1. You toss a fair coin until you get head twice. What is the probability that you made k tosses?

P(K) = (K-1)!/(k-2)!1! \* (.5)k = (k-1) \* (.5)k

1. Each person in a group of n people is requested to select a number between 1 to k. Describe the probability that at least 2 people chose the same number.

((n-1)\*(n/2))/(k-1)

1. The frequency of the Malum Indentum disease in the population is 1 in 10,000. A test that checks if one is infected with the disease is 99% accurate. One takes the test and gets a positive response (test says she is infected). What’s the probability that she is infected?

99/1,000,000 (chance of getting disease and it being reported) + 9,999/1,000,000 (chance of not getting disease but getting a positive response in checks)

= 10,098/1,000,000 = .010098 total chance of being reported for the disease. Chance of actually having the disease is 1/10,000 or .0001

.0001/.010098 = . 00990295

The probability that she is infected is .00990295

1. Let X and Y be discrete random variables, Z be a continuous random variable, and α and β constants. Prove the following equalities:
   1. E(X+Y) = E(X)+E(Y)
   2. E(αZ) = αE(Z)
   3. If X and Y are independent then E(XY) = E(X)E(Y)
   4. V(αX+β) = α2V(X)
   5. If X and Y are independent then V(X+Y) = V(X)+V(Y)
2. Let Xi ~ Unif(0, 1) for 1 <= i <= n be IID (independent identically distributed) random variables. Let Y = max(X1, ..., Xn). What is E(Y)?
3. A drunken point hops on the number line, making jumps sized 1. The probability to jump to the right is fixed: P(right) = p. Let Xn be the position of the point after n jumps.

a. What is E(Xn)? b. WhatisV(Xn)?