Writing Assignment 2

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1.

Let T be the weight of two randomly selected 5 lb bags, T = X1 + X2.

Since Xi ~ N (5.36, 0.14) and two bags are independent, we know that T ~ N (5.36 + 5.36, √ (0.14*0.14 + 0.14*0.14)). Therefore, T ~ N is (10.72, 0.198).

P (T > Y) = P (T – Y > 0). Let the weight difference (D) between two 5 lb bags and one 10 lb bag. We know that D ~ N (10.72-10.22, √ (0.198*0.198 + 0.18*0.18)) so that D ~ N is (0.50, 0.268).

P (D > 0) = P (Z > (0 – 0.50)/0.268) = P (Z > -1.87) = 1 – 0.031 = 0.969

Therefore, the probability that the sum of the weights of the two 5 lb bags exceeds the weight of one 10 lb bag is 0.969.

2.

Let X be the number of occurrence of accidents in given month

P (X >= 1) = 1 - P (X < 1) = 1 – P (X = 0) = 1 – (e^-0.4)*(0.4^0)/0! = 0.330

The probability of at least 1 accident in next 8 of 12 months is choose(12, 8)*(0.330^8)*(0.67^4) = 0.0140.

3.

(a)

6 ways to roll double through total 36 ways to roll.

X ~ Geometric(p=⅙)

P(X=1) = ⅙

P(X=2) = ⅙ * ⅚=5/36

P(X=3) = ⅙ * ⅚ * ⅚=25/216

P(success within 3) = P(X=1) + P(X=2) + P(X=3) = 0.4213

(b) expected value = μ = 6

4.

(a) $S=\{0,1,2,3,4,5,6\}$

(b) Binomial Distribution.

The coin was tossed 6 times, so $N = 6$

A coin has a probability of 0.5 of coming up heads. Therefore, $p= 0.5$

(c) $\mu=np=0.5*6=3$. It is the mean of the binomial distribution. The standard deviation (σ) $=np(1-p)=1.2247$. It is the square root of the variance (σ^2).

(d) $P(X>2)$

$=1-P(X \leq 2)$

$=1-(P(X=2)+P(X=1)+P(X=0))$

$=1-((6,2)*(0.5)^2*(0.5)^4+(6,1)*(0.5)*(0.5)^5+(6,0)*(0.5)^0*(0.5)^6)$

$=0.6563$

(e)

Normal distribution:

$E(x)=np=1200*0.525=630$

$\sigma=\sqrt{}630*(1-0.525) = \sqrt{}299.25$

Consider continuity correction

$P(X\leq595)$

$= P(Z\leq (595.5-630)/\sqrt{}\ 299.25)\ )$

$=P(Z\leq -1.99435293)$

$=0.0231$

5.

a. P (no A in English or no A in Chemistry) = P (no A in English) + P (no A in Chemistry) – P (no A in both English and Chemistry)

= 0.8 + 0.9 – 0.95

= 0.75

b. Events "Earning an A in Chemistry" and "Earning an A in English" are not disjoint, because P (A in English and A in Chemistry) = 0.05 ≠ 0

c. P (A in Chemistry | A in English) = 0.05 / 0.2 = 0.25 ≠ 0.1

P (A in English | A in Chemistry) = 0.05 / 0.1 = 0.5 ≠ 0.2

Therefore, "Earning an A in English", and "Earning an A in Chemistry" are not independent events, because P (A) ≠ P (A | B).

6.

a. It's a hypergeometric probability distribution.

b. X ~ Hypergeometric (n=200, M=50, N=1100)

P (X = 25) = [(50,25)*(1050,175)]/(1100,200)=1.1999 × 10^-7

Here is the R code:

```
> hypergeometric <- function (x, n, N, M) {
+   return ((choose (M, x) * choose (N - M, n - x) / choose
   (N, n)))
+ }
> hypergeometric (25, 200, 1100, 50)
[1] 1.199866e-07
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7.

Let NV = a crime that is nonviolent

Let RNV = a crime that is reported given that it's a nonviolent crime

Let RV = a crime that is reported given that it's a violent crime

a. $P(R) = P(NV) \times P(RNV) + P(V) \times P(RV)$

$= 0.83 \times 0.62 + 0.17 \times 0.88$

$= 0.6642$

b. $P(NV \mid R) = P(R \mid NV) \times P(NV) / P(R)$

$= (0.62 \times 0.83) / 0.6642$

$= 0.7748$