

1. Rates of Change
2. You should be familiar with representing data on the Cartesian Coordinate System. In this lesson, we will define slope, and use it to find information about other data points on a line.
3. Suppose we are interested in the population growth of a town, and know the population in both 1970 and 1980. Let's assume the population is growing at a constant rate, and therefore the graph of the population is a straight line.
4. (a) We calculate the rate of growth of the population by calculating the change in population and the change in time.  
(b) The greek letter  $\Delta$  is used to represent the change in a quantity. We typically use variables to represent the quantities we are interested in measuring, in this case, we will use  $P$  for population and  $t$  for the time, measured in years. We calculate the change in each variable by subtracting the initial value from the final value. We divide the two changes to get the rate of change. This rate is a measure of the change in the variable in the numerator, in this case, the population, for each change of one in the denominator. In this case, the answer of 400 tells us that each year, the population goes up by 400.
5. In mathematics, we typically use the variables  $x$  and  $y$ , and the rate of change, called the **slope** compares the change in  $y$  to the change in  $x$ .
6. We can use the slope to find other data points. Suppose we are interested in the population in 1977. Since we are assuming the rate of change is constant at 400 people per year, the slope to the new point should also be 400. We can solve for  $y$  by comparing the 1977 population to the 1970 population. The original population of 18,000 in 1970 should have grown by 400 people per year for 7 years, giving a 1977 population of 20800.
7. We could also compare the 1977 population to the 1980 population to get the same answer.
8. We can also solve for the year. In what year will the population reach 40,000? We need the population to increase by a total of 22,000. At 400 people per year, this will take 55 years, so we will reach 40,000 people in the year 2025.
9. To recap: The greek letter  $\Delta$  represents the change in a quantity. The rate of change, called the slope, compares the changes in two quantities.