

# Inductive and Deductive Reasoning

**Objective** INBAT use inductive and deductive reasoning to make conjectures.

**Example:**

1. Find the next item in each pattern.

a. January, March, May, July

b. 0.4, 0.04, 0.004, 0.0004

**Conjecture:** A conjecture is an unproven statement based on observations.

**Inductive Reasoning:** when you find a pattern in specific cases and then write a conjecture for the general case.

**Example:**

2. Complete the conjectures.

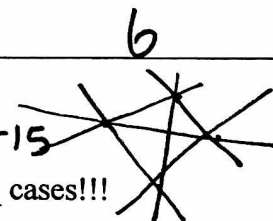
a. The sum of two positive numbers is positive.  $5+3=8$

$$3+6=9$$

$$1+4=5$$

b. The number of lines formed by 4 points, no three of which are collinear, is 6.

c. The product of two odd numbers is odd.  $(3)(3)=9$   
 $(-5)(3)=-15$



\* show that a conjecture is true, you must PROVE that it is true for ALL cases!!!

\*\*To show that a conjecture is false, you have to find ONE example in which the

conjecture is false. This case is called a counterexample (This can be a drawing or a statement.)

**Example:**

3. A student makes the following conjecture about the sum of two numbers. Find a counterexample to disprove the student's conjecture.

"The sum of two numbers is always greater than their difference.

$$5 + (-1) = 4$$

4 is not  $>$  6

$$5 - (-1) = 6$$

4. Find a counterexample to show that the conjecture is false: "Supplementary angles are adjacent.



not adj b/c  
no common side.

**In summary, the following is the process for using inductive reasoning:**

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

Deductive Reasoning: the process of using logic to draw conclusions from given facts. This is different from *inductive reasoning*, which uses specific examples and patterns to form a conjecture.

## LOGIC LAWS

Law of Detachment: If the hypothesis of a conditional statement is true, then the conclusion is also true.

In other words... Given a general  $p \rightarrow q$  ... if specific  $p$  is true, then  $q$  is true.

Example:

5. If two segments have the same length, then they are congruent. You know that  $BC = XY$ . Using the Law of Detachment, what statement can you make?

$$\overline{BC} \cong \overline{XY}$$

6. If a figure is a square, then it is a rectangle. You know that quadrilateral ABCD is a square. Using the Law of Detachment, what statement can you make?

quad. ABCD is a rectangle.

Law of Syllogism: If  $p \rightarrow q$  and  $q \rightarrow r$  are true statements, then  $p \rightarrow r$  is a true statement.

Example:

Example: If possible, use the Law of Syllogism to write a new conditional statement that follows from the pair of statements.

7. If  $x^2 > 25$  then  $x^2 > 20$   
If  $x > 5$ , then  $x^2 > 25$

$$\text{If } x > 5, \text{ then } x^2 > 20.$$

8. If a polygon is regular, then all angles in the interior of the polygon are congruent.  
If a polygon is regular, then all its sides are congruent.

Cannot use Law of Syllogism b/c one statement's conclusion is NOT the other's hypothesis.