# Association Is Not Causation



Association is not causation. For each pattern, ask: coincidence, a lurking variable, or a real cause?

Name _____ Date _____

## Words we use

say the math word, then the plain English

| WORD | PLAIN ENGLISH | WHAT YOU DO |
|---|---|---|
| Association | A pattern between two quantities. | See it in a scatter plot. |
| Correlation | How strong the straight-line pattern is, measured by r. | It measures a pattern, not a reason. |
| Causation | One thing actually makes the other happen. | Needs a real reason and, to be sure, an experiment. |
| Lurking variable | A hidden third quantity that affects both. | Ask: what else could be driving both? |
| Coincidence | A pattern that happened by chance. | Ask: is there any possible connection? |
| Experiment | A planned test with randomly assigned groups: the way to show cause. | Change one thing, keep everything else the same. |

## Part A Three words

| WORD | WHAT IT MEANS, IN YOUR OWN WORDS |
|---|---|
| Association | |
| Correlation | |
| Causation | |
| Lurking variable | |

## Part B Cause, or just connected?

| STORY | CAUSE, OR JUST CONNECTED | REASON OR LURKING VARIABLE |
|---|---|---|
| More hours under a grow light, taller plant | | |
| More ice cream shops, more sunburns | | |
| More cars owned, longer life | | |
| Longer Spelling Bee word, more spider deaths | | |
| More miles on a car, lower price | | |

Bigger shoe size, better reading (children)

More firefighters, more fires (cities)

## Part C Larry

1. Larry learns that people who own more cars tend to live longer, and decides to buy another car. What is wrong with his reasoning?



2. Name a lurking variable and explain how it could lead to both.

## Part D Showing cause

1. A study finds r = 0.95 between two quantities. Does that prove one causes the other? Why or why not?

2. A company says its plant food makes tomato plants taller. Describe an experiment that could show it.

## Part E Defend your pair

1. Name two variables where one really does cause the other.

2. Defend it: what is the reason, and how could you test it?

## Part F Exit ticket

1. What is the difference between association and causation?

2. Ice cream sales and sunburns rise together. What is going on?

3. What do you need to show that one thing really causes another?

## Answer key

Part A. Association: a pattern between two quantities. Correlation: how strong the straight-line pattern is. Causation: one thing makes the other happen. Lurking variable: a hidden third quantity that affects both.

Part B. Cause (light drives growth). Just connected (sunny weather). Just connected (money). Just connected (coincidence). Cause (wear lowers value). Just connected (age). Just connected (size of the city).

Part C. 1. He treated an association as a cause. 2. Money: wealthier people can buy more cars and also have better food, housing, and health care.

Part D. 1. No. r measures the strength of a straight-line pattern; coincidence or a lurking variable could explain it. 2. Similar plants, put into two groups at random, plant food for one group only, everything else the same, then compare heights.

Part E. Answers vary. A good answer names a clear way one thing makes the other happen and an experiment that could test it. Example: hours a candle burns and the height it loses.

Part F. 1. Association: they move together. Causation: one makes the other happen. 2. A lurking variable, hot sunny weather, causes both. 3. A carefully designed experiment with randomly assigned groups.