Factoring, Multiplying, and Dividing Algebraic Expressions (handout)

Author: Susan Lyons
Written: 2000
Last updated: January 11, 2011

**Factoring** allows you to break complex expressions of integers or, in algebra, integers plus variables into simpler units. When the units have no other factors but themselves and 1, they are called **prime** factors. You can sift prime factors from integers. The Sieve of Eratosthenes is one way to do this. Circle the prime numbers below. Cross out the non-primes (**composites**).

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

You can use your knowledge of prime factors to determine **greatest common factors** and **least common multiples** to manipulate fractional expressions more effectively. This is also true for **polynomial expressions**, in which you’re working with one or more variables with positive integer powers. Use common factors to simplify the expression.

Simplify (reduce) the following:

\[
\frac{9x}{45} \quad \frac{3yz}{6z^2} \quad \frac{121x^2yz}{132wz^4}
\]

Multiply the following and simplify your answer. Then divide the first number of each group by the second and simplify.

\[
\frac{24}{15y} \times \frac{3x}{8y} \quad \frac{29c^2 \times 4}{c} \quad \frac{21yz^3 \times 6az}{4xz \times 7x}
\]

Add or subtract the following so that we end up with the least common multiple in the denominator:

\[
\frac{7k + 3z}{4y} \quad \frac{5}{b + 4} + \frac{b}{5} \quad \frac{x^2 + 6x + 9}{x^2 - 1} - \frac{x^2 + 2x - 3}{x^2 + 4x + 3}
\]

Solve:

\[
\frac{6}{x + 3} = \frac{2}{x - 1} \quad y - \frac{18}{y} = 7
\]

\[
\frac{3}{x} + \frac{5}{x^2 + x} = \frac{6}{x + 1}
\]