STAT/MA 41600
In-Class Problem Set #36: November 8, 2017

1. A big rock has weight that is Normally distributed with mean 21 pounds and standard deviation 2 pounds. A small rock has weight that is Normally distributed with mean 10 pounds and standard deviation 1.5 pounds. It is assumed that the weights of all rocks are independent.

After a great deal of effort (and the help of some of his friends), Bruce collects 3 big rocks. Audrey and her friends collect 6 small rocks.

What is the probability that Audrey's rocks weigh more (altogether) than Bruce's rocks?

2. When choosing a random gas station in the State of Indiana, assume that the price of "unleaded 87 octane gas" is modelled by a Normal random variable with mean \$2.60 and standard deviation \$0.10.

Suppose 23 drivers are interviewed across the State of Indiana, and the drivers are chosen independently. Also suppose that each such driver bought 10 gallons of gas during her/his most recent purchase. What is the probability that these 23 purchases cost \$600 or more?

3. Consider three independent Normal random variables X, Y, Z. Suppose that $\mathbb{E}(X) = \mathbb{E}(Y) = \mathbb{E}(Z) = 5$ and $\mathrm{Var}(X) = \mathrm{Var}(Y) = \mathrm{Var}(Z) = 20$. Find the probability that X is bigger than the sum of Y and Z, i.e., find $P(X > Y + Z)$.

4. Suppose that the books published by a certain book publisher have weights that (roughly) have a Normal distribution with mean 14.2 ounces and standard deviation 1.7 ounces.

4a. Suppose that a person at the distribution warehouse selects books randomly (and independently of previous selections) until she finds a "heavy" book, i.e., a book that weighs 16 ounces or more. Then she stops, after finding this heavy book. What is the expected number of books that she selects?

4b. In the situation in 4a, what is the variance of the number of books that she selects?

4c. Now suppose that a different person at the distribution center puts 5 books into a box. What is the probability that such a box weighs more than 5 pounds?