Problem Solving with Linear Functions (pp. 1 of 3)

Linear functions can be applied to many real world problem situations to analyze the situation and to make predictions.

1. The A shift at Citco must drain an oil vat. Forty seconds after the plug has been released there are 13 gallons remaining in the vat. After one minute, 10 gallons remain in the vat. Assume the number of gallons varies linearly with time.

A) Identify what is represented by the independent and dependent variables.

Independent = ______________________________
Dependent = ______________________________

B) Fill in the table (at right).

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
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C) Place the data in the scatterplot. Label each axis.

D) Would the data be discrete or continuous?

E) Is the function increasing or decreasing?

F) Explain what parameter changes to the linear parent function \((y = x)\) must occur to fit a trend line to this data.

G) What equation results from using a linear regression on the data with a calculator? Graph this equation over the scatterplot above.

H) Find the \(y\)-intercept. What does it represent in the real world?

I) Find the \(x\)-intercept. What does it represent in the real world?

J) Explain the slope in terms of its units. What does the slope represent in the real world?
2. The Market sells one-gallon cartons of milk for $3.09 each and half-gallon cartons for $1.65 each. Assume that the number of cents you pay for a carton of milk varies linearly with the number of quarts the carton holds.

A) Identify what is represented by the independent and dependent variables.
   Independent = _____________________________
   Dependent = _____________________________

B) Fill in the table (at right).

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C) Place the data in the scatterplot. Label each axis.

D) Would the data be discrete or continuous?

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F) Explain what parameter changes to the linear parent function \(y = x\) must occur to fit a trend line to this data.

G) What equation results from using a linear regression on the data with a calculator? Graph this equation over the scatterplot above.

H) If The Market sold 3-gallon cartons, what price would be predicted using the function?

I) The actual prices for pint cartons and one-quart cartons are $0.57 and $0.99, respectively. Do these prices fit your mathematical model? If not, are they higher or lower than predicted?

J) Find the \(y\)-intercept. What does it represent in the real world?

K) Explain the slope in terms of its units. What does the slope represent in the real world?
3. Early Morning coffee comes in jars of several sizes. The prices for each size at one supermarket are shown below.

<table>
<thead>
<tr>
<th>Ounces</th>
<th>10</th>
<th>32</th>
<th>2</th>
<th>16</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>$4.00</td>
<td>$9.50</td>
<td>$2.00</td>
<td>$5.50</td>
<td>$3.00</td>
</tr>
</tbody>
</table>

A) Determine a function rule to represent the price as a function of ounces of coffee. Explain the process you use.

B) Predict the number of ounces of coffee that would cost $7.75.

C) Another brand, Café Latte, comes in similar sized jars, but it is more expensive per ounce than Early Morning. Write and graph an inequality that could be used to represent the cost of Café Latte.

4. The school basketball team decided to sell playoff T-shirts as a fundraiser. The company they chose charged them a one time set up fee of $100 plus $4.00 a shirt. They decided to sell the shirts for $6.00 each. How many would they have to sell to reach their goal of $300? Justify your answer.