

## Solving Radical & Absolute Equations

**EQ: How do you solve radical and absolute equations?**

**Standards:**

Understand solving equations as a process of reasoning and explain the reasoning

**MCC9-12.A.REI.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

**Solving Radical equations:**  $\sqrt{x+1} = 7$

1. Determine any restrictions...extraneous solutions.
2. Isolate the radical grouping.
3. Use the inverse function to solve.
4. Check your answer!

**Absolute Value:** The **DISTANCE** that a # is away from zero.

$$|x| \leq -5$$

no solution

### Solving Absolute Value Equations

1. Isolate the absolute value grouping.
2. Determine if the equation is positive.

If  $|bx - h| = \#$  split & create 2 new equations...  
 one pos# & one neg# then solve.

If  $|bx - h| = -\#$  then the answer is...

**Reminder:** Determine what  $x \neq \#$ . That # or range of numbers are where your extraneous solutions fall.

**Radicals:** You must have **even** root be  $\geq 0$ !

$$\sqrt{x + 2} = -8$$

no solution

**Absolute value:** The absolute  $\neq -\#$

$$|x + 3| = -4$$

no solution

Solve. Check for extraneous solutions.

$$1. \quad 3\sqrt{x+5} - 9 = 12$$

$\begin{array}{r} +9 \\ +9 \end{array}$

$$3\sqrt{x+5} = 21$$

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

$$x+5 = 49$$

$\begin{array}{r} -5 \\ -5 \end{array}$

ck

$$3\sqrt{44+5} - 9 = 12$$

$$3\sqrt{49} - 9 = 12$$

$\begin{array}{r} 7 \\ 21 - 9 = 12 \end{array}$

$$x = 44$$

$$2. \quad 4 - |x+9| = 2$$

$\begin{array}{r} -4 \\ -4 \end{array}$

$$|x+9| = -2$$

$$|x+9| = 2$$

$$x+9 = 2$$

$\begin{array}{r} -9 \\ -9 \end{array}$

$$x = -7$$

$$x+9 = -2$$

$\begin{array}{r} -9 \\ -9 \end{array}$

$$x = -11$$

$$3. \quad -2\sqrt[3]{x+100} + 4 = 22$$

$$\sqrt[3]{-8} = -2$$

$$-2 \cdot -2 \cdot -2$$

$$\underline{-2\sqrt[3]{x+100} = 18}$$

$$\underline{-2\sqrt[3]{x+100}}^3 = \underline{-2}^3$$

$$\underline{x+100 = -729}$$

$$\underline{x = -829}$$

$$\text{ck } -2\sqrt[3]{-829+100} + 4 = 22$$

$$22 = 22 \checkmark$$

$$4. \quad (\sqrt{2x+28})^2 = (x+2)^2$$

use for problems from  
book # 12, 14, 16, 22

$$2x+28 = (x+2)(x+2)$$

$$\begin{array}{r} 2x+28 \\ -2x \quad -28 \\ \hline \end{array} = \begin{array}{r} x^2+4x+4 \\ -2x \quad -28 \\ \hline \end{array}$$

$$\text{a=1 shortcut } 0 = x^2 + 2x - 24$$

$$0 = (x+6)(x-4) \quad \begin{array}{r|l} -24 & +2 \\ 6 \cdot -4 & 6+(-4) \end{array}$$

$$x+6=0 \quad x-4=0$$

$$x = -6 \text{ and } x = 4$$

$$\text{ck } \begin{array}{l} \sqrt{2(-6)+28} = -6+2 \\ \sqrt{16} = 4 \\ \text{extraneous solution} \end{array} \quad \begin{array}{l} \sqrt{2(4)+28} = 4+2 \\ \sqrt{36} = 6 \\ \text{ck} \end{array}$$

$$\boxed{x = 4}$$

$$5. \sqrt[3]{2x+18} - \frac{3}{2} \sqrt[3]{x} = 0$$

use for problems  
from book # 6, 8, 10

$$\left(\sqrt[3]{2x+18}\right)^3 = \left(\frac{3}{2} \sqrt[3]{x}\right)^3$$

$$2x + 18 = \frac{27}{8}x - 2x$$

$$\frac{8}{8} \cdot 18 = \frac{8}{8} \cdot \frac{11}{8}x$$

$$\boxed{\frac{144}{8} = x}$$

ck

$$0 = 0 \checkmark$$

$$6. \frac{1}{2}|x-5| + 14 = 6$$

$$\frac{-14 \quad -14}{-14 \quad -14}$$

$$2\left(\frac{1}{2}|x-5|\right) = -8 \cdot 2$$

$$|x-5| = -16 \quad \underline{\text{no solution}}$$

$$7. \quad (x + 7)^{1/2} + 5(x - 3)^{1/2} = 0$$

$$8. \quad 4(-3x)^{1/2} - 2 = 3$$

$$9. \sqrt[4]{\frac{1}{3}x - 6} = 5$$

HW:

p. 240 #2 - 22 evens & 26 & WS

**WS below!!**

Solve each equation. Check for extraneous solutions.

1.  $2|2x + 11| - 7 = 3$

4.  $|3x + 2| = 5$

2.  $\sqrt[3]{x + 40} = -5$

5.  $\frac{1}{3}\left|1 - \frac{1}{5}x\right| = 1$

3.  $(x^2 + 5)^{1/2} = x + 3$

6.  $3(x + 1)^{1/3} = 48$

7.  $-3|2x - 5| = 12$

10.  $\sqrt{6x - 5} + 10 = 3$

8.  $-2|6x - 9| + 8 = -4$

11.  $\left|\frac{1}{3}x + 7\right| + 9 = 13$

9.  $-2\sqrt[5]{3x - 1} + 4 = 0$

12.  $4|6x - 5| + 3 = 31$