

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## FACTORIZING TRINOMIALS

### ALGEBRA 2 WITH TRIGONOMETRY

Factoring trinomials, expressions of the form  $ax^2 + bx + c$ , is an important skill. Trinomials can be factored if they are the product of two binomials. The two main keys to factoring trinomials are: (1) the ability to quickly and accurately multiply binomials (FOIL) and (2) the ability to work with signed numbers. We practice both of these skills with four warm-up multiplication problems in *Exercise #1*.

**Exercise #1:** Without using your calculator, write each of the following products in simplest  $ax^2 + bx + c$  form.

(a)  $(3x+2)(5x+7)$

(b)  $(2x-3)(2x+5)$

(c)  $(5x-4)(x-2)$

(d)  $(4x+3)(3x-8)$

It is important that you know the fundamental rules governing the multiplication and addition of signed numbers. These rules will be key in factoring quickly and correctly. In each case, where a trinomial can be factored, it will be done using the guess-and-check method, where we **intelligently** guess binomial pairs and then check by seeing if the linear terms of the multiplication combine to form the linear term of the trinomial.

**Exercise #2:** Consider the trinomial  $6x^2 - 35x - 6$ . Below are four guesses of how this trinomial factors.

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

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

(c)  $(6x+1)(x-6)$

(d)  $(3x-2)(2x-3)$

(a) Two of these guesses are “unintelligent” – meaning that they should not even be checked. Cross them out and explain below them why they are unreasonable.

(b) Of the two that remain, check both above and determine which is the correct factorization of the trinomial.

The easiest of all trinomial factoring occurs when the leading coefficient is one ( $a = 1$ ).

**Exercise #3:** Using a guess-and-check technique, factor each of the following trinomials.

(a)  $x^2 + 2x - 35$

(b)  $x^2 + 11x + 24$

(c)  $x^2 - 13x + 22$

(d)  $x^2 - 5x - 50$



A step up from the last exercise occurs when the leading coefficient isn't one but is still a prime number. This is very often the case and makes at least part of the guessing much easier.

**Exercise #3:** Using a guess-and-check technique, factor each of the following trinomials that have prime leading coefficients. Show each guess and its check.

(a)  $3x^2 + 19x - 40$

(b)  $2x^2 - 15x + 18$

Finally, the hardest trinomials to factor are those whose leading coefficients are not prime. This is due to the fact that there are so many more intelligent guesses. In future lessons we will develop ways to eliminate some of these, but for now, the key will be to just keep **guessing until you get it right**.

**Exercise #4:** Factor each of the following trinomials. Show each guess and its check.

(a)  $15x^2 + 13x + 2$

(b)  $10x^2 + 13x - 30$

(c)  $12x^2 + 8x - 15$

(d)  $36x^2 - 35x + 6$



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**FACTORING TRINOMIALS**  
**ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK**

**SKILLS**

1. Multiply each of the following binomial pairs and express your answer in simplest trinomial form.

(a)  $(2x+5)(3x-2)$

(b)  $(3x-8)(5x-1)$

(c)  $(8x+3)(x+7)$

(d)  $(7x-5)(5x+2)$

2. Which of the following is the correct factorization of the trinomial  $12x^2 - 23x + 10$ . Hint – eliminate two of the choices because they are “unintelligent” guesses.

(1)  $(6x-1)(3x-10)$

(3)  $(4x-5)(3x+2)$

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

(4)  $(4x-5)(3x-2)$

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3. Written in factored form  $x^2 + 16x - 36$  is equivalent to

(1)  $(x-3)(x+12)$

(3)  $(x-2)(x+18)$

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

(4)  $(x-9)(x+4)$

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4. Write each of the following trinomials in its factored form. These are the easiest trinomials to factor because the leading coefficient is equal to one.

(a)  $x^2 - 7x - 18$

(b)  $x^2 + 14x + 24$

(c)  $x^2 - 17x + 30$

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

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

(f)  $x^2 - 15x + 44$

(g)  $x^2 + 21x + 20$

(h)  $x^2 - 6x - 16$



5. Each of the following trinomials has a leading coefficient that is prime. Using a guess-and-check technique, write each trinomial in its factored form. Show each guess and its check.

(a)  $5x^2 - 41x + 8$

(b)  $3x^2 + 4x - 20$

(c)  $2x^2 - 29x - 15$

(d)  $7x^2 + 39x + 20$

6. Each of the following trinomials has a non-prime leading coefficient. Using a guess-and-check technique, write each trinomial in its factored form. Show each guess and its check.

(a)  $18x^2 - 25x + 8$

(b)  $20x^2 - 11x - 42$

## REASONING

7. Consider the trinomial  $12x^2 + 7x - 10$ .

(a) Does this trinomial have a greatest common factor that could be “factored out”?

(b) Why is  $(4x - 2)(3x + 5)$  not an intelligent guess for factoring this trinomial even though  $4 \cdot 3 = 12$  and  $-2 \cdot 5 = -10$ ? Consider your answer to part (a).

