

1 Contraposition

Prove the statement "if $a + b < c + d$, then $a < c$ or $b < d$ ".

2 Perfect Square

A *perfect square* is an integer n of the form $n = m^2$ for some integer m . Prove that every odd perfect square is of the form $8k + 1$ for some integer k .

3 Infinite Primes

Prove by contradiction that there are an infinite number of primes.

4 Numbers of Friends

Prove that if there are $n \geq 2$ people at a party, then at least 2 of them have the same number of friends at the party.

(Hint: The Pigeonhole Principle states that if n items are placed in m containers, where $n > m$, at least one container must contain more than one item. You may use this without proof.)