

Name: _____

Date: _____

Factoring $ax^2 + bx + c$ Activity

Custom Showrooms now wants Factor Steele Buildings to create a floor plan with more than one great room. Instead, Custom Showrooms wants two great rooms, seven large offices, and six cubicles.

The trinomial $2x^2 + 7x + 6$ can be factored to determine the length and width of the entire office space.

1. **Attend to precision.** How is the trinomial $2x^2 + 7x + 6$ different from the trinomials you factored in the previous lesson.

EXAMPLE A: Factor $2x^2 + 7x + 6$ using a guess and check method.

MATH TIP

The factors of c will both have the same sign if $c > 0$. If $b < 0$, both factors will be negative. If $b > 0$, both factors will be positive.

Possible Binomial Factors	Reasoning
$(2x \quad)(x \quad)$	$a = 2$ can be factored as $2 \cdot 1$.
$(2x + \quad)(x + \quad)$	$c = 6$, so both factors have the same sign. $b = 7$, so both factors are positive. 6 can be factored as $1 \cdot 6$, $6 \cdot 1$, $2 \cdot 3$, or $3 \cdot 2$.
$(2x + 1)(x + 6)$	Product: $2x^2 + 13x + 6$, incorrect
$(2x + 6)(x + 1)$	Product: $2x^2 + 8x + 6$, incorrect
$(2x + 2)(x + 3)$	Product: $2x^2 + 8x + 6$, incorrect
$(2x + 3)(x + 2)$	Product: $2x^2 + 7x + 6$, correct factors

EXAMPLE B: Factor $3x^2 + 8x - 11$ using a guess and check method.

Possible Binomial Factors	Reasoning
$(3x \quad)(x \quad)$	$a = 3$ can be factored as $3 \cdot 1$.
$(3x + \quad)(x - \quad)$ or $(3x - \quad)(x + \quad)$	$c = -11$, so the factors have different signs. 11 can be factored as $11 \cdot 1$ or $1 \cdot 11$.
$(3x + 11)(x - 1)$	Product: $3x^2 + 8x - 11$, correct factors
$(3x - 11)(x + 1)$	Product: $3x^2 - 8x - 11$, incorrect
$(3x + 1)(x - 11)$	Product: $3x^2 - 32x - 11$, incorrect
$(3x - 1)(x + 11)$	Product: $3x^2 + 32x - 11$, incorrect

Try These A - B: Factor the trinomials.

a. $3x^2 + 5x + 2$

b. $2x^2 + 5x - 18$

c. $2x^2 + 6x - 7$

EXAMPLE C: Factor $4x^2 - 4x - 15$ using a guess and check method.

Possible Binomial Factors	Reasoning
$(4x \quad)(x \quad)$ or $(2x \quad)(2x \quad)$	$a = 4$ can be factored as $4 \cdot 1$ or $2 \cdot 2$.
$(4x - \quad)(x + \quad)$ or $(4x + \quad)(x - \quad)$ or $(2x - \quad)(2x + \quad)$ or $(2x + \quad)(2x - \quad)$	$c = -15$, so the factors have different signs. 15 can be factored as $1 \cdot 15$, $15 \cdot 1$, $3 \cdot 5$, or $5 \cdot 3$.
$(4x - 1)(x + 15)$	Product: $4x^2 + 59x - 15$, incorrect
$(4x + 1)(x - 15)$	Product: $4x^2 - 59x - 15$, incorrect
$(4x - 15)(x + 1)$	Product: $4x^2 - 11x - 15$, incorrect
$(4x + 15)(x - 1)$	Product: $4x^2 + 11x - 15$, incorrect
$(4x - 3)(x + 5)$	Product: $4x^2 + 17x - 15$, incorrect
$(4x + 3)(x - 5)$	Product: $4x^2 - 17x - 15$, incorrect
$(4x - 5)(x + 3)$	Product: $4x^2 + 7x - 15$, incorrect
$(4x + 5)(x - 3)$	Product: $4x^2 - 7x - 15$, incorrect
$(2x - 1)(2x + 15)$	Product: $4x^2 + 28x - 15$, incorrect
$(2x + 1)(2x - 15)$	Product: $4x^2 - 28x - 15$, incorrect
$(2x - 3)(2x + 5)$	Product: $4x^2 + 4x - 15$, incorrect
$(2x + 3)(2x - 5)$	Product: $4x^2 - 4x - 15$, correct factors

Try These C: Factor the trinomials.

a. $6x^2 - 11x - 2$

b. $6x^2 - 13x - 4$

c. $4x^2 - 20x + 21$

EXAMPLE D: Factor $9x^2 - 24x + 12$.

Step 1: The coefficients 9, -24 , and 12 are all divisible by 3. Factor out the GCF.

$$9x^2 - 24x + 12 = 3(3x^2 - 8x + 4)$$

Step 2: Factor $3x^2 - 8x + 4$ using a guess and check method.

Possible Binomial Factors	Reasoning
$(3x \quad)(x \quad)$	$a = 3$ can be factored as $3 \cdot 1$.
$(3x - \quad)(x - \quad)$	$c = 4$, so the factors have the same sign. $b = -8$, so both factors are negative. 4 can be factored as $4 \cdot 1$, $1 \cdot 4$, or $2 \cdot 2$.
$(3x - 4)(x - 1)$	Product: $3x^2 - 7x + 4$, incorrect
$(3x - 1)(x - 4)$	Product: $3x^2 - 13x + 4$, incorrect
$(3x - 2)(x - 2)$	Product: $3x^2 - 8x + 4$, correct factors

Solution: Write the complete factorization, including the GCF from Step 1:

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

Check: Multiply to check your answer.

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

$$= 3(3x^2 - 6x - 2x + 4) = 3(3x^2 - 8x + 4) = 9x^2 - 24x + 12$$

Try These D: Factor the trinomial completely. Check your work by multiplying the factors.

a. $8x^2 + 20x - 28$

b. $8x^3 - 14x^2 + 6x$