

1 Warning

Community College of Philadelphia is a firm adherent to the principle of academic freedom. In light of this, faculty are not required to follow a particular approach or a particular textbook for the courses they teach. Most faculty, however, have more or less uniform guidelines for specific courses, and indeed, many use a particular textbook or approach in order to conform to area institutions. Therefore, the sample syllabus found here is not binding to faculty, but represents a synthesis of what most faculty do or aspire to do when they teach a particular course. What follows should not be interpreted as a prescription, but rather, as a means to help the placement of our students in transfer institutions.

2 Catalogue Description

Elementary set theory and elementary logic; partitions and combinations; sequences and the binomial theorem; finite, conditional and a posteriori probability; common statistical measures. Prerequisite: MATH 118 with a grade of C or better or MATH 161 or higher placement.

3 Allotted Time

Math 152 is a 3-credit course. Courses at Community College of Philadelphia run for about **42 55**-minute periods. Instructors usually give three or four exams (generally lasting at least **55** minutes), and a 2-hour long final exam.

4 Topics Outline

- Sets: Operations with sets. Union, intersection, set difference. Number of subsets of a finite subset. Functions from a finite set to a finite set.
- Sample Spaces. Combining Events: Translation of combinations of simple events into set notation.
- Inclusion-Exclusion: Formula for two and three events. Euler phi function. Number of surjective functions of a finite set into a finite set.
- The Product Rule and Sum Rules.
- Permutations with or without repetitions.
- Combinations with or without repetitions. De Moivre's Theorem for the number of integral solutions of a linear equation with unit coefficients.
- Discrete probability models: Uniform Random Variables. Geometric Random Variables Hypergeometric Random Variables. Binomial Random Variables.
- Expectation, Variance and Standard Deviation of Random Variables.

- Conditional Probability. Bayes' Rule.
- Conditional Expectation.
- (Optional) Markov Chains.
- (Optional) Two-person Games.

5 Past Textbooks

- *Math 152: Probability* by Lial and Hungerford
- *Probability Lecture Notes* by Santos. Found here:

http://www.openmathtext.org/lecture_notes

6 Competencies

1. The student will be able to solve concrete problems that require the use of the basic counting models:
 - (a) The Addition Rule for Mutually Exclusive Events.
 - (b) The Multiplication Rule for Independent Events.
 - (c) Permutations with or without repeated objects.
 - (d) Combinations with or without repeated objects.
 - (e) The Inclusion-Exclusion Principle.
2. The student will have a working knowledge of basic probability theory:
 - (a) Identify the various axioms that define a probability space.
 - (b) Create simple models that satisfy those axioms.
 - (c) Calculate probabilities of simple, compound and conditional events.
3. The student will have a working knowledge of basic discrete random variables:
 - (a) by solving problems modeled after uniform discrete random variables.
 - (b) by solving problems modeled after geometric random variables.
 - (c) by solving problems modeled after binomial random variables.
 - (d) by solving problems modeled after negative binomial random variables.
 - (e) by solving problems modeled after hypergeometric random variables.
4. The student will have a working knowledge of the various characteristics of discrete random variables by:
 - (a) calculating the expected value of various discrete random variables and various combinations.
 - (b) calculating the variance of various discrete random variables and various combinations.