M341 Probability Semester 091 Review Guide for 1st Test Wed. Sept 30th
Format of the test: *Mostly problems which in a straight forward manner test your understanding of fundamental concepts covered. Some terms and formulas tested with true-false, multiple choice, or fill in the blank.*

Chapter 1 Axioms of Probability
Section 1.2 Sample Space and Events
Terms random experiment, outcome, outcome space, event.
For a given experiment describe sample space (using set notation, list all outcomes in the samle space).
Basic set (event) operations (complement, union, intersection). Empty set (event).
Problems like exercise 5, 10.
Draw Venn Diagrams for combinations of events.
Basic event relationships, including distribution laws and DeMorgan's laws (apply to problems if needed).
Be able to calculate the probability of events where each outcome is equally likely by counting.

1.3 Axioms of Probability
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Know the 3 axioms defining a probability function.
Use Theorem 1.3 to calculate the probability of events when outcomes equally likely.

1.4 Basic Theorems
Theorem 1.4: Probability of complement of an event.
Theorem 1.5 and its corollary
Theorem 1.6 and its generalization: Principle of inclusion-exclusion
Apply to examples like 1.15, 1.15, and 1.17
Theorem 1.7
Problems like Exercises 5 and 8
1.5-1.7
Random selection of points from intervals. When a point is selected at random from an (c,d), probability that point lies in the interval (a,b) -- apply to problems like those assigned.
Discuss and give an example: Is it possible for an event to have probability 0 and not be the empty set? Is it possible for an event to have probability 1 and not be the entire sample space S?
Problems like Exercise 2

Chapter 2 Combinatorial Methods
Section 2.2: Counting Principle
Counting Principle (product rule) – apply to counting problems.
Number of subsets of a set of size n – apply to problems.
Problems like Exercise 4, 5, 6, 7, 8
Section 2.3: Permutations
Formula for Permutation of size r from n objects using factorials.
Apply to problems.
Problems like Example 2.10, 2.11, 2.13

2.4 Combinations
Formula (in factorial form) for combination of size r from n objects in factorial form.
Apply to problems.
Problems like Example 2.16 and 2.17; Exercises 1, 3, 4

Chapter 3 Conditional Probability and Independence

3.1 Conditional Probability
Defining formula for calculating conditional probability. Apply to problems.
Use the method of reduction of sample space to simplify calculation for some conditional probabilities.
Problems like Example 3.5 and Example 3.6, Exercises 2, 3, 4
3.2 Law of Multiplication
Give Law of Multiplication formula and apply to problems.
Problems like Exercise 4 and 6, 8
3.3 Law of Total Probability
Apply Law of Total Probability (Theorem 3.3 and 3.4) to problems like example 3.12, 3.15 and assigned problems. Draw associated tree diagram.
Problems like 2, 3, 6, 9
3.4 Bayes' Formula
Apply Bayes' Formula and associated tree diagram to calculate "reverse" conditional probabilities.
Problems like class example and assigned problems 1, 2, 3

3.5 Independence
Definition of two independent events. Also interpret in terms of conditional probability.
Theorem 3.7 and its corollary
Determine whether two events are independent or dependent.
Definition of independence of a set of an arbitrary number of events.
Problems like Exercises 1, 4, 6

Chapter 4 Random Variables.
4.1 Random Variables
What is a random variable.
How to calculate the probability that random variable X is an element of set I.