

Speak Like A Mathematician:

inductive reasoning:

conjecture:

counterexample:

deductive reasoning:

Laws of Deductive Reasoning

Law of Detachment: If $p \rightarrow q$ is true and p is true, then _____ is true.

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

Example 1 - Find the Next Item

- a) Monday, Wednesday, Friday, ...
- b) 2, 6, 18, 54, ...
- c) 5, 3, 1, -1, ...

Example 2 - Find a Counterexample

Show that each conjecture is false.

- a) The product of two numbers is always greater than either number.
- b) For any real number x , $x^3 \geq x$.

c) Complementary angles are always adjacent.

d) For any number n , $n^2 > n$.

Example 3 - Complete the Conjecture

a) The sum of two negative numbers is _____.

b) The product of two even numbers is _____.

c) The number of segments determined by 5 points, no three collinear, is _____.

Example 4 - Inductive or Deductive?

Is each conclusion a result of inductive or deductive reasoning?

a) Every multiple of 10 ends in 0. The number N is a multiple of 10. Therefore N ends in 0.

b) The sun has risen every morning this month, so it will rise tomorrow.

c) A student lists the primes 3, 5, 7, 11, 13 and concludes that all prime numbers are odd.

Example 5 - Law of Detachment

Determine whether each conjecture is valid.

- a) Given: If a figure is a square, then it has four right angles. Figure ABCD is a square. Conjecture: ABCD has four right angles.

- b) Given: If a number is a multiple of 4, then it is even. The number 26 is even. Conjecture: 26 is a multiple of 4.

Example 6 - Law of Syllogism

- a) Given: If an animal is a whale, then it is a mammal. If an animal is a mammal, then it is warm-blooded. Conjecture: If an animal is a whale, then it is warm-blooded.

- b) Given: If a number is a multiple of 6, then it is even. If a number is even, then it is an integer. Conjecture: If a number is an integer, then it is a multiple of 6.

Example 7 - Draw a Conclusion

- a) If a polygon is a square, then it has four sides. If a polygon has four sides, then it is a quadrilateral. Polygon P is a square.

- b) A bookstore is taking 20% off all prices. Marcus chooses a book originally priced at \$15.

- c) If two angles form a linear pair, then they are supplementary. If two angles are supplementary, then their measures sum to 180° . $\angle 1$ and $\angle 2$ form a linear pair.