Hw4: Stat355, F 2016, Due October 5

1. A geologist has collected 10 specimens of basaltic rock and 10 specimen of granite. The geologist instructs a laboratory assistant to randomly select 15 of the specimens for analysis.
   (a) What is the pmf of number of granite specimens selected for the analysis?
   (b) What is the probability that all specimens of one of the two types of rocks are selected?
   (c) What is the probability that the number of granite specimens selected for analysis is within one standard deviation of its mean value?

2. The probability that a randomly selected box of a certain type of cereal has a particular prize is 0.2. Suppose you purchase box after box until you have obtained two of these prizes.
   (a) What is the probability that you purchase x boxes that do not have the desired prize?
   (b) What is the probability that you purchase four boxes?
   (c) What is the probability that you purchase at most four boxes?
   (d) How many boxes without the desired prize do you expect to purchase? How many boxes do you expect to purchase?

3. An article in the *Los Angeles Times* **(Dec. 3. 1993)** reports that 1 in 200 people carry the defective gene that causes inherited colon cancer. In a sample of 1000 individuals, what is the approximate distribution of the number who carry this gene? Use this distribution to calculate the approximate probability that
   (a) Between 5 and 8 (both inclusive) carry the gene?
   (b) At least 8 carry the gene?

4. Grasshoppers are distributed at random in a large field according to a Poisson process with parameter $\lambda = 2$ per square yard. How large should be the radius R of a circular sampling region to taken so that the probability of finding at least one grasshopper in the circle exceeds 0.99?

5. The error involved in making certain measurement is a continuous rv with pdf
$$f(x) = \begin{cases} c(4-x^2) & -2 \le x \le 2 \\ 0 & otherwise \end{cases}$$
   (a) What is the value of c?
   (b) Compute $P(X > 0)$.
   (c) Compute $P(X < -0.5 \text{ or } X > 1)$
   (d) Compute $V(X)$ and $V(X^2)$

6. Consider the pdf for total waiting time for two buses
$$f(y) = \begin{cases} \frac{1}{25}y & 0 \le y < 5 \\ \frac{2}{5} - \frac{1}{25}y & 5 \le y \le 10 \\ 0 & otherwise \end{cases}$$
   (a) Compute the CDF $F(y) = P(Y \le y)$.
   (b) For $0 < p < 1$, obtain the expression for $(100p)$th percentile.