

# Prime Factorization

When a whole number greater than 1 has *exactly* two factors, 1 and itself, it is called a **prime number**. When a whole number greater than 1 has more than two factors, it is called a **composite number**. The numbers 0 and 1 are *neither* prime *nor* composite. Notice that 0 has an endless number of factors and 1 has only one factor, itself.

## EXAMPLES

### Identify Numbers as Prime or Composite

1

33

The numbers 1, 3, and 11 divide into 33 evenly. So, 33 is composite.

2

59

The only numbers that divide evenly into 59 are 1 and 59. So, 59 is prime.

When a number is expressed as a product of factors that are all prime, the expression is called the **prime factorization** of the number. A **factor tree** is useful in finding the prime factorization of a number.

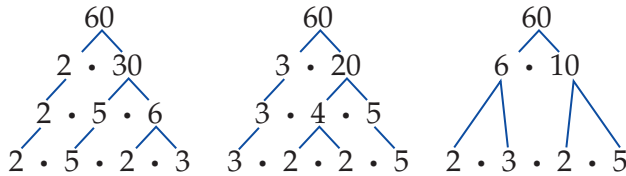
## EXAMPLE

### Write Prime Factorization

3

Use a factor tree to write the prime factorization of 60.

You can begin a factor tree for 60 in several ways.



Notice that the bottom row of “branches” in every factor tree is the same except for the order in which the factors are written. So,  $60 = 2 \cdot 2 \cdot 3 \cdot 5$  or  $2^2 \cdot 3 \cdot 5$ .

Every number has a unique set of prime factors. This property of numbers is called the **Fundamental Theorem of Arithmetic**.