

Econ 311: Problem Set #4

Monday, November 16, 2009

Question.1 The jurisdiction of a rescuer team includes emergencies occurring on a stretch of river that is 4 mile long. Experience has shown that the distance along this stretch, measured in miles from its northernmost point, at which an emergency occurs can be represented by a uniformly distributed random variable over the range 0 to 4 miles. Then, if X denotes the distance of an emergency from the northernmost point of this stretch of river, its probability density function is as follows:

$$f(x) = 0.25 \quad \text{for } 0 < x < 4 \\ = 0 \quad \text{otherwise.}$$

- a Draw the probability density function.
- b Find and draw the cumulative distribution function.
- c Find the probability that a given emergency arises within 1 mile of the northernmost point of this stretch of river.
- d The rescue team's base is at the midpoint of this stretch of river. Find the probability that a given emergency arises more than 1.5miles from this base.

Question.2 A salesman receives an annual salary of \$6,000 plus 8% of the values of the orders he takes. The annual value of these orders can be represented by a random variable with a mean of \$600,000 and a standard deviation of \$180,000. Find the mean and standard deviation of the salesman's annual income.

Question.3 Let the random variable X follow a normal distribution with $\mu = 0.2$ and $\sigma^2 = 0.0025$.

- a Find the probability that X is greater than 0.4.
- b Find the probability that X is greater than 0.15 and less than 0.28.
- c Find the probability that X is less than 0.10.
- d The probability is 0.2 that X is greater than what number?

Question.4 Given a random sample size of $n = 400$ from a binomial probability distribution with $P = 0.2$ do following.

- a Find the probability that the percentage of successes is less than 0.15.
- b With probability 0.11 the percentage of successes is greater than what percent?

Question. 5 Given an arrival process with $\lambda = 5$, what is the probability that an arrival occurs after $t = 5$ time units?

Question. 6 A random variable X is normally distributed with a mean of 1000 and a variance of 500, and a random variable Y is normally distributed with a mean of 200 and a variance of 400. The random variables have a correlation coefficient equal to -0.5. Find the mean and variance of the random variable:

$$W = 5X - 4Y$$