

STATISTICS I

SECTION R3

SPRING 2010

MARCH 31, 2010

TODAY'S PLANS

- **Midterm**
 - Midterm test review
 - Question?
 - Midterm grades are in
- **Probability**
- **Probability distribution functions**
 - Binomial distribution

Probability Review

- **Whenever it's possible, count events in the sample space, rather than using rules**
- **Conditional probability (*given that*):**
 - **Changes the sample space**
 - **Formula to use: $P(A|B) = P(A \text{ and } B)/P(B)$**
- **Multiplication rule: “and” probabilities**
- **Addition rule: “or” probabilities**

Practice Problems

- At the country club, 73% of the members play bridge and swim, and 82% play bridge. If a member is selected at random, find the probability that the member swims, *given that* the member plays bridge.
- We don't have the sample space, so we have to use the formula:
 - $P(\text{B and S}) = 0.73$
 - $P(\text{B}) = 0.82$
 - Find $P(\text{S}|\text{B}) = P(\text{B and S})/P(\text{B})$

Probability Distributions

- **Definitions**
 - ***A random variable*** is a variable whose values are determined by chance
 - ***A discrete probability distribution*** consists of the values a random variable can assume and the probabilities of those values
 - **Examples**
 - Rolling a die
 - Tossing 3 coins and counting how many heads

Example Probability Distribution

Rolling a Die

X = number on die

$P(X)$ = probability of X on die

X	$P(X)$
1	1/6
2	1/6
3	1/6
4	1/6
5	1/6
6	1/6

Example Probability Distribution

Tossing Coins and Counting Heads

$X = \# \text{ heads}$

$P(X) = \text{probability of } X \text{ heads}$

X	P(X)
0	1/8
1	3/8
2	3/8
3	1/8

Example Probability Distribution

How many courses a student takes

$X = \#$ of courses

$P(X)$ = probability student is taking X courses

X	P(X)
1	0.10
2	0.15
3	0.20
4	0.35
5	0.15
6	0.05

Characteristics of a Probability Distribution

- **It's a function**
- **It must follow the rules for probabilities**
 - Values must be between 0 and 1
 - Values must add up to 1
- **Classwork**
 - Determine if relationships are probability distributions

Mean of Probability Distribution

- **Expected value = another name for mean**
- **Formula:**
$$E(X) = \sum X \cdot P(X)$$
- **Examples**

Binomial Distribution

- 1. There must be a fixed number of trials**
- 2. Each trial can have only two outcomes (success or failure)**
- 3. The outcomes must be independent**
- 4. The probability of success does not change from one trial to the next**

Binomial Distribution

- **Formulas:**

$$P(X) = \frac{n!}{(n - X)!X!} \cdot p^x q^{1-x}$$

$$\mu = np$$

$$\sigma = \sqrt{npq}$$

- **Use Table B in the back of the book!**