Review Guide: Chapter 9

Probability

- What is the sample space of an experiment? *(p. 518)*
- What is an event in the sample space? *(p. 518)*
- What is the probability of an event when all the outcomes are equally likely? *(p. 518)*

Counting

- If m and n are integers with $m \leq n$, how many integers are there from m to n inclusive? *(p. 521)*
- How do you construct a possibility tree? *(p. 525)*
- What are the multiplication rule, the addition rule, and the difference rule? *(pp. 527, 540, 541)*
- What is the inclusion/exclusion rule? *(p. 545)*
- What is a permutation? an r-permutation? *(pp. 531, 533)*
- What is $P(n, r)$? *(p. 533)*
- How does the multiplication rule give rise to $P(n, r)$? *(pp. 533-534)*
- When should you use the multiplication rule and when should you use the addition rule? *(p. 577)*
- What are some situations where both the multiplication and the addition or difference rule must be used? *(pp. 542-545)*
- What is the formula for the probability of the complement of an event? *(p. 543)*
- How are IP addresses created? *(p. 544)*
- How is the inclusion/exclusion rule used? *(pp. 546-549)*
- What is an r-combination? *(p. 566)*
- What is an unordered selection of elements from a set? *(p. 566)*
- What is complete enumeration? *(p. 567)*
- What formulas are used to compute $\binom{n}{r}$ by hand? *(p. 568)*
- What are some situations where both r-combinations and the addition or difference rule must be used? *(pp. 569-571)*
- What are some situations where r-combinations, the multiplication rule, and the addition rule are all needed? ? *(pp. 573-574)*
- How can r-combinations be used to count the number of permutations of a set with repeated elements? *(pp. 575-576)*
- What are some formulas for the number of permutations of a set of objects when some of the objects are indistinguishable from each other? *(p. 577)*
- What are Stirling numbers of the second kind? How do you find a recurrence relation for the number of ways a set of size n can be partitioned into r subsets? *(pp. 578-580)*
- What is an r-combination with repetition allowed (or a multiset of size r)? *(p. 584)*
- How many r-combinations with repetition allowed can be selected from a set of n elements? *(p. 586)*

The Pigeonhole Principle

- What is the pigeonhole principle? *(p. 554)*

- How is the pigeonhole principle used to show that rational numbers have terminating or repeating decimal expansions? *(pp. 557-559)*
- What is the generalized pigeonhole principle? *(p. 559)*
- What is the relation between one-to-one and onto for a function defined from one finite set to another of the same size? *(p. 562)*

Pascal's Formula and the Binomial Theorem

- What is Pascal's formula? Can you apply it in various situations? *(p. 593)*
- What is the algebraic proof of Pascal's formula? *(p. 595)*
- What is the combinatorial proof of Pascal's formula? *(pp. 595-596)*
- What is the binomial theorem? Can you apply it in various situations? *(p. 598)*
- What is the algebraic proof of the binomial theorem? *(p. 598-600)*
- What is the combinatorial proof of the binomial theorem? *(pp. 600-601)*

Probability Axioms and Expected Value

- What is the range of values for the probability of an event? *(p. 605)*
- What is the probability of an entire sample space? *(p. 605)*
- What is the probability of the empty set? *(p. 605)*
- If A and B are disjoint events in a sample space S, what is $P(A \cup B)$? *(p. 605)*
- If A is an event in a sample space S, what is $P(A^c)$? *(p. 605)*
- If A and B are any events in a sample space S, what is $P(A \cup B)$? *(p. 606)*
- How do you compute the expected value of a random experiment or process, if the possible outcomes are all real numbers and you know the probability of each outcome? *(p. 608)*
- What is the conditional probability of one event given another event? *(p. 612)*
- What is Bayes' theorem? *(p. 616)*
- What does it mean for two events to be independent? *(p. 618)*
- What is the probability of an intersection of two independent events? *(p. 618)*
- What does it mean for events to be mutually independent? *(p. 620)*
- What is the probability of an intersection of mutually independent events? *(p. 621)*