

Day 22: Linear Functions and Slope

Situation	Complete Table	Write an Equation	Graph																				
<p>Bailey babysits for the Wilson family. She charges \$5 just to drive there to pay for gas, and then she charges \$9 per hour.</p>	<table border="1"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td>0</td><td>5</td></tr> <tr><td>1</td><td>14</td></tr> <tr><td>2</td><td>23</td></tr> <tr><td>3</td><td>32</td></tr> <tr><td>4</td><td>41</td></tr> <tr><td>5</td><td>50</td></tr> <tr><td>20</td><td>185</td></tr> <tr><td>21.5</td><td>198.5</td></tr> <tr><td>x</td><td><math>9x + 5</math></td></tr> </tbody> </table>	x	y	0	5	1	14	2	23	3	32	4	41	5	50	20	185	21.5	198.5	x	$9x + 5$	<p>Define the variables:                      x: # of hours                       y: \$ made                       Equation:  <math>y = 9x + 5</math></p>	
x	y																						
0	5																						
1	14																						
2	23																						
3	32																						
4	41																						
5	50																						
20	185																						
21.5	198.5																						
x	$9x + 5$																						
<p>Make up a situation:                      I had 14 pieces of candy, but every minute I eat 2 pieces.</p>	<table border="1"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td>0</td><td>14</td></tr> <tr><td>1</td><td>12</td></tr> <tr><td>2</td><td>10</td></tr> <tr><td>3</td><td>8</td></tr> <tr><td>4</td><td>6</td></tr> <tr><td>5</td><td>4</td></tr> <tr><td>20</td><td>-26</td></tr> <tr><td>21.5</td><td>-29</td></tr> <tr><td>x</td><td><math>-2x + 14</math></td></tr> </tbody> </table>	x	y	0	14	1	12	2	10	3	8	4	6	5	4	20	-26	21.5	-29	x	$-2x + 14$	<p>Define the variables:                      x: # of minutes                       y: # of pieces of candy                       Equation: <math>y = -2x + 14</math></p>	
x	y																						
0	14																						
1	12																						
2	10																						
3	8																						
4	6																						
5	4																						
20	-26																						
21.5	-29																						
x	$-2x + 14$																						

# SLOPE!

Make a list of all the ways you have learned to identify/calculate slope:

$$\text{Slope} = \text{rate of change} = \frac{\text{rise}}{\text{run}} = m$$

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

## HOW TO CALCULATE SLOPE

Slope is also called Rate of Change.

### Situation/Pattern

You decide to go to the pumpkin patch this weekend with your family. Pumpkins cost \$0.99 per lb, and it costs \$3 to enter the pumpkin patch.

$$m = .99 \frac{\$/lb}{1}$$

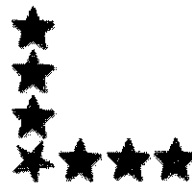
Figure 1



Figure 2



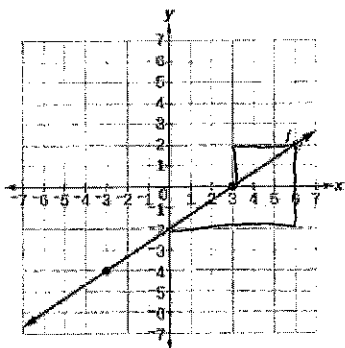
Figure 3



$$m = 2 \text{ stars/figure}$$

### Graph

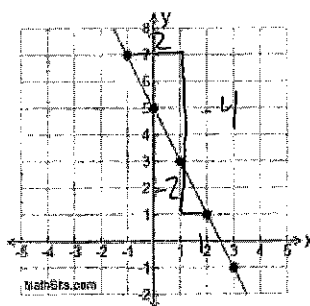
Example:



$$m = \frac{2}{3}$$

$$m = \frac{4}{6}$$

Example:



$$m = \frac{-4}{2} = \frac{-2}{1} = -2$$

### Table

Example:

x	y
2	-10
6	-4
10	a
14	8
18	14
22	20

$$4 \left( \begin{array}{l} 2 \\ 6 \end{array} \right) \rightarrow 6$$

$$m = \frac{6}{4}$$

You Try:

x	y
-1	13
-3	16
-5	19
-7	22
-9	25
-11	28

$$-2 \left( \begin{array}{l} -1 \\ -3 \end{array} \right) \rightarrow +3$$

$$m = \frac{3}{-2}$$

### Two Points

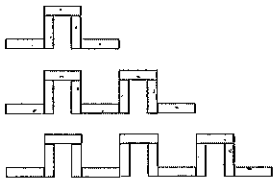

FORMULA:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

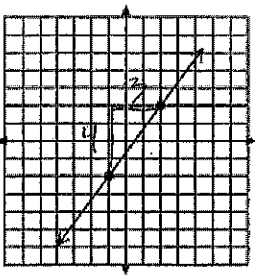
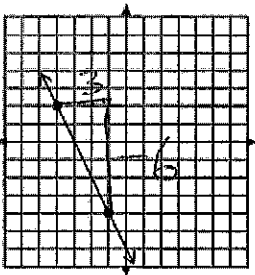
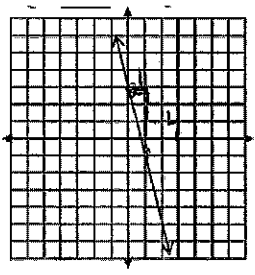
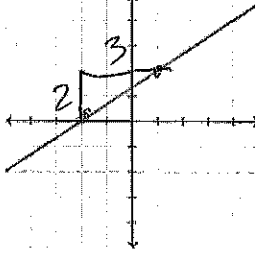
Example: (-1, 2) and (3, 5)

$$m = \frac{5 - 2}{3 - (-1)} = \frac{3}{4}$$

Find the slope in each situation or pattern:

<p>1. Jordan is mowing lawns each week for \$30 per lawn. They already have \$350 saved up.</p> <p>Slope: <u>30</u></p>	<p>2. Emiko is tying knots in a rope and re-measuring its length after each knot. She started with a length of 140 cm, and it decreases by 3.5 each knot.</p> <p>Slope: <u>-3.5</u></p>	<p>3. </p> <p>Slope: <u>4</u></p>	<p>4. </p> <p><math>m = 4</math></p>
---	---	---	---

Calculate the slope from each graph:

<p>5. </p> <p>Slope: <u><math>4/3</math></u></p>	<p>6. </p> <p>Slope: <u><math>-6/3 = -2</math></u></p>	<p>7. </p> <p>Slope: <u><math>-4/1 = -4</math></u></p>	<p>8. </p> <p>Slope: <u><math>2/3</math></u></p>
--	--	---	--

Calculate the slope from each table of values:

<p>9. <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td>-1</td><td>3</td></tr> <tr><td>0</td><td>5</td></tr> <tr><td>1</td><td>7</td></tr> <tr><td>2</td><td>9</td></tr> </tbody> </table> <math>\rightarrow 2</math></p> <p>Slope: <u><math>2/1 = 2</math></u></p>	x	y	-1	3	0	5	1	7	2	9	<p>10. <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td>-1</td><td>3</td></tr> <tr><td>1</td><td>2</td></tr> <tr><td>3</td><td>1</td></tr> <tr><td>5</td><td>0</td></tr> </tbody> </table> <math>\rightarrow -1</math></p> <p>Slope: <u><math>-1/2</math></u></p>	x	y	-1	3	1	2	3	1	5	0	<p>11. <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td>-1</td><td>0</td></tr> <tr><td>-3</td><td>1</td></tr> <tr><td>-5</td><td>2</td></tr> <tr><td>-7</td><td>3</td></tr> </tbody> </table> <math>\rightarrow 1</math></p> <p>Slope: <u><math>-1/2</math></u></p>	x	y	-1	0	-3	1	-5	2	-7	3	<p>12. <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td>-1</td><td>9</td></tr> <tr><td>-3</td><td>5</td></tr> <tr><td>-5</td><td>1</td></tr> <tr><td>-7</td><td>-3</td></tr> </tbody> </table> <math>\rightarrow -4</math></p> <p>Slope: <u><math>-4/-2 = 2</math></u></p>	x	y	-1	9	-3	5	-5	1	-7	-3
x	y																																										
-1	3																																										
0	5																																										
1	7																																										
2	9																																										
x	y																																										
-1	3																																										
1	2																																										
3	1																																										
5	0																																										
x	y																																										
-1	0																																										
-3	1																																										
-5	2																																										
-7	3																																										
x	y																																										
-1	9																																										
-3	5																																										
-5	1																																										
-7	-3																																										

Calculate the slope from two points:

<p>13. (1, 4) and (3, -2)</p> $\frac{-2-4}{3-1} = \frac{-6}{2} = -3$	<p>14. (-3, -1) and (-2, 1)</p> $\frac{1-(-1)}{-2-(-3)} = \frac{2}{1} = 2$	<p>15. (-6, 3) and (5, -2)</p> $\frac{-2-3}{5-(-6)} = \frac{-5}{11}$
--	--	--

For #1 and #2 on the previous page, describe in a sentence what the slope represents.

#1:  $m = 30$ .

He earns \$30  
per lawn mowed

#2:  $m = -3.5$

The rope gets 3.5cm  
shorter per knot tied.

3. What does slope tell you about a graph?

$$\frac{\text{rise}}{\text{run}}$$

4. What does slope tell you about a table?

$$\frac{\Delta y}{\Delta x} = \frac{\text{Change in } y}{\text{Change in } x}$$

5. Do you know any vocabulary that describes when graphs have the same slope?

Parallel!