

**Math 102**  
**Exam 3 Review Sheet**

**Section 12.1:** Introduction to Counting Methods

**Key Topics:**

- Counting sets by listing in roster form
- Counting using tree diagrams

**Section 12.2:** The Fundamental Counting Principle

**Key Topics:**

- Using the Fundamental Counting Principle to count a task that can be broken into a several steps. (multiply the number of ways of doing each step)
- Using “Slot Diagrams” to organize information in a counting problem.
- Counting situations involving extra conditions or restrictions.

**Section 12.3** Permutations and Combinations

**Key Topics:**

- Know the definitions of permutations and combinations, and how to determine whether a given example is a permutation, a combination, or neither (hint: in permutations, order matters)
- Memorize and be able to apply the counting formulas for both permutations and combinations:  
 $P(n, r) = \frac{n!}{(n-r)!}$  and  $C(n, r) = \frac{n!}{r!(n-r)!}$
- Know how to use Pascal’s Triangle to count combinations

**Section 12.FI:** Counting and Gambling

**Key Topics:**

- Memorize the the basics of how a deck of cards is put together (52 cards, 4 suits) and what the standard poker hands are (pair, 2 pair, three of a kind, straight, flush, full house, four of a kind, straight flush)
- Know how to apply basic counting principles in order to determine how many ways a given poker hand can occur
- Know how to count the ways of winning in a game of chance such as a slot machine.

**Section 13.1:** The Basics of Probability Theory

**Key Topics:**

- Know the definitions of: experiment, outcomes, sample space, and event
- Know how to describe an event as a subset of the sample space
- Know the definition of the probability of an outcome and the probability of an event.
- Know the difference between Empirical Assignment of Probability and Theoretical Assignment of Probability.
- Memorize the three basic properties of probability
- Know how to use counting to calculate both the probability of an event and the “odds” of an event in the case where all outcomes are equally likely.

### **Section 13.2:** Complements and Unions of Events

#### **Key Topics:**

- Know how to write a given event as either the complement of an event or as the union of two other events.
- Memorize the basic formulas for computing the probability of the complement of an event and the union of two events.
- Be able to apply Venn diagrams for probability and basic probability formulas to find the probability of events in a given situation.

### **Section 13.3:** Conditional Probability and Intersections of Events

#### **Key Topics:**

- Know the definition of conditional probability and be comfortable with the idea that knowing that one event has occurred can impact the probability that other events occur.
- Know how to compute conditional probabilities both in the case that all outcomes are equally likely, and when outcomes are not all equally likely.
- Know the definition of independent and dependent events, and be able to apply it to a given pair of events.
- Memorize and be able to apply the rule for computing the probability of the intersection of two events.
- Know how to use a tree diagram to help compute conditional probabilities and the probability of the intersection of multiple events.

### **Section 13.4:** Expected Value

#### **Key Topics:**

- Know the definition of expected value, and memorize the method for computing it in a specific situation.
- Be able to use expected value to predict the “average” outcome of an experiment or game.
- Memorize the definition of a fair game, and know how to use expected value to determine whether or not a given game is fair.

**Practice Problems: Chapter 12 Test page 713-714 # 2, 4, 5, 8, 9, 10, 12, 14; Chapter 12 FI # 16; Chapter 13 Test # 1, 3, 6, 7, 8, 9, 11, 12, 14**