

**I. What is INDUCTIVE REASONING?**

Example: Find the next item in each pattern:

a. Monday, Wednesday, Friday, Sunday

b. 3, 6, 9, 12, 15, ... 18

When several examples form a pattern and you assume the pattern continues, you are applying INDUCTIVE REASONING.

**II. INDUCTIVE REASONING and CONJECTURES:**

**Inductive Reasoning** is the process of reasoning that a rule or statement is true because specific cases are true.

**What is a conjecture?**

A **conjecture** is a statement that you believe to be true based on inductive reasoning.

Example:

The product of an even number and an odd number is EVEN.

Examples:  $(2)(5) = \underline{10}^E$ ,  $(3)(12) = \underline{36}^E$ ,  $(15)(2) = \underline{30}^E$ ,  $(24)(3) = \underline{72}^E$

Conjecture: The product of an even number and an odd number is EVEN!

The product of two odd numbers is ODD.

Examples:  $(5)(9) = \underline{45}^O$ ,  $(7)(11) = \underline{77}^O$ ,  $(51)(3) = \underline{153}^O$ ,  $(31)(7) = \underline{217}^O$

Conjecture: The product of two odd numbers is ODD!

**Conjectures:**

1. To show that a conjecture is always true, you must prove it.
2. To show that a conjecture is false, you have to find only one example in which the conjecture is not true, the **counterexample**.
3. A counterexample can be a drawing, a statement, or a number.

Summary:

Inductive reasoning:

1. Look for a pattern.
2. Make a conjecture.
3. Prove the conjecture or find a counterexample.

III. Finding COUNTEREXAMPLES

Example: Show that each conjecture is false by finding a counterexample.

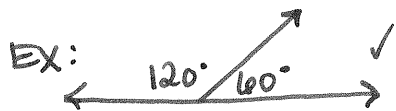
a. For any real number  $x$ ,  $x^2 \geq x$ .

EX:  $2 \Rightarrow 2^2 \geq 2$   
 $4 \geq 2 \checkmark$

EX:  $-10 \Rightarrow (-10)^2 \geq -10$   
 $100 \geq -10 \checkmark$

EX:  $\frac{1}{2} \Rightarrow (\frac{1}{2})^2 \geq \frac{1}{2}$

b. Supplementary angles are adjacent.



$\frac{1}{4} \geq \frac{1}{2}$   
NOT TRUE

COUNTEREXAMPLE

c. The radius of every planet in the solar system is less than 50,000 km.

Planets' Diameters (km)

Mercury: 4880  $\checkmark$   
Jupiter: 143,000  $\times$   
Pluto: 2300  $\checkmark$

Venus: 12,100  $\checkmark$   
Saturn: 121,000  $\times$

Earth: 12,800  $\checkmark$   
Uranus: 51,100  $\checkmark$

Mars: 6790  $\checkmark$

Neptune: 49,500  $\checkmark$

radius  $> 50,000$

COUNTEREXAMPLES!