PSTAT 5A Practice Worksheet 5

Continuous Random Variables and Confidence Intervals

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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# 1. Instructions and Overview

**⏰ Time Allocation:**

* **Intro & Setup** : 10 minutes
* **Section A (Continuous Distributions):** 20 minutes
* **Section B (Confidence Intervals):** 20 minutes
* **Optional Questions:** Do on your own
* **Total:** 50 minutes

**📝 Important Instructions:**

* Use the formulas and tables provided for guidance
* Round final answers to 4 decimal places unless otherwise specified
* For confidence intervals, always interpret your results in context
* Use [z-table](https://math.arizona.edu/~rsims/ma464/standardnormaltable.pdf) or [t-table](https://www.sjsu.edu/faculty/gerstman/StatPrimer/t-table.pdf) as appropriate
* Show your work for all calculations

**📚 Key Formulas Reference:**

**Continuous Random Variables:**

**Normal Distribution:**

* **PDF:**
* **Standardization:** where
* **Mean:**
* **Variance:**

**Uniform Distribution:**

* **PDF:** for
* **Mean:**
* **Variance:**

**Exponential Distribution:**

* **PDF:** for
* **Mean:**
* **Variance:**

**Confidence Intervals:**

**For Population Mean (σ known):**

**For Population Mean (σ unknown):**

**Margin of Error:** or

**Sample Size:**

# 2. Section A: Continuous Random Variables

*⏱️ Estimated time: 20 minutes*

**Problem A1: Distribution Identification and Properties**

For each scenario below, identify the appropriate continuous distribution and find the requested values:

**(a)** The time (in minutes) between arrivals at a coffee shop follows an exponential distribution with an average of 2 minutes between arrivals.

* What is the parameter ?
* What is the probability that the next customer arrives within 1 minute?

**(b)** A random number generator produces values uniformly between 10 and 30.

* What are the parameters a and b?
* What is the expected value and variance?

**Work Space:**

**Problem A2: Normal Distribution Calculations**

The heights of adult women in the US are normally distributed with inches and inches.

**(a)** What is the probability that a randomly selected woman is taller than inches?

**(b)** What height represents the th percentile?

**(c)** What is the probability that a randomly selected woman has a height between and inches?

|  |
| --- |
| Tip |
| **Remember to standardize:** Convert to -scores using  For part (b), you’re looking for the value such that |

**Work Space:**

# 3. Section B: Confidence Intervals

*⏱️ Estimated time: 20 minutes*

**Problem B1: Understanding Confidence Intervals**

**(a)** Explain in your own words what a confidence interval means.

**(b)** A confidence interval for the mean weight of apples is (150g, 170g). What is the sample mean and margin of error?

**(c)** True or False: “There is a probability that the population mean lies within our calculated confidence interval.” Explain your reasoning.

**Work Space:**

**Problem B2: Constructing Confidence Intervals**

A sample of students has a mean test score of with a standard deviation of .

**(a)** Construct a confidence interval for the population mean test score.

**(b)** Interpret this interval in the context of the problem.

**(c)** What would happen to the width of the interval if:

* We increased the confidence level to ?
* We increased the sample size to ?

|  |
| --- |
| Tip |
| **Decision Guide:**   * Use -distribution when is **known** OR * Use -distribution when is **unknown** AND * For CI: |

**Work Space:**

# 4. Optional Questions

**Optional Problem: Conceptual Understanding**

**(a)** Explain the key difference between discrete and continuous random variables in terms of:

* The values they can take
* How we calculate probabilities

**(b)** Why do we use for any specific value in a continuous distribution?

**(c)** What’s the relationship between PDF and CDF for continuous distributions?

**Work Space:**

**📋 Quick Reference:**

**Common Z-values:**

* CI:
* CI: = 1.96$
* CI: = 2.576$

**Common t-values (selected):**