

CUT & GLUE SORT

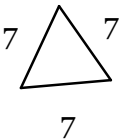
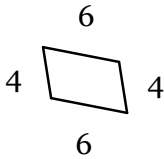
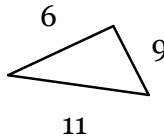


INDUCTIVE REASONING, CONJECTURE AND COUNTEREXAMPLE

Counterexample, Agrees, or Not About It?

12 claims and cases · 3 rows · check 1 first

FREE

A Claim: If a shape is a triangle, then exactly one of its sides is the longest. Case: the shape below. 	B Claim: If a whole number is a multiple of 3, then it is odd. Case: the number 9.	C Claim: If a whole number is a multiple of 4 and a multiple of 6, then it is a multiple of 24. Case: the number 8.	D Claim: If a number is not zero, then half of it is smaller than the number. Case: the number 10. Half of 10 is 5.
E Claim: If a whole number is a multiple of 4 and a multiple of 6, then it is a multiple of 24. Case: the number 36.	F Claim: If a shape is a triangle, then exactly one of its sides is the longest. Case: the shape below. 	G Claim: If a whole number is a multiple of 3, then it is odd. Case: the number 6.	H Claim: If a shape is a triangle, then exactly one of its sides is the longest. Case: the shape below. 
I Claim: If a number is not zero, then half of it is smaller than the number. Case: the number 0. Half of 0 is 0.	J Claim: If a whole number is a multiple of 4 and a multiple of 6, then it is a multiple of 24. Case: the number 48.	K Claim: If a whole number is a multiple of 3, then it is odd. Case: the number 10.	L Claim: If a number is not zero, then half of it is smaller than the number. Case: the number -4. Half of -4 is -2.

Cut & Glue Sort — how to run it

25 minutes, including the cutting

1. **Hand out pages 3 and 4**, one of each per student. Also hand out scissors and glue.
2. **Say this once:** *“Check 1 first: does the case fit the if part? If it does not, the claim is not about it, even when the then part is false.”*
3. **Every row gets 4 pieces.** A row with more or fewer has a piece in the wrong place.

Student sheets pages 3 and 4, one of each per student. The two checks are printed on page 3.
Answers page 5.

The third row is the most important one. A case that does not fit the if part says nothing about the claim. The four pieces there all have a false then part on purpose: 8, a four-sided shape with two longest sides, 0, 10. A student who skips check 1 puts them all in the first row and gets only eight of the twelve pieces right. This is the most common wrong counterexample.

Each claim has one piece in every row, so the words of a claim never decide the row. Two things need a note. The claim “If a number is not zero ...” leaves 0 out, so 0 is not about it. Its counterexample is -4 , because half of -4 is -2 , which is bigger. The shape pieces are judged by their printed side lengths, not by how the drawing looks.

Do not accept “it is just a special case”. A piece in the first row shows that its claim is false. One case is enough.



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Counterexample or not?

Claims and cases

Name _____

Period _____

Date _____

A counterexample passes two checks. Check 1: the case fits the *if* part of the claim. **Check 2:** for this case, the *then* part is false. Both checks: it is a counterexample. If check 1 fails, the claim is not about this case.

One case can show that a claim is false. No number of cases can show that it is true.

Cut out the twelve pieces on the next page. Each piece has a claim and a case. Decide: is the case a counterexample to the claim on the piece? Do check 1 first. Then glue the piece into the matching row.

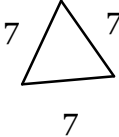
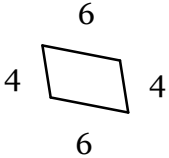
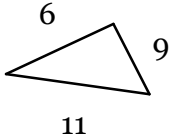
Correct: it is a counterexample. *The case fits the if part, and the then part is false for it.*

Wrong: it agrees with the claim. *The case fits the if part, and the then part is true for it.*

Wrong: the claim is not about this case. *The case does not fit the if part.*

The twelve pieces

Cut along the dotted lines

A Claim: If a shape is a triangle, then exactly one of its sides is the longest. Case: the shape below. 	B Claim: If a whole number is a multiple of 3, then it is odd. Case: the number 9.	C Claim: If a whole number is a multiple of 4 and a multiple of 6, then it is a multiple of 24. Case: the number 8.	D Claim: If a number is not zero, then half of it is smaller than the number. Case: the number 10. Half of 10 is 5.
E Claim: If a whole number is a multiple of 4 and a multiple of 6, then it is a multiple of 24. Case: the number 36.	F Claim: If a shape is a triangle, then exactly one of its sides is the longest. Case: the shape below. 	G Claim: If a whole number is a multiple of 3, then it is odd. Case: the number 6.	H Claim: If a shape is a triangle, then exactly one of its sides is the longest. Case: the shape below. 
I Claim: If a number is not zero, then half of it is smaller than the number. Case: the number 0. Half of 0 is 0.	J Claim: If a whole number is a multiple of 4 and a multiple of 6, then it is a multiple of 24. Case: the number 48.	K Claim: If a whole number is a multiple of 3, then it is odd. Case: the number 10.	L Claim: If a number is not zero, then half of it is smaller than the number. Case: the number -4. Half of -4 is -2.



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Cut & Glue Sort — answers

For the teacher

Correct: it is a counterexample.	A — a triangle with three longest sides	E — $36 = 4 \times 9 = 6 \times 6$, and 36 is not a multiple of 24	G — 6 is a multiple of 3 and is even	L — half of -4 is -2 , and -2 is bigger than -4
Wrong: it agrees with the claim.	B — 9 is a multiple of 3 and is odd	D — 5 is smaller than 10	H — one longest side, 11	J — $48 = 24 \times 2$
Wrong: the claim is not about this case.	C — 8 is not a multiple of 6	F — four sides: not a triangle	I — the claim leaves out 0	K — 10 is not a multiple of 3