

# Counterexample

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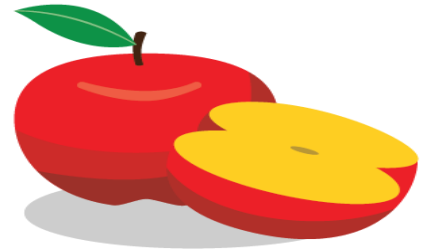
A counterexample is used to check the validity of an argument. Consider the following statement: If a food is a fruit, then it is an apple. Now, consider this statement: Mango is a food. It is a fruit, but it is not an apple. Therefore, the mango is the counterexample, thereby making the first statement invalid.

Counterexamples are used in math to contradict a statement. Counterexamples are used to prove the limitations of possible theorems.

**If a food is a fruit, then it is an Apple** → **Statement**

**Condition**

**Conclusion**



**Condition is true but conclusion is false.**

**Mango is a counter example.**

**Mango is a fruit but not an Apple.**

## What is a Counterexample?

### Counterexample Definition

A counterexample is an example that meets the mathematical statement's condition but does not lead to the statement's conclusion.

### Counterexample Math

Instead of showing that the statement is true, we show that the statement is false using the counterexample.

Consider this situation where a teacher asks Benny about prime numbers

Teacher: Hey Benny, do you know about [prime numbers](#)?

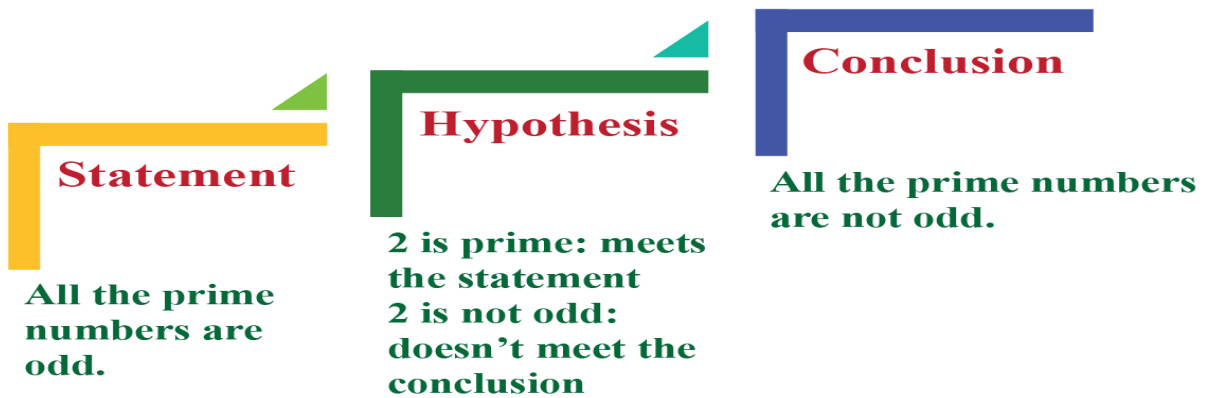
Benny: Prime numbers are those numbers that are divisible by 1 and itself only.

Teacher: You are right! They cannot be factored further. What else can you say about the prime numbers?

Benny: All the prime numbers are odd.

Ron: But the prime number 2 is even.

Teacher: 2 is a prime number. It meets the statement but does not meet the conclusion that it is odd. Thus 2 is the counterexample.



**2 is the counterexample**

Thus, the counterexample helps us in disproving the mathematical conjectures.