

Proof

- A **conjecture** is a mathematical statement that has yet to be proven.
- A **theorem** is a mathematical statement that has been proven.

Proof by Deduction:

Examples:

1. **“Prove that the product of two odd numbers is odd.”**

2. **“Prove that $(3x + 2)(x - 5)(x + 7) \equiv 3x^3 + 8x^2 - 101x - 70$ ”**

3. Prove that if three consecutive integers are the sides of a right-angled triangle, they must be 3, 4 and 5

Test your Understanding:

Prove that the sum of the squares of two consecutive odd numbers is 2 more than a multiple of 8.

Extension

[STEP 1 2005 Q1] 47231 is a five-digit number whose digits sum to

$$4 + 7 + 2 + 3 + 1 = 17.$$

- (i) Prove that there are 15 five-digit numbers whose digits sum to 43. You should explain your reasoning clearly.
- (ii) How many five-digit numbers are there whose digits sum to 39?