COMP 170 Discrete Mathematical Tools for CS
2005 Fall Semester – Practice Assignment # 2
Distributed: Dec 2, 2005

This handout is meant as a *practice* assignment to let you practice the material taught during the last weeks of class. Solutions to this assignment *should not* be handed in.

Many of these problems are taken (modified) from the backs of section 5.7 of the book.

Problem 1: Suppose a student who knows 60% of the material covered in a chapter of a textbook is going to take a five-question objective (each answer is either right or wrong, not multiple choice or true-false) quiz. Let X be the random variable that gives the number of questions the student answers correctly for each quiz in the sample space of all quizzes the instructor could construct.
(a) What is the expected value of the random variable $X - 3$?
(b) What is the expected value of $(X - 3)^2$?
(c) What is the variance of X?

Problem 2: If the quiz in Problem 1 has 100 questions;
(a) what is the expected number of right answers?
(b) what is the variance of the expected number of right answers?

Problem 3: Show that if X and Y are independent and b and c are constant, then $X - b$ and $Y - c$ are independent.
(Note: This simplifies the proof of Theorem 5.29)

Problem 4: A cup contains three coins; one \$1 coin; one \$2 coin and one \$5 coin. Withdraw two coins, first one and then the second, without replacement.
(a) What is the expected amount of money and variance for the first draw?
(b) For the second draw?
(c) For the sum of both draws?

Problem 5: What are the expected number of failures and the variance of the number of failures in n independent trials with probability p of success?
Compare your answers with the corresponding results for successes.

Problem 6: Let X be a random variable and c a constant number. What is $Var(cX)$ (as a function of $Var(X)$)?

Problem 7: (a) Roll a fair die and let X be the number of dots showing on top. What are $E(X)$ and $Var(X)$?
(b)What are $E(2X)$ and $Var(2X)$?
(c) Now roll another die and let Y be the number of dots showing. What are $E(X + Y)$ and $Var(X + Y)$?

Problem 8: Flip four fair coins. let X be the number of heads showing. Now flip four $\frac{1}{3}$-biased coins (that is, they have $P(H) = \frac{1}{3}$) and let Y be the number of heads showing.

(a) What is $E(X + Y)$?

(b) What is $Var(X + Y)$?