Algebra 1 Week 2 notes More on Factoring and zero product property

Two Different Approaches to Factoring Quadratics

Factoring Quadratic Trinomials Notes

There are several ways we can factor a polynomial of the form $ax^2 + bx + c$, $a \neq 0$.

Example 1: Factor $x^2 + 5x + 6$

Step 1: List the factors of 6:

Step 2: The value of c, 6, is positive. Which factors of 6 add up to 5?

Step 3: The signs of the factors will be positive because b is positive.

Factored version: $(x + 3)(x + 2)$

Step 4: CHECK YOUR WORK. Multiply your answer and check it is what we started with.

Example 2: Factor $x^2 - 5x - 6$

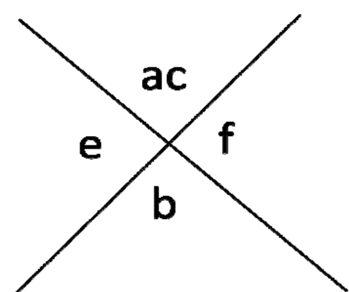
Step 1: List the factors of 6:

Step 2: The value of c, -6, is negative. Which factors of 6 when subtracted give 5? Which factor should be negative and which should be positive?

Step 3: The signs of the 6 should be negative since b is negative 5

Factored version: $(x - 6)(x + 1)$

Method 3: Diamond Method



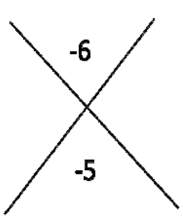
This method works for any value of a.

Steps:

- In the top, put the product of a and c.
- In the bottom, put the value of b.
- The left and the right locations are the numbers that when multiplied, give us ac, and when added, give us b, that is ef = ac and e + f = b.
- Put a fraction bar over the left and right values, and put a on top. Reduce.
- The top part of the fraction bar is the x-coefficient of the binomial factor, and the bottom part is the constant part.

Example: $2x^2 - 5x - 3$

1)



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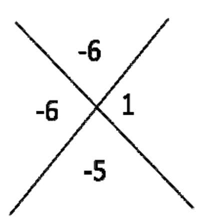

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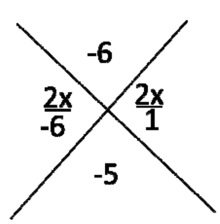

4)

$\frac{2x}{-6} = \frac{x}{-3} \longrightarrow x - 3$

$\frac{2x}{1} \longrightarrow 2x + 1$

The Zero Product Property

Quadratic equations in factored form can be solved by using the Zero Product Property which states: If the product of two quantities equals zero, at least one of the quantities must equal zero.

If $(x)\ (y) = 0$, then

$x = 0$ or $y = 0$

If $(x + 3)\ (x - 2) = 0$, then

$x + 3 = 0$ or $x - 2 = 0$

You can use the Zero Product Property to solve any quadratic equation written in factored form, such as $(a + b)(a - b) = 0$.

Examples: Solve the quadratic equations by factoring

1) Solve $y = \boldsymbol{x^2} + 4x - 5$ **We substitute zero for y because ZEROES are the SOLUTIONS of quadratic equations.**

$0 = \boldsymbol{x^2} + 4x - 5$ **Now we factor the quadratic (see previous lessons) to find the ZEROES.**

$0 = (x + 5)(x - 1)$ **Find the zeros of $(x + 5)(x - 1) = 0$ by setting each factor equal to 0.**

$\boldsymbol{x + 5 = 0}$ **or** $\boldsymbol{x - 1 = 0}$ *Set each factor equal to 0.*

$\boldsymbol{x = -5}$ **or** $\boldsymbol{x = 1}$ *Solve each equation for x.*

2) Solve $(x - 7)(x + 2) = 0$.

$x - 7 = 0$ or $x + 2 = 0$ *Set each factor equal to 0.*

$x = 7$ or $x = -2$ *Solve each equation for x.*

Using Zero Product Property Example (Given Factored Form):

Problem: Find the solutions for: (x+2)(x-5)=0

What to do: Set each factor to zero and then solve.

Work: x+2 = 0 x– 5 = 0

X = –2 x = 5

Using Zero Product Property Example (Given in Standard Form and not factored):

Problem: Find the solutions for: $\boldsymbol{x^2} - 4x - 12 = 0$

What to do: Fire Factor, then Set each factor to zero, and then solve.

Work: (x– 6)(x+2)=0

x+2=0 x– 6 = 0

x = –2 x = 5

Factoring Trinomials (a = 1)

Factor each completely.

1) $b^2 + 8b + 7$

2) $n^2 - 11n + 10$

3) $m^2 + m - 90$

4) $n^2 + 4n - 12$

5) $n^2 - 10n + 9$

6) $b^2 + 16b + 64$

7) $m^2 + 2m - 24$

8) $x^2 - 4x + 24$

Solve each equation by using the zero product property.

1) $(n-5)(n+3) = 0$

2) $(x-3)(x+1) = 0$

3) $(a+3)(a+8) = 0$

4) $m(m+7) = 0$

5) $(3x-8)(x-3) = 0$

6) $(3p+1)(8p-3) = 0$

7) $(a-7)(a-3) = 0$

8) $(4v+5)(v+7) = 0$

9) $3p(5p-1) = 0$

10) $(v+8)^2 = 0$

Solve each equation by factoring.

1) $x^2 + 10x + 21 = 0$

2) $a^2 + 7a - 8 = 0$

3) $k^2 + 2k - 35 = 0$

4) $4x^2 + 20x - 24 = 0$

5) $3n^2 - 75 = 0$

6) $v^2 - 5v = 0$

Algebra 1 Summary Assignment Week 2

Factor Completely. If non-factorable, say so.

1. $2a^2 - 6a$	2. $x^2 - 26x + 25$
3. $x^2 + 12x + 36$	4. $y^2 - 4y - 45$
5. $w^2 - 6w + 7$	6. $2x^2 + 10x + 8$

Solve for x. Show all work. Circle your answers.

7. $x^2 - 3x = 0$	8. $(2x - 5)(x + 7) = 0$
9. $x^2 + 2x - 15 = 0$	10. $x^2 + 5x = 24$