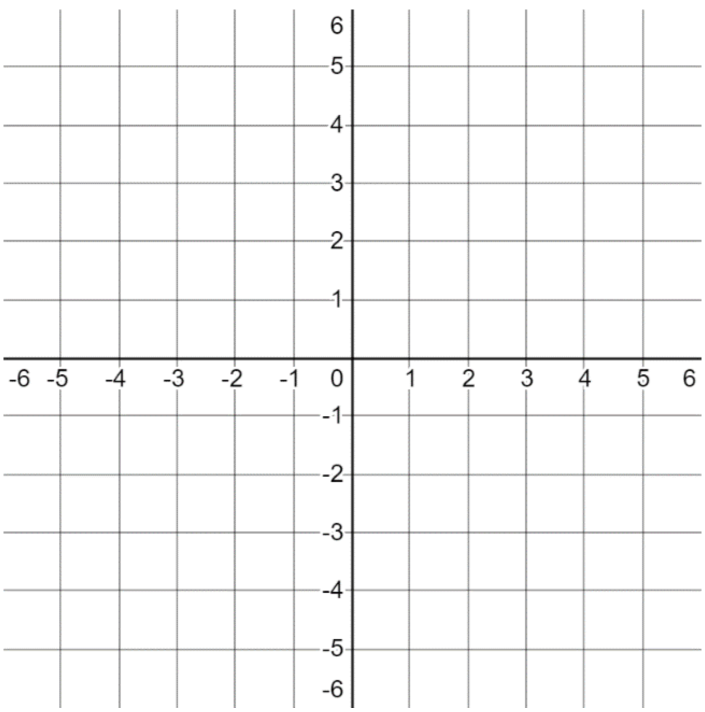
# Lesson 13 – Slope and Linear Equations

| **Goal**: |
|---|
| • Can describe the slope of a line given as a graph, set of ordered pairs, or equation<br>• Can use multiple definitions of slope<br>• Can build the equation of a line in slope-intercept form |
| **New Terminology**:<br>• Slope<br>• Intercept<br>• Slope-Intercept Form |

**Discuss**: Consider the arithmetic sequence with a common difference of $1.5$ and the 3rd term is $1$. Determine the first 5 terms of the sequence and plot them on the grid.

Plot a second sequence that still has a 3rd term of 1, but the common difference is $-0.5$



Arithmetic sequences are just

Remember with our formula for arithmetic sequences we had two major parts to the equation:

$$a_n = a_0 + n \cdot d$$

In function notation we could write this as:

Which shows that $n$ is the

and $a(n)$ is the

While $a_0$ and $d$ are special constants.

The common difference, $d$, is now called **SLOPE** and defined as:

The zeroth term, $a_0$, is now called the **Y-INTERCEPT** and defined as:

**Practice**: Determine the common difference of an arithmetic sequence if $a_4 = 8$ and $a_{10} = 6$.

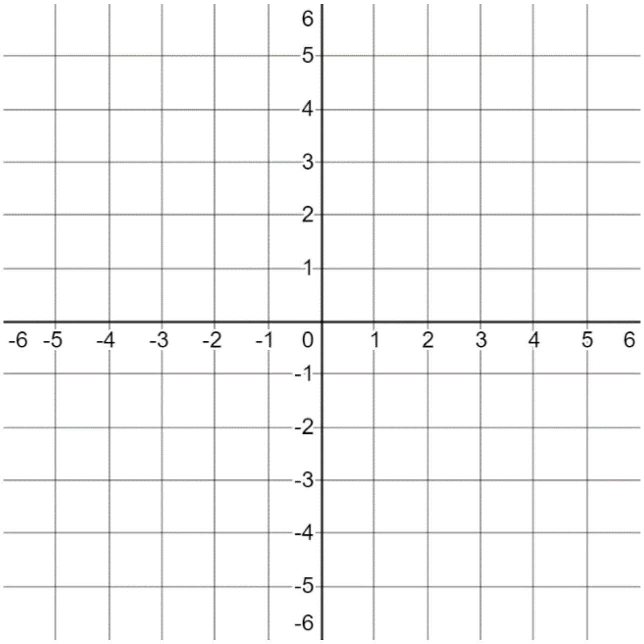
**Discuss**: Determine the slope of a line that passes through the points $(3,4)$ and $(12, 20)$. [How is this like finding the common difference of an arithmetic sequence?]

**Practice**: Determine the slope of a line that passes through the points $(-3,2)$ and $(5, -8)$.

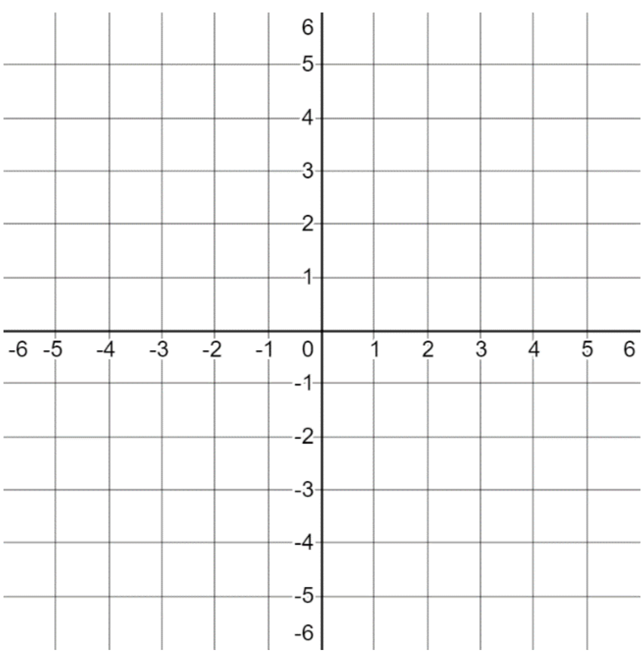
**Discuss**: Determine the slope of the line that passes through the points $(3,9)$ and $(-17,9)$. AND determine the slope of the line that passes through the points $(-2, -4)$ and $(-2, 5)$.

Once we are comfortable with the slope of a line, we can describe the $y$-intercept and then graph the line.

**Practice**: Graph the line with a slope of $\frac{1}{2}$ and $y$-intercept of $-1$.




**Practice**: Graph the line with a slope of $-\frac{2}{3}$ and $y$-intercept of $2$.



All that's left is to put it together in an equation form. But we already have a beautiful equation from our arithmetic sequence.

$$a(n) = d \cdot n + a_0$$

The standard convention is for the slope to be:

And the $y$-intercept to be:

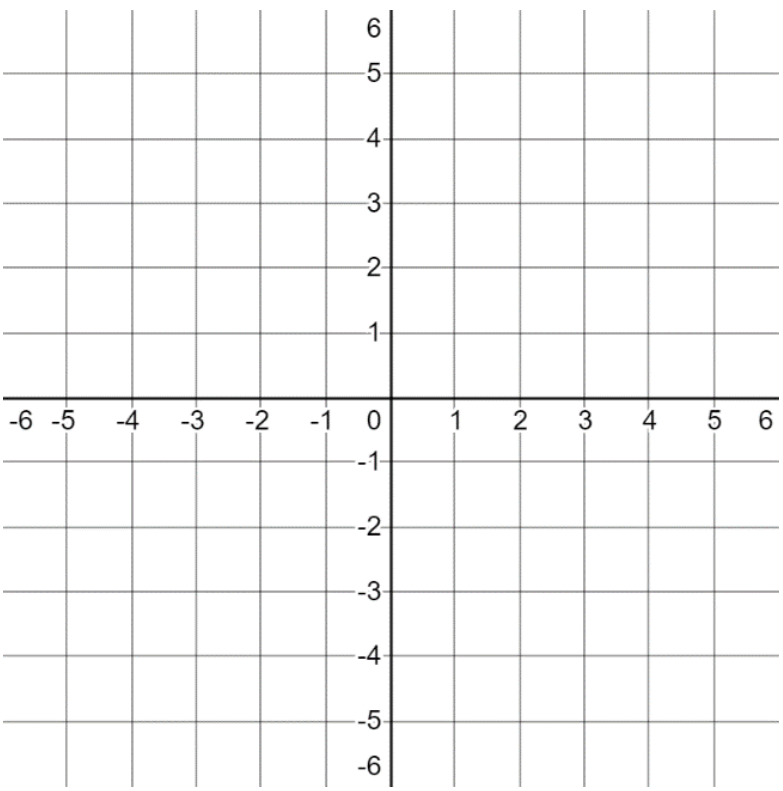
So, our linear equation in **SLOPE-INTERCEPT FORM** is:

$$f(x) =$$

Let's go back and determine the equations to the lines described!

Using the slope-intercept form, we can quickly graph any line.

**Example**: Graph the line $3x + 4y = 6$




**Practice**: On the same grid, graph and label the line $5x - 2y + 15 = 0$

Finally, we want to be able to make the equation to lines given their characteristics. We use the basic idea that every linear function will have the form:

$$f(x) = mx + b$$

And that the $y$-intercept is the point $(0, b)$.

**Example**: Find the equation to the line that has a slope of $\frac{1}{3}$ and passes through the point $(4, 6)$

**Practice**: Find the equation to the line that has a $y$-intercept of $-3$ and passes through the point $(2, 5)$.

**Discuss**: Determine the equation of the line that passes through $(6, 5)$ and $(-3, 8)$.

**Assigned Problems**: 6.5 page 325 – 328 # 1-5, 10, 18

12, 14, 16

7.1 page 349 – 356 # 1-3, 5-10, 12, 13, 19-21, 24

15, 18, 23 (ghost pepper)

**Key Ideas** on page 324 and 349