Math 1320: Simplifying Expressions - Common Mistakes

Why is simplifying expressions important? Consider the two algebraic expressions below:

$$8x + 4 + 2(7x - 3) \qquad\qquad 22x - 2$$

The expressions are equivalent. If I were to ask you to find the value at $x = 4$, which expression would you use? Probably the one on the right, as there is less work for us to do to evaluate the expression at $x = 4$. The expression has been simplified.

What does it mean to simplify expressions? Previously, we learned how to evaluate algebraic expressions for certain values of x. When there are a lot of x's and no values given, we will want to simplify our expressions to help us make sense of what the expression may represent. When we simplify expressions, we rewrite them in the simplest way possible. To simplify expressions, we will use different algebraic rules, such as order of operations, combining like terms, exponent and radical rules, and distribution properties.

What are some common mistakes when simplifying expressions? Let's look at some common mistakes when simplifying expressions and how we may correct them.

Distributing a Negative

Common Mistake: Only distributing to the first term.

$-5(x + 7)$	$-5(x + 7)$
$= -5(x) + 5(7)$	$= -5(x) + (-5)7$
$= -5x + 35$	$= -5x - 35$

Remember to distribute the negative to **all** terms in the parentheses.

Polynomial Raised to a Power

Common Mistake: Distributing the power to the terms in parentheses.

$(x + 2)^2$	$(x + 2)^2$
$= x^2 + 2^2$	$= (x + 2)(x + 2)$
$= x^2 + 4$	$= x(x) + x(2) + 2(x) + 2(2)$
	$= x^2 + 4x + 4$

Remember to expand the expression.

Distributing a Square Root

Common Mistake: Distributing with addition and subtraction.

$\sqrt{9 + 16}$	$\sqrt{9 \cdot 16}$
$= \sqrt{9} + \sqrt{16}$	$= \sqrt{9} \cdot \sqrt{16}$
$= 3 + 4$	$= 3 \cdot 4$
$= 7$	$= 12$

Remember that radicals can only be distributed over multiplication and division.

Multiplying Polynomials

Common Mistake: Only multiplying corresponding terms.

$(2x + 1)(x^2 + 4x - 3)$	$(2x + 1)(x^2 + 4x - 3)$
$= 2x(x^2) + 1(4x) - 3$	$= 2x(x^2) + 2x(4x) + 2x(-3)$
$= 2x^3 + 4x - 3$	$+ 1(x^2) + 1(4x) + 1(-3)$
	$= 2x^3 + 8x^2 - 6x + x^2 + 4x - 3$
	$= 2x^3 + 9x^2 - 2x - 3$

Remember to multiply each term of one polynomial by each term of the other. Combine like terms.

Practice simplifying the expressions below. The answers are provided.

1. $x^2 + \sqrt{4 \cdot 25} - 2 = x^2 + 8$
2. $(2x - 1)^2 - (x + 3) = 4x^2 - 5x - 2$
3. $(\sqrt{\frac{64}{16}})x - 3(x + 1) = -x - 3$