

# P5 – Factoring Quadratic Equations

## Factoring Quadratic Equations

Standard form of a quadratic equation -  $ax^2 + bx + c = 0$

### Zero Product Property

For any real numbers  $a$  and  $b$ , if  $ab = 0$ , then either  $a = 0$ ,  $b = 0$ , or both  $a$  and  $b$  equal zero

Factoring quadratics when  $a = 1$ , first identify  $a$ ,  $b$ , and  $c$  and find the factors  $m$  and  $n$  of  $c$  that add up to  $b$

Then determine the signs of the factors based on the signs of  $b$  and  $c$

<p>If <math>c</math> is positive and <math>b</math> is positive  <math>ax^2 + bx + c = 0</math>                      When <math>c</math> is positive the signs of the factors will be the same and the sign of <math>b</math> tells us the what that sign is  <math>(x + m)(x + n) = 0</math></p>	<p>If <math>c</math> is positive and <math>b</math> is negative  <math>ax^2 - bx + c = 0</math>                      When <math>c</math> is positive the signs of the factors will be the same and the sign of <math>b</math> tells us the what that sign is  <math>(x - m)(x - n) = 0</math></p>
<p>If <math>c</math> is negative and <math>b</math> is positive  <math>ax^2 + bx - c = 0</math>                      When <math>c</math> is negative, the signs of the factors are different and the sign of <math>b</math> tells us the sign of the larger factor (let <math>m &gt; n</math>)  <math>(x + m)(x - n) = 0</math></p>	<p>If <math>c</math> is negative and <math>b</math> is negative  <math>ax^2 - bx - c = 0</math>                      When <math>c</math> is negative, the signs of the factors are different and the sign of <math>b</math> tells us the sign of the larger factor (let <math>m &gt; n</math>)  <math>(x - m)(x + n) = 0</math></p>

Example 1 Solve by Factoring

a)  $x^2 - 8x + 12 = 0$

$$(x - 6)(x - 2) = 0$$

$$x = 6 \quad x = 2$$

b)  $x^2 + 2x - 3 = 0$

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

$$x = -3 \quad x = 1$$

HW: (23, 24, 25, 28)

Solve each equation by factoring. (Example 4)

23.  $x^2 - 10x + 21 = 0$

24.  $p^2 - 6p + 5 = 0$

25.  $x^2 - 3x - 28 = 0$

26.  $4w^2 + 19w - 5 = 0$

27.  $4r^2 - r = 5$

28.  $g^2 + 6g - 16 = 0$

## Factoring when $a \neq 1$

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Step 1	Multiply $a$ and $c$
Step 2	Find factors of $ac$ with a sum of $b$
Step 3	Rewrite as a 4-term polynomial using the factors from step 2
Step 4	Factor by grouping or boxing

#### Example 1 Factor

a.  $3x^2 + 16x + 5 = 0$

Group 15.1

$$(3x^2 + 15x)(x + 5) = 0$$

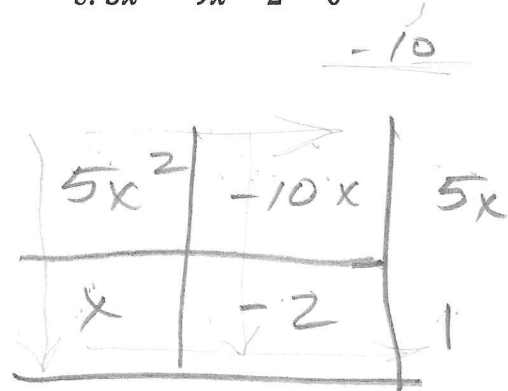
$$3x(x + 5) + 1(x + 5) = 0$$

$$(3x + 1)(x + 5) = 0$$

$$x = -\frac{1}{3} \quad x = -5$$



b.  $5x^2 - 9x - 2 = 0$



$$x - 2$$

$$(5x + 1)(x - 2) = 0$$

$$x = -\frac{1}{5} \quad x = 2$$

### Factoring Trinomials When $a > 1$

Use a separate sheet of paper.

Factor by Grouping.

1.  $3x^2 + 16x + 5 = 0$

2.  $6x^2 - 11x - 2 = 0$

3.  $5x^2 - 9x - 2 = 0$

4.  $6x^2 - 11x - 10 = 0$

Factor by Boxing.

5.  $10x^2 + 17x + 6 = 0$

6.  $14x^2 - 15x + 4 = 0$

7.  $8x^2 + 2x - 3 = 0$

8.  $2x^2 + 19x - 10 = 0$