

Date: 4/24/17

Hour: 4<sup>th</sup>

30  
30

### If the Shoe Fits Algebra 1 - Linear Equations Project

#### About the Project:

What size shoe do you wear? As you grow, your shoe size can change rapidly. If your foot grows half an inch, does that mean you should get shoes that are a half-size larger?

For this project, you will collect data about foot length and shoe size of men or women. You will create a scatter plot displaying the data and draw a trend line to predict the shoe size a person should wear. Then you will use a line of best fit to analyze the accuracy of your trend line. Lastly you will create a foot scale that can be used to help men or women find the appropriate shoe size for them.

#### I. Collecting and Displaying Data

a. What is the length of your right foot (to the nearest 1/8 of an inch)? 8.37 in (as a decimal)

b. What shoe size do you wear? 5

c. (A.CED.2, 2pts) Identify the independent and dependent variables

- Independent Variable =  $x =$  Foot length
- Dependent Variable =  $y =$  Shoe Size

d. (F.IF.2, 2pts) Identify a reasonable domain and range for this situation.

- Domain:  $x \geq 0$
- Range:  $0 \leq y < \infty$

e. Collect data from 15 men or women (not both) and record in the chart below.

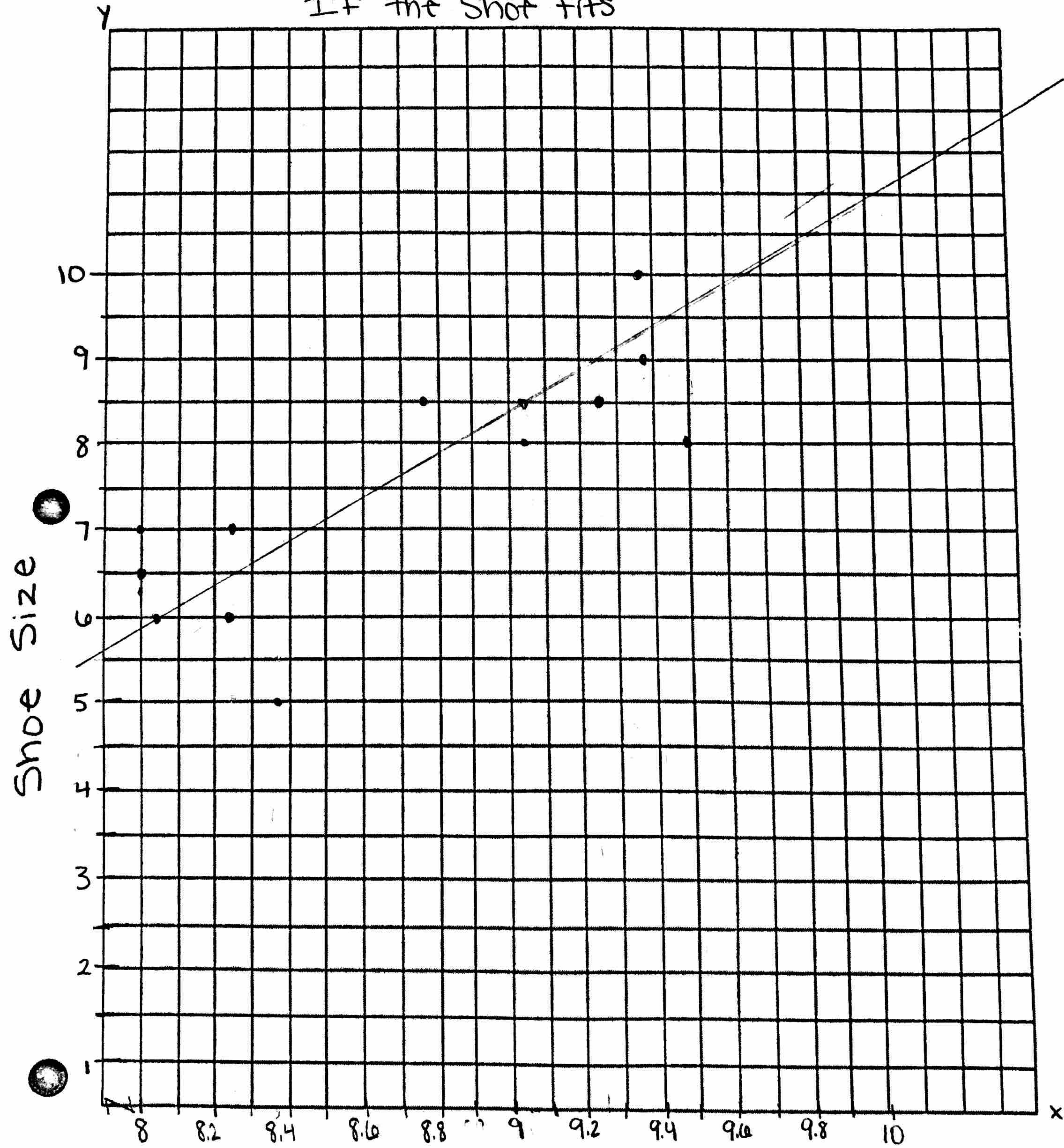
Name	Right Foot Length	Shoe Size
MA	9.25	8.5
AB	9.25	8.5
CB	8.25	6
JB	9.37	10
EB	9.37	9
JG	8.37	5
GW	8	6.5
HS	8	7
ES	9.125	8
AR	8.125	6
HO	8.25	7.5
ML	8.75	8.5
JS	9.5	8
JH	9.125	8.5
GG	9.5	8



f. (S.ID.6, 2pts) Create a scatter plot to display your data. Be sure to

- Title graph
- Label and scale x-axis
- Label and scale y-axis
- Graph all the data points from your table

IF the Shot fits



Right Foot length



## II. Finding the Linear Pattern

A person's shoe size is a function of the length of their foot length.

- a. (S.ID.6, 1pt) Draw a trend line on the graph to represent the linear pattern shown by your data.
- b. (F.IF.4, 2pts) Identify two points on your line. What do these points mean in terms of the situation graphed?

- The point  $(8.25, 6)$  means the right foot length is 8.25 in and the shoe size is 6
- The point  $(9.125, 8.5)$  means the right foot length is 9.125 in and the shoe size is 8.5

- c. (S.ID.7, 2pts) Calculate the slope of your trend line. What does the slope (rate of change) mean in terms of the situation graphed? Be sure to include labels on your answer.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8.5 \text{ in} - 6}{9.125 \text{ in} - 8.25} = \frac{2.5}{0.875} = \frac{2.86}{1}$$

Every time the shoe size increases by 2.86 in the foot length increases by 1

- d. (F.IF.7, 1pt) Write a function for your trend line in point-slope form.  $y - y_1 = m(x - x_1)$

$$y - 6 = 2.5(x - 8.25)$$

- e. (A.SSE.2, 1pt) Convert the function from d. into slope-intercept form. Be sure to include your work.

$$y - 6 = 2.5(x - 8.25)$$

$$y - 6 = 2.5x - 20.625$$

$$y = 2.5x - 14.625$$

- f. (S.ID.7, 2pts) What is the y-intercept of the trend line? What does this mean in terms of the situation graphed? Is the y-intercept practical (possible in real life)?

$$(0, -14.625)$$

If your right foot length is 0 in then your shoe size is -14.625. The y-int is not practical because you can't have a neg. shoe size.

- g. (F.IF.4, 2pts) What is the x-intercept of the trend line? What does this mean in terms of the situation graphed? Is the x-intercept practical (possible in real life)?

$$(5.85, 0) \text{ x-int}$$

$$\begin{array}{r} 0 = 2.5x - 14.625 \\ +14.625 \quad +14.625 \\ \hline 14.625 = 2.5x \\ \underline{2.5 \quad 2.5} \\ x = 5.85 \end{array}$$

When your right foot length is 5.85 in, your shoe size is 0. The x-int is not practical because you can't have a shoe size of 0



### III. Making Predictions

- a. (F.IF.2, 2pts) Use your trend line to find the appropriate shoe size for a person with each foot length listed in the table. Round to the nearest half shoe size. (There are no half sizes after size 12.)

Length of Right Foot (to nearest 1/8 of an inch)	Shoe Size (using trend line)	Shoe Size (using line of best fit)
8.875	7.5625	7.8
9	7.875	8
9.125	8.1875	8.2109 = 8.5
9.25	8.5	8.4306 = 8.5
9.375	8.8125	8.6505 = 9
9.5	9.125	8.8704 = 9
9.675	9.4375	9.0902 = 9
9.75	9.75	9.31 = 9.5
9.875	10.063	9.5
10	10.375	9.74 = 10
10.125	10.688	10
10.25	11	10.2 = 10.5
10.375	11.313	10.4 = 10.5
10.5	11.625	10.6 = 11
10.625	11.938	10.8 = 11.5
10.75	12.25	11.07 = 12
10.875	12.563	11.3 = 12.5
11	12.875	11.5
11.125	13.188	11.7 = 13
11.25	13.5	11.9 = 13
11.375	13.813	12.2 = 12.5
11.5	14.125	12.4 = 12.5
11.625	14.438	12.6 = 13
11.75	14.75	12.9 = 13
11.875	15.063	13.05 = 13
12	15.375	13.3 = 13.5
12.125	15.688	13.5 =
12.25	16	13.7 = 14
12.375	16.313	13.3 = 14
12.5	16.625	14.14 = 14.5



#### IV. Analyzing the Results

- a. (S.ID.7, 1pt) Use a calculator to find the equation for the line of best fit. Record the equation below.

$$y = 1.76x - 7.84$$

- b. (S.ID.8, 2pts) Is there a strong correlation between foot length and shoe size? Explain how you know.

Yes, there is a strong correlation between foot lengths and shoe size because it is a 77%.

- c. (F.IF.2, 2pts) On the table, fill in the Shoe Size column (using line of best fit).

- d. (F.IF.2, 1pt) According to your trend line, what size shoe should you wear? According to the line of best fit what size shoe should you wear? Which equation more accurately predicts your actual shoe size?

According to my trend line, the size that I should wear is 6.85. My foot length was not in the chart, therefore I cannot get a shoe size for the line of best fit.

- e. (2pts) Look at your chart in part III. Does your equation give an accurate prediction of a person's shoe size compared to the line of best fit (for what foot lengths are the equations the same and different)? Include some reasons why your trend line may give false sizes, and how your trend line could be improved.

Yes the chart gives a good shoe size, a person's foot was 9.25 and their shoe size was 8.5 which was the same. The trend line might be false b/c the trend line I drew might not be accurate.

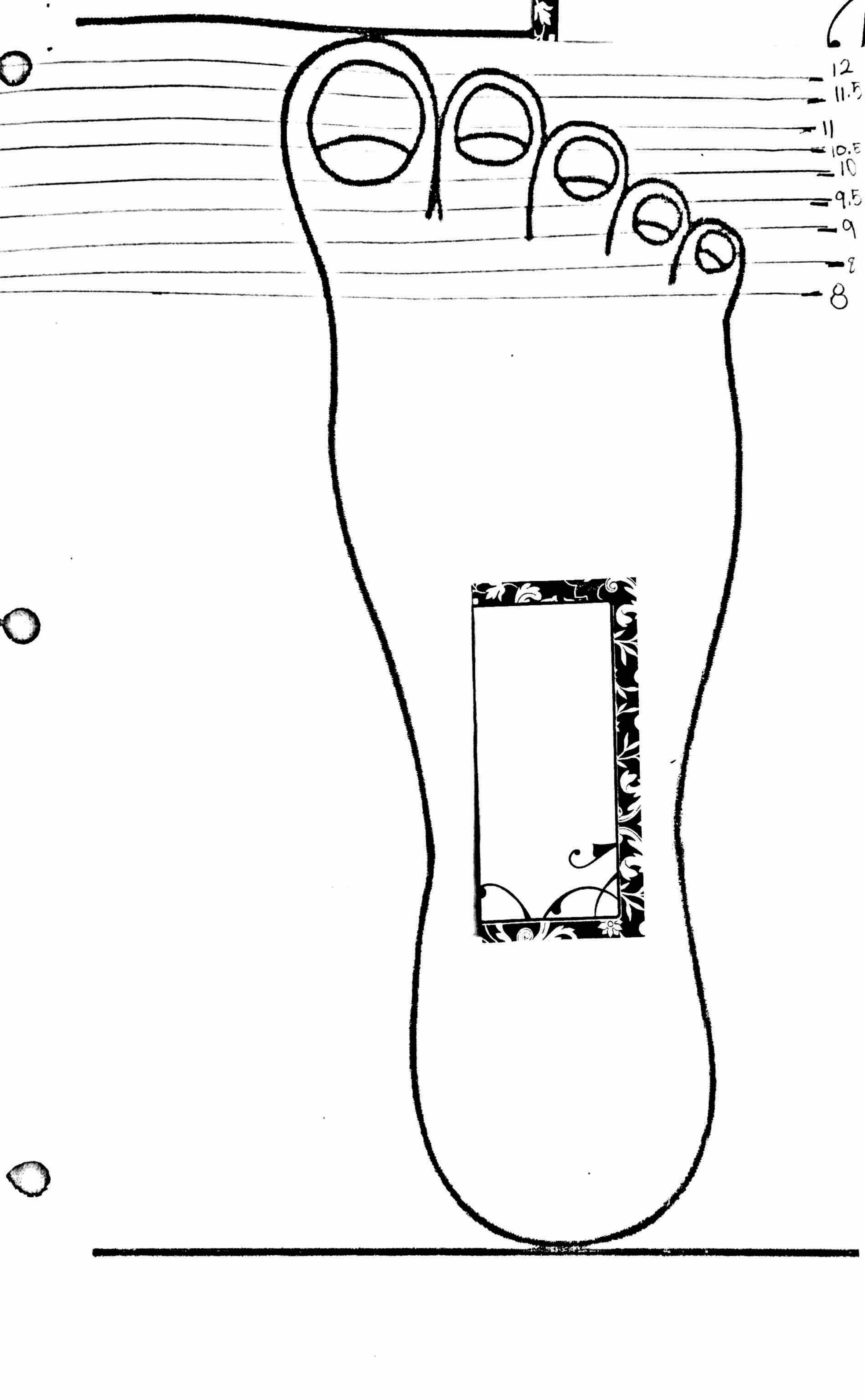
- f. (S.ID.7, 1pt) If your foot grows half of an inch does that mean you should get shoes that are half a size larger? Explain.

No, because if your shoe size is 8 & your length is 9, & grows to 9.5, your shoe size is closer to 10.

#### V. Creating a Foot Scale

- a. (F.IF.7, 2pts) Using the line of best fit, create a foot scale that could be used to help an individual find the appropriate size shoe to wear.





12  
11.5  
11  
10.5  
10  
9.5  
9  
8  
7

