

Algebra Section 9-6 Notes

Factoring $ax^2 + bx + c$

Name: _____

Date: _____ Block: _____

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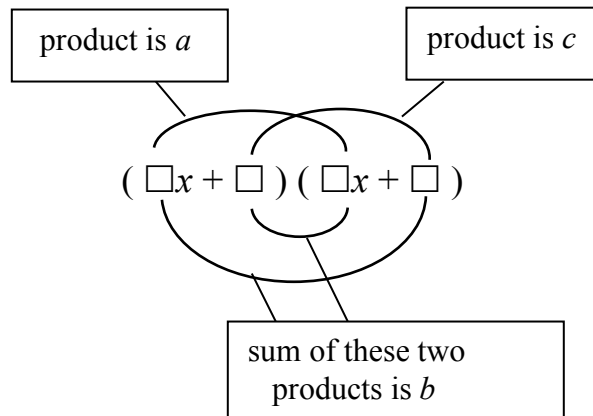
Suppose you have a polynomial $ax^2 + bx + c$, where a is a positive integer greater than 1.

To understand how to factor such a polynomial, look at the following product that has been simplified using *FOIL*:

F O I L

$$\text{Ex: } (2x + 3)(5x + 4) = 10x^2 + 8x + 15x + 12 = 10x^2 + 23x + 12$$

To break down $ax^2 + bx + c$ into its factors, look for a pair of binomials that have the following characteristics:



Note a few things:

1. If c is positive and b is positive, then the two factors of c are positive.
2. If c is positive and b is negative, then the two factors of c are negative.
3. If c is negative, then one of its factors is positive and the other is negative.

Example One: c is positive

Factor $6n^2 + 23n + 7$.

	$6n^2$	+	$23n$	+	7	
factors of a	$1 \cdot 6$		$1 \cdot 7 + 1 \cdot 6 = 13$		$1 \cdot 7$	factors of c
			$1 \cdot 1 + 7 \cdot 6 = 43$		$7 \cdot 1$	
	$2 \cdot 3$		$2 \cdot 7 + 1 \cdot 3 = 17$		$1 \cdot 7$	
			$2 \cdot 1 + 7 \cdot 3 = 23 \checkmark$		$7 \cdot 1$	
			↓ ↓ ↓ ↓			
	$6n^2 + 23n + 7 = (2n + 7)(3n + 1)$					

You try!

a. Factor $6x^2 + 13x + 5$.

b. Factor $4x^2 + 8x + 3$

Factoring ax^2+bx+c

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Example Two: c is NegativeFactor $7x^2 - 26x - 8$.

	$7x^2$	+	$(-26)x$	+	(-8)	
factors of a	$1 \cdot 7$		$(1) \cdot (-8) + (1) \cdot (7) = -1$		$(1) \cdot (-8)$	
			$(1) \cdot (1) + (-8) \cdot (7) = -55$		$(-8) \cdot (1)$	factors of c
	$2 \cdot 3$		$(1) \cdot (-4) + (2) \cdot (7) = 10$		$(2) \cdot (-4)$	
			$(1) \cdot (2) + (-4) \cdot (7) = -26 \checkmark$		$(-4) \cdot (2)$	

$$7x^2 - 26x - 8 = (1x + -4)(7x + 2)$$

You try! Factor $3x^2 - x - 4$.

Some polynomials can be factored repeatedly.

Continue the process of factoring until there are no common factors other than 1.

If a trinomial has a common monomial factor, factor it out before trying to find binomial factors.

Example Three: Factoring out a Monomial FirstFactor $20x^2 + 80x + 35$ completely. $20x^2 + 80x + 35 = 5(4x^2 + 16x + 7)$ The GCF is 5. Now factor the trinomial in the parentheses.

	$4x^2$	+	$16x$	+	7
	$1 \cdot 4$		$1 \cdot 7 + 1 \cdot 4 = 11$		$1 \cdot 7$
			$1 \cdot 1 + 7 \cdot 4 = 29$		$7 \cdot 1$
	$2 \cdot 2$		$2 \cdot 7 + 1 \cdot 2 = 16 \checkmark$		$1 \cdot 7$

$$4x^2 + 16x + 7 = (2x + 1)(2x + 7)$$

To finish: $20x^2 + 80x + 35 = 5(2x + 1)(2x + 7)$

Include the GCF in your final answer!

You try! Factor $10x^2 + 15x + 5$.

Homework: Practice 9-6, #4, 8, 12, ..., 60 (every fourth problem, 15 problems total)