Format and topics for exam 2
Math 142

General information. Exam 2 will be a timed test of 75 minutes, covering sections 5.1–5.5 and 6.1 of the text. No books, notes, calculators, etc., are allowed. Most of the exam will rely on understanding the problem sets (including problems to be done but not to be turned in) and the definitions and theorems that lie behind them. If you can do all of the homework, and you know and understand all of the definitions and the statements of all of the theorems we've studied, you should be in good shape. You should not spend time memorizing proofs of theorems from the book, but you should defintely spend time memorizing the *statements* of the important theorems in the text, especially any result with a name.

The types of questions on exam 1 are the same types that will appear on exam 2.

Definitions. The most important definitions and symbols we have covered are:

5.2	permutation	r-permutation
	r-combination	$P(n, r)$
	$C(n, r) = \binom{n}{r}$	
5.3	$P(n; a, b, \dots)$	
6.1	generating function	power series
	coefficient of x^r	

Theorems, results, algorithms. The most important theorems, results, and algorithms we have covered are listed below. You should understand all of these results, and you should be able to cite them as needed.

Sect. 5.1: Multiplication principle, addition principle.

Sect. 5.2: Set composition principle (slots).

Sect. 5.3: Thm. 1 (MISSISSIPPI theorem); Thm. 2 (Divider theorem).

Sect. 5.4: Big board of balls in boxes (left 2 columns).

Types of computations. You should also know how to do the following general types of problems, some of which are straight computations, and some of which require explanation.

Sect. 5.3: Arranging MISSISSIPPI (and similar), with answer in $P(n; a, b, \dots)$ notation. Picking objects with repetition. Enumerating all partitions of an integer into a given number of parts ($9 = 7 + 1 + 1 = 6 + 2 + 1$, etc.).

Sect. 5.4: Translating between distribution and arrangement problems (ex. 27–28). Translating among distribution, selection, and integer solution problems (ex. 29–30). Numbers of integer solutions, using Divider theorem.

Sect. 6.1: Modelling with generating functions (possibly via integer solutions).

Of course, since enumeration is the main focus of Sects. 5.1–5.5, you should also be able to do enumerations of the various types seen in the assigned homework and in class. Note that since one of the goals of Ch. 5 is to help you learn problem-solving skills to be used on unfamiliar problems, there may also be problems that do not closely resemble something from the homework. Nevertheless, it will definitely be helpful to know how to do all of the problems from the homework.

Not on exam. Sect. 5.2: Stirling's approximation (p. 186).

Good luck.