

## Summary of Topics for Test 2

The test will cover material from sections 5.3, 5.4, 5.5, 5.6, 5.7, 6.2, 6.3, 6.4, and 6.5

These are things that you should study:

- **Three Set Venn diagrams**

-how to fill in the diagram from survey results and answer questions from information in the completed diagram.

- **Counting**

The Multiplication Principle and using trees for counting

Permutations – counting the number of ordered arrangements.

$$P(n, r) = \frac{n!}{(n-r)!}$$

Combinations – counting the number of subsets or unordered samples

$$C(n, r) = \frac{n!}{(n-r)!r!}$$

Special families of counting problems-

1. Toss a coin  $n$  times (or choose a binary strings of length  $n$  at random)
2. Drawing balls from the urn
3. Street networks

- **The Binomial Theorem**

-how to expand  $(x + y)^n$  and find coefficients of the terms.

-how to apply the Binomial Theorem to counting problems

- **Probability**

Terms: sample space, outcomes, events, complement, union and intersection of events.

Properties of Probability

$$\text{For any event } E, P(E) + P(E') = 1$$

$$\text{For any events } E \text{ and } F, P(E \cup F) = P(E) + P(F) - P(E \cap F)$$

- how to calculate the Empirical Probability of outcomes and events from a data set

- how to calculate the Theoretical Probability of outcomes and events when the outcomes are equally likely:

$$\text{For each outcome } s \in S, P(s) = \frac{1}{n(S)}$$

$$\text{For each event } E \subseteq S, P(E) = \frac{n(E)}{n(S)}$$

Conditional Probability

$$\text{The probability of } E \text{ given } F: P(E/F) = \frac{P(E \cap F)}{P(F)}$$