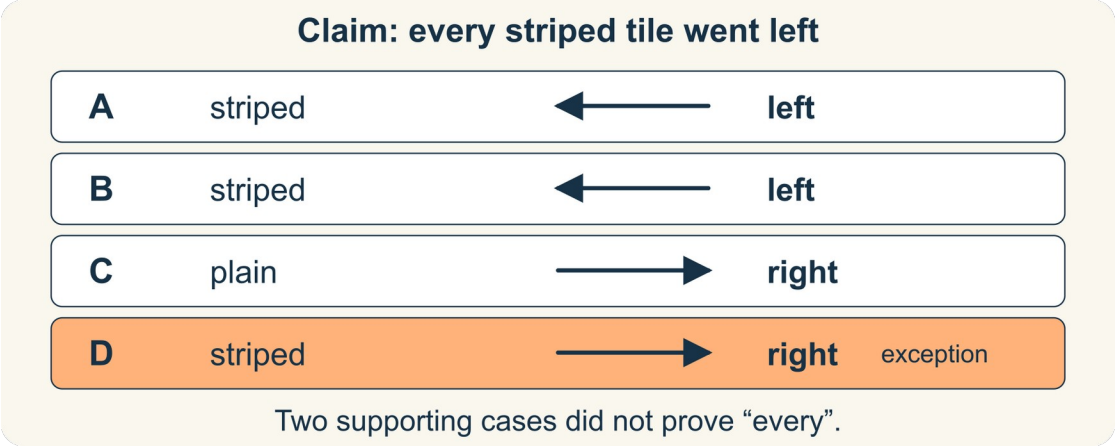
A claim a reason and a question

What would make an invented explanation stronger or weaker?

Use four invented machine records to separate a claim, its supporting reason and the question that could change it.

Investigate | 15–25 minutes, or one comparison | Paper and a pen or pencil, The supplied model; no purchase, account or internet connection needed

Start here Copy this fictional record: striped tile A went left; striped tile B went left; plain tile C went right. The machine is only a drawing.



Four records, one over-wide claim

1 Name the claim

Write: “Every striped tile goes left.” Underline “every”. This claims more than the three listed records: it covers striped tiles not yet shown.

2 Give the reason accurately

A and B support the claim because both are striped and went left. C says something about a plain tile, so it does not settle what every striped tile does.

3 Use a new supplied record

Now add invented tile D: striped, went right. Check whether it belongs to the claim’s category and whether its result conflicts. D does both, so the “every” claim fails for this record set.

4 Revise and ask

A defensible replacement is: “A and B went left; D did not.” Ask what feature or rule might explain the different result. Do not invent an unseen mechanism as an established fact.

A reason can support a claim without proving it

A, B, C and D are constructed examples, not observations from a real machine.

• Before D: A and B are positive cases, but checking two striped tiles does not establish an unrestricted “every” claim.

• After D: a striped tile went right. One genuine conflicting case defeats the claim as stated.

• Revised report: 2 of the 3 supplied striped tiles went left. That is a description of these records, not a prediction for all possible tiles.

What this example can show Changing a claim to fit records is different from discovering why the records occurred. The hidden rule remains unspecified.

A different way

Compare A and D only, or use two columns headed “claim” and “record”. Someone may read or scribe; no personal belief needs discussing.

If you want to go further

Construct a different rule that fits all four records. Explain why fitting them still does not prove it is the machine’s actual rule.

Something to notice

Did I change my confidence because of evidence, or quietly change what my claim meant?

Read or explore more

Horizon topic Knowledge Evidence

https://launchhorizonhq.com/learn/knowledge-evidence/

Horizon topic Arguments Logic

https://launchhorizonhq.com/learn/arguments-logic/

Horizon topic Philosophy

https://launchhorizonhq.com/learn/philosophy/

The Philosophy Foundation Knowledge

https://www.philosophy-foundation.org/enquiries/view/knowledge

Lancaster University 3.5 Counterexamples - MATH111: Numbers and Relations

https://www.lancaster.ac.uk/~prendivs/accessible/math111/doth3.S5.html

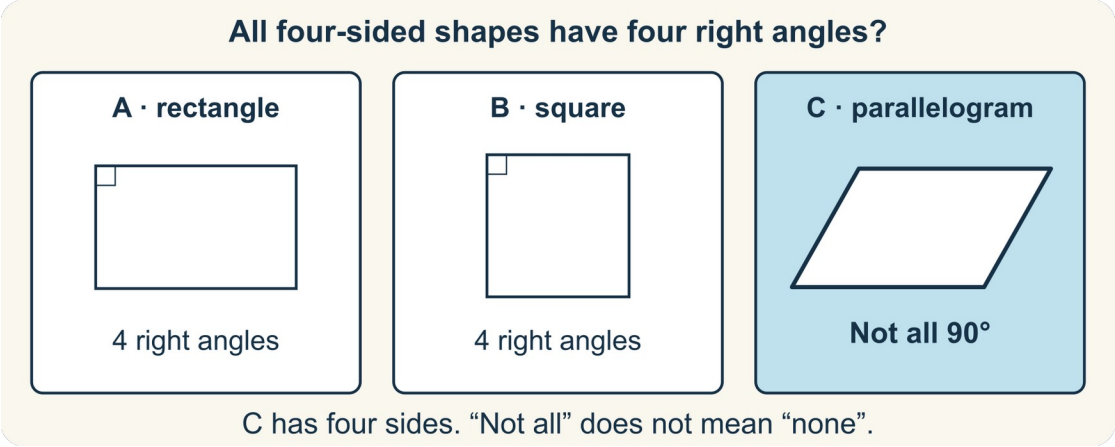
Find a shape that breaks a rule

What can one clear counterexample show about an ‘all’ claim?

Check an “all” claim with three constructed shape cards, then write exactly what one exception establishes.

Investigate | 15–25 minutes, or one comparison | Paper and a pen or pencil, The supplied model; no purchase, account or internet connection needed

Start here Draw A as a rectangle, B as a square and C as a slanted parallelogram. Keep all three closed and four-sided.



A four-sided exception

1 State the rule to test

Use this claim: “All four-sided shapes have four right angles.” A right angle is 90°. The claim concerns every quadrilateral, not just rectangles.

2 Sort support and contradiction

A and B fit the claim. C has two pairs of parallel sides but slanted corners, so not all of its angles are right angles. It still has four sides, so it is a relevant counterexample.

3 Repair the scope

A true narrower statement is: “Rectangles have four right angles.” Squares are rectangles with equal sides. The change is to the named category, not to the shape C.

4 Say what has not followed

C does not show that no quadrilateral has right angles: A and B already do. Keep “not all” separate from “none”.

One exception is enough for an all claim

These three original drawings are examples chosen to test the stated rule.

• A rectangle and B square both have four right angles. Two fitting examples cannot establish the universal claim.

• C is a parallelogram with oblique, not right, corners. It is four-sided, so it falls inside the claim but fails its stated property.

• Conclusion: not every quadrilateral has four right angles. This says nothing about how common each shape is.

What this example can show A sketch must show the intended properties clearly. A triangle would be irrelevant here because it has only three sides.

A different way

Use only A and C, or trace the four sides while someone labels the corners. Pointing to a relevant exception is enough.

If you want to go further

Test "All rectangles are squares." Construct a rectangle with unequal adjacent sides and state why the reverse category relationship does not hold.

Something to notice

Have I shown both that my example belongs to the category and that the claimed property fails?

Read or explore more

Horizon topic Categories Counterexamples

https://launchhorizonhq.com/learn/categories-counterexamples/

Horizon topic Concepts Definitions

https://launchhorizonhq.com/learn/concepts-definitions/

Horizon topic Philosophy

https://launchhorizonhq.com/learn/philosophy/

Lancaster University 3.5 Counterexamples - MATH111: Numbers and Relations

https://www.lancaster.ac.uk/~prendivs/accessible/math111/doth3.S5.html

NRICH, University of Cambridge Completing Quadrilaterals

https://nrich.maths.org/problems/completing-quadrilaterals

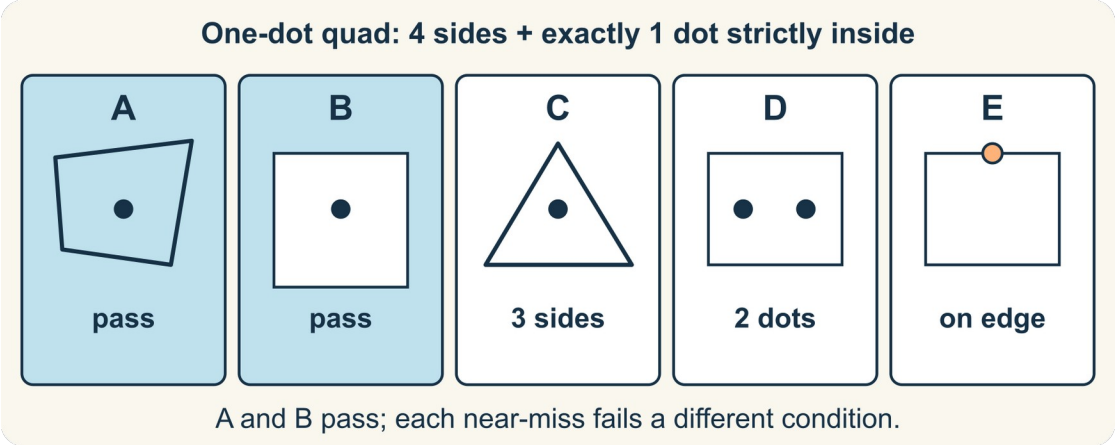
A definition that needs revising

When does an invented category become too broad or too narrow?

Invent a precise category for five supplied shape cards, including a boundary case. Your definition must tell another reader what to do.

Make | 15–25 minutes, or one comparison | Paper and a pen or pencil, The supplied model; no purchase, account or internet connection needed

Start here Call the target category "one-dot quad". Card A is an irregular quadrilateral with one dot inside; B is a square with one dot inside. These are your intended examples.



Which condition does each card fail?

1 Add three near-misses

C is a triangle with one inside dot. D is a rectangle with two inside dots. E is a rectangle with one dot centred on its top edge. These are deliberately different cases.

2 Test a broad definition

"A shape with a dot" wrongly includes C, D and E. It does not state side count, exact dot count or whether an edge counts as inside.

3 Test a narrow definition

"A square with one inside dot" keeps B but wrongly excludes intended example A. A definition can exclude something you meant to include as well as include too much.

4 Write the working definition

For this game use: "A closed four-sided shape with exactly one dot strictly inside." Apply it again: A and B pass; C, D and E do not. "Strictly inside" excludes the boundary.

A definition is a usable membership rule

All five cards and the category name are invented for this activity.

• A and B are intended members even though their side lengths and angles differ.

• The final rule requires four sides, exactly one dot and an interior position. Each requirement removes a different near-miss.

• C fails side count; D fails exact dot count; E fails the strictly-inside condition.

What this example can show This is a locally invented category, not a new official geometry term. Agreeing a rule is different from proving that a word has always meant it.

A different way

Compare only A, B and C first. Cards may be described aloud, enlarged or marked by a scribe; drawing neatness is irrelevant.

If you want to go further

Add a four-sided outline with a curved side and decide whether your use of “side” needs clarification. State any revised convention before sorting it.

Something to notice

Which single word in my definition changed a card’s membership?

Read or explore more

Horizon topic Concepts Definitions

https://launchhorizonhq.com/learn/concepts-definitions/

Horizon topic Questions Assumptions

https://launchhorizonhq.com/learn/questions-assumptions/

Horizon topic Analogy Comparison

https://launchhorizonhq.com/learn/analogy-comparison/

NRICH, University of Cambridge Completing Quadrilaterals

https://nrich.maths.org/problems/completing-quadrilaterals

NRICH, University of Cambridge Guess My Quad

https://nrich.maths.org/problems/guess-my-quad