Lagunita is retiring and will shut down at 12 noon Pacific Time on March 31, 2020. A few courses may be open for self-enrollment for a limited time. We will continue to offer courses on other online learning platforms; visit http://online.stanford.edu.



# Algebra Review

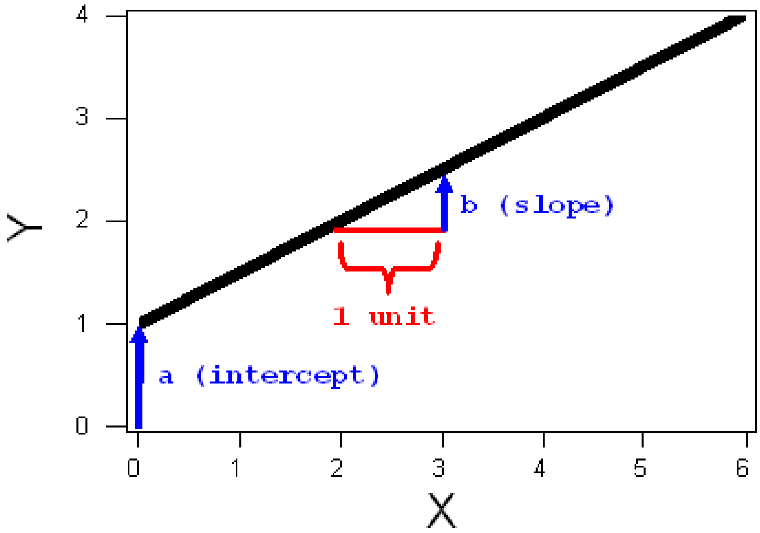
For the remainder of this lesson, you'll need to feel comfortable with the algebra of a straight line. In particular you'll need to be familiar with the **slope** and the **intercept** in the equation of a line, and their interpretation. If you'd like a refresher on the algebra of a line, keep reading. Otherwise, continue on to the next page.

## The Algebra of a Line

A line is described by a set of points **(X,Y)** that obey a particular relationship between **X** and **Y**. That relationship is called the equation of the line, which we will express in the following form: $Y = a + \mathrm{bX}$ In this equation, **a** and **b** are constants that can be either negative or positive. The reason to write the line in this form is that the constants **a** and **b** tell us what the line looks like, as follows:

1. The **intercept (a)** is the value that **Y** takes when **X = 0**
2. The **slope (b)** is the change in **Y** for every increase of 1 unit in **X**.

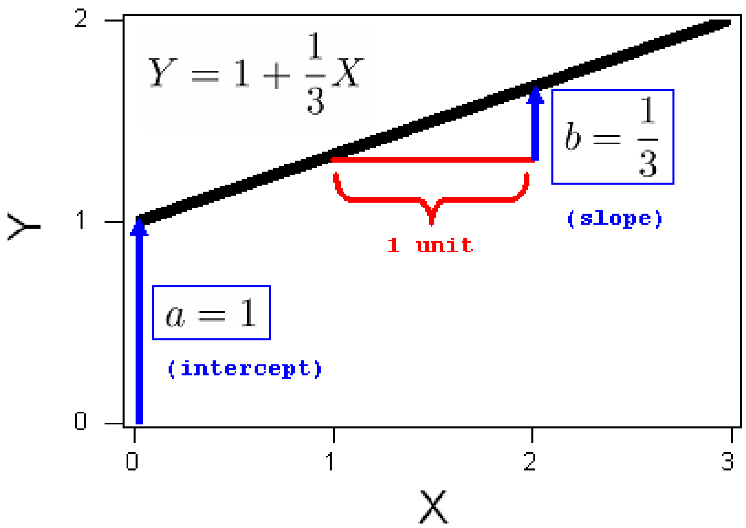
The slope and intercept are indicated with arrows on the following diagram:




Note that if either the intercept **(a)** or the slope **(b)** is negative, the corresponding blue arrow on the diagram above would point downward.

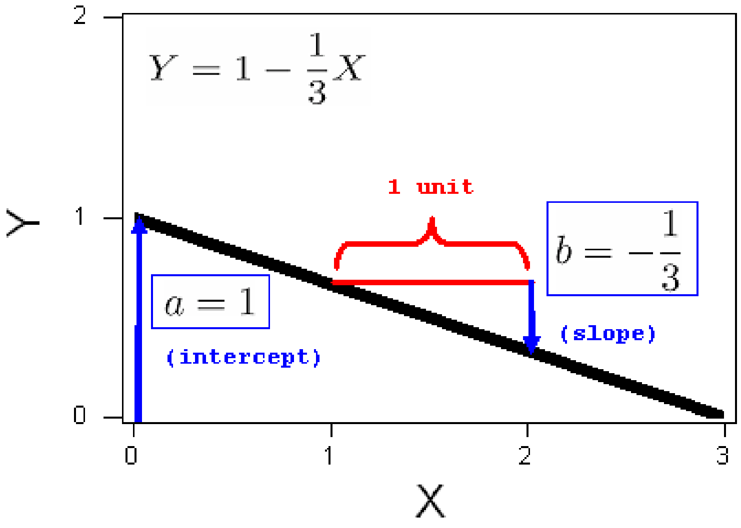
### Example: 1

Consider the line $Y = 1 + \frac{1}{3}X$. The intercept is 1. The slope is 1/3, and the graph of this line is, therefore:




### Example: 2

Consider the line $Y = 1 - \frac{1}{3}X$. The intercept is 1. The slope is -1/3, and the graph of this line is, therefore:




This interactive simulation allows you to see how changing the values of the slope and intercept changes the line.

Equation for a Line

While the correlation coefficient is useful for telling us whether two variables are correlated, it does not describe the nature of the relationship between the two variables. Often we know or strongly suspect that two variables are related; what we want to know is precisely how they are related. For example, it is not surprising that there is a positive relationship between an automobile's speed and its stopping time on dry pavement. What we want to know is how much stopping distance increases with each speed increase of, say, 10 mph.

Lines are very useful for describing relationships between two variables. Some relationships are much more complicated than lines, but lines always are a useful starting point and are often all we need for many relationships. Before we see how lines are used to model relationships between variables, we will first review the basis of lines and how they work.

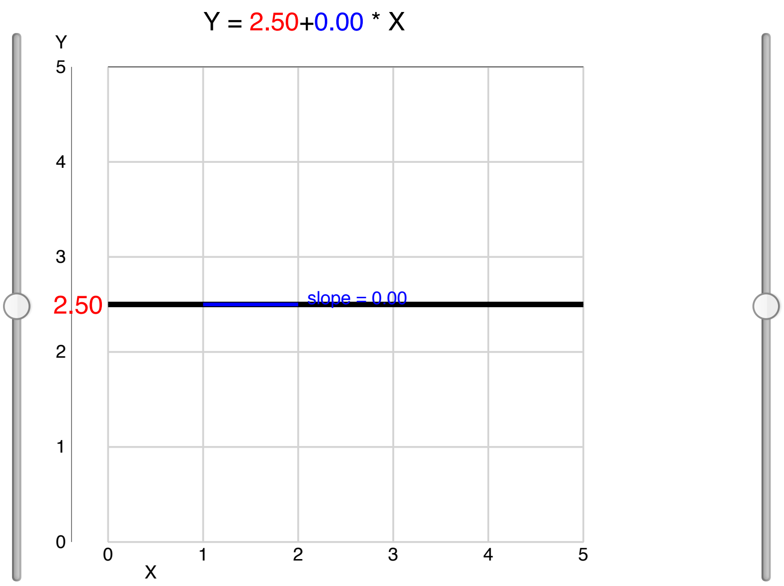
The equation for a line is:

$$Y = a + \mathrm{bX}$$

Two variables are related by the two parameters in the equation: **a** is the intercept and **b** is the slope. Use the simulation below to explore how these parameters affect the line.

Use the left scrollbar to slide the line up and down to change the intercept.

Use the right scrollbar to move the slope of the line up and down.

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