

Factors, Multiples and Common Ones: GCF and LCM

Grade 6 math · Lesson · Standards: 6.NS.B.4

Quick answer: The greatest common factor (GCF) of two whole numbers is the largest number that divides both with no remainder. The least common multiple (LCM) is the smallest positive number that both numbers divide into evenly. Prime factorization finds both, and the GCF also lets you rewrite a sum such as $36 + 8$ as $4(9 + 2)$.

Standards: 6.NS.B.4 · **Level:** Grade 6

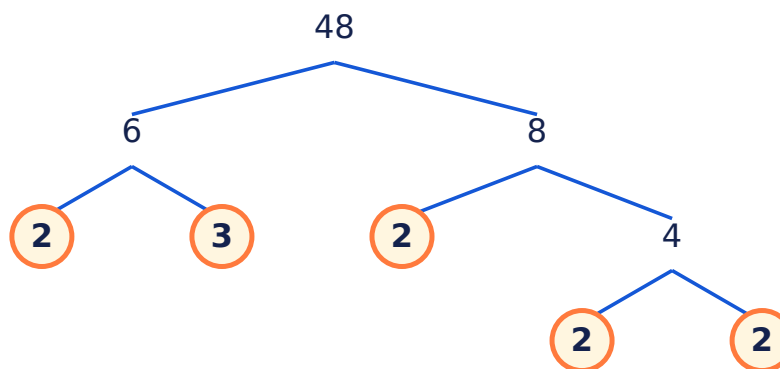
What are factors, multiples and prime factors?

Key vocabulary

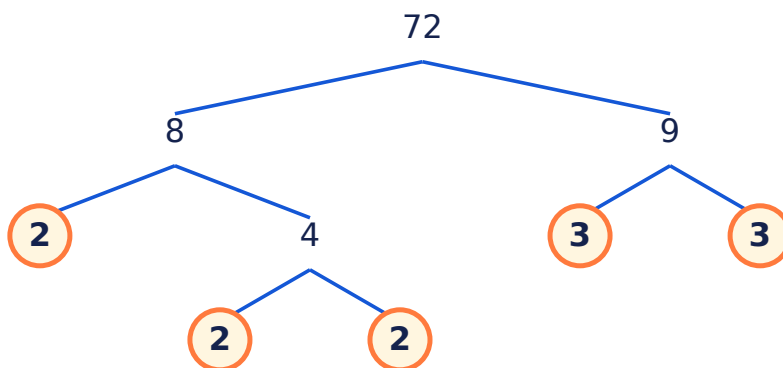
- A **factor** of a number divides it with no remainder. The factors of 18 are 1, 2, 3, 6, 9 and 18.
- A **multiple** of a number is what you get when you multiply it by 1, 2, 3, and so on. Multiples of 7: 7, 14, 21, 28.
- A **prime number** has exactly two factors, 1 and itself. A **composite number** has more than two.

How do you find the greatest common factor with prime factorization?

A factor tree keeps splitting a number into smaller factors; each branch stops at a circled prime.



Factor tree for 48: $48 = 2 \times 2 \times 2 \times 2 \times 3$.



Factor tree for 72: $72 = 2 \times 2 \times 2 \times 3 \times 3$.

Method: GCF by prime factorization

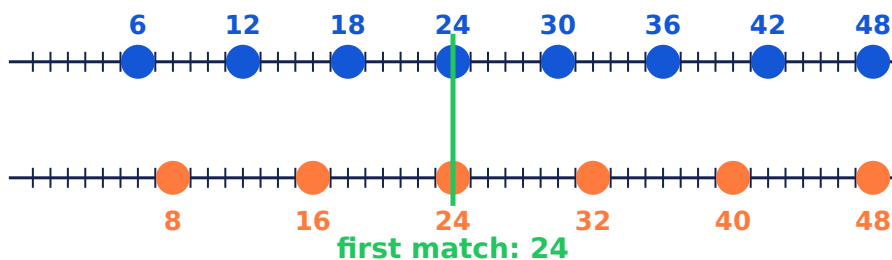
1. Write each number as a product of primes using a factor tree.
2. Circle the primes that appear in both lists, counting repeats.
3. Multiply the shared primes.

Worked example: GCF of 48 and 72

$48 = 2 \times 2 \times 2 \times 2 \times 3$ and $72 = 2 \times 2 \times 2 \times 3 \times 3$. Shared primes: 2, 2, 2 and 3. The GCF is $2 \times 2 \times 2 \times 3 = \mathbf{24}$.

How do you find the least common multiple?

Write out the multiples of each number until the two lists share a value. For 6 and 8, the first shared multiple is 24, so the LCM of 6 and 8 is 24.

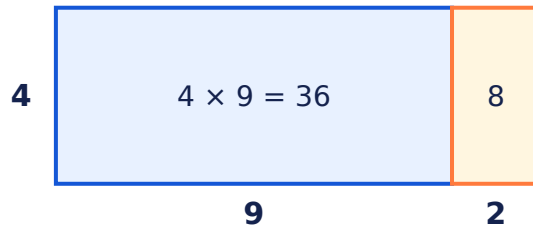


Multiples of 6 (blue) and 8 (orange). The first match is 24.

Idea	Goal	Result is
GCF	split into equal groups	never larger than the smaller number
LCM	find when events line up	never smaller than the larger number

How does the GCF help you factor a sum?

Distributing in reverse lets you pull the GCF out of a sum. The GCF of 36 and 8 is 4, so $36 + 8 = 4 \times 9 + 4 \times 2 = 4(9 + 2)$.



$36 + 8 = 4(9 + 2)$: both areas share the height 4.

Common mistake

Mixing up the two ideas. Reach for the GCF to share items into equal groups; reach for the LCM when two repeating cycles must coincide again.

Mathbot's tip

Expand your factored answer. If it does not return the starting sum, a factor slipped away.

Key points to remember

- A prime number has exactly two factors: 1 and itself.
- GCF = product of the primes the numbers share.
- LCM = the first multiple that appears in both lists.
- The GCF of two numbers is at most the smaller number; the LCM is at least the larger.
- A sum $a + b$ can be written as $\text{GCF} \times (a \div \text{GCF} + b \div \text{GCF})$.

Factors, Multiples and Common Ones: GCF and LCM: frequently asked questions

What is the difference between a factor and a multiple?

A factor divides a number evenly, so factors are smaller than or equal to it. A multiple is the number times a whole number, so multiples are larger than or equal to it. Factors of 12 include 4, while 48 is a multiple of 12.

Is 1 a prime number?

No. A prime has exactly two different factors, and 1 has only one factor. Because 1 is also not composite, it belongs to neither group.

When should I use the GCF and when the LCM?

Use the GCF to split quantities into the largest equal groups with nothing left over. Use the LCM to find when repeating events, such as bus schedules, happen together again.

What is the GCF of two numbers that share no prime factors?

The GCF is 1. For example, 15 and 28 share no primes, so their only common factor is 1. Such numbers are called relatively prime.

How do you factor $45 + 60$ with the GCF?

The GCF of 45 and 60 is 15. Divide each term by 15 to get 3 and 4, so $45 + 60 = 15(3 + 4)$. Multiplying back gives $15 \times 7 = 105$, which checks.