Uniform & Normal Distribution Practice Problems

1. You arrive at a building and are about to take an elevator to your floor. Once you call the elevator, it will take between 0 and 40 seconds to arrive to you. We will assume that the elevator arrives uniformly between 0 and 40 seconds after you press the button. In this case a = 0 and b = 40.
   a) Calculate the probability that the elevator takes less than 15 seconds to arrive.
   b) What is the *expected* amount of time you will need to wait for the elevator?
   c) What is the standard deviation of your waiting time?

2. Suppose the time it takes a nine-year old to eat a donut is between 0.5 and 4 minutes, inclusive. Let *X* = the time, in minutes, it takes a nine-year old child to eat a donut. Then X~ U (0.5, 4).
   a) What is the probability it takes a randomly selected 9-year old child at least 2 mins to eat a donut?
   b) What is the probability a different 9-year old eats a donut in more than 2 mins, given the child has already been eating the donut for more than 1.5 mins?

3. The average amount of salt consumption per day by an American is 15 grams (or 15,000 milligrams), although the actual physiological minimum daily requirement for salt is only 220 mgs. Suppose the amount of salt intake per day is approximately normally distributed with a std deviation of 5 grams.
   a) What proportion of all Americans consume between 14 and 22 grams of salt per day?
   b) Physicians recommend that those Americans who want to reach a level of salt intake at which hypertension is less likely to occur should consume less than 1 gram of salt per day. What is the probability that a randomly selected American consumes less than 1 gram of salt per day?

4. The annual rate of return on an equity fund is normally distributed with mean 12% and standard deviation 6%. The annual rate of return on an income fund is normally distributed with mean 10% and standard deviation 2%.
   a) What is the probability that the rate of return of the equity fund will exceed 15%?
   b) What is the probability that the equity fund will lose money (the annual rate of return will be less than 0)?
   c) Find the 90^{th} percentile of the equity fund's rate of return and interpret.
   d) What is the probability that the rate of return on the income fund will be more than 8%?
   e) What is the probability that the rate of return on the equity fund will be more than 8%?
   f) Explain why the answer to (*d*) is greater than the answer to (*e*), even though the average rate of return of the income fund is less than the average rate of return on the equity fund.

5. A certain amount of material is wasted in cutting patterns for garments. A producer of army uniforms has found that the lot-to-lot waste is normally distributed with mean 4.1% and std deviation 0.6%.
   a) In a particular lo*t, what is the probability that the wastage exceeds 5%?*
   b) If the actual amount of material required for a lot is 4700 yards, and 5000 yards of material are available, what is the probability that the supply of material is adequate?

6. The time required to verify and fill a common prescription at a neighborhood pharmacy is normally distributed with a mean of 10 minutes and a standard deviation of 3 minutes.
   a) What proportion of the time should a customer expect to wait at least 15 minutes?
   b) What is the 99^{th} percentile of wait times?

7. The population mean heart rate is about 74.0 bpm with a standard deviation of 7.5 bpm and is assumed to be a normally distributed random variable.
   a) What is the *Z*-score of a person with a heart rate of 80 bpm?
   b) What is the *percent* of people with a heart rate of 80 bpm or more?
   c) What is a *reasonable range* of heart rates (assume this to be 95%)?