

Intermediate Algebra

Name: _____

Unit 1 Activity 0: Introduction to Numerical, Graphical, and Algebraic Modeling

update 2/6/06

Why: Mathematics can be used to create models of situations we want to study in “real life”. These models are useful for studying relationships, observing patterns, and making predictions. Mathematical models can be numerical, graphical, or symbolic. Each type of model has advantages and disadvantages.

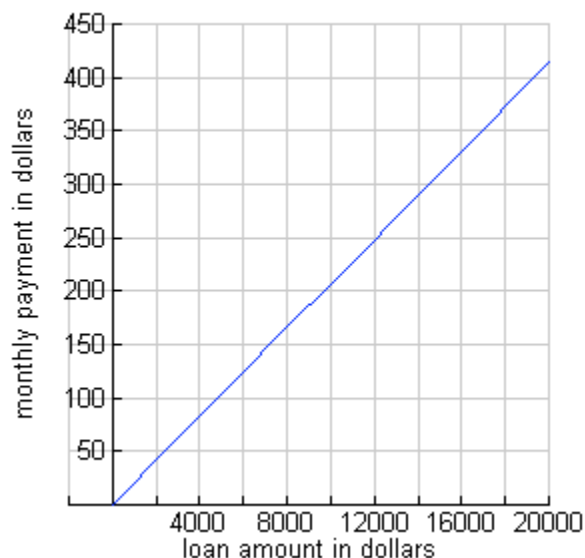
Learning Objectives:

1. Communication:
 - Explain the mathematical reasoning supporting an answer.
 - Show work in a neat and organized manner.
2. Multiple Representations:
 - Use tabular, graphical, and symbolic models to answer questions.
 - Identify the advantages and disadvantages of using each type of model.

Warm-up:

1. Suppose that you are planning to borrow money to buy a car. What factors can influence the monthly payment?

2. Here is the graph of the monthly payments for a loan in terms of the amount of the loan, assuming the loan is paid off in 5 years at an 8.9% annual interest rate. Use the graph to answer the following questions.



- a. In problem #1 you listed factors that could affect the monthly payment on a loan. A graph is one way of modeling the relationship between two variables. Which two factors are used as variables in this graph?
- b. In a mathematical model, one variable is treated as the independent variable (the input) and the other as the dependent variable (the output). Which is the dependent variable in this scenario?
- c. Locate the point (10,000 , 207.10) on the graph. Interpret the meaning of this point in the context of this scenario.
- d. Locate the point (10,000 , 400). This point does not lie on the graph. How does this fact affect the way you would interpret the meaning of this point?

Group Exercise:

1. Use the graph to answer the following questions. Show on the graph how you determined each answer.

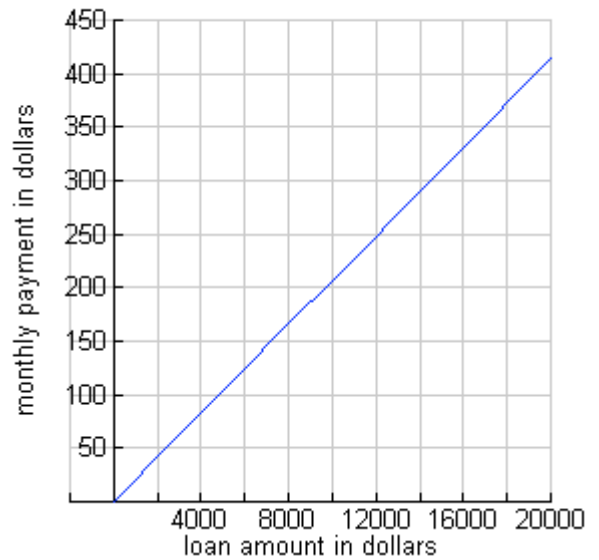
a. Under these conditions, how much would your monthly payments be if you want to borrow

\$2,000?

\$7,000?

\$24,000?

b. If you know that you can afford a \$300 monthly payment, approximately how much money can you borrow?



c. Suppose that you have already negotiated your loan, then you decide to borrow an additional \$1,000, how much will the monthly payment increase? Briefly explain your reasoning.

d. An algebra textbook says “Linear graphs have a constant rate of change”. What does this mean in this scenario?

e. Make up a question dealing with car loans that could not be answered using this graph.

f. What are the advantages and disadvantages of using a graph as a model.

2. The table relates the monthly payments to the original amount of a loan under the same conditions (5 year term with 8.9% annual interest). Use the table to answer the following questions. Briefly document your reasoning in an organized manner.

- a. Under these conditions, how much would your monthly payments be if you want to borrow

\$1,000?

\$7,000?

\$9,500?

\$22,500?

Amount of loan	Monthly payments
2000	41.42
4000	82.84
6000	124.26
8000	165.68
10000	207.10
12,000	248.52
14,000	289.94
16,000	331.36
18,000	372.78
20,000	414.20

- b. If you know that you can afford a \$300 monthly payment, approximately how much money can you borrow? Document your reasoning.

- c. Describe any patterns you see in the table.

- d. If you borrow an additional dollar, how much does your monthly payment increase?

- e. Make up a question dealing with car loans that could not be answered using this table.

- f. What are the advantages and disadvantages of using a table as a model?

3. The equation $R = 0.02071A$, gives the monthly payments, R , for a 5-year loan at 8.9% annual interest in terms of the amount of the loan, A . Use the equation to answer the following questions. Show your work.
- What does the variable R represent in this equation? What does the variable A represent?
 - Under these conditions, how much would your monthly payments be if you want to borrow

\$10,000?

\$9,500?

\$25,249?
 - If you know that you can afford a \$250 monthly payment, approximately how much money can you borrow? Show your work.
 - What do you think the number 0.02071 in the equation tells us?
 - Make up a question dealing with car loans that could not be answered using this equation.
 - What are the advantages and disadvantages of using an equation as a model?