

Unit 3A

Solving Quadratic Equations
by Finding Square Roots



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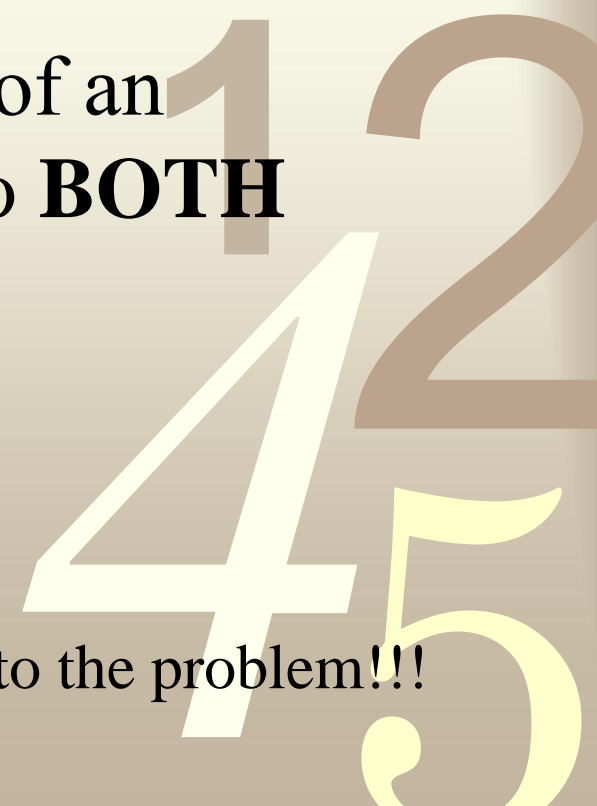


Unit 3A

Solving Quadratic Equations by Finding Square Roots

- Sometimes a quadratic equation can be solved by taking square roots.
- It's OK to take the square root of an equation, as long as you do it to **BOTH SIDES**.
- Simple example: $x^2 = 25$
 $x = \pm 5$

Use a \pm when you have to insert it into the problem!!!



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Vocabulary

- Radical sign

$\sqrt{\quad}$

- Radicand

- Number under radical sign

- Radical

- Expression itself is the radical

$\sqrt{16}$, 16 is radicand, $\sqrt{16}$ is radical



Properties of Square Roots

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- Product Property

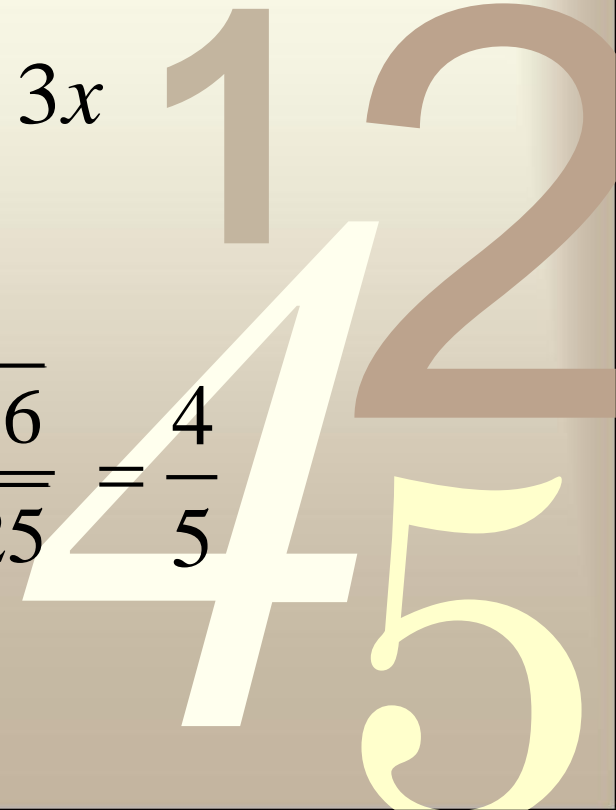
$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

$$\begin{aligned}\sqrt{9x^2} &= \sqrt{9} \cdot \sqrt{x^2} \\ &= 3x\end{aligned}$$

- Quotient Property

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

$$\sqrt{\frac{16}{25}} = \frac{\sqrt{16}}{\sqrt{25}} = \frac{4}{5}$$



Examples

- Find the largest factor of the radicand that is a perfect square
- Take square root of the perfect square factor
- Other factor stays under radical

a) $\sqrt{45} = \sqrt{9} \cdot \sqrt{5} = 3\sqrt{5}$

b) $\sqrt{8} \cdot \sqrt{15} = \sqrt{120} = \sqrt{4} \cdot \sqrt{30} = 2\sqrt{30}$

c) $\sqrt{\frac{2}{9}} = \frac{\sqrt{2}}{\sqrt{9}} = \frac{\sqrt{2}}{3}$

d. $3\sqrt{12} \cdot \sqrt{6}$

Method 2

$$3\sqrt{4} \sqrt{3} \cdot \sqrt{6}$$

$$3\sqrt{72}$$

$$3 \cdot 2\sqrt{3} \cdot \sqrt{6}$$

$$3\sqrt{36} \sqrt{2}$$

$$6\sqrt{18}$$

$$3 \cdot 6\sqrt{2}$$

$$6\sqrt{9} \sqrt{2}$$

$$18\sqrt{2}$$

$$6 \cdot 3\sqrt{2}$$

$$18\sqrt{2}$$



Rationalizing Denominator

- **Cannot have radicals in denominator**
- To remove radicals from denominator:
 - Simplify all radicals
 - Multiply top and bottom by radical in denominator

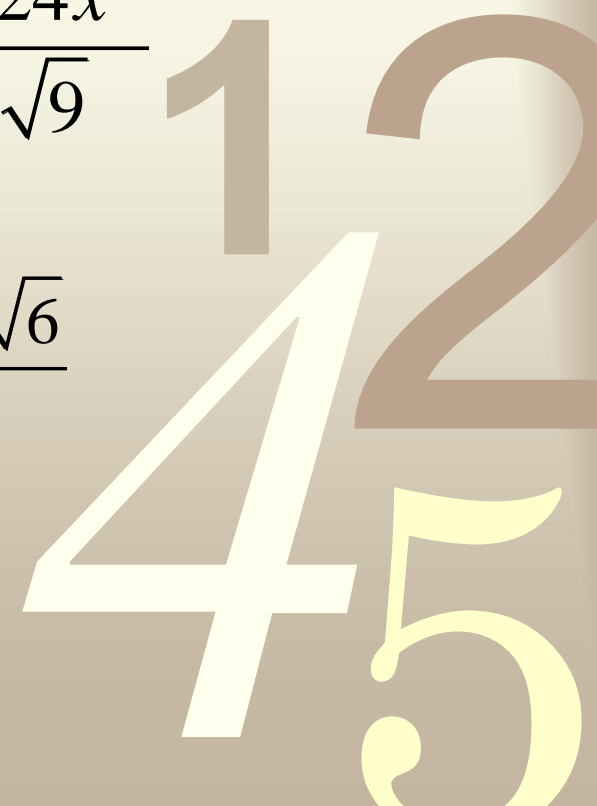
$$\sqrt{\frac{3}{5}} = \frac{\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{15}}{\sqrt{25}} = \frac{\sqrt{15}}{5}$$

Rationalizing Denominator

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- Simplify by rationalizing the denominator:

$$\begin{aligned}\sqrt{\frac{8x^2}{3}} &= \frac{\sqrt{8x^2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{24x^2}}{\sqrt{9}} \\ &= \frac{\sqrt{4x^2} \sqrt{6}}{3} = \frac{2x\sqrt{6}}{3}\end{aligned}$$



Unit 3A

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(Day 2)



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- Review from last time!



Solving Quadratics (By Isolating)

- Get the term that is squared by itself
- Take square root of both sides (when you put in the square root)
 - Be sure to include positive and negative answers
- Get x by itself if necessary



Solving a Quadratic Equation

- Ex: $3x^2 - 5 = 7$

$$3x^2 = 12$$

$$x^2 = 4$$

$$x = \pm 2$$

- Ex: $\frac{1}{2}(x - 3)^2 = 8$

$$(x - 3)^2 = 16$$

$$x - 3 = \pm 4$$

$$x = 3 \pm 4$$

$$x = 3 + 4$$

$$x = 7$$

$$x = 3 - 4$$

$$x = -1$$



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Solve

$$5. \quad 3 - 5x^2 = -9$$

$$-5x^2 = -12$$

$$x^2 = \frac{12}{5}$$

$$x = \pm \sqrt{\frac{12}{5}} = \pm \frac{\sqrt{12}}{\sqrt{5}} = \pm \frac{\sqrt{4} \cdot \sqrt{3}}{\sqrt{5}} = \pm \frac{2\sqrt{3}}{\sqrt{5}}$$

$$= \pm \frac{2\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \pm \frac{2\sqrt{15}}{5}$$

Solve

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$$6. \quad 3(x - 2)^2 = 21$$

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

$$x - 2 = \pm\sqrt{7}$$

$$\boxed{x = 2 \pm \sqrt{7}}$$



Solve

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$$7. \frac{1}{5}(x-4)^2 = 6$$

$$(x-4)^2 = 30$$

$$x-4 = \pm\sqrt{30}$$

$$x = 4 \pm \sqrt{30}$$



Solving a Quadratic Equation

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- Ex: $3(x - 5)^2 = 81$

$$(x - 5)^2 = 27$$

$$x - 5 = \pm\sqrt{27}$$

$$x = 5 \pm\sqrt{27}$$

$$x = 5 \pm\sqrt{9}\sqrt{3}$$

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

