

Algebra 2

4.3

Write quadratic equations in standard form

Solve quadratic equations by factoring*

*Algebra 1 Ch. 8

binomial

trinomial

polynomial

distributive property

EWE

~~FOIL method (boo...FAIL method)~~

factoring by grouping

zero product property

whiteboards

$$\begin{array}{l} (x^2 - 2x - 15) \\ (x + 3) \\ (x - 5) \end{array}$$

$$\begin{array}{l} -5x - 15 \\ x^2 + 3x \end{array}$$

$$x^4 + 3x^2 - 7x + 5$$

$$3x(x^2 + 3x - 6)$$
$$3x^3 + 9x^2 - 18x$$

Standard Form

$$y = x^2 - 8x + 12$$

Factored Form

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

Factors

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

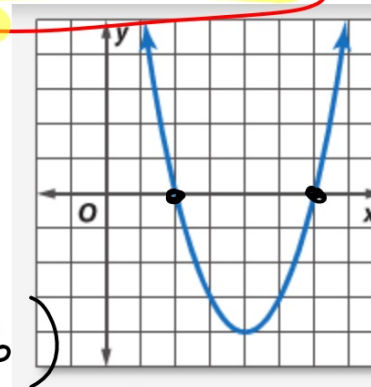
$$\begin{array}{l} \downarrow \quad \downarrow \\ x - 6 = 0 \quad x - 2 = 0 \\ +6 \quad +6 \quad +2 \quad +2 \\ x = 6 \quad x = 2 \end{array}$$

graph... zeros
equation... solutions

$$\begin{array}{r} 12 \\ -2 \quad -6 \\ \hline -8 \end{array}$$

$$\begin{array}{r} 1 \quad 12 \\ 2 \quad 6 \\ 3 \quad 4 \end{array}$$

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



Related Graph
2 and 6 are
x-intercepts.

KeyConcept ~~FOIL Method for~~ Multiplying Binomials

FAIL method...

EWE

$$(x + 5)(x + 3) \quad \sim$$

$$(x - 8)(x + 2)$$

$$x + 5$$

$$x + 3$$

$$ax^2 + bx + c = 0$$

Write a quadratic equation in standard form with 2 and -5 as its roots.

2. 2. 2. 2. $x^2 + \frac{3}{2}x - 5 = 0$ Work backwards...

$$x^2 + 3x - 10 = 0$$

$$2x^2 + 3x - 10 = 0$$

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

$$x-2=0 \quad x+5=0$$

$$x=2$$

$$x=-5$$

Standard form:
integers (no fractions)
in order
GCF & pos. x coefficient
(might need to divide by -1)

$$\frac{-x^2}{-1} + \frac{5x}{-1} - \frac{7}{-1} = \frac{0}{-1}$$

Example 1 Translate Sentences into Equations

Write a quadratic equation in standard form with

roots of -4 and 6

$$x^2 - 5x + 7 = 0$$

$$x^2 - 2x - 24 = 0$$

$$(x+4)(x-6) = 0$$

$$x+4=0 \quad x-6=0$$

$$x=-4 \quad x=6$$

Standard form:

integers

in order

x coefficient is positive

Guided Practice

1. Write a quadratic equation in standard form with $\frac{3}{4}$ and -5 as its roots.
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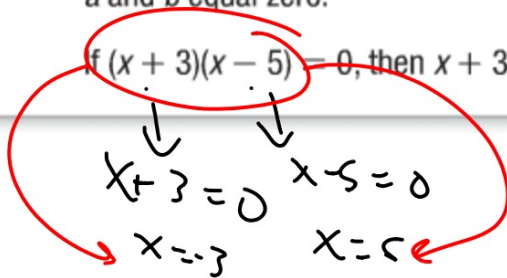
$$(2x-7)(5x+6)$$

2 Solve Equations by Factoring Solving quadratic equations by factoring is an application of the Zero Product Property.

 Key Concept Zero Product Property

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

Example If $(x+3)(x-5) = 0$, then $x+3 = 0$ or $x-5 = 0$.


$$\begin{array}{ccc} \downarrow & & \downarrow \\ x+3=0 & & x-5=0 \\ \swarrow & & \searrow \\ x=-3 & & x=5 \end{array}$$

Example 2 Factor the GCF

Solve $\frac{16x^2}{8x} + \frac{8x}{8x} = 0$.

$$8x \cdot (2x + 1) = 0$$

$$\begin{array}{l} \downarrow \qquad \qquad \downarrow \\ 8x = 0 \qquad 2x + 1 = 0 \\ \cancel{8} \quad \cancel{8} \qquad 2x = -1 \\ x = 0 \qquad \qquad x = -\frac{1}{2} \end{array}$$

$$\begin{array}{l} x^2 + 10x + 25 \\ (x+5)(x+5) \\ (x+5)^2 \end{array}$$

1. GCF
2. X-factor

DOS
PST

 other... factor by grouping

$$\begin{array}{l} x^2 - 16 \\ (x+4)(x-4) \end{array}$$

• **Guided Practice** Solve each equation.

2A. $\frac{20x^2}{5x} + \frac{15x}{5x} = 0$

2B. $4y^2 + 16y = 0$

2C. $6a^5 + 18a^4 = 0$

$$5x(4x + 3) = 0$$

Example 3 Perfect Squares and Differences of Squares

Solve each equation.

a. $x^2 + 16x + 64 = 0$

$$(x + 8)^2 = 0$$

$$(x + 8)(x + 8) = 0$$

$$\downarrow$$
$$x = -8 \quad x = -8$$

$$x = 5$$

$$\sqrt{x^2} = \sqrt{64} \quad x = 8$$

$$x^2 - 64 = 0$$

$$(x+8)(x-8) = 0$$

$\downarrow \qquad \qquad \downarrow$

$$x = -8 \quad x = 8$$

Guided Practice

3A. $4x^2 - 12x + 9 = 0$

3B. $81x^2 - 9x = 0$

3C. $6a^2 - 3a = 0$

$$(2x - 3)^2 = 0$$

Example 4 Factor Trinomials

Solve each equation.

a. $x^2 + 9x + 20 = 0$

 GuidedPractice

4A. $x^2 - 11x + 30 = 0$

4B. $x^2 - 4x - 21 = 0$

factor by grouping

$$\begin{array}{ccc} a & b & c \\ \downarrow & \downarrow & \downarrow \\ \text{b. } 6y^2 & -23y & +20 = 0 \end{array}$$

$$\left(\frac{6y^2}{2y} - \frac{8y}{2y} - \frac{15y}{-5} + \frac{20}{-5} \right) = 0$$

$$2y(3y-4) - 3(3y-4) = 0$$

$$(2y-3)(3y-4) = 0$$

a · c

$$6 \cdot 20$$

$$120$$

$$1 \quad 120$$

$$2 \quad 60$$

$$3 \quad 40$$

$$4 \quad 30$$

$$5 \quad 24$$

$$6 \quad 20$$

$$8 \quad 15$$

4C. $15x^2 - 8x + 1 = 0$

4D. $-12x^2 + 8x + 15 = 0$

$$\begin{array}{r} -180 \\ \hline 18 \quad -18 \end{array}$$

$$\left(\begin{array}{c} a \quad b \quad c \\ -12x^2 + 8x + 15 = 0 \end{array} \right)$$

$$\left(\begin{array}{c} -12x^2 + 18x \\ -6x \end{array} \right) \left(\begin{array}{c} -10x + 15 \\ -5 \end{array} \right) = 0$$

$$-6x(2x - 3) - 5(+2x - 3) = 0$$

$$(2x - 3)(-6x - 5) = 0$$