Section 6.4 **Objective: Review of solving quadratic equations**

We've learned how to solve quadratic equations by factoring, by the square root property and by using the quadratic formula. Let's review each way to solve quadratic equations.

Solving Quadratic Equations by Factoring:

1. Get a zero on one side of the equation.
2. Factor completely.
3. Set each factor *containing a variable* equal to 0.
4. Solve the resulting equations.

Examples:

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

$2x-3=0$, $+3$ $+3$, $2x=3$, $\frac{2x}{2}=\frac{3}{2}$, $\boxed{x=\frac{3}{2}}$

$x+5=0$, -5 -5, $\boxed{x=-5}$

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

set $=0$

$x^2+x-12=0$

-12 | 1
$-1\cdot 12$
$-2\cdot 6$
$-3\cdot 4$ | $-3+4$

	x	-3
x	x^2	$-3x$
4	$4x$	-12

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

$x-3=0$, $+3$ $+3$, $\boxed{x=3}$

$x+4=0$, -4 -4, $\boxed{x=-4}$

$x^2-7x+6=0$

mult add
6 | -7
$-1\cdot -6$ | $-1+-6=-7$
$-2\cdot 3$ | $-2+-3=-5$

	x	-1
x	x^2	$-1x$
-6	$-6x$	6

$(x-1)(x-6)=0$

$x-1=0$, $+1$ $+1$, $\boxed{x=1}$

$x-6=0$, $+6$ $+6$, $\boxed{x=6}$

The Quadratic Formula: A quadratic equation written in the form $ax^2+bx+c=0$, where $a\neq 0$, has the solutions

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}.$$

Solving a Quadratic Equation Using the Quadratic Formula:

1. Write the equation in standard form: $ax^2+bx+c=0$.
2. Identify a, b, and c. Plug them into the equation. Be careful with parentheses.
3. Simplify. Be careful to follow order of operations and deal with negatives correctly.

Examples: Solve each equation using the quadratic formula.

$ax^2+bx+c=0$

a) $x^2+4x-3=0$

a = 1, **b =** 4, **c =** -3

$$x=\frac{-4\pm\sqrt{(4)^2-4(1)(-3)}}{2(1)}$$

$$\frac{-4\pm\sqrt{28}}{2}$$

$$\boxed{\frac{-4\pm 2\sqrt{7}}{2}}$$

$$\frac{\cancel{2}(-2\pm 1\sqrt{7})}{\cancel{2}}=\boxed{-2\pm\sqrt{7}}$$

b) $3x^2 - 4x = -5$

$3x^2 - 4x + 5 = 0$

a = 3, b = −4, c = 5

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(5)}}{2(3)}$$

$$\frac{4 \pm \sqrt{-44}}{6}$$

$$\frac{4 \pm i\sqrt{44}}{6}$$

$$\frac{4 \pm i\,2\sqrt{11}}{6} \Rightarrow \boxed{\frac{4 \pm 2i\sqrt{11}}{6}}$$

$$\frac{\cancel{2}(2 \pm 1\sqrt{11})}{\cancel{6}\,3}$$

$$\boxed{\frac{2 \pm 1\sqrt{11}}{3}}$$

Solving Equations by Taking Square Roots: Do this when the equation has a perfect square and no other variables.

1. Get the perfect square alone on one side of the equation.
2. Use the square root property.
3. Simplify all square roots. Write the square roots of negative numbers in terms of *i*.
4. Solve for the variable, if necessary.

Examples:

Solve for x by using the square root principle (property).

a) $x^2 = 48$

$\sqrt{x^2} = \pm\sqrt{48}$

$\sqrt{x \cdot x} = \pm 4\sqrt{3}$

$\boxed{x = \pm 4\sqrt{3}}$

b) $x^2 = 81$

$\sqrt{x^2} = \pm\sqrt{81}$

$\boxed{x = \pm 9}$

c) $4(x+1)^2 = -68$

$\frac{\cancel{4}(x+1)^2}{\cancel{4}} = \frac{-68}{4}$

$(x+1)^2 = -17$

$\sqrt{(x+1)\cancel{(x+1)}} = \pm\sqrt{-17}$

$x + \cancel{1} = \pm i\sqrt{17}$

$\quad \cancel{-1} \quad -1$

$\boxed{x = -1 \pm i\sqrt{17}}$

d) $2x^2 - 8 = -24$

$\quad +8 \quad +8$

$\frac{\cancel{2}x^2}{\cancel{2}} = \frac{-16}{2}$

$x^2 = -8$

$\sqrt{x \cdot x} = \pm\sqrt{-8}$

$x = \pm i\sqrt{8}$

$\boxed{x = \pm 2i\sqrt{2}}$

e) $\frac{\cancel{3}(t-2)^2}{\cancel{3}} = \frac{54}{3}$

$(t-2)^2 = 18$

$\sqrt{(t-2)(t-2)} = \pm\sqrt{18}$

$t-2 = \pm 3\sqrt{2}$
$+2$

$\boxed{t = 2 \pm 3\sqrt{2}}$

f) $x^2 + \cancel{5} = 30$
$\quad -\cancel{5} \quad -5$

$x^2 = 25$

$\sqrt{x \cdot x} = \pm\sqrt{25}$

$\boxed{x = \pm 5}$