Factoring Polynomials

Focus:

1. To be able to factor polynomials in the form of $ax^2 + bx + c$ algebraically

Curricular Competencies:
D2: I can connect math concepts to each other

Factoring Difficult Trinomials

There are ways that we complicate factoring of trinomials. The factoring still follows the same procedure … just a few things thrown in to see if you are paying attention! ☺

Extra Variables

$x^2 + 3xy - 18y^2$

1 18
2 9
3 6

$(x - 3y)(x + 6y)$

$x^2 - 10xy + 9y^2$

1 9
3 3

$(x - 1y)(x - 9y)$

Going Backwards and Negatives

$7 - 8y + y^2$

$y^2 - 8y + 7$

$(y - 1)(y - 7)$

$-m^2 - 4m + 12$

1 12
2 6
3 4

$-1m^2 - 4m + 12$

$-1(m^2 + 4m - 12)$

$-(m + 6)(m - 2)$

When A isn't 1!

$ax^2 + bx + c$

When the leading coefficient or "a" isn't 1, we need another way to factor. This method is called decomposition. It can be used for both types of factoring. It just takes more steps so we typically reserve this method for when "a" isn't 1.

Steps to factor by decomposition: ax^2+bx+c

Find two numbers that multiply to ac and add to b.

Rewrite the trinomial so that the middle term is separated into 2 terms with your numbers from step 1.

Common factor in pairs ~ grouping.

Factor out any GCF from each bracket + put leftovers in 2nd bracket

a) $3x^2 + 8x + 4$ $\times 12$ $+8$ 1,12 2,6 3,4

$3x^2+2x+6x+4$

$x(3x+2)+2(3x+2)$

$(3x+2)(x+2)$

b) $6x^2 - 5xy + y^2$ $\times 6$ $+-5$ 16 23

$6x^2-2xy-3xy+y^2$

$2x(3x-y)+y(-3x+y)$

$2x(3x-y)-y(3x-y)$

$(3x-y)(2x-y)$

c) $3x^2 + 2x + 4$ $\times 12$ $+2$ 1,12 2,6 3,4

not possible

d) $24x^2 - 30x - 9$ $\times -24$ $+-10$ 1,24 2,12 3,8 4,6

$3(8x^2-10x-3)$

$3(8x^2+2x-12x-3)$

$3[2x(4x+1)-3(4x+1)]$

$3(4x+1)(2x-3)$

e) $-x^2 + 15x - 14$

$-1(x^2-15x+14)$

$-1(x^2-1x-14x+14)$

$-1[x(x-1)-14(x-1)]$

$-1(x-1)(x-14)$

f) $-2x^2 - 10x - 12$ 1,6 2,3

$-2(x^2+5x+6)$

$-2(x+2)(x+3)$

g) $2x^2 + 7x - 4$

1,8
2,4

$2x^2 - 1x + 8x - 4$

$x(2x-1) + 4(2x-1)$

$(2x-1)(x+4)$

h) $-3a^2 - 51a - 30$

$-3(a^2 + 17a + 10)$

1,10
2,5

Application

A rescue worker launches a signal flare into the air from the side of a mountain. The height of the flare can be represented by the formula $h = -16t^2 + 144t + 160$. In the formula, h is the height, in feet, above the ground, and t is the time, in seconds.

a) What is the factored form of the formula?

$-16t^2 + 144t + 160$

$-16(t^2 - 9t - 10)$

$-16(t-10)(t+1)$

1,10
2,5

b) What is the height of the flare after 5.6 s?

$h = -16(5.6)^2 + 144(5.6) + 160$

$= 464.64$ ft

assignment: p 234 2 (choose 2), 6, 7, 8, 11, 15