1. Suppose you have one 4-sided die and one 6-sided die. Roll them both, and let $X$ denote the sum of their values.

   (a) Write down the full distribution for this process.
   (b) Calculate the expected value of this process.
   (c) Calculate the variance of this process. (The variance is defined as the expectation of $(X - \mu(X))^2$).
   (d) What is the probability that $X \geq 7$?

2. Suppose $X$ has an exponential distribution with parameter $\lambda = 1/2$.

   (a) Calculate the expected value and the standard deviation of $X$ (the standard deviation is the square root of the variance.)
   (b) Calculate the probability that $X \geq 2.5$.
   (c) Suppose $X_1$ and $X_2$ are independent random variables, both exponential with parameter $\lambda = 1/2$. What is the probability that both $X_1$ and $X_2$ are and both bigger than or equal to 3?

3. You have chosen to open an artisan bakery. When a customer orders a loaf of bread, you price the loaf according to the following scheme: you first generate a random number $p$ from a beta distribution with parameters $a = 2$ and $b = 2$. You then generate a random “inflation factor” $k$ from a uniform distribution on the interval [1, 3]. Finally, you charge $pk^2$ dollars for the loaf.
Use a computer to estimate the expected price of a loaf of bread.