

Algebra 2
3.6 Quadratic Formula

For the equations $ax^2 + bx + c = 0$ the solutions to the quadratic equation are found by:

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

You can memorize the quadratic formula by singing it in a song with the tune of "Pop Goes the Weasel"

EXAMPLE 1 Solve an equation with two real solutions

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

$$x = \frac{5 \pm \sqrt{25 - 4(1)(7)}}{2 \cdot 1}$$

$$= \frac{5 \pm \sqrt{25 - 28}}{2} = \frac{5 \pm \sqrt{3}}{2}$$

EXAMPLE 2 Solve an equation with one real solution

Solve $16x^2 - 23x + 25 = 17x - 25$

$$16x^2 - 40x + 25 = 0$$

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

$$x = \frac{40 \pm \sqrt{1600 - 4(16)(25)}}{2 \cdot 16}$$

$$x = \frac{40 \pm \sqrt{1600 - 1600}}{32}$$

$$x = \frac{40 \pm \sqrt{0}}{32} = \frac{40 \pm 0}{32} = \frac{40}{32}$$

$$x = \frac{5}{4}$$

EXAMPLE 3 Solve an equation with imaginary solutions

Solve $x^2 - 6x + 10 = 0$

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

$$x = \frac{6 \pm \sqrt{36 - 4(1)(10)}}{2 \cdot 1}$$

$$x = \frac{6 \pm \sqrt{36 - 40}}{2} \quad x = \frac{6 \pm \sqrt{-4}}{2}$$

$$x = \frac{6 \pm 2i}{2} = \frac{3 \pm i}{1}$$

$$3 \pm i$$

GUIDED PRACTICE for Examples 1, 2, and 3

Use the quadratic formula to solve the equation.

1. $x^2 = 6x - 4$ $3 \pm \sqrt{5}$ 2. $4x^2 - 10x = 2x - 9$ $1\frac{1}{2}$ 3. $7x - 5x^2 - 4 = 2x + 3$ $\frac{5 \pm i\sqrt{115}}{10}$

$$x^2 - 6x + 4 = 0$$

$$x = \frac{6 \pm \sqrt{36 - 4(1)(4)}}{2 \cdot 1}$$

$$= \frac{6 \pm \sqrt{36 - 16}}{2}$$

$$= \frac{6 \pm \sqrt{20}}{2}$$

$$= \frac{6 \pm 2\sqrt{5}}{2}$$

$$3 \pm \sqrt{5}$$

$$4x^2 - 12x + 9 = 0$$

$$x = \frac{12 \pm \sqrt{144 - 4(4)(9)}}{2 \cdot 4}$$

$$\frac{12 \pm \sqrt{144 - 144}}{8}$$

$$\frac{12 \pm \sqrt{0}}{8}$$

$$\frac{12}{8} = \frac{3}{2}$$

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

$$x = \frac{-5 \pm \sqrt{25 - 4(-5)(-7)}}{2(-5)}$$

$$\frac{-5 \pm \sqrt{25 - 140}}{-10}$$

$$\frac{-5 \pm \sqrt{-115}}{-10}$$

$$\frac{-5 \pm i\sqrt{115}}{-10}$$

What are the solutions of $x^2 - 6x = -21$?

A) $x = 3 \pm \sqrt{30}$

B) $x = 3 \pm 2i\sqrt{3}$

C) $x = -3 \pm 2i\sqrt{3}$

D) $x = -3 \pm i\sqrt{30}$

$$x^2 - 6x + 21 = 0$$

$$x = \frac{6 \pm \sqrt{36 - 4(1)(21)}}{2 \cdot 1}$$

$$x = \frac{6 \pm \sqrt{36 - 84}}{2}$$

$$\frac{6 \pm \sqrt{48} \cdot i}{2} = \frac{6 \pm 4i\sqrt{3}}{2}$$

$$3 \pm 2i\sqrt{3}$$

Homework:

Worksheet

