

STAT/MA 41600
In-Class Problem Set #34: November 6, 2015

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?