5.2 Solving Quadratic Equations

$$x^2 = 16 \qquad\qquad 4^2 = 16$$
$$4 \cdot 4 = 16$$
$$\sqrt{x^2} = \sqrt{16} \qquad (-4)^2 = 16$$
$$x = \pm 4 \qquad -4 \cdot -4 = 16$$

Evaluate $\sqrt{16}$ 4

$$x^{2\;-16\;\;-16} = 16$$

Set = 0
$$x^2 - 16 = 0$$

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

Set each
Factor = 0
Product Property
of zero

$$x + 4 = 0 \quad \text{or} \quad x - 4 = 0$$
$$-4 \;\; -4 \qquad\qquad +4 \;\; +4$$

Solve $\quad x = -4 \qquad x = {}^+4$

$$x^2 {}^{+25} - 25 {}^{+25} = 0$$

$$\sqrt{x^2} = \sqrt{25}$$

$$x = \pm 5$$

$$\frac{2x^2}{2} = \frac{18}{2}$$

$$\sqrt{x^2} = \sqrt{9}$$

$$x = \pm 3$$

$$\frac{4x^2}{4} = \frac{1}{4}$$

$$\sqrt{x^2} = \sqrt{\frac{1}{4}}$$

$$x = \frac{\sqrt{1}}{\sqrt{4}}$$

$$x = \pm \frac{1}{2}$$

$$\sqrt{4x^2} = \sqrt{1}$$

$$\frac{2x}{2} = \frac{\pm 1}{2}$$

$$x = \pm \frac{1}{2}$$

$$4x^2 = 0$$
$$\frac{}{4} \qquad \frac{}{4}$$

$$\sqrt{x^2} = \sqrt{0}$$

$$x = 0$$

$$2x^2 - 5 = 6 \qquad {}^{+5} \quad {}^{+5}$$

$$\frac{2x^2}{2} = \frac{11}{2} \qquad \text{Calc } \sqrt{x^2} = \sqrt{\frac{11}{2}}$$

$$\sqrt{x^2} = \sqrt{\frac{11}{2}} \qquad \sqrt{5.5}$$

$$\text{Approx } x = \pm 2.345$$

Exact $\quad x = \dfrac{\sqrt{11}}{\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} \quad$ Rationalize the denominator

$$x = \frac{\sqrt{22}}{\sqrt{4}} \qquad \frac{\sqrt{2} \cdot \sqrt{2}}{\sqrt{4}}$$

$$2$$

Exact $\quad x = \pm \dfrac{\sqrt{22}}{2} \qquad$ Approximate Calc $\sqrt{22}$

$$\div 2$$

$$x = \pm \ 2.345$$

$(x-5)^2 = 16$ $\sqrt{x^2} = \sqrt{16}$
$x = \pm 4$

$\sqrt{(x-5)^2} = \sqrt{16}$

$x - 5 = \pm 4$

$x - 5 = 4$ or $x - 5 = -4$ (+5, +5)

$x = 9$ or $x = 1$

$7 = 2(x+1)^2 - 3$ (+3, +3)

$\dfrac{2(x+1)^2}{2} = \dfrac{10}{2}$

$\sqrt{(x+1)^2} = \sqrt{5}$

$x + 1 = \pm\sqrt{5}$

Exact
$x + 1 = \pm\sqrt{5}$ (-1, -1)
$x = -1 \pm\sqrt{5}$

Approximate
$x + 1 = \pm\sqrt{5}$
$x + 1 = \pm 2.236$

$x + 1 = 2.236$ or $x + 1 = -2.236$ (-1, -1)
$x = 1.236$ or $x = -3.236$

$(x+1)^2 = 5$

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

$x^2 + x + x + 1 = 5$
$x^2 + 2x + 1 = 5$
$x^2 + 2x - 4 = 0$

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

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Pythagorean Theorem
$a^2 + b^2 = c^2$