Slope of a Line

Grade: 7, pre-algebra

Objective: Find the slope of a line, and use slope to understand graphs.

Standard: 7th grade, Algebra & Functions 3.3, Graph linear functions, noting the vertical change (change in y-value) per unit of horizontal change (change in x-value) is always the same and know the ratio ("rise over run") is called the slope of a graph.

Prerequisites: Family of Functions Lesson, this can also be done as part of this lesson.


Part 1: What does slope mean?

Show the graph:

What linear function does this graph show?  
[The Mother] Students should make the mother with their arms.

What is the equation?  
[y = x]

Tell what you notice about the line.  
[it splits the graph exactly in two, it is exactly in between the x and y axis, it crosses both axis’ at 0, it is diagonal]

This line has a slope that is equidistant from both axis’. We can change the equation so the slope will be closer or farther from the x-axis. This will change the steepness of the line. The slope of this line is positive 1.


Part 2: How do we find slope?

**Graph**

We can use a graph to determine the slope by measuring the *rise* (gain or loss vertically) in relation to the *run* (gain or loss horizontally). We write this as a fraction.

\[
slope = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x}
\]

Is this line positive or negative? [positive]

What is the rise? [2]

What is the run? [3]

Therefore the slope is \( \frac{2}{3} \).

**Table**

We can use a table to determine the slope by measuring the change from point to point.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

We read our graphs left to right, so we write our points in order from left to right.

\[
slope = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2}{3}
\]

**Formula**

We can use a formula to determine the slope by plugging in the \( x \) and \( y \) values.

What is the first point marked on the line on the graph? \([(-2, -1)]\)

What is the next point on the line? \([(1, 1)]\)

\[
slope = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-1)}{1 - (-2)} = \frac{2}{3}
\]
**Graph**

Is the graph positive or negative?
[negative]

What is the rise from left to right?
[-2]

What is the run from left to right?
[3]

When we plug in the rise over the run, what is our slope?
\[
\left[ -\frac{2}{3} \right]
\]

**Table**

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>-1</td>
</tr>
</tbody>
</table>

Is the rate of change constant or variable?
[constant]

What is the rate of change for the y-values?
[-2]

What is the rate of change for the x-values?
[3]

When we plug in the change in y-values over the change in x-values, what is the slope of the line?
\[
\left[ -\frac{2}{3} \right]
\]

**Formula**

What is the first point marked on the line on the graph?
[(-3, 3)]

What is the next point on the line?

\[
slope = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 1}{0 - (-3)} = \frac{2}{3}
\]

Use choral response to the above questions, also have students discuss how the different use of methods increases their understanding.
Graphs for the lesson

\[ y = x \]

negative slope
undefined slope

zero slope
Problem #1

You Try #1

You Try #1
Date: ____________

CST: 7AF 3.3

Which graph shows a line with a slope of 2?

A

C

B

D

*Name the line for each graph. Tell whether it is positive or negative.