

## Solving Quadratics by Extracting Square Roots

### Simplifying Square Roots (Radicals)

We will simplify radicals (square roots) by taking out perfect squares that are greater than 1. Perfect squares are the only numbers whose square roots are whole numbers (not decimals).

Make a list of perfect squares and their square roots:

perfect squares: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100 ...

square roots:  $\sqrt{1}=1$ ,  $\sqrt{4}=2$ ,  $\sqrt{9}=3$ ,  $\sqrt{16}=4$ ,  $\sqrt{25}=5$ ,  $\sqrt{36}=6$ , etc. . .

Simplify each radical expression.

$$\begin{aligned} 1. \sqrt{50} \\ &= \sqrt{25 \cdot 2} \\ &= 5\sqrt{2} \end{aligned}$$

$$\begin{aligned} 2. \sqrt{18} \\ &= \sqrt{9 \cdot 2} \\ &= 3\sqrt{2} \end{aligned}$$

$$\begin{aligned} 3. \sqrt{36} \\ &= 6 \end{aligned}$$

$$\begin{aligned} 4. \sqrt{52} \\ &= \sqrt{4 \cdot 13} \\ &= 2\sqrt{13} \end{aligned}$$

$$\begin{aligned} 5. -5\sqrt{300} \\ &= -5\sqrt{100 \cdot 3} \\ &= -5(10)\sqrt{3} \\ &= -50\sqrt{3} \end{aligned}$$

$$\begin{aligned} 6. 3\sqrt{24} \\ &= 3\sqrt{4 \cdot 6} \\ &= (3)(2)\sqrt{6} \\ &= 6\sqrt{6} \end{aligned}$$

$$\begin{aligned} 7. \sqrt{45} \\ &= \sqrt{9 \cdot 5} \\ &= 3\sqrt{5} \end{aligned}$$

$$\begin{aligned} 8. \sqrt{27} \\ &= \sqrt{9 \cdot 3} \\ &= 3\sqrt{3} \end{aligned}$$

$$\begin{aligned} 9. -3\sqrt{60} \\ &= -3\sqrt{4 \cdot 15} \\ &= (-3)(2)\sqrt{15} \\ &= -6\sqrt{15} \end{aligned}$$

## Solving Quadratic Equations By Taking Square Roots

### TIPS:

1. Look for equations of the form:  $(\quad)^2 = \#$
2. Don't forget the  $\pm$  when you perform a  $\sqrt{\quad}$

Solve each quadratic by extracting the square roots.

1.  $x^2 = 12$

$$x = \pm \sqrt{12}$$

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

2.  $x^2 - 25 = 0$

$$x^2 = 25$$

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

$$x = \pm 5$$

3.  $2x^2 - 98 = 0$

$$2x^2 = 98$$

$$x^2 = 49$$

$$x = \pm \sqrt{49}$$

$$x = \pm 7$$

4.  $(x + 8)^2 = 83$

$$x + 8 = \pm \sqrt{83}$$

$$x = -8 \pm \sqrt{83}$$

5.  $(x - 17)^2 = 52$

$$x - 17 = \pm \sqrt{52}$$

$$x = 17 \pm \sqrt{52}$$

$$x = 17 \pm 2\sqrt{13}$$

6.  $(x + 7)^2 = 45$

$$x + 7 = \pm \sqrt{45}$$

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

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