What is pH?

In pure water, a very small proportion of the molecules will break up or IONIZE into a hydrogen ion (H^+) and a hydroxyl ion (OH^-).

$$H_2O \leftrightarrow H^+ + OH^-$$

This reaction goes both ways. Every time a water molecule breaks down into an H^+ and a OH^-, two other ions join back together to form a new water molecule. The reaction occurs continuously in both directions, causing the proportion of water molecules-to-ions to remain constant. This reaction is therefore in 'equlibrium'.

Only about 1/10,000,000th of a gram of hydrogen ions will exist in equlibrium with every liter of water molecules. This concentration is easier to read and write in exponential form:

1/10,000,000 = .0000001 = 10^{-7} grams H^+/liter H_2O

For the sake of convience, this exponent number is used as the pH value. This is why the pH of pure water is 7. This means that pH is a measure of the hydrogen ion concentration of a solution. Because the pH value is the negative exponent of hydrogen ion concentration, be sure and remember that an 'increase' in hydrogen ion concentration mathmatically results in a 'decrease' in pH number. The more free hydrogen ions in a solution of water, the lower the pH value. And, of course, vise-versa with decreasing hydrogen ion concentration resulting in an increase in pH value.
So, a pH 1 stands for 1/10th gram of H^+/liter of water.
As you can see, there is a low pH value, but a very high concentration of hydrogen ions (1/10th gram is a lot of hydrogen ions compared to 1/10,000,000 gram of hydrogen ions found in water.)
Likewise, a pH 5 stands for 1/100,000th gram of H^+/liter of water.

The concentration of hydroxyl ions (OH^-) in a solution is inversely related to the H^+ concentration. As H^+ concentration increases, the OH^- concentration decreases. You will notice that the sum of the exponents for the H^+ concentration and the OH^- concentration will always add up to equal 14.
For example, pH 5 (H^+ concentration of 10^{-5} and OH^- concentration of 10^{-9})
pH 7 (H^+ concentration of 10^{-7} and OH^- concentration of 10^{-7})

When you either increase or decrease the pH value by one integer (say, when you go from pH 7 to pH 6), you are increasing or decreasing the amount of hydrogen ions by a factor of 10.

A change of pH 7 to pH 6 is a change of 1/10,000,000th gram H^+ to 1/1,000,000th gram H^+ (a factor of 10). To change from pH 6 to pH 5 is to increase the number of hydrogen ions from 1/1,000,000th gram to 1/100,000th gram.

So to increase the number of H^+ from pH 7 to pH 5 is to increase the number of H^+ from 1/10,000,000th gram to 1/100,000 gram (a factor of 100).

It is similar to the Richter Scale for measuring the intensity of earthquakes, which we all understand very well. A Richter Scale reading of 4.0 is ten times as strong as a reading of 3.0. Likewise with pH. A pH of 6 is ten times greater in the number of hydrogen ions than a solution with a pH 7. An earthquake of 6.0 is one hundred times as big as an earthquake of 4.0. A solution of pH 5 is one hundred times as concentrated with hydrogen ions as a solution of pH 7.