

Link or Cause?

Tell what data can, and cannot, prove.

HIGH SCHOOL • MA.912.DP.1.3

MA.912.DP.1.3 "Explain the difference between correlation and causation in the contexts of both numerical and categorical data."

NAME _____

DATE _____

ASSOCIATION IS NOT PROOF

Correlation describes a pattern between two numerical variables. For categorical data, use association when group percentages differ. Neither pattern proves causation unless a well-designed experiment controls other influences.

WORKED EXAMPLE

A team records practice hours of 1, 2, and 3 and shots made of 4, 6, and 8. What can the team conclude?

1. As practice hours rise, shots made rise.
2. The variables have a positive correlation.
3. Other factors, such as coaching or prior skill, could affect shots made.

Answer: There is a positive correlation, but the data do not prove that practice caused more shots made.

PRACTICE 5 problems

- 1** In a survey, 12 of 20 band students and 6 of 20 non-band students report enjoying school. Is there an association between band membership and enjoying school?

ANSWER _____

- 2** As the temperature rises from 50 to 70 to 90 degrees, a store sells 2, 5, and 8 bottles of water. Describe the correlation.

ANSWER _____

- 3** Students who sleep more often earn higher grades in an observational study. Name one possible third variable.

ANSWER _____

- 4** A researcher randomly assigns 24 students to use either a review app or paper notes before the same quiz. Can the researcher compare the methods for a causal effect?

ANSWER _____

- 5** Ice cream sales and sunburn cases both increase in summer. Does this prove that ice cream causes sunburn?

ANSWER _____

APPLY IT Show your work

- 1** A student council survey finds that students who report more hours of social media use also report fewer hours of sleep. The council says social media use causes less sleep. Is that claim justified? Explain.

WORK SPACE

ANSWER _____

- 2** A teacher randomly assigns 30 students to study with music and 30 students to study in silence. Both groups take the same vocabulary quiz. The music group has a higher average score. What conclusion is supported?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A school survey shows that students in clubs are more likely to report high grades than students not in clubs. Later, a random experiment gives some students a weekly study-planning session and others no session. The session group earns higher grades. Which result supports causation, and why?

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	In a survey, 12 of 20 band students and 6 of 20 non-band students report enjoying school. Is there an association between band membership and enjoying school?	Yes. The percentages differ: 12/20 versus 6/20, so there is an association.
2	As the temperature rises from 50 to 70 to 90 degrees, a store sells 2, 5, and 8 bottles of water. Describe the correlation.	There is a positive correlation between temperature and water sales.
3	Students who sleep more often earn higher grades in an observational study. Name one possible third variable.	Study time is one possible third variable.
4	A researcher randomly assigns 24 students to use either a review app or paper notes before the same quiz. Can the researcher compare the methods for a causal effect?	Yes. Random assignment allows the researcher to investigate whether the method caused a difference in quiz scores.
5	Ice cream sales and sunburn cases both increase in summer. Does this prove that ice cream causes sunburn?	No. Summer weather or time spent outside could affect both variables.

PART 2 • APPLY IT

- No. The survey shows a negative correlation, not causation. A factor such as homework load could affect both social media use and sleep.** This is observational data, so it can show a relationship but cannot rule out other variables.
- The teacher can conclude that studying with music caused a higher average quiz score for these students under these conditions.** Random assignment makes the groups comparable, so a difference in averages can support a causal conclusion.

CHALLENGE

The random experiment supports causation because students were assigned to groups. The club survey shows only an association because factors such as motivation may affect both club participation and grades.

Accept equivalent wording for positive or negative correlation and association. For third variables, accept any reasonable factor that could influence both variables.