



MULTIPLES

A **multiple** is a number obtained by multiplying other numbers together. For example:
The numbers 0, 3, 6, 9, and 12 are all multiples of 3.

$$3 \cdot 0 = 0, 3 \cdot 1 = 3, 3 \cdot 2 = 6, 3 \cdot 3 = 9, 3 \cdot 4 = 12$$

Some numbers are multiples of many numbers.

$$\begin{array}{ll} 1 \cdot 12 = 12 & 12 \text{ is a multiple of 1 and a multiple of 12...} \\ 2 \cdot 6 = 12 & \text{a multiple of 2 and a multiple of 6...} \\ 3 \cdot 4 = 12 & \text{a multiple of 3 and a multiple of 4.} \end{array}$$

FACT: Zero is a multiple of all numbers!

Some numbers are only multiples of themselves and 1. We call this a **prime number**.

$$1 \cdot 13 = 13 \quad 13 \text{ is a multiple of 1 and 13 only.}$$

FACT: Every number is a multiple of 1!

In order to find the common multiple that has the lowest value (**Least Common Multiple**), multiply the highest powers of all the prime factors together.

$$\begin{array}{ll} 12 = 2 \cdot 2 \cdot 3 = 2^2 \cdot 3 & \text{The LCM of 12 and 81 is } 2^2 \text{ (the highest power of the prime} \\ 81 = 3 \cdot 3 \cdot 3 \cdot 3 = 3^4 & \text{factor 2) times } 3^4 \text{ (the highest power of the prime factor 3).} \end{array}$$
$$2^2 \cdot 3^4 = 4 \cdot 81 = \mathbf{324}$$

The LCM of any sized group of numbers can be found.

$$\begin{array}{ll} 12 = 2 \cdot 2 \cdot 3 = 2^2 \cdot 3 & \text{The LCM of 12, 33 and 81 is } 2^2 \text{ (the highest power of the} \\ 33 = 3 \cdot 11 & \text{prime factor 2) times } 3^4 \text{ (the highest power of the prime} \\ 81 = 3 \cdot 3 \cdot 3 \cdot 3 = 3^4 & \text{factor 3) times } 11^1 \text{ (the highest power of the prime factor 11).} \end{array}$$
$$2^2 \cdot 3^4 \cdot 11 = 4 \cdot 81 \cdot 11 = \mathbf{3,564}$$