

Today, we will factor quadratic¹ trinomials².

¹ a polynomial with a degree of two
² three terms (separated by addition or subtraction)

CFU

What are we going to do today?

What are we factoring?

We are factoring quadratic trinomials.

What are we going to do with a quadratic trinomials?

We are factoring quadratic trinomials.

We are factoring quadratic trinomials.

Activate (or provide) Prior Knowledge

A quadratic trinomial is a polynomial with a degree of two and three terms.

$3x^2 + 6x + 8$ or $x^2 + 4x + 5$

Identify which polynomial is a quadratic trinomial.

A. $3x^3 + 4x - 9$ B. $2x^2 - 4x$ C. $x^2 - 3x + 8$



CFU

Identify if a polynomial is a quadratic trinomial. How did you know ___ is a quadratic trinomial?
We have already learned how to identify a quadratic trinomial. Today, we will be factoring quadratic polynomials.

To **factor** is to write an expression as a product.

$$6x^2 \rightarrow 2 \bullet 3 \bullet x \bullet x$$

$$4x^2 - 3x \rightarrow x(4x - 3)$$

$$x^2 + 3x + 2 \rightarrow (x + 2)(x + 1)$$

Remember: the **opposite** of factoring a quadratic polynomial is multiplying binomials.

$$(x + 2)(x + 1) \rightarrow x^2 + 3x + 2$$

$$3x^2 + 14x + 8$$

Trial and Error (<i>Guess and Check</i>) Method		Diamond/Box Method	
1	$(3x + 1)(1x + 8) = 3x^2 + 25x + 8$	$3x^2 + 14x + 8$ 14 212 24	3x2 2 x 4 3x² 12x 2x 8 $(x + 4)(3x + 2) = 3x^2 + 14x + 8$
2	$(3x + 8)(1x + 1) = 3x^2 + 11x + 8$		
3	$(3x + 4)(1x + 2) = 3x^2 + 10x + 8$		
4	$(3x + 2)(1x + 4) = 3x^2 + 14x + 8$		

CFU

What does it mean to factor? To factor means ~~to write an expression as a product.~~

Which quadratic trinomial is factored? Why? A. $6x^2 + 7x - 3$ B. $(3x - 1)(2x + 3)$



Importance

It is important to learn how to factor a quadratic trinomial because:

- *multiplication has useful properties that addition and subtraction don't share .*
- *it is tested on the CST and benchmark.*
- *it is used in Physics to determine velocity described by equations like*

$$-16t^2 + 12t + 4$$

46 Which of the following shows $9t^2 + 12t + 4$ factored completely?

- A $(3t + 2)^2$
- B $(3t + 4)(3t + 1)$
- C $(9t + 4)(t + 1)$
- D $9t^2 + 12t + 4$

CSA20106

CFU

Does anyone else have another reason why it is important to factor a quadratic trinomial? (pair-share) Why is it important to factor a quadratic trinomial? You may give me one of my reasons or one of your own. Which reason means the most to you? Why?

To **factor** is to write an expression as a product.

Factoring Quadratic Trinomials										
Step #1: <u>Multiply</u> the coefficients of the first and the last terms. Place in the bottom of the diamond $3x^2 + 10x + 8$ 24	Step #2: <u>Place</u> the coefficient of the middle term in the top of the diamond. $3x^2 + 10x + 8$ 10 24	Step #3: <u>Determine</u> which two numbers multiply to get the bottom number and add to get the top. 10 6 4 24								
Step #4: <u>Complete</u> the box, placing the appropriate terms in their place. <table border="1"><tr><td>$3x^2$</td><td>$6x$</td></tr><tr><td>$4x$</td><td>8</td></tr></table>	$3x^2$	$6x$	$4x$	8	Step #5: <u>Factor</u> out the GCFs for the columns and rows. $3x$ 4 <table border="1"><tr><td>x $3x^2$</td><td>2 $6x$</td></tr><tr><td>$4x$</td><td>8</td></tr></table>	x $3x^2$	2 $6x$	$4x$	8	Step #6: <u>Write</u> the result and the product of two binomials. Check your answer. $(3x + 4)(x + 2)$ $3x^2 + 6x + 4x + 8$ $3x^2 + 10x + 8$
$3x^2$	$6x$									
$4x$	8									
x $3x^2$	2 $6x$									
$4x$	8									
Step #1: $2x^2 + 9x + 10$ 20	Step #2: $2x^2 + 9x + 10$ 9 20	Step #3: 9 4 5 20								
Step #4: <table border="1"><tr><td>$2x^2$</td><td>$4x$</td></tr><tr><td>$5x$</td><td>10</td></tr></table>	$2x^2$	$4x$	$5x$	10	Step #5: $2x$ 5 <table border="1"><tr><td>x $2x^2$</td><td>2 $4x$</td></tr><tr><td>$5x$</td><td>10</td></tr></table>	x $2x^2$	2 $4x$	$5x$	10	Step #6: $(2x + 5)(x + 2)$ $2x^2 + 4x + 5x + 10$ $2x^2 + 9x + 10$
$2x^2$	$4x$									
$5x$	10									
x $2x^2$	2 $4x$									
$5x$	10									

CFU - How did I get 24? Why did I write 10 on top of the diamond? How did I come up with 6 and 4? How did I complete the box? How did I create the binomials (3x+4) and (x+2)?
Step #1 W/B: How did you get 20? Step #2 W/B: Why did you write 9 on top of the diamond? Step #3 W/B: How did you come up with 4 and 5? Step #4 W/B: How did you complete the box? Steps #5,6 W/B: How did you create the binomials (2x+5) and (x+2)? Algebra I 11.0
Students apply basic factoring techniques to second- and simple third-degree polynomials.

To factor is to write an expression as a product.

Factoring Quadratic Trinomials										
Step #1: <u>Multiply</u> the coefficients of the first and the last terms. Place in the bottom of the diamond $6x^2 + 7x - 3$ -18	Step #2: <u>Place</u> the coefficient of the middle term in the top of the diamond. $6x^2 + 7x - 3$ 7 -18	Step #3: <u>Determine</u> which two numbers multiply to get the bottom number and add to get the top. 9 7 -2 -18								
Step #4: <u>Complete</u> the box, placing the appropriate terms in their place. <table border="1"><tr><td>$6x^2$</td><td>$9x$</td></tr><tr><td>$-2x$</td><td>-3</td></tr></table>	$6x^2$	$9x$	$-2x$	-3	Step #5: <u>Factor</u> out the GCFs for the columns and rows. $3x$ $2x$ 3 <table border="1"><tr><td>$6x^2$</td><td>$9x$</td></tr><tr><td>$-2x$</td><td>-3</td></tr></table> -1	$6x^2$	$9x$	$-2x$	-3	Step #6: <u>Write</u> the result and the product of two binomials. Check your answer. $(3x-1)(2x+3)$ $6x^2 + 9x - 2x - 3$ $6x^2 + 7x - 3$
$6x^2$	$9x$									
$-2x$	-3									
$6x^2$	$9x$									
$-2x$	-3									
Step #1: $5x^2 + 7x - 6$ -30	Step #2: $5x^2 + 7x - 6$ 7 -30	Step #3: 10 7 -3 -30								
Step #4: <table border="1"><tr><td>$5x^2$</td><td>$10x$</td></tr><tr><td>$-3x$</td><td>-6</td></tr></table>	$5x^2$	$10x$	$-3x$	-6	Step #5: $5x$ x 2 <table border="1"><tr><td>$5x^2$</td><td>$10x$</td></tr><tr><td>$-3x$</td><td>-6</td></tr></table> -3	$5x^2$	$10x$	$-3x$	-6	Step #6: $(5x-3)(x+2)$ $5x^2 + 10x - 3x - 6$ $5x^2 + 7x - 6$
$5x^2$	$10x$									
$-3x$	-6									
$5x^2$	$10x$									
$-3x$	-6									

To **factor** is to write an expression as a product.

Factoring Quadratic Trinomials										
Step #1: <u>Multiply</u> the coefficients of the first and the last terms. Place in the bottom of the diamond $6x^2 - 11x - 10$ -60	Step #2: <u>Place</u> the coefficient of the middle term in the top of the diamond. $6x^2 - 11x - 10$ -60 -11	Step #3: <u>Determine</u> which two numbers multiply to get the bottom number and add to get the top. -60 -15 4 -11								
Step #4: <u>Complete</u> the box, placing the appropriate terms in their place. <table border="1"><tr><td>$6x^2$</td><td>$-15x$</td></tr><tr><td>$4x$</td><td>-10</td></tr></table>	$6x^2$	$-15x$	$4x$	-10	Step #5: <u>Factor</u> out the GCFs for the columns and rows. $3x$ $2x$ 2 <table border="1"><tr><td>$6x^2$</td><td>$-15x$</td></tr><tr><td>$4x$</td><td>-10</td></tr></table>	$6x^2$	$-15x$	$4x$	-10	Step #6: <u>Write</u> the result and the product of two binomials. Check your answer. $(3x + 2)(2x - 5)$ $6x^2 - 15x + 4x - 10$ $6x^2 - 11x - 10$
$6x^2$	$-15x$									
$4x$	-10									
$6x^2$	$-15x$									
$4x$	-10									
Step #1: $4x^2 - 4x - 15$	Step #2: $4x^2 - 4x - 15$ -4	Step #3: -4 6 -10 -60								
Step #4: <table border="1"><tr><td>$4x^2$</td><td>$6x$</td></tr><tr><td>$-10x$</td><td>-15</td></tr></table>	$4x^2$	$6x$	$-10x$	-15	Step #5: $2x$ $2x$ -5 <table border="1"><tr><td>$4x^2$</td><td>$6x$</td></tr><tr><td>$-10x$</td><td>-15</td></tr></table>	$4x^2$	$6x$	$-10x$	-15	Step #6: $(2x - 5)(2x + 3)$ $4x^2 + 6x - 10x - 15$ $4x^2 - 4x - 15$
$4x^2$	$6x$									
$-10x$	-15									
$4x^2$	$6x$									
$-10x$	-15									

1. What does it mean to factor?
To factor means to write an expression as a product.
2. What did you learn today about factoring? Why is that important to you?
3. Factor the trinomials below.

Factor a Quadratic Trinomial

Step #1: Multiply the coefficients of the first and the last terms. Place in the bottom of the diamond.

Step #2: Place the coefficient of the middle term in the top of the diamond.

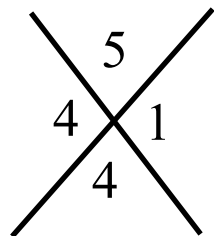
Step #3: Determine which two numbers multiply to get the bottom number and add to get the top.

Step #4: Complete the box, placing the appropriate terms in their place.

Step #5: Factor out the GCFs for the columns and rows.

Step #6: Write the result and the product of two binomials. Check your answer.

$$2x^2 + 5x + 2$$



2x
1

	x	2
$2x^2$	$4x$	
$1x$	2	

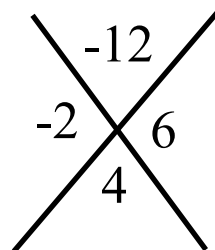
$$(2x+1)(x+2)$$

$$2x^2 + 4x + 1x + 2$$

$$2x^2 + 5x + 2$$

$2x^2$	$4x$
$1x$	2

$$4x^2 + 4x - 3$$



2x
3

	$2x$	-1
$4x^2$	$-2x$	
$6x$	-3	

$$(2x+3)(2x-1)$$

$$4x^2 + 6x - 2x - 3$$

$$4x^2 + 4x - 3$$

$4x^2$	$-2x$
$6x$	-3