1. A production line manufacturers 1000-ohm resistors that have 10 percent tolerance. Let $X$ denote the resistance of a resistor. Assuming that $X$ is a normal r.v. with mean 1000 and variance 2500. Find the probability that a resistor picked at random will be rejected.

2. A squirrel starts from the root of the tree and walks on the tree. At every node, if there are 3 branches, it walks to the center branch with probability 3/4 and to the right or left branch with probability of 1/16 and 3/16 respectively. It stops whenever it is trapped on a left or right branch. Calculate the probability of the squirrel being trapped at level $k$ of the tree ($k=1,2,\ldots$).

3. If $X$ is a continuous uniform random variable in the interval $[a,b]$ 
   (a) Find the cdf of $X$.
   (b) If we define $X$ to be the weight (in pounds) of a package with the weight range between 45 and 60 pounds. Use the calculated cdf in part (a) to find $P(X \geq 50)$
   (c) Find $P(40 \leq X \leq 85)$

4. When we receive a signal (usually corrupted by noise) at the receiver, we assume it’s distribution to be Gaussian. We are trying to distinguish between the case in which the signal is present at the receiver (in this case the signal amplitude is assumed to be Gaussian $\mathcal{N}(0.5,0.1^2)$) and the case in which noise only is present the distribution is assumed to be $\mathcal{N}(0,0.1^2)$. We want to know if the signal is present at the receiver and we do so by comparing the received signal to 0.25. If the received signal is larger than 0.25, we claim that it is indeed present. Find the probability of the following two types of errors.
   (a) a miss, when we say the signal is absent but it is present; and
   (b) a false alarm, when we say that the signal is present but it is not.