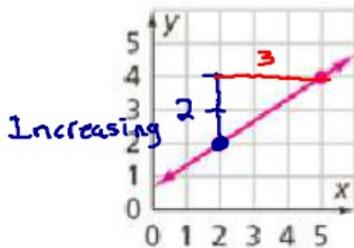


# Writing Linear Equations

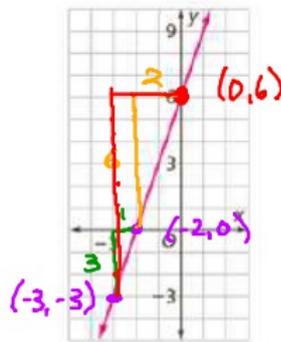
slope =  $\frac{\text{vertical change}}{\text{horizontal change}}$  or  $\frac{\text{rise}}{\text{run}}$

The steepness of the line is the ratio of rise to run, or vertical change to horizontal change, for this step. We call this ratio the **slope** of the line. Slope is also known as the rate of change.

## Line With Positive Slope



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

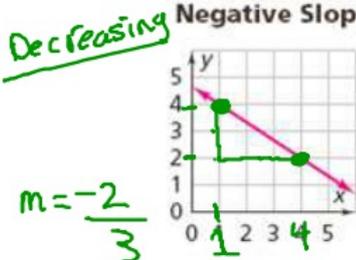


$m = \frac{3}{1} = \frac{6}{2} = \frac{9}{3}$

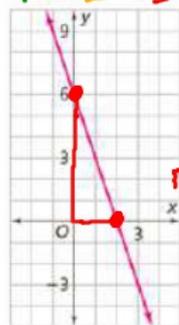


$m = \frac{2}{6} = \frac{1}{3} = \frac{\$1}{3 \text{ min}}$

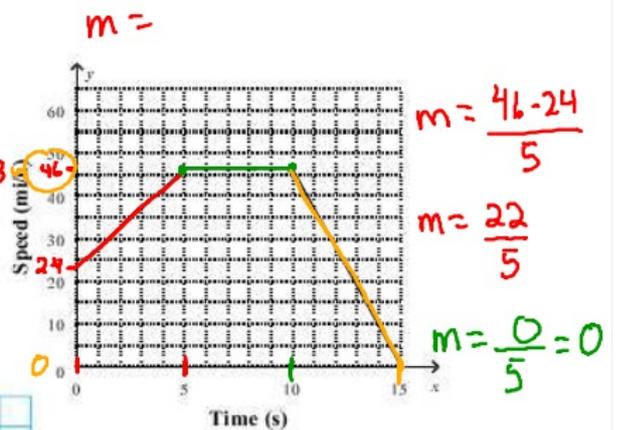
## Line With Negative Slope



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



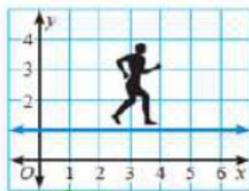
$m = -\frac{6}{2} = -3$



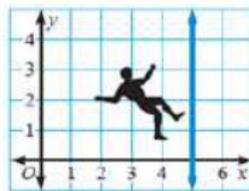
$m = \frac{46-24}{5}$

$m = \frac{22}{5}$

$m = \frac{0}{5} = 0$

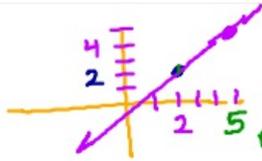


**Zero slope**  
If the line is horizontal, the slope is zero.



**Undefined slope**  
If the line is vertical, the slope is undefined.

$m = \frac{46-0}{5}$   
 $m = \frac{46}{5} \frac{\text{miles}}{\text{seconds}}$



Positive Slope from a Table

$$m = \frac{2}{3} = \frac{\Delta Y}{\Delta X} = \frac{\text{change in } y}{\text{change in } x} = \frac{\text{difference in } y\text{'s}}{\text{difference in } x\text{'s}}$$

Subtract y's  
Subtract x's

x	2	5
y	2	4

x	-6	-4	-2	0	2	4
y	-10	-7	-4	-1	2	5

$\Delta X = +2$   
 $\Delta Y = +3$

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

Squeaky Clean Car Wash Charges

x	Time (min)	5	10	15	20	25
y	Charge	\$8	\$13	\$18	\$23	\$28

$\Delta t = 5$   
 $\Delta \$ = 5$

slope =  $\frac{5}{5} = 1$  per minute

x	y
-4	-4
-2	0
0	4
2	8

$\Delta x = 2$  (between rows)  
 $\Delta y = 4$  (between rows)

slope =  $\frac{4}{2} = 2$

Negative Slope from a Table

x	1	4
y	4	2

$\Delta x = 3$   
 $\Delta y = -2$

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

x	1	2	3	4	5	6
y	4.5	4.0	3.5	3.0	2.5	2.0

$\Delta x = 1$   
 $\Delta y = -.5$

slope =  $-\frac{.5}{1}$

$m = \frac{-10}{5} = -2$

x	y
5	50
10	40
15	30
20	20

$\Delta x = 5$   $\Delta y = -10$

x	y
4	-10
5	-13
6	-16
7	-19
8	-22

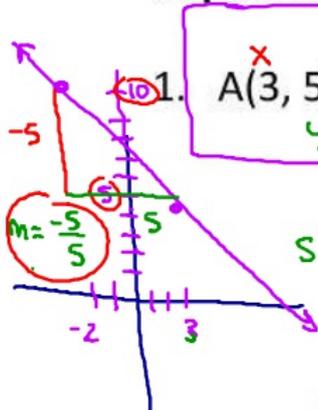
$\frac{\Delta y}{\Delta x} = \frac{-3}{1}$

x	y
4	9
5	8
6	9
7	36
8	11

Not Linear  
No slope

$$\text{slope} = \frac{\text{subtract } y\text{'s}}{\text{subtract } x\text{'s}} = \frac{y_2 - y_1}{x_2 - x_1}$$

Find the slope of each line that passes through each pair of points



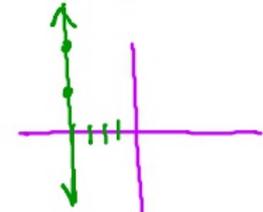
1. A(3, 5) and B(-2, 10)

$$\text{slope} = m = \frac{5 - 10}{3 - (-2)} = \frac{-5}{5} = -1$$

$$\text{slope} = m = \frac{10 - 5}{-2 - 3} = \frac{5}{-5} = -1$$

2. A(2, -1) and B(3, 2)

$$m = \frac{-1 - 2}{2 - 3} = \frac{-3}{-1} = 3$$



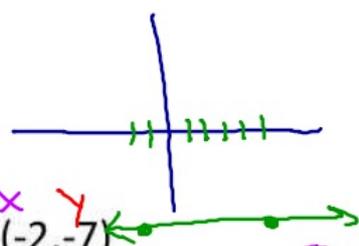
3. C(-1, 2) and D(1, 1)

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

4. J(-4, 8), K(-4, 4)

$$m = \frac{8 - 4}{-4 - (-4)} = \frac{4}{-4 + 4} = \frac{4}{0}$$

slope undefined  
x-coord are the same



5. P(5, -7), Q(-2, -7)

$$m = \frac{-7 - (-7)}{5 - (-2)} = \frac{-7 + 7}{5 + 2} = \frac{0}{7} = 0$$

y-coord same  
m = 0