If the rate of change is constant, then it is also called slope.

**Slope is the average rate of change.** It tells how steep a linear function is when graphed. It is represented by $m$.

(Side note: It is unsure why Americans use the letter $m$ to represent slope. Slope comes from the Latin root “slupan,” for the word “slip.” Schools around the world use different letters, such as $s$, $a$, $p$, and $k$.)

**How to Find Slope**

$$m = \frac{\text{change in } y}{\text{change in } x} \text{ or } \frac{\Delta y}{\Delta x} \text{ or } \frac{y_2 - y_1}{x_2 - x_1} \text{ or } \frac{\text{rise}}{\text{run}}$$

(Another side note: $\Delta$ is the Greek letter delta, which means change)

**Four Different Types of Slope**

- **Positive**: Line rises to right
- **Negative**: Line rises to left
- **Zero**: Line is horizontal
- **Undefined**: Line is vertical (Not a function)
**Example 1: Finding the Slope from a Graph**

The table below shows the relationship between the number of seconds \( y \) it takes to hear the thunder after a lightning strike and the distance \( x \) you are from the lightning.

<table>
<thead>
<tr>
<th>Distance (( x ))</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seconds (( y ))</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

**YOU TRY:**

a. Graph the data.

b. Find the slope of the line. (You can simply read the slope from your graph here.)

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

c. Interpret the slope. What does it mean in the context of the problem?

**YOU TRY:**

Find the rate of change (slope) for each line.
Example 2: Finding the Slope through Given Points
The table below shows the distance $y$ Cheryl traveled in $x$ minutes while competing in the cycling portion of a triathlon. We know she travels at a constant rate of change. (So, these points would form a line.)

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>45</th>
<th>90</th>
<th>135</th>
<th>180</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (km)</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

a. Find the slope of this linear function.

Pick any two points to calculate the slope. 
(5, 45) and (15, 135) are fine

You need to calculate the change in $y$ and the change in $x$ here. It doesn’t matter which point is considered #1 or #2. You need to subtract using the same ordering.

$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{135 - 45}{15 - 5} = \frac{90}{10} = 9$$

b. **YOU TRY:** Interpret the slope. What does it mean in the context of the problem?

YOU TRY:

a. Find the slope of the line that passes through the given points. Distance in inches is $x$, and distance in miles is $y$.

<table>
<thead>
<tr>
<th>Distance on Map (in.)</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Distance (mi)</td>
<td>40</td>
<td>80</td>
<td>120</td>
<td>160</td>
</tr>
</tbody>
</table>

b. Interpret the slope. What does it mean in the context of the problem?

Example 3: Find the Slope through Two Points
Find the slope of the line that passes through (-2, 0) and (1, 5).

You need to calculate the change in $y$ and the change in $x$ here. It doesn’t matter which point is considered #1 or #2. You need to subtract using the same ordering.

$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 0}{1 - -2} = \frac{5}{1+2} = \frac{5}{3}$$
YOU TRY:
Find the slope of the line that passes through each pair of points.

a. (-3, 4) and (2, -3)
b. (-3, -1) and (2, -1)
c. (-2, 4) and (-2, -3)
d. (3, 6) and (4, 8)
e. (-4, -2) and (0, -2)
f. (-4, 2) and (-2, 10)
g. (6, 7) and (-2, 7)