

Geometry Lesson 14

Objective: TSW disprove conjectures with counterexamples.

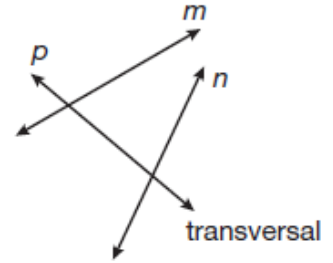
Consider the simple conjecture given below.

If two lines are both intersected by a transversal, then they are parallel.

This conjecture is false: two lines do not have to be parallel to be intersected by a transversal. A simple way to prove that this statement is not true is to use a counterexample.

_____ - An example that proves a conjecture or statement false.

For example, the diagram shows a pair of lines that are not parallel, but they are intersected by a transversal. It disproves the statement given above because it gives a specific example where the statement is *not* true. To construct a counterexample, find a situation where the hypothesis of the statement is _____ but the conclusion is _____.



Example 1 Finding a Counterexample to a Geometric Conjecture

Use the conjecture to answer a and b.

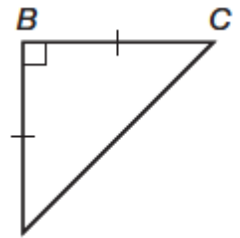
If a triangle is isosceles, then it is acute.

a. What is the hypothesis of the conjecture? What is its conclusion?

SOLUTION

b. Find a counterexample to the conjecture.

SOLUTION



Math Reasoning

Model Is there another kind of triangle that could be a counterexample to this statement?

Not all conjectures are geometric. Counterexamples can be used to disprove _____ conjectures or any other kind of conjecture.

Example 2 Finding a Counterexample to an Algebraic Conjecture

a. Find a counterexample to the conjecture.

Every quadratic equation has either no solution or two solutions.

SOLUTION

b. Find a counterexample to the conjecture.

If $5x - 10 = 15$, then $2x + y > 9$.

SOLUTION

Example 3 Application: Astronomy

Use the data in the table to prove the conjecture false.

If a planet orbits our Sun, its orbital period (year) is proportional to its distance from the Sun.

Planet	Orbital Period (days)	Distance from Sun (million miles)	Proportion
Earth	365	93.0	
Mars	687	142	
Saturn	10,760	888	

You Try!!!!

Use the conjecture below to answer a and b.

If line a is perpendicular to line b and to line c, then lines b and c are perpendicular.

- What is the hypothesis of the conjecture? What is its conclusion?
- Find a counterexample to the conjecture.

Use the conjecture below to answer c and d.

If $x^2 = 9$, then $x = 3$.

- What is the hypothesis of the conjecture? What is its conclusion?
- Find a counterexample to the conjecture.

e. The masses of two sedimentary rocks are 327 grams and 568 grams, respectively. Their volumes are 275 cm³ and 501 cm³, respectively.

Explain how this data disproves the conjecture below.

If a rock is sedimentary, then its mass is proportional to its volume.