Factoring Simple Trinomials

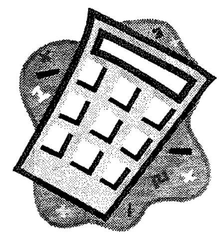
Learning Target: We are learning to… factor quadratics in the form: $x^2 + bx + c$

Success Criteria: I can… factor quadratics in the form: $x^2 + bx + c$

A simple trinomial is a trinomial ($y = ax^2 + bx + c$) where $a = 1$. As we talked about yesterday, factoring is the opposite of expanding. Let's do some expanding (then simplifying) to see if we can determine a pattern/rule to factor simple trinomials.

Binomials $(x+m)(x+n)$	Expand to form a Trinomial in the form: $x^2 + bx + c$	Value of m	Value of n	Value of b	Value of c
$(x+4)(x+3)$	$x^2+3x+4x+12 = x^2+7x+12$	4	3	7	12
$(x+1)(x+5)$	$x^2+5x+x+5 = x^2+6x+5$	1	5	6	5
$(x+7)(x+8)$	$x^2+8x+7x+56 = x^2+15x+56$	7	8	15	56.

How can you calculate "b" and "c" using the values of "m" and "n"?



$b =$ m+n (sum)

$c =$ m•n (product)

Use the pattern you've come up with to reverse the process, that is, FACTOR a trinomial in the form of $x^2 + bx + c$ into 2 binomial factors.

Trinomial $x^2 + bx + c$	$b =$ [sum]	$c =$ [product]	$m =$	$n =$	Binomials $(x+m)(x+n)$
$x^2 + 6x + 8$	6	8	2	4	$(x+2)(x+4)$
$x^2 - 9x + 20$	−9	20	−4	−5	$(x-4)(x-5)$
$x^2 + 5x - 24$	5	−24	−3	8	$(x-3)(x+8)$
$x^2 - x - 12$	−1	−12	3	−4	$(x+3)(x-4$

Factoring a simple trinomial expression in the form of $\boldsymbol{x^2 + bx + c}$

$$x^2 + bx + c = (x+m)(x+n)$$

where $b =$ m+n (sum) and $c =$ m•n (product) *m and n are integers

Characteristics:

- If the product is positive and the sum is positive then m and n are positive.
- If the product is positive and the sum is negative then m and n are negative.
- If the product is negative but the sum is positive then the smaller # is negative.
- If the product is negative but the sum is negative then the larger # is negative.

MPM2D: Factoring Simple Trinomials

Examples:

1. Determine the binomials that represent the dimensions of this rectangle. → want: length & width

Area = $x^2 + 6x + 5$

sum = 6
product = 5 } #'s are 1 & 5

Area = $(x+5)(x+1)$
length width.

2. Factor, if possible.

(a) $x^2 + 8x + 12$ sum = 8, product = 12 } 6 & 2

$= (x+6)(x+2)$

(b) $x^2 + x + 1$ S: 1, P: 1 } ?

Not Factorable

(c) $c^2 - 12c + 35$ S: −12, P: 35 } −7, −5

$= (c-7)(c-5)$

3. Factor fully. Hint: Look for *Common Factoring* first!

(a) $3x^2 - 12x - 36$

$= 3(x^2 - 4x - 12)$ S: −4, P: −12 } −6 & 2

$= 3(x-6)(x+2)$

(b) $-2x^2 + 2x + 4$ S: −1, P: −2

$= -2(x^2 - x - 2)$

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

(c) $-3x^2 - 18x - 24$ S: 6, P: 8

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

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

(d) $x^4 - 7x^2 + 10$ S: −7, P: 10

$= (x^2-5)(x^2-2)$

(e) $2x^2y^2 + 4xy + 2$ S: 2, P: 1

$= 2(x^2y^2 + 2xy + 1)$

$= 2(xy+1)(xy+1)$

$= 2(xy+1)^2$

(f) $a^2b^2 - 6ab + 5$ S: −6, P: 5

$= (ab-5)(ab-1)$

4. Determine two values of "b" so that each expression can be factored.

(a) $x^2 + bx + 12$ S = b, P = 12

① 1×12, b = 13 ② 2×6, b = 8 ③ 3×4, b = 7 ④ −1×−12, b = −13 ⑤ −2×−6, b = −8 ⑥ −3×−4, b = −7

(b) $x^2 + bx + 18$ where $b<0$ S = b, P = 18

① −1×−18, b = −19 ② −2×−9, b = −11 ③ −3×−6, b = −9

5. Determine two values of "c" so that each expression can be factored for $x^2 + 4x + c$.

b = 4: 2+2, c = 4; 1+3, c = 3

b = 4: 5+(−1), c = −5; 10+(−6), c = −60

There are many possibilities!!

Homework: CP p. 76 (odd letters)