MATHEMATICS · GRADES 7-9

Correlation Versus Causation

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you tell the difference between two things happening together and one causing the other. Ice cream sales and sunburns both rise in summer, but ice cream does not cause sunburn, the hot sun causes both. Mixing the two up leads to bad decisions, like banning ice cream to prevent sunburn. Spotting the difference keeps you from being fooled by a headline that claims one thing causes another.



Rule

Correlation does not prove causation.

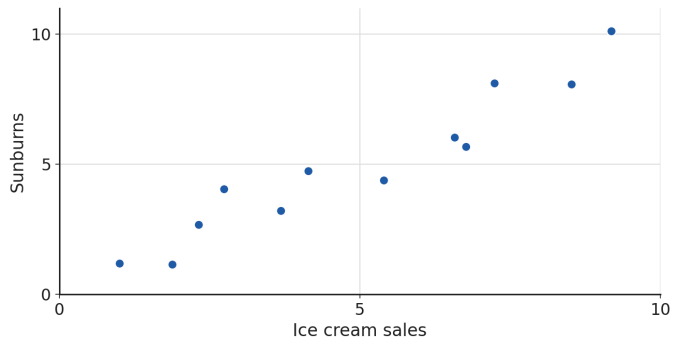
Two things changing together does not mean one causes the other. A third factor may cause both, so you need a direct link, not just a pattern, before you claim a cause.

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Worked examples

EXAMPLE 1

Q Ice cream sales and sunburns rise together in summer. Does ice cream cause sunburns?



SOLUTION

Check: do they change together? Yes, both rise in summer.

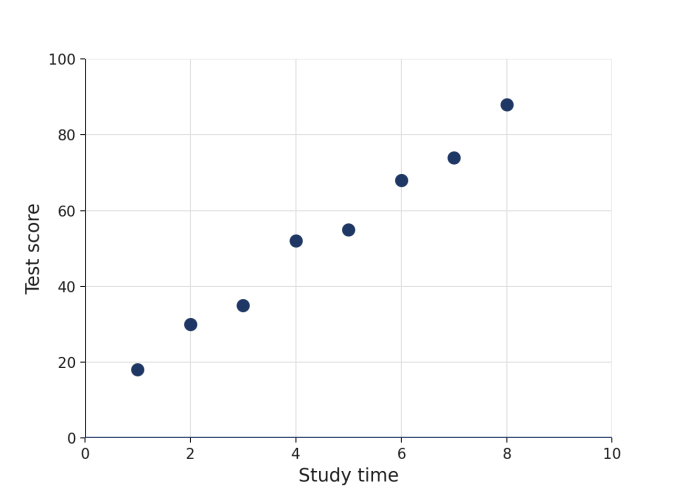
Check for a cause: is there a direct link from ice cream to sunburns? No.

No. Summer heat is a third factor. This is correlation, not causation.

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EXAMPLE 2

Q Studying more is linked to higher scores, and studying can directly build knowledge. Is causation plausible?



SOLUTION

They change together: more study, higher scores.

There is a direct mechanism: studying builds knowledge.

Yes, causation is plausible here, though other factors may also matter.

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Practice questions

1 **Sunglasses sold and ice cream sales both rise over the summer months. Does eating ice cream cause people to buy sunglasses? Answer yes or no, and name the third factor.**

- **A** No, summer heat
- **B** Yes, ice cream causes people to buy sunglasses.
- **C** No, the price of sunglasses
- **D** No, the number of shops

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2

Ice cream sales and drownings both rise over the summer months. What is the likely third factor?

A Summer, or warm weather

B The number of ice cream shops

C The price of ice cream

D The time of day

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3

Umbrellas sold and rainfall both rise over four months. Do umbrellas cause rain? Answer yes or no.

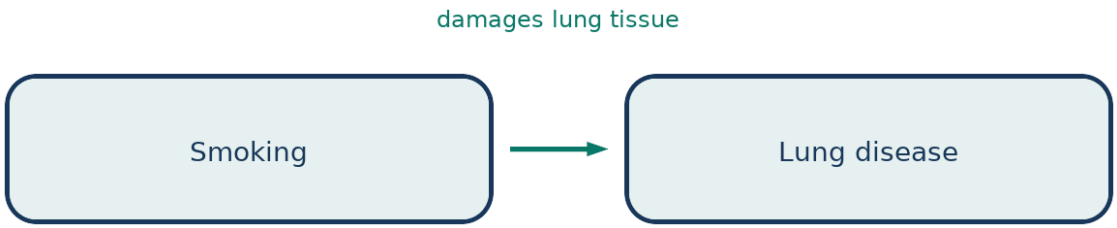
A Yes

B No

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4 **The arrow diagram links smoking to lung disease, and the arrow is labelled with the mechanism. Is causation plausible? Give the reason shown on the arrow.**



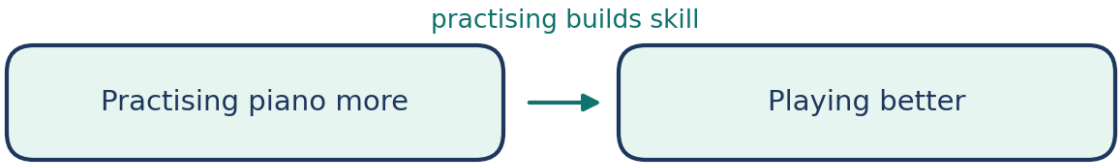
- **A** Yes, smoking damages lung tissue directly
- **B** Yes, smoking causes lung disease because smokers are older
- **C** No, lung disease causes smoking
- **D** Yes, smoking makes people exercise less

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5

The arrow diagram links practising piano more to playing better. What extra evidence would best support that practising causes better playing?



A Piano players own more pianos

B Beginners who practised improved more than beginners who did not

C Good players practise more

D Pianos cost more than before

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6

Children with bigger feet read better than children with smaller feet. Why does age explain this link?

A Older children have bigger feet and have had more reading practice

B Big feet help children hold books

C Reading makes feet grow

D Older children wear bigger shoes

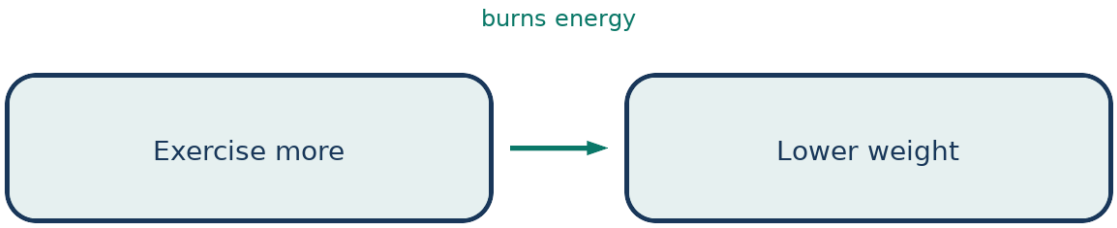
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7

The arrow diagram links exercising more to lower weight. What does the arrow mean?



A Exercising more causes lower weight

B Lower weight causes more exercise

C Exercise and weight are unrelated

D Weight causes exercise

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8

A town with more churches also has more crime. What mistake is it to say the churches cause the crime?

A Mixing up correlation and causation

B Measuring the town wrong

C Counting churches twice

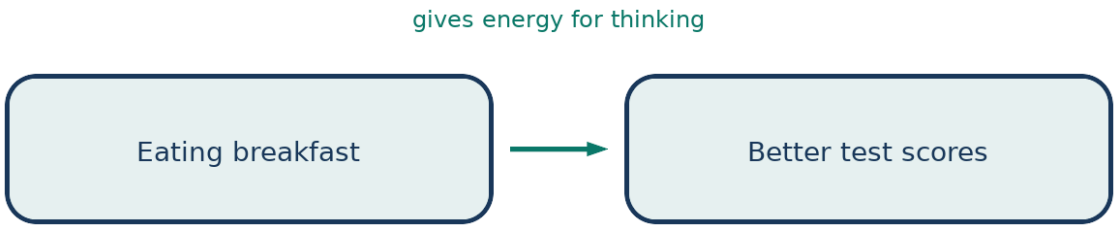
D Asking too few people

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9 **The arrow diagram links eating breakfast to better test scores. Which of these is a third factor that could also explain why breakfast eaters score higher?**



- **A** They get more sleep
- **B** Breakfast gives energy for thinking directly
- **C** They eat breakfast at school
- **D** They like mornings

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10 **Two quantities rise together over time. Is that proof that one causes the other? Answer yes or no.**

- **A** Yes
- **B** No

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ANSWER KEY

1. No, summer heat

2. Summer, or warm weather

3. No

4. Yes, smoking damages lung tissue directly

5. Beginners who practised improved more than beginners who did not

6. Older children have bigger feet and have had more reading practice

7. Exercising more causes lower weight

8. Mixing up correlation and causation

9. They get more sleep

10. No

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