

Name: _____

Period: _____

Paragraphs: Font Size and Height

In this activity, you will investigate: *How is the height of a paragraph related to font size?*

Your task is to fit the data and find the function that describes the relationship.

Introduction

If you take a paragraph of text in your word processor and change the font size, and the height of the paragraph will also change. To you, this is probably common sense, and something you have explored before. If you make the font large, the height of the paragraph will increase, and if you make the font smaller, the paragraph's height will decrease; there is some sort of relationship here.

The data summarized in this activity are the heights and font sizes of 10 paragraphs. The width and amount of text are the same for all these paragraphs.

- Open the Tuva dataset at: tuva.la/2L2BWQT

1) Investigate: How does the height of the paragraph relate to font size?

Think Ahead!

What will happen to the paragraph when you increase the font size?

How will the height of the paragraph change when you decrease the font size?

Make a Prediction

Before you begin graphing, try to describe what the *graph* relating font size and paragraph height will look like below. Explain your reasoning.

Now Graph it:

- Drag **Font Size** to the x-axis.
- Drag **Height** to the y-axis.

Explore your graph:

Q1: How does height change with font size?

- ☐ a. Height increases as font size decreases
- ☐ b. Height increases as font size increases
- ☐ c. Height does not change with font size

2) Group Discussion:

- On the graph, the data points look fairly linear. How can you tell, convincingly, that the relationship is not linear after all?

★ *Tuva Tip: Hint* ★

- Consider looking up the coordinates of a few points to find out how height changes in relation to font size over different intervals through the graph
- Consider if the slope stays constant through the graph

3) Continue to Investigate: How does the height of the paragraph relate to font size?

Explore your graph:

Q2: What is the height of a paragraph set in a 3-point font?

- ☐ a. 4 cm
- ☐ b. 0.7 cm
- ☐ c. 8.7 cm

Q3: Approximately, how much does the height change from a paragraph set in a 3-point font to a paragraph set in a 6-point font?

- ☐ a. Height is halved
- ☐ b. Height doubles
- ☐ c. Height quadruples

Is there a pattern in how height changes when font size is doubled?

- Click on a few other points to find out!

Q4: What function might be a good model for these data?

- ☐ a. Inverse Proportional
- ☐ b. Exponential
- ☐ c. Quadratic

4) Group Discussion:

- What pattern in the data convinces you that the function is quadratic?

★ *Tuva Tip: Hint* ★

→ Consider by what factor does y increase in a quadratic function when x is doubled. Does that happen with your data?

5) Continue to Investigate: How does the height of the paragraph relate to font size?

Build Your Function

- Choose $f(x)$ from the toolbar above the graphing area to open the Modeling Card.
- You can enter the function ($y = a * x^2$) in the editor.
- Notice that this is the same as $\text{height} = k/\text{width}$, with symbols for width and height.

Two things should happen:

1. Your function appears on the graph.
2. The parameter a appears as a slider below the function.

Explore the parameter

★ Tuva Tip: Tweaking the Parameter in Tuva ★

- You can change the value of a parameter by dragging the slider pointer or by typing in a new value and pressing enter. As you do this, the curve will move.
- The default value of k is 1. You can set the upper limit to a large number such as 100 and then move the slider up and down.
- You can tweak the maximum value of k on the slider by clicking on it and inputting the desired value in the box in the middle.

Q5: How does the function behave when you make a larger than 1?

- ___ a. It gets stretched vertically
- ___ b. It gets compressed vertically
- ___ c. It shifts horizontally
- ___ d. It gets reflected along the x-axis

Q6: How does the function behave when you make a smaller than 1, but keep it positive (between 0 and 1)?

- ☐ a. It gets stretched vertically
- ☐ b. It gets compressed vertically
- ☐ c. It shifts horizontally
- ☐ d. It gets reflected along the x-axis

Q7: What happens to the function when you make a negative?

- ☐ a. It gets stretched vertically
- ☐ b. It gets compressed vertically
- ☐ c. It shifts horizontally
- ☐ d. It gets reflected along the x-axis

Q8: Try to fit the data as closely as possible by manipulating a . What is a good value (or range of values for a ?

- ☐ a. It gets stretched vertically
- ☐ b. It gets compressed vertically
- ☐ c. It shifts horizontally
- ☐ d. It gets reflected along the x-axis

Apply Your Function

Q9: Suppose you set the paragraph in 18-point type. According to your function, how tall would the passage be? Does your answer make sense? Explain.

5) Group Problems:

Lebron James

NBA star LeBron James is 203.2 cm tall. What font size would make the passage as tall as him?

Challenging Assignment!

Your monumentally hard English teacher has assigned you a 10-page essay. You could only come up with five pages. (Sigh!) You have been typing in 10-point font. What do you need to do to make it ten pages without changing the margins, or writing any more text?