Name: _____ July 25, 2017

FINITE MATH: QUIZ 9

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- The Honor Code is in effect for this quiz. All work must be your own.
- Please turn off all cellphones or any other electronic devices.
- Calculators are allowed. Give your answers to 1-3 decimal places.
- There are 12 points available to try for. It is NOT possible to get more than 10 points on this quiz.
- The quiz lasts 12 minutes.

Useful Formulas

- $\mu = \bar{x} = \dfrac{x_1 + x_2 + \cdots + x_n}{n}$ (population or sample mean)
- $\sigma^2 = \dfrac{(x_1 - \mu)^2 + (x_2 - \mu)^2 + \cdots + (x_n - \mu)^2}{n}$ (population variance)
- $s^2 = \dfrac{(x_1 - \mu)^2 + (x_2 - \mu)^2 + \cdots + (x_n - \mu)^2}{n-1}$ (sample variance)
- stdev $= \sqrt{\text{variance}}$
- $E(X) = x_1 \cdot p(x_1) + x_2 \cdot p(x_2) + \cdots + x_n \cdot p(x_n)$
- $E[u(X)] = u(x_1) \cdot p(x_1) + u(x_2) \cdot p(x_2) + \cdots + u(x_n) \cdot p(x_n)$
- $E(c) = c$ for constants
- $E[c \cdot u(X)] = c \cdot E[u(X)]$ for constant c and function $u(X)$
- $E[c \cdot u(X) + v(X)] = c \cdot E[u(X)] + E[v(X)]$ for constant c and functions u, v
- $Var(X) = (x_1 - \mu)^2 \cdot p(x_1) + (x_2 - \mu)^2 \cdot p(x_2) + \cdots + (x_n - \mu)^2 \cdot p(x_n)$
- $Var(X) = E(X^2) - [E(X)]^2$
- Binomial: $P(X = k) = \binom{n}{k} p^k q^{n-k}, \quad \mu = np, \quad \sigma^2 = npq$

Problem 1. When dealing with the life events of two people (such as Kennedy and Lincoln), we estimated the probability of coincidence of a **single** life event to be 0.01 or 1%. Suppose we are looking at 1,000 independent life events in the lives of two people, and we are interested in the number of coincidences that occur.

a) (1pt) What is the expected number of coincidences for the 1,000 life events?

b) (1pt) Calculate the probability of having exactly 10 coincidences.

c) (2pt) Calculate the probability of having at most 10 coincidences (inclusive).

d) (2pt) Calculate the probability of having at least 5 coincidences (inclusive).

e) (2pt) Calculate the probability of having between 5 and 10 coincidences (inclusive).

Problem 2. The Fibonacci sequence $\{1, 1, 2, 3, 5, 8, 13, 21, \ldots\}$ with starting values $F_1 = 1$ and $F_2 = 1$ (the first two values in the sequence) satisfies the relation

$$F_n = F_{n-1} + F_{n-2}$$

so to get the next number, you add up the previous two values (e.g. $13 = 5 + 8$).

a) (1pt) What sequence do you obtain of you use starting values 0 and 1? Write the first 10 terms (including 0 and 1).

b) (3pt) What sequence do you obtain if you use starting values 1 and 3? Write the first 10 terms (including 1 and 3).