**L8, Review for Test 1**

Sets and Venn diagrams

 ( *A* and *B* mutually exclusive)



Ex. Two events *A* and *B* are such that  and 

* + 1. Find .
    2. Find 
    3. Find 

Counting Methods and Probability

Ex. Four students are to be randomly selected to fill certain student government positions, from a group of 3 undergraduate and 5 graduate students. Find the probability that exactly 2 undergraduates will be among the four chosen.

Ex. From a standard deck of 52 playing cards a hand of 5 cards is dealt. Find the probability of having all five cards being from the same suit (i.e. a flush).

Conditional Probability, Independent events and Mutually exclusive events

 ,



Two events are independent if: 

Two events are mutually exclusive if 

Ex. If *A* and *B* are independent events with and  find .

Bays Rule

Assume that  is a partition of *S*, such that , for *i* = 1, 2, …,*k*. Then



Example:

In a certain factory, machines A, B, and C are all producing springs of the same length with defective rates: 2%, 1%, and 3% respectively. Of the total production of springs in the factory, machine A produces 35%, machine B produces 25% and machine C produces 40%.

1. If a spring is chosen at random from a day’s production, what is the probability that it is defective?
2. If a defective spring is selected, what is the probability that it was produced by machine C?

Example:

A gambler has in his pocket a fair coin and a two-headed coin. He selects a coin at random and when he flips it, it shows heads. What is the probability that the coin he flipped is the fair coin?

Expected Value, mean, Variance

, mean  Variance 

Example:

Given the pmf  Find the mean and variance.

Example:

Let *X* be a discrete random variable with the distribution shown in the table below:

(Since most calculators can calculate the following, work must be show in order to receive credit.)

|  |  |
| --- | --- |
| ***x*** | ***f*(*x*)** |
| 21 | .05 |
| 22 | .20 |
| 23 | .30 |
| 24 | .25 |
| 25 | .15 |
| 26 | .05 |

1. Find E(*X*).
2. Find Var(*X*)
3. What is the standard deviation of *X* ?

Binomial Probability Distribution

 mean  Variance 

Example:

In a lab experiment involving inorganic syntheses of molecular precursors to organometallic ceramics, the final step of a five-step reaction involves the formation of a metal to metal bond. The probability of such a bond forming is  *p* = 0.20. Let*X* equal the number of successful reactions out of *n* = 25 such experiments.

1. Find the probability that *X* is at most 4.
2. Find the probability that *X* is at least 5.
3. Find the probability that *X* is equal to 6. Give the mean, variance and standard deviation of *X*.

Geometric Probability Distribution (How long will it take to succeed?)

 mean  Variance 

Example:

The probability of it raining on any day in June is 0.2. Find the expected number of days before it rains in June.

Example:

(example 3.11 & 3.12) Suppose that the probability of an engine malfunction during any one-hour period is *p =* 0.02,

a) Find the probability that a given engine will survive three hours. (ex. 3.11 ask for two hours.)

1. Find the mean and standard deviation.