LESSON MAKER PRO

Spot the Pattern

Compare groups in observational studies

HIGH SCHOOL · S.IC.B.7.a

S.IC.B.7.a "Conduct observational studies."

NAME _____ DATE _____

COMPARE GROUP RATES

In an observational study, you record what people already do instead of assigning them to groups. For each group, divide the number with the outcome by that group's total, then compare the rates. A difference shows an association in the sample, but it does not prove that one behavior caused the outcome.

WORKED EXAMPLE

A survey records how students travel to school and whether they arrive before the first bell. What percent of each group arrives early, and what is the difference in percentage points?

TRAVEL AND ARRIVAL SURVEY

Travel group	Arrived early	Total
Bicycle	21	28
Other travel	14	28

1. Bicycle group: 21/28 = 3/4 = 75%.
2. Other travel group: 14/28 = 1/2 = 50%.
3. Difference: 75% - 50% = 25 percentage points.

Answer: 75% of the bicycle group and 50% of the other group arrived early. The bicycle group's rate was 25 percentage points higher.

PRACTICE 6 problems

1 Students report whether they ate breakfast and felt alert in first class. What fraction of the students who ate breakfast felt alert? Write your answer in simplest form.

BREAKFAST AND ALERTNESS

Breakfast	Felt alert	Total
Ate breakfast	18	24
Skipped breakfast	9	18

ANSWER _____

2 A survey records whether students use a planner and submit an assignment on time. What percent submitted on time in each group?

PLANNER SURVEY

Planner use	On time	Total
Uses a planner	12	16
Does not use one	9	20

ANSWER _____

3 Observers record whether students visit the library after school and finish a study guide. By how many percentage points do the completion rates differ?

LIBRARY VISITS AND STUDY GUIDES

Library visit	Finished guide	Total
Visited	16	20
Did not visit	10	20

ANSWER _____

4 A survey asks whether students have a part-time job and take the bus to school. Which group has a higher bus-riding rate, and by how many percentage points?

JOBS AND BUS RIDES

Part-time job	Takes bus	Total
Has a job	6	12
Does not have a job	12	30

ANSWER _____

5 Student council surveys students about a weekend event and whether they posted about it. What percent of students who did not attend posted about the event?

EVENT SURVEY

Attended event	Posted about it	Total
Attended	18	30
Did not attend	9	36

ANSWER _____

6 Students report whether they study with music and score at least 80% on a quiz. Find the difference between the groups' scoring rates in percentage points. Do these data prove that music improves scores?

MUSIC AND QUIZ SCORES

Studies with music	Scored at least 80%	Total
Yes	16	20
No	12	20

ANSWER _____

APPLY IT Show your work

1 A student wants to study whether charging a phone outside the bedroom is associated with arriving at school on time. The table shows results from a student survey. Find each group's on-time rate and the difference in percentage points. Then describe how you could select students for a new observational study without telling them where to charge their phones.

PHONE CHARGING AND ARRIVAL

Usual charging spot	On time	Total
Outside bedroom	18	30
In bedroom	12	30

ANSWER _____

2 A school surveys students about whether they saw a social media post advertising a school game and whether they attended. Compare the attendance rates. Does the survey show that seeing the post caused students to attend? Give one other possible reason for the association.

GAME POST AND ATTENDANCE

Saw the post	Attended game	Total
Yes	24	40
No	10	40

ANSWER _____

CHALLENGE One step up

A school records whether students play a school sport and pass a course. Calculate the overall passing rate for each sports group, combining both grades. Then explain why comparing only the overall rates could be misleading. Do these data show that playing a sport causes students to pass?

SPORTS AND COURSE RESULTS

Grade	Plays sport: passed/total	Does not play: passed/total
Seniors	4/5	15/20
First-year students	8/20	1/4

WORK SPACE AND ANSWER

ANSWER KEY

Spot the Pattern

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Students report whether they ate breakfast and felt alert in first class. What fraction of the students who ate breakfast felt alert? Write your answer in simplest form.	**3/4**
2	A survey records whether students use a planner and submit an assignment on time. What percent submitted on time in each group?	**Planner users: 75%. Nonusers: 45%.**
3	Observers record whether students visit the library after school and finish a study guide. By how many percentage points do the completion rates differ?	**30 percentage points**
4	A survey asks whether students have a part-time job and take the bus to school. Which group has a higher bus-riding rate, and by how many percentage points?	**Students with a part-time job, by 10 percentage points.**
5	Student council surveys students about a weekend event and whether they posted about it. What percent of students who did not attend posted about the event?	**25%**
6	Students report whether they study with music and score at least 80% on a quiz. Find the difference between the groups' scoring rates in percentage points. Do these data prove that music improves scores?	**20 percentage points. No, the observational data do not prove that music improves scores.**

PART 2 · APPLY IT

1. **Outside bedroom: 60%. In bedroom: 40%. Difference: 20 percentage points. For a new study, randomly select students from the school roster and ask about their usual charging spot and arrival time without assigning either behavior.** Compute 18/30 = 60% and 12/30 = 40%, then subtract to get 20 percentage points. The proposed study observes students' existing habits rather than assigning a charging spot.
2. **The attendance rates were 60% for students who saw the post and 25% for those who did not, a difference of 35 percentage points. The survey does not show causation. Students already interested in attending may have been more likely to see the post.** Divide 24 and 10 by their group totals of 40, then compare 60% and 25%. Because students were not assigned to see the post, another factor could explain the difference.

CHALLENGE

Sport group: 12/25 = 48%. No-sport group: 16/24 = 66 2/3%. Within each grade, the sport group has a higher passing rate, but the sport group includes more first-year students, whose passing rates are lower in both groups. Comparing only the overall rates hides this grade-level difference. The observational data do not show that playing a sport causes students to pass.

Accept equivalent fractions and percentages when exact. For the written responses, accept other plausible explanations for an association and sampling plans that observe existing behavior without assigning it.