



# Counterexamples

**Math Concepts:** Logic, counterexamples

**Materials:** None

**Players:** Pairs, Small groups, or Whole class

**Set up:** Divide the students into pairs, small groups, or run this as a whole class discussion.

**Play:** One person makes a statement and the other players in the group attempt to show that the person is lying. The person makes the statement as if the statement were true, but it must be a statement that is sometimes false; that is, the statement must have some counterexamples.

Typically, people will use two types of statements: those that are general statements of “facts,” and others of the form “if \_\_, then \_\_.” See examples of both kinds of statements at the bottom of this page.

**Goal:** Challenge each other to think of hard to find counterexamples.

## – DISCUSSION AND TIPS –

Discuss the role that counterexamples play in showing that a statement is false.

## – EXAMPLES –

### Simple Statements With Counterexamples

- All trucks have four wheels. - Large trucks often have 6, 10 or more wheels.
- All rectangles are squares. - Rectangles need not have all their sides the same length.
- All birds can fly. - Ostriches, emus, and kiwis are birds that cannot fly.
- The moon is only visible at night. - The moon is often visible during the day.
- All shapes have straight sides. - A circle does not have a straight side.
- All playgrounds have swing sets. - Some playgrounds don't have swing sets.
- All rooms have chairs. Bedrooms and bathrooms often don't have a chair.

### If - Then Statements With Counterexamples

- If today is Monday, then it is a school day. - Some Mondays are holidays or occur during the summer.
- If I don't eat for 3 hours, then I'm hungry. - Most people sleep more than 3 hours and are not hungry.
- If a person is taller, then they are older. - Children often grow up to be taller than their parents.
- If the sun is shining, it is a warm day. - Winter days can be sunny and cold.
- If someone is late, something bad must have happened to them. - Sometimes people are late through carelessness or reasons beyond their control (traffic, bad weather, car trouble).