

NAME:

SECTION 10.1A

Exercises

Tip: Start sketching graph of Hypothesis H_0

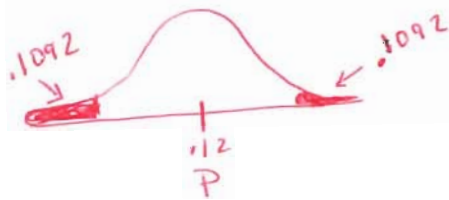
In Exercises 1 to 6, each situation calls for a significance test. State the appropriate null hypothesis H_0 and alternative hypothesis H_a in each case. Be sure to define your parameter each time.

1. Lefties Simon reads a newspaper report claiming that 12% of all adults in the United States are left-handed. He wonders if 12% of the students at his large public high school are left-handed. Simon chooses an SRS of 100 students and records whether each student is right- or left-handed.

P = proportion of lefties in his school

$H_0: P = .12$

$H_A: P \neq .12$ (the proportion of lefties is NOT 12%)



5. Cold cabin? During the winter months, the temperatures at the Colorado cabin owned by the Starnes family can stay well below freezing (32°F or 0°C) for weeks at a time. To prevent the pipes from freezing, Mrs. Starnes sets the thermostat at 50°F . The manufacturer claims that the thermostat allows variation in home temperature of $\sigma = 3^\circ\text{F}$. Mrs. Starnes suspects that the manufacturer is overstating how well the thermostat works.

σ = standard deviation of the temperature in the cabin.

$H_0: \sigma = 3$

$H_A: \sigma > 3$ (Manufacturer is overstating how well the thermostat works)



WHEN DEFINING $H_0 + H_A$ ALWAYS:

- 1 USE POPULATION parameters (P, μ)
- 2 define population parameter.

competition, the organizers estimate that the variation in distance flown by the athletes will be $\sigma = 10$ meters. An experienced jumper thinks that the organizers are underestimating the variation.

3. Attitudes The Survey of Study Habits and Attitudes (SSHA) is a psychological test that measures students' attitudes toward school and study habits. Scores range from 0 to 200. The mean score for U.S. college students is about 115. A teacher suspects that older students have better attitudes toward school. She gives the SSHA to an SRS of 45 of the over 1000 students at her college who are at least 30 years of age.

μ = mean attitude score on the SSHA for students at least 30 at the college

$H_0: \mu = 115$

$H_A: \mu > 115$ (older students have better attitudes)



- 11 Lefties Refer to Exercise 1. In Simon's SRS, 16 of the students were left-handed. A significance test yields a P-value of 0.2184. $.12 = .1092$

- (a) Interpret this result in context.
- (b) Do the data provide convincing evidence against the null hypothesis? Explain.

(a) IF THE PROPORTION OF LEFTIES AT SIMON'S SCHOOL IS REALLY .12 THERE IS A 21.84% CHANCE OF FINDING A SAMPLE OF 100 STUDENTS WITH A VALUE OF \hat{P} THAT IS AS FAR FROM .12 AS THE SAMPLE VALUE IN EITHER DIRECTION.

(b) THE HIGH P-VALUE (21.84%) DOES NOT PROVIDE CONVINCING EVIDENCE, SOMETHING THAT HAPPENS OVER 20% OF THE TIME JUST BY CHANCE WHEN H_0 IS TRUE IS NOT STRONG EVIDENCE AGAINST H_0 (WE WOULD FAIL TO REJECT H_0).

In Exercises 7 to 10, explain what's wrong with the stated hypotheses. Then give correct hypotheses.

7. Better parking A change is made that should improve student satisfaction with the parking situation at a local high school. Right now, 37% of students approve of the parking that's provided. The null hypothesis $H_0: p > 0.37$ is tested against the alternative $H_a: p = 0.37$.

THE ALTERNATE HYPOTHESIS GIVES THE CURRENT SITUATION THAN WHAT WE ARE LOOKING FOR EVIDENCE FOR

CORRECTION:

$$H_0: p = 0.37$$

$$H_a: p > 0.37$$

9. Birth weights In planning a study of the birth weights of babies whose mothers did not see a doctor before delivery, a researcher states the hypotheses as

$$H_0: \bar{x} = 1000 \text{ grams}$$

$$H_a: \bar{x} < 1000 \text{ grams}$$

THE HYPOTHESES ARE ABOUT THE SAMPLE STATISTIC (\bar{x}). You ALWAYS USE Population Parameters.

CORRECTION:

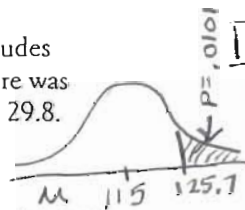
$$H_0: \mu = 1000 \text{ grams}$$

$$H_a: \mu < 1000 \text{ grams}$$

13. Attitudes In the study of older students' attitudes from Exercise 3, the sample mean SSHA score was 125.7 and the sample standard deviation was 29.8. A significance test yields a P-value of 0.0101.

(a) Interpret the P-value in context.

(b) What conclusion would you make if $\alpha = 0.05$? If $\alpha = 0.01$? Justify your answer.



15. Is this what P means? When asked to explain the meaning of the P-value in Exercise 13, a student says, "This means there is only probability 0.01 that the null hypothesis is true." Explain clearly why the student's explanation is wrong.

EITHER H_0 IS TRUE (PROBABILITY THAT H_0 IS TRUE IS 1) OR H_0 IS FALSE (PROBABILITY THAT H_0 IS TRUE IS 0)

A P-VALUE of 0.01 means that if H_0 is true, then the chance of observing a test statistic with the value we obtained or with a value that is more extreme is 1%.

- (a) If the mean score on the SSHA for older students at this school is really 115, there is a 1.01% chance of finding a sample of 45 older students with a mean score of at least 125.7.

- (b) If $\alpha = 0.05 > p\text{-value} = 0.0101$ THEN REJECT THE NULL HYPOTHESIS H_0 .

IF $\alpha = 0.01 < p\text{-value} = 0.0101$ THEN FAIL TO REJECT THE NULL HYPOTHESIS H_0