Factoring Trinomials

Factoring Trinomials where $a \neq 1$

A second-degree trinomial (that is, a quadratic) is written in the form $ax^2 + bx + c$.

You already know how to factor expressions where $a = 1$.

Try this one, where $a = 1$, $b = 15$, and $c = 50$:

$x^2 + 15x + 50$

$= (x + 5)(x + 10)$

How can we factor an expression like this one… where $a = 3$, $b = 8$ and $c = 4$?

$3x^2 + 8x + 4$

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

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

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

① Get the product of "a" and "c"

$3(4) = 12$

② List factors of 12

1, 12
2, 6
3, 4

Look for factors that add to give "b"

③ Split ("decompose") middle term and then factor by grouping

Example 1

Factor, if possible.

a) $2x^2 + 9x + 9$

$2(9) = 18$

Factors of 18

1, 18
2, 9
3, 6 ← these factors add to give "b" value

$= 2x^2 + 3x + 6x + 9$

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

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

Now, decompose and factor by grouping.

b) $3x^2 + 2x + 4$

$3(4) = 12$

Factors of 12

1, 12
2, 6
3, 4

none of these factors have a sum of 2

not possible to factor!

∴ it is not possible to factor this expression.

c) $3x^2 + 7xy + 2y^2$

$3(2) = 6$

Factors of 6

1, 6
2, 3

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

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

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

- Note that two variables doesn't change anything!
- Same process to factor.

d) $16x^2 + 26x - 12$ Hmm... common factor first! Then carry on...

$= 2[8x^2 + 13x - 6]$

$8(-6) = -48$

Factors of -48

-1, 48
-2, 24
-3, 16

$= 2[8x^2 - 3x + 16x - 6]$

$= 2[x(8x-3) + 2(8x-3)]$

$= 2(8x-3)(x+2)$

Remember…

1. Always LOOK to common factor first!
2. Not every trinomial can be factored!

Opportunity to Learn

Use this IXL page to master the concepts we have discussed above. Earn a "Smart Score" of 90% or better. IMPORTANT: Write out your answers on paper, then type into IXL.

P.4 Factor quadratics with other leading coefficients