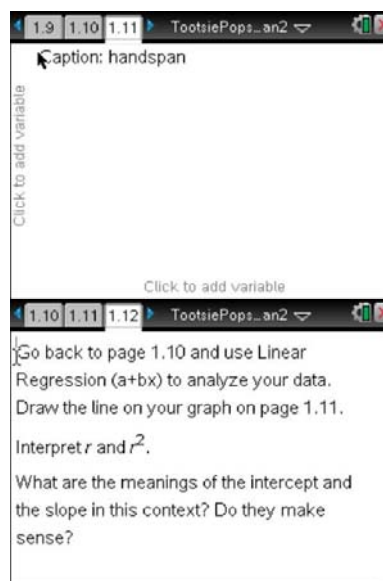
Use *Tab* to select the explanatory and response variables on the Data & Statistics page (Page 1.11).

Move to page 1.12

Go back to Page 1.10, and use Linear Regression ($a+bx$) to analyze your data. Draw the line on your graph on Page 1.11.

Interpret r and r^2 .

What are the meanings of the intercept and the slope in this context? Do they make sense?



Move to page 1.13

Go back to Page 1.11, and add a residual plot. Identify and discuss any outliers or influential points.

Move to page 1.14

Predict the number of Tootsie Pops™ picked up by someone with a hand span of 22 cm and someone with a hand span of 27 cm. Which prediction do you feel is more reliable, and why?

Move to page 1.15

Discuss sources of error in the data collection.

Do your results show causation? Why or why not?

Discussion points:

Although students might measure their own hand span, it might be more accurate to have another student verify the measurement.

What might be the effect of not stretching your fingers as wide as possible? How much inaccuracy can one or two centimeters have on the results?

What happens to our regression line when we reverse the explanatory and response variables?

How the residual plot is related to the scatterplot?

