In God we trust. All others must bring data.
Robert Hayden, Plymouth State College

Chapter 8
Sec 8.1

Frequently we encounter situations where there are only two outcomes of interest like:
tossing a coin to yield heads or tails, attempting a free throw in basketball which will either be successful or not, predicting the sex of an unborn child (either male or female), quality testing of parts which will either meet requirements or not. In each case we can describe the two outcomes as either a success or a failure depending on how the experiment is defined.

When four specific conditions are satisfied in an experiment it is called a BINOMIAL setting which will produce a BINOMIAL DISTRIBUTION. The four requirements are:
1) each observation falls into one of two categories called a success or failure
2) there is a fixed number of observations
3) the observations are all *independent*
4) the probability of success (p) for each observation is the same - equally likely

Statistics jargon: If the experiment is a binomial setting, then the random variable X = number of successes and is called a binomial random variable, and the probability distribution of X is called a binomial distribution

BINOMIAL DISTRIBUTION DEFINED::
The distribution of the count X of successes in the binomial setting is the binomial distribution with parameters n and p. The parameter n is the number of observations, and p is the probability of a success on any one observation. The possible values of X are the whole numbers from 0 to n and is written X is B(n,p).

The binomial distributions are an important class of discrete probability distributions. See page 440-441 for examples. The TI 83 can calculate binomial probabilities as described in Ex. 8.5 page 442.

pdf (probability distribution function, specifically binomial pdf)**...**
Given a discrete random variable X, the probability distribution function assigns a probability to each value of X. The probabilities must satisfy the rules for probabilities studied earlier.

Frequently we want to find the probability that a random variable takes a range of values...the cuulative binomial probability cdf or specifically binomial cdf.

cdf (cumulative (probability) distribution function, specifically binomial cdf)**...**
Given a random variable X, the cumulative distribution function (cdf) of X calculates the SUM of the probabilities for 0, 1, 2, ... up to the value of X. That is, it calculates the probability of obtaining at most X success in n trials.

In addition to being helpful in answering questions involving wording such as "find the probability that it takes *at most* 6 trials," the cdf is also particularly useful for calculating the probability that it takes *more than* a certain number of trials to see the first success using the complement rule...

$$\boxed{P(X > n) = 1 - P(X \leq n) \quad n = 2, 3, 4, \ldots}$$

Binomial formulas exist to computer these probabilities by hand. We must first consider the
Binomial coefficient...

The number of ways of arranging *k* successes among n observations is given by the binomial coefficient

$$\binom{n}{k} = \frac{n!}{k!(N-k)!}$$

Binomial Probability

The number of ways of arranging *k* successes among n observations is given by the binomial coefficient **P(X=k) =**

$$\binom{n}{k} p^{k} (1-p)^{n-k}$$

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