Worksheet 6: Hypothesis Testing Practice

One-Sample Tests & Linear Regression

PSTAT 5A

July 29, 2025

Instructions

Objectives: Practice t-tests, z-tests, and basic linear regression
Guidelines: Show all work, use $\alpha = 0.05$, round to 3 decimal places

Part I: One-Sample t-Test

Quick Reference

Use when: σ unknown **Test statistic:** $t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}}$ **df:** $n - 1$

Problem 1: Coffee Shop Claims

A coffee shop claims average wait time is 4 minutes. A sample of 8 customers shows wait times:

$$3.2, 4.5, 3.8, 4.1, 3.6, 4.3, 3.9, 4.2$$

Test if the average differs from 4 minutes.

Hypotheses: H_0: _____ H_a: _____
Sample Statistics: $\bar{x} =$ _____ $s =$ _____ $n =$ _____
Test Statistic: $t =$ _____
Critical Value(s): _____ **Decision:** _____

Part II: One-Sample z-Test

Quick Reference

Use when: σ known **Test statistic:** $z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$

Problem 2: Quality Control

A factory produces bolts with target diameter 10.0 mm. Population $\sigma = 0.15$ mm. A sample of 25 bolts has $\bar{x} = 9.94$ mm. Test if the process meets the target.

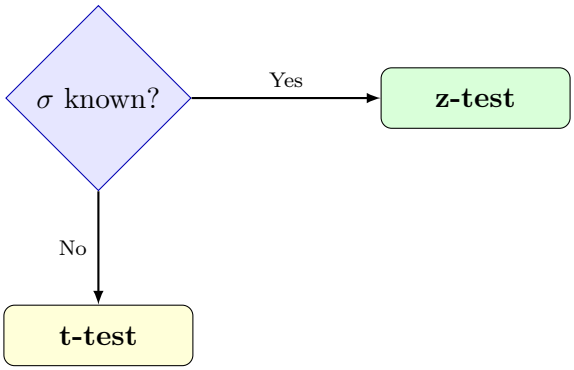
Hypotheses: H_0: _____ H_a: _____

Given: $\mu_0 =$ _____ $\sigma =$ _____ $\bar{x} =$ _____ $n =$ _____

Test Statistic: $z =$ _____

Critical Value(s): _____ **Decision:** _____

When to Use Which Test?



Part III: Linear Regression

A study examines the relationship between study hours (x) and exam scores (y) for 6 students:

Student	1	2	3	4	5	6
Hours (x)	2	4	6	8	10	12
Score (y)	65	70	80	85	90	95

Given summary statistics: $\sum x = 42$, $\sum y = 485$, $\sum x^2 = 364$, $\sum y^2 = 39,975$, $\sum xy = 3,620$

Question 1: Basic Calculations

a) Sample means: $\bar{x} =$ _____ $\bar{y} =$ _____

b) Slope: $b_1 = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2} =$ _____

c) Y-intercept: $b_0 = \bar{y} - b_1\bar{x} =$ _____

d) Regression equation: $\hat{y} =$ _____

Question 2: Interpretation

a) Predict the exam score for a student who studies 7 hours:

b) Interpret the slope in context:

Question 3: Correlation

a) Calculate correlation: $r = \frac{\sum xy - n\bar{x}\bar{y}}{\sqrt{(\sum x^2 - n\bar{x}^2)(\sum y^2 - n\bar{y}^2)}} =$ _____

b) Calculate $r^2 =$ _____ and interpret: