

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. $5x^2 - 125 = 0$

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

$$5x^2 = 125$$

$$x^2 = 25$$

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

$$x = \pm 5$$

$$\boxed{x = 5, \quad x = -5}$$

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

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

$$6x^2 = 240$$

$$x^2 = 40$$

$$\sqrt{x^2} = \sqrt{40}$$

$$x = \pm\sqrt{4}\sqrt{10}$$

$$x = \pm 2\sqrt{10}$$

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

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

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

$$\sqrt{(x - 3)^2} = \sqrt{12}$$

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

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

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

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

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

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

$$(x + 4)^2 = 20$$

$$\sqrt{(x + 4)^2} = \sqrt{20}$$

$$x + 4 = \pm\sqrt{4}\sqrt{5}$$

$$x + 4 = \pm 2\sqrt{5}$$

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

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

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

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

$$\sqrt{(3x + 1)^2} = \sqrt{15}$$

$$3x + 1 = \pm\sqrt{15}$$

$$3x = -1 \pm \sqrt{15}$$

$$x = \frac{-1 \pm \sqrt{15}}{3}$$

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

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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