Review: Expanding and Factoring

Example 1: Expand and Simplify

Recall: When multiplying terms (and brackets), you must distribute all terms from the first bracket with all terms from the second. To finish simplifying, collect like terms if possible.

a) $2(x+4)$
$=2x+8$

b) $3x(7-x)$
$=21x-3x^2$

c) $(x+3)(x-4)$
$=x^2-4x+3x-12$
$=x^2-x-12$

d) $(x+3)(2x^2-5x+3)$
$=2x^3-5x^2+3x+6x^2-15x+9$
$=2x^3-5x^2+6x^2+3x-15x+9$
$=2x^3-x^2-12x+9$

e) $(x+3)(x-2)(x+2)$
$=(x^2-2x+3x-6)(x+2)$
$=(x^2+x-6)(x+2)$
$=(x^2+x-6)(x+2)$
$=x^3+2x^2+x^2+2x-6x-12$
$=x^3+3x^2-4x-12$

Factoring is the process of "undoing" expansion and breaking a polynomial into simpler expressions.

The first type of factoring you learned was **common factoring**. This involves finding a common value that can be divided out of each term.

Example 2: Common Factor.

a) $2x+14$
$=2(x+7)$

b) $15x^2+10x$
$=5x(3x+2)$

c) $14x^2-21x+56$
$=7(2x^2-3x+8)$

d) $2x(x+3)-5(x+3)$
$=(x+3)(2x-5)$

When you learned quadratics, you learned about **trinomial factoring**. We'll start with simple trinomial factoring, for which you may have learned the acronym "MAN" (**M**ultiplies to ..., **A**dds to ..., **N**umbers are...) A simple trinomial has a leading coefficient of **1**.

Example 3: Factor.

a) $x^2+12x+27$
$=(x+3)(x+9)$
M: 27
A: 12
N: 3, 9

b) $x^2-4x-12$
$=(x-6)(x+2)$
M: -12
A: -4
N: -6, 2

c) $x^2-11x+10$
$=(x-10)(x-1)$
M: 10
A: -11
N: -10, -1

When the leading coefficient is not 1, it is sometimes (but not always) possible to common factor and then factor what remains.

Example 4: Factor by common factoring first, then trinomial factoring.

a) $2x^2+12x+16$
$=2(x^2+6x+8)$
$=2(x+2)(x+4)$
M: 8
A: 6
N: 2, 4

b) $7x^2-14x+7$
$=7(x^2-2x+1)$
$=2(x-1)(x-1)$
M: 1
A: -2
N: 1, 1

c) $10x^3-40x$
$=10x(x^2-4)$
$=10x(x-2)(x+2)$
M: 4
A: 0
N: -2, 2

Practice: