

What's the Price of the Cup?

Learning Target

I can create a model using regression analysis to interpolate or extrapolate from data.

Standards for Mathematical Content

S-ID.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

F-LE.2: Construct linear functions, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

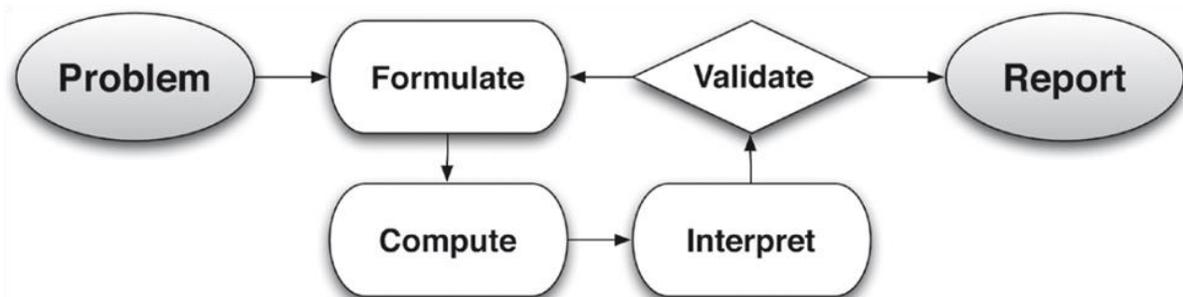
Standards for Mathematical Practice

MP4: Model with Mathematics

MP5: Use appropriate tools strategically

Summary of Task

Students gather data regarding the number of ounces and price of different sizes of drinks at two fast food restaurants or coffee shops. They represent this data on a scatter plot, and describe how the variables are related. Using a regression model, students calculate the cost of a drink that is 0 ounces. The task is structured to follow a mathematical modeling cycle, requiring students to identify relevant variables, formulate a model, use the model to answer questions, and interpret their findings considering possible revisions to the model along the way.



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Opening Exercise

Have you ever asked for an empty cup at a fast food restaurant or coffee shop? Do you think McDonald's or Starbucks would give you free cup? Based on what you know about the cost of the beverage at each place, predict what the prize of an empty cup would be at McDonald's and Starbucks.

PROBLEM

Your task will be to formulate a mathematical model to determine the price of an empty cup at two fast food restaurant or coffee shops. Identify the variables in this situation and select those that represent essential features in your model.

Research the number of ounces and price of different sizes of coffee at Starbucks and fountain drinks at Macdonald's (or any two restaurants of your choice).

Starbucks Coffee	
Ounces	Price
12	1.75
16	1.95
20	2.25

McDonalds Fountain Drink	
Ounces	Price
16	1
21	1.29
30	1.49

(Sample Data)

FORMULATE

Before attempting a regression analysis of data, it is often helpful to examine a scatter plot of the data to see which regression model is most likely going to be a good fit. Keep in mind that when working with real world data, it is unlikely that any regression model is going to be a "perfect" fit. The goal is to find the model that fits as many of the data points as possible and will be the best indicator of trends in the data.

A scatter plot graphically displays two related sets of data. Such a visual representation can indicate patterns, trends and relationships.

If you are looking for values that fall within the plotted values, you are **interpolating**.

If you are looking for values that fall outside the plotted values, you are **extrapolating**. **Be careful** when extrapolating. The further away from the plotted values you go, the less reliable is your prediction.

- Prepare a scatter plot of the data.
- Determine which regression model will best approximate your data. *Justify your reasoning.*
- Write a regression equation that can be used to predict the price of beverage at each restaurant based on the number of ounces.

COMPUTE and INTERPRET

Extrapolate: Based on your regression equation, determine the price of an empty cup at each restaurant? Is the cup free? Does this price make sense? Explain.

Interpolate: Based on your regression equation, predict the price of a 50 ounce drink at each restaurant. Does this price make sense? Explain.

VALIDATE

Compare your findings with your initial prediction.

Does your model need to be revised or improved?

REPORT

What is the price of an empty cup? Is this *initial* price the same for all restaurants? Explain.