1. Binomial Probabilities - Part II

2. You should be familiar with the basic notions of probability, including combining events with AND, OR and NOT, Pascal's Triangle and its connection to counting combinations. You should also be familiar with Binomial Probabilities for coin flips where the chance of success is 1/2 and with the concept of random variables. In this lesson, we will calculate probabilities in successive trials with two options, even if the chance of success is not 1/2.

3. Recall the binomial probability model for coin flips, where each string has equal probability. The numerators are found from Pascal's Triangle, the denominator is 2 raised to the power of the number of flips.

4. What happens when the chance is success is not 50%? Suppose a basketball player shooting a free throw is a random event with a 70% chance of success. There are four possible strings of made and missed free throws. To find the probability of each we multiply the probabilities. For instance, making two free throws is making the first free throw AND making the second free throw.

   Notice that Pascal's Triangle still appears. The number of strings of free throws for 0, 1 and 2 successes are 1, 2, and 1 respectively. There are the numbers in the second row of Pascal's Triangle. The difference is that the probability of any given string depends on whether they are made free throw or missed free throws, since the underlying probabilities are different.

   Also notice that for each value of X, the probabilities of the separate strings are the same. For example, the probability of making the first and missing the second is the same as the probability of missing the first and making the second. They both multiply the numbers .3 and .7 in some order. This will be true for any number of shots, we are merely rearranging the placement of the numbers, but they are the same numbers and we get the same answer when we multiply.

5. (a) Now let's shoot five free throws and find the probability that three are made. From Pascal's Triangle, there are 10 possible strings of three made and two missed free throws
   (b) The probability of any such string is $(.7)^3(.3)^2$
   (c) There are 10 string in all, so the total probability for getting the first string OR the second string OR ... is to add the ten probabilities together, all of which are the same product, so in total, we have $10(.7)^3(.3)^2$, with the 10 coming from Pascal's Triangle.

6. In general, to compute the probability of getting k successes in n attempts, find the number of such strings from Pascal's Triangle, and multiply the probabilities associated with the successes and failures.

7. (a) Here is an example. You may wish to pause the video to work out the answer.
   (b) There are 4 choose 3, or 4 possible strings. Three shots are made with 65% probability and one missed with 35% probability, for a total of a 38.45% chance.