LESSON MAKER PRO

Chance or Evidence?

Use simulations to test a claim.

HIGH SCHOOL · S.IC.B.7

S.IC.B.7 "Conduct statistical investigations."

NAME _____ DATE _____

TEST A CLAIM

Simulate results using a chance model. The simulated p-value is the number of results at least as extreme as the one observed, divided by the total number of simulations. A p-value at or below the cutoff is evidence against the chance model, not proof.

WORKED EXAMPLE

A player wins all 4 games in a set. To test whether the player's win rate is above 50%, someone simulates 30 sets using a 50% win rate. Is there evidence at a 10% cutoff?

SIMULATED FOUR-GAME SETS

Wins	Sets
0 to 3	28
4	2

1. Count sets with at least 4 wins: 2.
2. Find the p-value: 2/30 = 1/15.
3. Since 1/15 < 1/10, the p-value is below the cutoff.

Answer: Yes. The simulations give evidence that the player's win rate is above 50%.

PRACTICE 4 problems

1 In 100 simulations, 3 results are at least as extreme as the observed result. Find the simulated p-value.

ANSWER _____

2 In 80 simulations, 8 results are at least as extreme as the observed result. Find the simulated p-value.

ANSWER _____

3 In 50 simulations, 4 results are at least as extreme as the observed result. Find the p-value. Is it evidence against the chance model at a 5% cutoff?

ANSWER _____

4 In 60 simulations, 6 results are at least as extreme as the observed result. Find the p-value. Is it evidence against the chance model at a 10% cutoff?

ANSWER _____

APPLY IT Show your work

1 A school randomly assigns students to two notification schedules. Students on the new schedule have higher average screen time. The table shows results after shuffling the group labels 100 times. At a 5% cutoff, is there evidence that the new schedule raises average screen time?

SHUFFLED DIFFERENCES IN AVERAGE SCREEN TIME

Compared with observed difference	Shuffles
At least as high	4
Lower	96

ANSWER _____

2 A gaming club gets heads 9 times in 12 flips and wonders if its coin favors heads. Of 80 simulated sets using a fair coin, 8 have at least 9 heads. At a 5% cutoff, is there evidence that the coin favors heads?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A spinner lands on blue 9 times in 10 spins. To test whether it is fair, count simulated results at least as far from 5 blue outcomes in either direction. Use the table to find the two-sided p-value. Is there evidence that the spinner is not fair at a 5% cutoff? Explain.

200 SIMULATIONS OF A FAIR SPINNER

Blue outcomes in 10 spins	Simulations
0 or 1	4
2 to 8	193
9 or 10	3

WORK SPACE AND ANSWER

ANSWER KEY

Chance or Evidence?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	In 100 simulations, 3 results are at least as extreme as the observed result. Find the simulated p-value.	**3/100 = 0.03**
2	In 80 simulations, 8 results are at least as extreme as the observed result. Find the simulated p-value.	**8/80 = 1/10 = 0.10**
3	In 50 simulations, 4 results are at least as extreme as the observed result. Find the p-value. Is it evidence against the chance model at a 5% cutoff?	**4/50 = 0.08. No, 0.08 is above 0.05.**
4	In 60 simulations, 6 results are at least as extreme as the observed result. Find the p-value. Is it evidence against the chance model at a 10% cutoff?	**6/60 = 0.10. Yes, 0.10 is at the cutoff.**

PART 2 · APPLY IT

1. **Yes. The simulated p-value is 4/100 = 0.04, below 0.05.** Four of the 100 shuffled differences are at least as high as the observed difference. Compare 0.04 with the 0.05 cutoff.
2. **No. The simulated p-value is 8/80 = 0.10, above 0.05.** Divide 8 by 80 to get 0.10. This does not meet the 0.05 cutoff.

CHALLENGE

The two-sided p-value is (4 + 3)/200 = 7/200 = 0.035. Yes, 0.035 is below 0.05, so the simulations give evidence that the spinner is not fair.

Accept equivalent fractions or decimals. Conclusions should describe evidence, not proof.