

Hypothesis Tests/Confidence Intervals Word Problems

1. A government agency reports a confidence interval of (26.2, 30.1) when estimating the mean commute time (in minutes) for the population of workers in a city. Find the sample mean and the estimated margin of error.

$$\bar{x} = 28.15$$

$$\text{Margin of Error} = 1.95$$

2. From a random sample of 36 business days, the mean closing price of Apple stock was \$116.16. Assume the standard deviation is \$10.27. Construct a 90% and 95% confidence interval for the population mean. Interpret the results and compare the widths of the confidence intervals.

$$90\% \rightarrow (113.34, 118.98)$$

$$95\% \rightarrow (112.81, 119.51)$$

3. $\mu < 128$ is a claim as part of a hypothesis test. Would it have to be a null hypothesis or an alternative hypothesis? Why?

Alternative. The null hypothesis always uses the “=” sign.

4. An urban planner claims that the noontime mean traffic flow rate on a busy downtown college campus street is 35 cars per minute. Describe type I and type II errors for a hypothesis test of this claim.

Type I: Conclude the mean rate is not 35 cars/min when it is.

Type II: Conclude the mean rate is 35 cars/min when it is not.

5. A medical research team is investigating the mean cost of a 30-day supply of a heart medication. A pharmaceutical company thinks that the mean cost is less than \$60. You want to support this claim. How would you write the null and alternative hypothesis?

$$H_o: \mu = 60$$

$$H_a: \mu < 60$$

6. Find the P-value for the hypothesis test with a standardized test statistic z . Decide whether to reject the null hypothesis for the level of significance α .
 - a. Left-tailed test, $z = -1.32$, $\alpha = 0.10$
 - b. Right-tailed test, $z = 2.46$, $\alpha = 0.01$
 - c. Two-tailed test, $z = -1.68$, $\alpha = 0.05$
 - a) P-value: 0.09342 reject H_o

- b) P-value: 0.0069 reject H_0
- c) P-value: 0.092957 fail to reject H_0

7. The two intervals (114.4, 115.6) and (114.1, 115.9) are confidence intervals computed using the same sample data.
- a. What is the value of the sample mean? (Hint: Where is the confidence interval centered?)
 - b. The confidence level for one of the intervals is 90% and the other is 99%. Which is which, and how can you tell?
 - a) 115
 - b) The first interval is for 90%. A smaller confidence level yields a narrower interval width.
8. Consider the following statement for a 95% confidence interval (7.8, 9.4): There is a 95% chance that μ is between 7.8 and 9.4. Is this statement correct? Why or why not?

No. μ , the population mean, is a set value, it does not vary. The above statement implies μ is random and can change.

9. For the following pairs, indicate which do not comply with the rules for setting up hypotheses, and explain why:
- a. $H_0: \mu = 15, H_a: \mu = 15$
 - b. $H_0: \mu = 123, H_a: \mu < 123$
 - c. $H_0: \mu = 123, H_a: \mu = 125$
 - a) Does not comply, H_a can not use “=”
 - b) Complies
 - c) Does not comply. Both hypotheses needs to use the same number.
10. For each pair of P-value and significance level, state whether you would reject the null hypothesis:
- a. P-value = .084, $\alpha = .05$
 - b. P-value = .003, $\alpha = .001$
 - c. P-value = .489, $\alpha = .05$
 - d. P-value = .084, $\alpha = .10$
 - e. P-value = .039, $\alpha = .01$
 - f. P-value = .218, $\alpha = .10$
 - a) Fail to reject H_0
 - b) Fail to reject H_0
 - c) Fail to reject H_0
 - d) Reject H_0
 - e) Fail to reject H_0
 - f) Fail to reject H_0

11. The standard deviation for a population is 12.6. A sample of 36 observations selected from this population has a mean equal to 74.8. Construct a 90%, 95%, and a 99% confidence interval for μ .

90% \rightarrow (71.35, 78.54)

95% \rightarrow (70.68, 78.92)

99% \rightarrow (69.39, 80.21)

12. According to the U.S. National Center for Health Statistics, the mean hospital stay for delivery of a baby was 2.4 days in 1993. A recently taken random sample of 150 births found a mean hospital stay of 2.2 days with a standard deviation of .9 days. Find the P-value for the hypothesis test with the alternative hypothesis that the current mean time in the hospital for childbirth is less than 2.4 days.

P-value: 0.003642