CSc 144 — Discrete Structures for Computer Science I
(McCann)

Collected Definitions Since Exam #3

Here are the definitions that we've covered since the material for the last midterm exam. I'm not going to re–print all of the definitions for the whole semester — if you lost a previous exam's definition handout, you can print another from the class web page or D2L.

Topic 12: Counting [This is a partial Topic 12 list; see the Exam #3 definition collection for the rest.]

- An ordering of n distinct elements is called a *permutation*.
- An ordering of an r-element subset of n distinct elements is called an *r-Permutation*.
- An r-Combination of an n-element set X is an r-element subset of X. The quantity of r-element subsets is denoted $C(n, r)$ or $\binom{n}{r}$, and is read "n choose r."
- A *combinatorial proof* is an argument based on the principles of counting.

Topic 13: Finite Probability

- The *probability* that a specific event will occur, denoted $P(E)$, equals $\frac{|E|}{|S|}$, where $|E|$ is the quantity of occurrences of interest and $|S|$ is the quantity of possible occurrences.
- Let X and Y be events. The *conditional probability* of X given Y, denoted $P(X|Y)$, is $\frac{P(X \cap Y)}{P(Y)}$.
- If $P(A|B) = P(A)$, then the events A and B are *independent*.
- A *discrete random variable* (DRV) X is a function that maps outcomes of an activity to a countable range.
- A *probability distribution* is a function that maps the elements of the sample space to their probabilities of occurrence.
- A *probability histogram* is a visualization of a probability distribution that has the elements of the sample space on the x axis and their probabilities on the y axis.
- The population *mean* (a.k.a. *expected value*) of a DRV Y, denoted μ, equals $\frac{\sum_i y_i}{n}$, where y_i is observation i and n is the cardinality of Y's sample space. (A version using probability is given next.)
- The population *mean* (a.k.a. *expected value*) of a DRV Y, denoted μ, equals $\sum yP(Y = y)$. (A version not using probability is given just above.)
- The population *variance* of a DRV Y, denoted σ^2, equals $\sum(y-\mu)^2 P(Y = y)$ and also $\sum y^2 P(Y = y) - \mu^2$.
- The population *standard deviation* (SD), denoted σ, of a DRV Y is the square root of Y's sample variance.
- A *binomial distribution* is a probability distribution whose sample space has only two possible outcomes.
- A *Bernoulli trial* is a sequence of experiments in which each experiment (a) either succeeds or fails, (b) is independent of the other experiments, and (c) has the same probability of success as the others.
- The *binomial probability formula* for a binomial distribution on a DRV Y of n trials and a probability of success p is $P(Y = y) = \binom{n}{y} p^y (1-p)^{n-y}$, where $0 \leq y \leq n$.