

**Definition:**

- **Quadratic Equation:** is an equation that can be written in the form

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

where  $a$ ,  $b$ , and  $c$  are real numbers,  $a \neq 0$ .

**Important Properties:**

- **Square Root Property:** If  $c$  is a positive number and if  $x^2 = c$ , then

$$x = \sqrt{c} \quad \text{or} \quad x = -\sqrt{c}.$$

(This can be written as one answer as  $\pm\sqrt{c}$ .) In other words, when solving a quadratic equation by the square root property, we want both the positive and negative square roots.

**Common Mistakes to Avoid:**

- Do NOT forget to include the negative square root in the answer.
- Before you apply the square root property make sure the squared term is isolated.
- $\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$ .

**PROBLEMS**

Use the square root property to solve each equation.

1.  $x^2 = 36$

$$x^2 = 36$$

$$\sqrt{x^2} = \sqrt{36}$$

$$x = \pm 6$$

$$\boxed{x = 6, \quad x = -6}$$

2.  $x^2 = 18$

$$x^2 = 18$$

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

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

$$x = \pm 3\sqrt{2}$$

$$\boxed{x = 3\sqrt{2}, \quad x = -3\sqrt{2}}$$

3.  $5x^2 - 125 = 0$

$$\begin{aligned}
 5x^2 - 125 &= 0 \\
 5x^2 &= 125 \\
 x^2 &= 25 \\
 \sqrt{x^2} &= \sqrt{25} \\
 x &= \pm 5
 \end{aligned}$$

$$x = 5, \quad x = -5$$


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4.  $6x^2 - 240 = 0$

$$\begin{aligned}
 6x^2 - 240 &= 0 \\
 6x^2 &= 240 \\
 x^2 &= 40 \\
 \sqrt{x^2} &= \sqrt{40} \\
 x &= \pm\sqrt{4}\sqrt{10} \\
 x &= \pm 2\sqrt{10}
 \end{aligned}$$

$$x = 2\sqrt{10}, \quad x = -2\sqrt{10}$$


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5.  $(x - 3)^2 = 12$

$$\begin{aligned}
 (x - 3)^2 &= 12 \\
 \sqrt{(x - 3)^2} &= \sqrt{12} \\
 x - 3 &= \pm\sqrt{4}\sqrt{3} \\
 x - 3 &= \pm 2\sqrt{3} \\
 x &= 3 \pm 2\sqrt{3}
 \end{aligned}$$

$$x = 3 + 2\sqrt{3}, \quad x = 3 - 2\sqrt{3}$$

6.  $(x + 4)^2 - 3 = 17$

$$\begin{aligned}
 (x + 4)^2 - 3 &= 17 \\
 (x + 4)^2 &= 20 \\
 \sqrt{(x + 4)^2} &= \sqrt{20} \\
 x + 4 &= \pm\sqrt{4}\sqrt{5} \\
 x + 4 &= \pm 2\sqrt{5} \\
 x &= -4 \pm 2\sqrt{5}
 \end{aligned}$$

$$x = -4 + 2\sqrt{5}, \quad x = -4 - 2\sqrt{5}$$


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7.  $(3x + 1)^2 = 15$

$$\begin{aligned}
 (3x + 1)^2 &= 15 \\
 \sqrt{(3x + 1)^2} &= \sqrt{15} \\
 3x + 1 &= \pm\sqrt{15} \\
 3x &= -1 \pm \sqrt{15} \\
 x &= \frac{-1 \pm \sqrt{15}}{3}
 \end{aligned}$$

$$x = \frac{-1 + \sqrt{15}}{3}, \quad x = \frac{-1 - \sqrt{15}}{3}$$

8.  $(2x - 5)^2 = 24$

$$(2x - 5)^2 = 24$$

$$\sqrt{(2x - 5)^2} = \sqrt{24}$$

$$2x - 5 = \pm\sqrt{4}\sqrt{6}$$

$$2x - 5 = \pm 2\sqrt{6}$$

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

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

$x = \frac{5 + 2\sqrt{6}}{2}, \quad x = \frac{5 - 2\sqrt{6}}{2}$
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9.  $(7x - 5)^2 - 75 = 0$

$$(7x - 5)^2 - 75 = 0$$

$$(7x - 5)^2 = 75$$

$$\sqrt{(7x - 5)^2} = \sqrt{75}$$

$$7x - 5 = \pm\sqrt{25}\sqrt{3}$$

$$7x - 5 = \pm 5\sqrt{3}$$

$$7x = 5 \pm 5\sqrt{3}$$

$$x = \frac{5 \pm 5\sqrt{3}}{7}$$

$x = \frac{5 + 5\sqrt{3}}{7}, \quad x = \frac{5 - 5\sqrt{3}}{7}$
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