ECO 204 (Section 9)
@EWU

Quiz-1
Spring - 2025

March 10, 2025

Name: _____

Student ID: _____

- *Please avoid all unethical behaviors (e.g., looking at others' solutions, asking others), as this will result in a grade of zero in the quiz.*
- *The exam is worth* 12 *points (which would be later 8% of the final grade), and total duration of the exam is* 10 *minutes.*

1. **True/False (6 points)** Write "T" if True and "F" if False.
   (a) (1 point) ___**F**___ Simple random sampling ensures that a specific group of people will be more in the sample.
   (b) (1 point) ___**F**___ With a random sample we can always calculate the population quantity with 100% precision.
   (c) (1 point) ___**F**___ And estimator is a random quantity and its value won't change from sample to sample.
   (d) (1 point) ___**T**___ For a continuous random variable the probability of any specific value is always zero.
   (e) (1 point) ___**T**___ For Bernoulli distribution the mean and variance is always same.
   (f) (1 point) ___**F**___ point estimation will give us a possible range of values for the unknown target quantity

2. **Short Questions (6 points)**
   (a) (3 points) Let X be a binary random variable that represents whether an EWU student live in a hostel or not, i.e., $X = 1$ means live in a hostel, and $X = 0$ means otherwise, assume $\mathbb{P}(X = 1) = 0.3$, how would you interpret this probability, what is the mean $\mathbb{E}(X)$ and variance $\mathbb{V}(X)$?

   Solution:
   If X is a random variable that represents whether an EWU student live in a hostel or not, then $\mathbb{P}(X = 1) = 0.3$ means that 30% of the students live in a hostel. The mean $\mathbb{E}(X)$ is $\mathbb{E}(X) = 0.3 \times 1 + 0.7 \times 0 = 0.3$ and the variance $\mathbb{V}(X) = \mathbb{E}[(X - \mathbb{E}(X))^2] = (0 - 0.3)^2 \times 0.7 + (1 - 0.3)^2 \times 0.3 = 0.21$.
   Or in this case if you know the direct formula of the variance of a Bernoulli random variable, then you know that $\mathbb{V}(X) = 0.3 \times 0.7 = 0.21$.

   (b) (3 points) If we construct sample mean $\overline{X}$ with a sample size of 8 students, what is $\mathbb{E}(\overline{X})$?

   Solution:
   The theory suggests (in particular look at Theorem 1.1 of Chapter 1),

   $$\mathbb{E}(\overline{X}) = \mathbb{E}(X) = 0.3$$

   Also the question didn't ask, but if you want to know the variance of the sample mean, then from the same theorem we get,

   $$\mathbb{V}(X) = \frac{\mathbb{V}(X)}{n} = \frac{0.3 \times 0.7}{8}$$