LESSON MAKER PRO

The P-Value Call

Decide what the evidence supports.

HIGH SCHOOL · S.P.3.2

S.P.3.2 "Analyze decisions about statistical significance based on reported p-values."

NAME _____ DATE _____

COMPARE AND DECIDE

The null hypothesis says there is no effect or difference. Compare the reported p-value with the significance level, α: if $p \le \alpha$, reject the null hypothesis and call the result statistically significant. If $p > \alpha$, fail to reject the null hypothesis, but do not claim that it is proven true.

WORKED EXAMPLE

A school tests whether two snack machines have different error rates. The test reports $p = 0.024$, and the significance level is $\alpha = 0.06$. Is the result statistically significant?

1. Compare the values: $0.024 < 0.06$.
2. Because p is less than α, reject the null hypothesis.
3. The result is statistically significant at $\alpha = 0.06$.

Answer: Yes. There is statistical evidence that the machines have different error rates.

PRACTICE 6 problems

1 A test reports $p = 0.03$ at $\alpha = 0.05$. Reject or fail to reject the null hypothesis?

ANSWER _____

2 A test reports $p = 0.07$ at $\alpha = 0.05$. Reject or fail to reject the null hypothesis?

ANSWER _____

3 A test reports $p = 0.01$ at $\alpha = 0.01$. State the decision and explain how equality affects it.

ANSWER _____

4 A test reports $p = 0.011$ at $\alpha = 0.01$. Reject or fail to reject the null hypothesis?

ANSWER _____

5 A test reports $p = 4.9\%$ at $\alpha = 0.05$. Write the p-value as a decimal and state the decision.

ANSWER _____

6 A test reports $p = 0.051$ at $\alpha = 0.05$. State the decision. Does it prove the null hypothesis is true?

ANSWER _____

APPLY IT Show your work

1 A student group tests whether a new study playlist increases average quiz scores compared with studying in silence. The null hypothesis says the playlist does not increase scores. The test reports $p = 0.018$ at $\alpha = 0.05$. What decision should the group make, and what does it mean here?

WORK SPACE

ANSWER _____

2 A track team tests whether a new warm-up lowers runners' average 100-meter times. The null hypothesis says the warm-up does not lower times. The test reports $p = 0.12$ at $\alpha = 0.10$. What decision should the team make? Has the test proven the warm-up has no effect?

WORK SPACE

ANSWER _____

CHALLENGE One step up

An app team tests whether a new layout changes average daily screen time and reports $p = 0.028$. At which significance levels, $\alpha = 0.01$, $\alpha = 0.05$, or $\alpha = 0.10$, should the team reject the null hypothesis? Explain why the same p-value can lead to different decisions.

WORK SPACE AND ANSWER

The P-Value Call

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A test reports p = 0.03 at α = 0.05. Reject or fail to reject the null hypothesis?	**Reject the null hypothesis.**
2	A test reports p = 0.07 at α = 0.05. Reject or fail to reject the null hypothesis?	**Fail to reject the null hypothesis.**
3	A test reports p = 0.01 at α = 0.01. State the decision and explain how equality affects it.	**Reject the null hypothesis. A result is statistically significant when p equals α.**
4	A test reports p = 0.011 at α = 0.01. Reject or fail to reject the null hypothesis?	**Fail to reject the null hypothesis.**
5	A test reports p = 4.9% at α = 0.05. Write the p-value as a decimal and state the decision.	**p = 0.049; reject the null hypothesis.**
6	A test reports p = 0.051 at α = 0.05. State the decision. Does it prove the null hypothesis is true?	**Fail to reject the null hypothesis. No, this result does not prove it is true.**

PART 2 · APPLY IT

1. **Reject the null hypothesis. There is statistical evidence that the playlist increases average quiz scores.** Since 0.018 < 0.05, the result is statistically significant. Interpret the decision using the stated claim about average scores.
2. **Fail to reject the null hypothesis. No, the test has not proven that the warm-up has no effect.** Since 0.12 > 0.10, the result is not statistically significant at this level. Insufficient evidence of an improvement is not proof of no effect.

CHALLENGE

Reject at α = 0.05 and α = 0.10, but fail to reject at α = 0.01. The p-value is no greater than the first two levels, but it is greater than 0.01. The decision depends on the chosen significance level.

Accept "statistically significant" in place of "reject the null hypothesis" when the decision is clear. Do not accept "the null hypothesis is true" for a failure to reject.