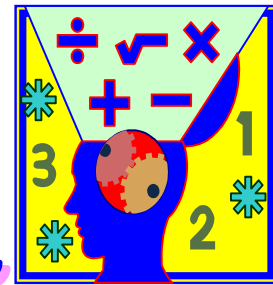


# Algebra Connections



Mr. Breitsprecher's Edition

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Web: [www.clubtnt.org/my\\_algebra](http://www.clubtnt.org/my_algebra)

# Main Factors of Factoring

Factoring is an idea you might be familiar with from multiplication. Numbers that can be multiplied together to get another number are its factors. For example,  $4 \cdot 3 = 12$ , so 3 and 4 are factors of 12. However, they're not its only factors; 1, 2, 6, and 12 are other factors of 12. (Another way of defining a factor is a number that goes evenly into the number you're factoring.)

A number is prime if it can not be divided evenly by anything except itself and 1. For example, 5 is a prime number, because the only factors of 5

are  $1 \cdot 5 = 5$ . However, 12 is not a prime number, because  $1 \cdot 12 = 12$ ,  $2 \cdot 6 = 12$ , and  $3 \cdot 4 = 12$ . Prime factorization means finding all the prime numbers that are factors of a number.

Why is this important – it is the foundation of what we will do the rest of the semester! We need to be able to find Lowest Common Multiples (LCM). In our "Review," we saw that the Lowest Common Multiple is the Lowest Common Denominator (R-2).

It will not be possible to work with fractions without this understanding.

Please NEVER attempt to add or subtract fractions unless they have a common denominator!

Suppose you want to find the Least Common Multiple (Please remember  $LCM = LCD$ ) of 6 and 10. If we start by factoring them into primes, we get this:

$$\begin{aligned} 6: & 2 \cdot 3 \\ 10: & 2 \cdot 5 \end{aligned}$$

Now the challenge is to find the smallest possible set of prime factors that contains all the factors of each original number.

In other words, we need a 2 and a 3 from the 6. So far we have  $2 \cdot 3$ . But we don't need to include another 2 from the 10 since we already have the 2 from the 6.

All we need to add to our set is the 5, so now we have  $2 \cdot 3 \cdot 5$ . As a check, can you find  $2 \cdot 3$  in our set of  $2 \cdot 3 \cdot 5$ ? How about  $2 \cdot 5$ ? Yes, both original factor sets are included and there is nothing extra. So, our LCM is  $2 \cdot 3 \cdot 5$  or 30.

Let's try another one. Suppose you are looking for the LCM of 8, 10 and 12. Start by factoring each one out:

$$\begin{aligned} 8: & 2 \cdot 2 \cdot 2 \\ 10: & 2 \cdot 5 \\ 12: & 2 \cdot 2 \cdot 3 \end{aligned}$$

Now let's put together the smallest set that contains each of those three sets. We start with three 2's from the 8. That gives us:  $2 \cdot 2 \cdot 2$

For the 10, we certainly don't need another 2 since we already have three of them, but we do need to add in a 5. Now we have:  $2 \cdot 2 \cdot 2 \cdot 5$

For the 12, we don't need to do anything with the two 2's because we already have three of them, but we do need to toss in the 3. Now we have:  $2 \cdot 2 \cdot 2 \cdot 5 \cdot 3$

Again, can you find each of the three smaller factor sets within that bigger one? Yes, so we're in business. The LCM is  $2 \cdot 2 \cdot 2 \cdot 5 \cdot 3$  or 120.

Source: mathforum.org

## Prime Time Primes

Being able to think about numbers is the first step towards being able to work with them. Fundamental to number theory are numbers themselves, and the basic building blocks for numbers are prime numbers.

A prime number is a counting number that only has two factors, itself and one. Counting numbers which have more than two factors (such as six, whose factors are 1, 2, 3 and 6), are said to be composite numbers.

The number one only has one factor and is considered to be neither prime nor composite.

You can learn EVERYTHING you could ever imagine about prime numbers at:

<http://www.utm.edu/research/primes/>

Here are some prime numbers starting with 2:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199, 211

In this class, you will benefit if you can recognize prime numbers and factors up to at least 59.

### MS EXCEL and Primes?

Can you generate these lists from MS Excel? Well, no – not without special "plug-ins." Software to generate primes is available FREE as shareware.

**Prime Derivatives** is one such program. It is available at:

<http://www.sharewareconnection.com/prime-derivatives.htm>

This attractive, handy little prime number calculator takes any number up to twenty digits, and then factorizes all the unique prime numbers that evenly divide into the number that was entered into the field. It's small enough to neatly fit in the corner of your monitor while you easily factorize the numbers you need for that school or office assignment.

A great interactive site to check prime factorizations is at:

<http://www.gomath.com/algebra/factor.php>