Stat509 Fall 2014 HW3
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Instruction: Please finish this homework before the class on 10/07. You will have a quiz based on the homework during the class.

1. In 1990 the lead concentration in gasoline ranged from 0.1 to 0.5 grams/liter. Let $Y =$ grams per liter of lead in gasoline. The probability density function for Y is

$$f(y) = 12.5y - 1.25, \text{ for } 0.1 < y < 0.5.$$

   (a) What is the probability that a random liter of gasoline would contain between 0.1 and 0.4 grams/liter of lead?

   (b) What is the probability that a random liter of gasoline will contain more than 0.3 grams/liter of lead?

   (c) Give the cumulative probability function $F_Y(y)$ (*Hint: you need to discuss the value of y by cases*).

   (d) Use the cumulative probability function $F_Y(y)$ to calculate the probability that a random liter of gasoline will contain less than 0.35 grams of lead.

   (e) Calculate the expected value of Y.

   (f) Calculate the variance for Y.

2. Explosive devices used in mining operations produce (nearly) circular craters when detonated. The radii of these craters, say, Y, follow an exponential distribution with $\lambda = 0.10$.

   (a) Find the proportion of radii that will exceed 20 meters.

   (b) Find the probability that a single denotation will produce a radius between 5 and 15 meters.

   (c) The area of the crater is $W = \pi Y^2$. Find the expected (mean) area produced by the explosive devices; that is, compute $E(W)$.

3. Suppose X has an exponential distribution with a mean of 10. Calculate $P(X < 15|X > 10)$. (*Hint: apply the memoryless property*)

4. The number of calls received by a telephone answering service follows a Poisson distribution. The calls average 20 per hour.

   (a) What is the probability that 30 calls will arrive in a given 2 hour period? Give answer to 4 decimals.

   (b) What is the probability of waiting more than 15 minutes between two calls? (*Hint: 15 minutes = 0.25 hour*)

   (c) What is the probability that there are 22 phone calls in a given hour?

5. Suppose the weight, say, Y, in pounds of a certain packaged chemical is uniform from 48 to 50 pounds. That is the pdf is of the form

$$f_Y(y) = \frac{1}{2}, \text{ for } 48 < y < 50.$$

   (a) What is the mean weight of the chemical?

   (b) What is the probability that a randomly chosen package of chemical will weigh between 48.5 and 49.4 pounds?

   (c) In the long run, what proportion of packages will weigh more than 49.2 pounds?