MAT 1372 Stat w/ Prob classwk 9 Fall 2013

Review (of 4.7):

Given a pool of size n, there are several possible ways to select m objects.

1. If there is REPLACEMENT of the objects and order applies, then the number of possible outcomes is n each time. If the process is ITERATED m times, then the number of outcomes is 

Example: number of 3 letter words: 

1. If there is NO REPLACEMENT of the objects and order still applies, then the number of possible outcomes each time goes down by 1: 

Example: number of 3 letter words with DISTINCT letters: 

1. If there is NO REPLACEMENT and ORDER does NOT apply, then the number of possible outcomes is a binomial coefficient: 

Example: number of committees of size 7 from a pool of 20: 

5.2 RANDOM VARIABLES:

A random variable X is an experiment with a SINGLE numeric outcome

Nonexample: roll 2 dice and record outcome as an ordered pair

Example: roll 2 dice and record the SUM of the faces

Exercise: Give 2 other examples and nonexamples.



means the probability that the outcome is 3.



means the probability that the outcome is between 6 and 8, inclusive.

Exercise: If X is roll 2 dice and sum, what is ? ?

Some more examples:

1. What is the probability that a 3 letter word has 0 repeats, exactly 2 repeated letters, 3 repeated letters?

There are possible letters. If we want distinct letters, then there are words. For a pair of distinct, we choose the locations for the repeats , then the repeated letter (26), then the other letter(25). If the letters are all the same, then there are 26 possible outcomes. Using Excel we get:

# repeats probability formula

0 0.887573964 PERMUT(26,3)/26^3

2 0.110946746 COMBIN(3,2)\*PERMUT(26,2)/26^3

3 0.00147929 26/26^3

 1 sum of probabilities

2. Suppose that a couple will have 3 children, let the random variable *W* equal the number of girls that came before the first boy. (If the outcome is (*g*, *g*, *g*), take *W* equal

to 3.) Give the possible values of *W* along with their probabilities. That is, give the probability distribution of *W*. First step is to assign to each outcome a number:

(*b*, *b*, *b*) (*b*, *b*, *g*) (*b*, *g*, *b*) (*b*, *g*, *g*) (*g*, *b*, *b*) (*g*, *b*, *g*) (*g*, *g*, *b*) (*g*, *g*, *g*)

0 0 0 0 1 1 2 3

Now make a table of the outcomes (numeric) with their probabilities:

0 1 2 3

1/2 1/4 1/8 1/8

5. Suppose a pair of dice is rolled. Let *Y* denote the smaller of the two numbers appearing on the two dice. (If both dice show the same number, take that as the value of *Y*.) Determine the probability distribution of *Y*. The outcomes are grouped together in hooks with the pivot on the diagonal.

1 2 3 4 5 6

11/36 9/36 7/36 5/36 3/36 1/36

Additional Classroom exercises (for possible group work):

6. Two people are to meet in the park. Each person is equally likely to

arrive, independent of the other, at 2:00, 2:30, or 3:00 p.m. Let *X* equal

the time that the first person to arrive has to wait, where *X* is taken to

equal 0 if both people arrive at the same time.

**(a)** What are the possible values of *X*?

**(b)** What are the probabilities that *X* assumes each of these values?

**7.** Two volleyball teams are to play a 2-out-of-3 series, in which they

continue to play until one has won 2 games. Suppose that the home

team wins each game played, independently, with probability 0.7. Let

*X* denote the number of games played.

**(a)** What are the possible values of *X*?

**(b)** What is the probability distribution of *X*?

**8.** Suppose that 2 batteries are randomly chosen from a bin containing

10 batteries, of which 7 are good and 3 are defective. Let *X* denote the

number of defective batteries chosen. Give the possible values of *X*

along with their probabilities.

**19.** A bakery has 3 special cakes at the beginning of the day. The daily

demand for this type of cake is

# probability

0 0.15

1 0.20

2 0.35

3 0.15

4 0.10

5+ 0.05

Let *X* denote the number of cakes that remain unsold at the end of the

day. Determine the probability distribution of *X*.

[Note that the chart itself does not technically define a random variable.

The last category “5+” is not a single number.]