

HYPOTHESIS TESTING OF SINGLE MEAN AND SINGLE PROPORTION: PRACTICE 1*

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Abstract

This module provides a practice of Hypothesis Testing of Single Mean and Single Proportion as a part of Collaborative Statistics collection (col10522) by Barbara Illowsky and Susan Dean.

1 Student Learning Outcomes

- The student will explore hypothesis testing with single mean and known population standard deviation.

2 Given

Suppose that a recent article stated that the average time spent in jail by a first-time convicted burglar is 2.5 years. A study was then done to see if the average time has increased in the new century. A random sample of 26 first-time convicted burglars in a recent year was picked. The average length of time in jail from the survey was 3 years with a standard deviation of 1.8 years. Suppose that it is somehow known that the population standard deviation is 1.5. Conduct a hypothesis test to determine if the average length of jail time has increased.

3 Hypothesis Testing: Single Mean (Average)

Exercise 1

Is this a test of averages or proportions?

(Solution on p. 3.)

Exercise 2

State the null and alternative hypotheses.

(Solution on p. 3.)

a. H_o :

b. H_a :

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Exercise 3 (Solution on p. 3.)

Is this a right-tailed, left-tailed, or two-tailed test? How do you know?

Exercise 4 (Solution on p. 3.)

What symbol represents the Random Variable for this test?

Exercise 5 (Solution on p. 3.)

In words, define the Random Variable for this test.

Exercise 6 (Solution on p. 3.)

Is the population standard deviation known and, if so, what is it?

Exercise 7 (Solution on p. 3.)

Calculate the following:

- $\bar{x} =$
- $\sigma =$
- $s_x =$
- $n =$

Exercise 8 (Solution on p. 3.)

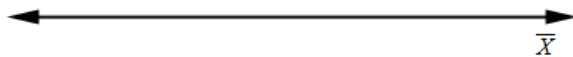
Since both σ and s_x are given, which should be used? In 1 -2 complete sentences, explain why.

Exercise 9 (Solution on p. 3.)

State the distribution to use for the hypothesis test.

Exercise 10

Sketch a graph of the situation. Label the horizontal axis. Mark the hypothesized mean and the sample mean \bar{x} . Shade the area corresponding to the p-value.



Exercise 11 (Solution on p. 3.)

Find the p-value.

Exercise 12 (Solution on p. 3.)

At a pre-conceived $\alpha = 0.05$, what is your:

- Decision:
- Reason for the decision:
- Conclusion (write out in a complete sentence):

4 Discussion Questions

Exercise 13

Does it appear that the average jail time spent for first time convicted burglars has increased? Why or why not?

Solutions to Exercises in this Module

Solution to Exercise 1 (p. 1)

Averages

Solution to Exercise 2 (p. 1)

a: $H_o : \mu = 2.5$ (or, $H_o : \mu \leq 2.5$)

b: $H_a : \mu > 2.5$

Solution to Exercise 3 (p. 2)

right-tailed

Solution to Exercise 4 (p. 2)

\bar{X}

Solution to Exercise 5 (p. 2)

The average time spent in jail for 26 first time convicted burglars

Solution to Exercise 6 (p. 2)

Yes, 1.5

Solution to Exercise 7 (p. 2)

a. 3

b. 1.5

c. 1.8

d. 26

Solution to Exercise 8 (p. 2)

σ

Solution to Exercise 9 (p. 2)

$\bar{X} \sim N\left(2.5, \frac{1.5}{\sqrt{26}}\right)$

Solution to Exercise 11 (p. 2)

0.0446

Solution to Exercise 12 (p. 2)

a. Reject the null hypothesis