

# Unit 4

## Lesson 3

Square & Cube Root Equations

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- There are four steps to solving a radical equation:
- 1) Isolate the radical.
  - 2) Raise both sides to the power of the root.
  - 3) Solve for  $x$ .
  - 4) Check for extraneous solution(s).

What is an **EXTRANEIOUS** solution? A solution to the final equation but not to the original equation. Extraneous solutions can occur when solving a **square root equation** but not when solving linear or quadratic equations.

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1.  $(\sqrt{x})^2 = (8)^2$

$x = 64$



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$$2. \sqrt{x + 7} = (8)^2$$

$$x + 7 = 64$$
$$-7 \quad -7$$

$$x = 57$$

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$$3. \quad 2\sqrt{x+6} = 14$$

$$(\sqrt{x+6})^2 = (7)^2$$

$$x+6 = 49$$
$$\quad -6 \quad -6$$

$$x = 43$$

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$$4. \quad -4\sqrt{x} + 11 = 3$$

~~-11~~   ~~-11~~

$$\frac{-4\sqrt{x}}{-4} = \frac{-8}{-4}$$

$$(\sqrt{x})^2 = (2)^2$$

$$x = 4$$

$$5. \quad (x-2)^{1/2} - 2 = 2$$

$$((x-2)^{1/2})^2 = (4)^2$$

+2 +2

$$x-2 = 16$$

+2 +2

$$x = 18$$

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

$$x-2 = 16$$

+2 +2

$$x = 18$$

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$$6. \quad \begin{array}{r} 10 \\ -10 \end{array} - 3\sqrt[3]{2x+5} = \begin{array}{r} -11 \\ -10 \end{array}$$

$$\frac{-3\sqrt[3]{2x+5}}{-3} = \frac{-21}{-3}$$


$$\left(\sqrt[3]{2x+5}\right)^3 = \left(7\right)^3$$

$$\begin{array}{r} 2x+5 \\ -5 \end{array} = \begin{array}{r} 343 \\ -5 \end{array} \quad \checkmark$$

$$\frac{2x}{2} = \frac{338}{2} \quad x = 169$$

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<p>7. <math>(\sqrt{10x^2 - 49})^2 = (3x)^2</math></p> $10x^2 - 49 = 9x^2$ $\begin{array}{r} -9x^2 \\ -9x^2 \end{array}$ $x^2 - 49 = 0$ $(x-7)(x+7) = 0$ $x = \pm 7$ $x^2 - 49 = 0$ $\sqrt{x^2} = \sqrt{49}$ $x = \pm 7$ <p>+7    <del>-7</del>    <math>x = \pm 7</math></p> <p>✓    extraneous</p>	<p>8. <math>(\sqrt{2x - 6})^2 = (\sqrt{5x - 15})^2</math></p> $2x - 6 = 5x - 15$ $\begin{array}{r} -2x \\ -2x \end{array}$ $-6 = 3x - 15$ $\begin{array}{r} +15 \\ +15 \end{array}$ $\frac{9}{3} = \frac{3x}{3}$ $3 = x \quad \checkmark$ <p>Created with Doceri </p>
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$$9. \left( (6x - 5)^{1/3} \right)^3 = \left( (3x + 2)^{1/3} \right)^3$$

$$6x - 5 = 3x + 2$$
$$\begin{array}{r} -3x + 5 \\ -3x + 5 \end{array}$$


$$\frac{3x}{3} = \frac{7}{3}$$


$$\boxed{x = 7/3}$$



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<p>10. <math>(\sqrt{3x+7})^2 = (x+1)^2</math></p>	<p>11. <math>((15-7x)^{1/2})^2 = (x-1)^2</math></p>
<p><math>3x+7 = (x+1)(x+1)</math></p>	<p><math>15-7x = (x-1)(x-1)</math></p>
<p><math>3x+7 = x^2+2x+1</math></p>	<p><math>15-7x = x^2-1x-1x+1</math></p>
<p><math>-3x-7 \quad -3x-7</math></p>	<p><math>15-7x = x^2-2x+1</math></p>
<p><math>0 = x^2-1x-6</math></p>	<p><math>-15+7x \quad +1x-15</math></p>
<p><math>0 = (x-3)(x+2)</math></p>	<p><math>0 = x^2+5x-14</math></p>
<p><math>x=3</math></p>	<p><math>0 = (x+7)(x-2)</math></p>
<p><math>x=3</math> ✓</p>	<p><math>x=-7</math> <span style="border: 1px solid purple; border-radius: 50%; padding: 2px;"><math>x=2</math></span> ✓</p>
<p><del><math>x=-2</math></del> extraneous</p>	<p>Created with Doceri </p>

$12. (\sqrt{x+2})^2 = (4-\sqrt{x})^2$ $x+2 = (4-\sqrt{x})(4-\sqrt{x})$	$13. (\sqrt{x+3})^2 = (\sqrt{x+4})^2$ $(\sqrt{x+3})(\sqrt{x+3}) = x+4$
$x+2 = 16 - 4\sqrt{x} - 4\sqrt{x} + x$	$x+3\sqrt{x}+3\sqrt{x}+9 = x+4$
$x+2 = 16 - 8\sqrt{x} + x$	$x + 6\sqrt{x} + 9 = x + 4$
$-x$ $2 = 16 - 8\sqrt{x}$	$-x$ $-9 -x -9$ $6\sqrt{x} = -5$
$-16 -16$ $-14 = -8\sqrt{x}$	$\left(\frac{6}{\sqrt{x}}\right)^2 = \left(\frac{-5}{6}\right)^2$
$\frac{-14}{-8} = \frac{-8\sqrt{x}}{-8}$	$x = 25/36$
$\left(\frac{1}{4}\right)^2 = (\sqrt{x})^2$ $49/16 = x$	 <p>Created with Doceri</p>

<p>14. <math>(\sqrt{x+8})^2 = (\sqrt{x+\sqrt{3}})^2</math></p> $x+8 = (\sqrt{x+\sqrt{3}})(\sqrt{x+\sqrt{3}})$ $x+8 = x + \sqrt{3x} + \sqrt{3x} + 3$ $x+8 = x + 2\sqrt{3x} + 3$ $\cancel{x} - 3 - x \qquad \qquad \qquad -3$ $\frac{5}{2} = \frac{2\sqrt{3x}}{2}$ $3 \cdot \frac{25}{4} = \frac{3x}{3}$ $\left(\frac{5}{2}\right)^2 = (\sqrt{3x})^2$ $\frac{25}{4} = x$	<p>15. <math>(\sqrt{x+3})^2 = (\sqrt{x+1+1})^2</math></p> $x+3 = (\sqrt{x+1+1})(\sqrt{x+1+1})$ $x+3 = x+1 + \sqrt{x+1} + \sqrt{x+1} + 1$ $x+3 = x+2 + 2\sqrt{x+1}$ $\cancel{x} - 2 - x - 2$ $\frac{1}{2} = \frac{2\sqrt{x+1}}{2}$ $\left(\frac{1}{2}\right)^2 = (\sqrt{x+1})^2$ $\frac{1}{4} = x+1 \quad x = -3/4 \text{ or } -.75$ <p>-1</p>
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HW: Pg 11-12

Symbolab

2, 4, 6, 8, 10, 12, 14, 15, 16

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A large rectangular area with a black border, containing horizontal blue lines for writing. The lines are evenly spaced and extend across the width of the box. In the bottom right corner of this area, there is a watermark that reads "Created with Doceri" in a light gray font, followed by a green hand icon with the index finger pointing upwards.