1. Some students take an examination in a course at Purdue. Let X denote the percent of students who pass the examination. Suppose that X is a Beta random variable with $\alpha = 8$ and $\beta = 2$.
    1a. What is the expected percentage of students who pass the exam? I.e., what is $\mathbb{E}(X)$?
    1b. What is the probability density function $f_X(x)$ of X?
    1c. Can you verify that $f_X(x)$ is a valid probability density function?

2. Same setup as #1.
    2a. Find $P(X > 0.90)$, i.e., the probability that at least 90% of students pass the exam.
    2b. Find $P(X > 0.90 \mid X > 0.80)$.

3. In a certain town in Oregon, the percentage of rainy days during a given time period is modelled by a Beta random variable X with $\alpha = 2$ and $\beta = 20$.
    Find $P(X < 0.15)$. Hint: Use the u-substitution $u = x - 1$.

4. Review question:
    4a. Is the sum of two independent Bernoulli random variables (with the same parameters p) also a Bernoulli random variable? If not, what kind of random variable is the sum?
    4b. Is the sum of two independent Binomial random variables (with the same parameters p) also a Binomial random variable? If not, what kind of random variable is the sum?
    4c. Is the sum of two independent Geometric random variables (with the same parameters p) also a Geometric random variable? If not, what kind of random variable is the sum?
    4d. Is the sum of two independent Negative Binomial random variables (with the same parameters p) also a Negative Binomial random variable? If not, what kind of random variable is the sum?
    4e. Is the sum of two independent Poisson random variables also a Poisson random variable? If not, what kind of random variable is the sum?
    4f. Is the sum of two independent Exponential random variables (with the same parameters λ) also an Exponential random variable? If not, what kind of random variable is the sum?
    4g. Is the sum of two independent Gamma random variables (with the same parameters λ) also an Gamma random variable? If not, what kind of random variable is the sum?