

Factor Trinomials when $a = 1$

Factoring by the Area Model

Exploration:

- For each of the boxes below, determine what trinomial is represented in the box.
- Then find the GCF of each row and column. Write your answer in factored form.

a) Trinomial: $x^2 + 8x + 12$

Factored Form: $(x+6)(x+2)$

	$1x$	$+2$
$1x$	$\underline{1x^2}$	$2x$
$+6$	$6x$	$\underline{12}$

$6x + 2x = 8x$

b) Trinomial: $x^2 + 2x - 15$

Factored Form: $(x+5)(x-3)$

	$1x$	-3
$1x$	$\underline{1x^2}$	$-3x$
$+5$	$5x$	$\underline{-15}$

$-3x + 5x = 2x$

c) Trinomial: $x^2 - 10x + 24$

Factored Form: $(x-4)(x-6)$

	$1x$	-6
$1x$	$\underline{1x^2}$	$-6x$
-4	$-4x$	$\underline{24}$

$-10x$

What you just discovered was a way to factor a trinomial using something you are familiar with – the Box Method!

Factoring a trinomial means to write the polynomial as a product of 2 binomials. In other words, what two binomials did you have to multiply together to get the trinomial you are trying to factor?

Factoring by the Area Model

If you preferred multiplying polynomials using the box method, then you will probably understand/like the box method for factoring. It is essentially the reverse of multiplying polynomials using the box. You start by filling in the box and working backwards to get the factors on the outside.

Factor: $x^2 - 4x - 32$

$$\begin{array}{r|l} -32 & -4 \\ \hline 4 & -8 \end{array} \neq -4$$

<p>1. Factor any GCF's from the expression.</p>	$1(x^2 - 4x - 32)$
<p>2. Multiply the coefficients of the "a" and "c" terms together and place that number in the top of the "number diamond"</p> <p>Place the coefficient of the "b" term in the bottom.</p> <p>Determine what two numbers can be multiplied to get your "a-c" term and added to get your "b" term.</p>	
<p>3. Create a 2x2 box and place your "a" term in the top left box and "c" term in the bottom right box.</p> <p>Fill the remaining two boxes with the two numbers you found in your number diamond and place an x after them.</p>	
<p>4. Pull out a GCF of each row and column to create the binomials or factors you are looking for.</p>	$1x \quad -8$ $\quad \quad -8x \quad -32$
<p>5. Check your factors on the outside by multiplying them together to make sure you get all the expressions in your box.</p>	<p>Factored Form: $1(x-8)(x+4)$</p>

Practice: Factor the following trinomials.

a. $x^2 + 6x + 8$

b. $x^2 - 7x + 12$

c. $x^2 + 4x - 12$

d. $x^2 + 2x - 24$