Further investigations:
Discuss relationships between varying quantities with your student. Decide if the relationship is a linear function. Here are some examples: miles driven, amount of gasoline remaining in the tank; grams of fat in one serving, calories in that serving; number of friends, amount of one shared pizza each friend gets; and number of minutes a player is in a basketball game, the number of points that player scores.

Pretend you just won $50,000 in the Lottery and you want to split most of your winnings between paying down your mortgage and saving for your student’s future education. You want to put no more than $---- in the mortgage account and at least $---- in savings for education. Ask your student to graph these relationships.

Terminology:
Constant function: A relationship between two variables in which the dependent variable does not change. The graph of a constant function is a horizontal line.

Function: A relation such that each input value (x) is associated with exactly one output value (y).

Line of best fit: The line that best represents the trend established by the points in a particular scatter plot.

Linear function: A relationship between two variables in which the rate of change is constant. Graphs of linear functions are non-vertical lines.

Linear inequality: An inequality in two variables for which the graph of the solutions form a half-plane on one side of a line and may or may not also form the line itself.

Relation: A set of ordered pairs of coordinates.

Scatter plot: The graph of a collection of ordered pairs of coordinates.

Slope: The steepness of a line which may be calculated by finding the ratio of the difference between the y-coordinates of two points on a line to the difference between the x-coordinates of those two points.

Slope intercept form: One way to write a linear equation: \( y = mx + b \) where \( m \) is the slope and \( b \) is the y-intercept.

Standard form: One way to write a linear equation: \( ax + by = c \) where \( a, b, \) and \( c \) are constants.

Related Files:
www.ceismc.gatech.edu/csi

Slippery Slope

Students will:
• Collect data about relationships between varying quantities, organize that data into tables, and graph the data
• Analyze tables, graphs, and equations to determine the relationship between varying quantities
• Interpret slope as how the rate of change in one variable affects the other
• Determine the meanings of slope and y-intercept in a given situation
• Graph equations in slope-intercept form and standard form
• Identify functions as linear or non-linear
• Graph the open and closed half-plane solution set of a linear inequality
• Solve problems involving linear relationships by collecting data, graphing the data as a scatter plot, determining the line of best fit, writing its equation, and interpreting the solution of the equation in the context of the original problem.

Classroom Cases:
1. Jenny noticed that her parents had recorded her height every month in her baby book for almost 2 ½ years. A part of the measurements are shown below. Graph the data, determine the line of best fit, write its equation, and interpret the slope and y-intercept.

<table>
<thead>
<tr>
<th>Age in months</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
<th>28</th>
<th>29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height in cm.</td>
<td>76.1</td>
<td>77</td>
<td>78.1</td>
<td>78.2</td>
<td>78.8</td>
<td>79.7</td>
<td>79.9</td>
<td>81.1</td>
<td>81.2</td>
<td>81.8</td>
<td>82.8</td>
<td>83.5</td>
</tr>
</tbody>
</table>

Case Closed - Evidence:
I chose two points on the line: (20, 77.5) and (24, 80).
Using the points, I found the slope of the line:
\[ m = \frac{80 - 77.5}{24 - 20} = \frac{0.625}{4} = 0.15625 \]

My equation is \( y = 0.15625x + 65 \). The y-intercept is 65 cm which is about Jenny's height when she was 0 months old, and the slope is 0.625 which means that as Jenny got a month older, her height increased by 0.625 cm on average. Jenny's Height at birth was less than 65cm. She grew more rapidly during her first year.

2. After finishing dinner and before going to bed, Frank has 3 hours to do his homework and practice his guitar. He wants to spend more time practicing guitar than doing homework, but he has to finish a report and study for a science test, which will take at least one hour. Write inequalities to represent the conditions in Frank’s situation and graph each inequality on a different pair of axes.

Case Closed - Evidence:
Let \( x \) = homework time
\[ y = \text{guitar time} \]

Then \( x + y \leq 3 \) \quad Homework time and guitar time must be less than or equal to three hours.
\( y > x \) \quad He wants to spend more time on guitar than on homework.
\( x \geq 1 \) \quad Homework will require at least one hour.