LCM and GCF

Vocabulary:

Multiples: The result of multiplying a number by an integer (not by a fraction). Examples:
• 12 is a multiple of 3, because 3 × 4 = 12
• –6 is a multiple of 3, because 3 × –2 = –6
• But 7 is NOT a multiple of 3

Factors: the numbers we can multiply together to get another number:

$$2 \times 3 = 6$$

Factor   Factor

2 and 3 are factors of 6

A number can have many factors.

Example: 12
- 3 × 4 = 12, so 3 and 4 are factors of 12
- Also 2 × 6 = 12, so 2 and 6 are also factors of 12,
- And 1 × 12 = 12, so 1 and 12 are factors of 12 as well.

Least Common Multiple (LCM) (Also called Lowest Common Multiple)

The smallest positive number that is a multiple of two or more numbers.
Example: the Least Common Multiple of 3 and 5 is 15, because 15 is a multiple of 3 and also a multiple of 5. Other common multiples include 30 and 45, etc, but they are not the smallest (least).

Greatest Common Factor (GCF)

The greatest number that is a factor of two (or more) other numbers. When we find all the factors of two or more numbers, and some factors are the same ("common"), then the largest of those common factors is the Greatest Common Factor.

Example: the GCF of 12 and 16 is 4, because 1, 2 and 4 are common factors of both 12 and 16, and 4 is the greatest of them.

LCM and GCF Using the Prime Factorization

To determine the Least common Multiple:

1. Find the prime factorization for each number using exponents.
2. For **each** prime factor, write the base with the **greatest** exponent.
3. Multiply.

Finding the LCM Using Prime Factorization

Find the LCM of 36 and 24

```
        36                    24
        /\                    /\
      2   18                2   12
          /\                    /\
        2   9                 2   6
            /\                    /\
          3   3                 2   3
36= 2×2×3×3              24= 2×2×2×3
      2² x 3²                   2³ x 3
```

$$\underline{2^3 \times 3^2}$$

The LCM of 36 and 24 is 2X2X2X3X3 = 72

Using Prime Factorization

Find the GCF of 36 and 24

```
        36                    24
        /\                    /\
      2   18                2   12
        /\                    /\
      2   9                 2   6
        /\                    /\
      3   3                 2   3
36= 2×2×3×3              24= 2×2×2×3
```

The GCF of 36 and 24 is 2×2×3=12