

# Adding and Subtracting Radicals

How hard can adding be?

**You just have to remember that you can't take the square root of a negative number!** Not yet...

State the restriction:

$$\sqrt{4 - x}$$

$$4 - x \geq 0$$

$$4 \geq x$$

$$\sqrt{x - 3}$$

$$x - 3 \geq 0$$

$$x \geq 3$$

Solve:

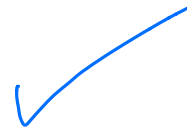
$$\begin{aligned} \star x+1 &\geq 0 \\ x &\geq -1 \end{aligned}$$

$$\sqrt{x+1} + 3 = 5$$

Here are the steps you want to follow every time you have a radical in your expression:

1. Isolate the radical
  - Get the root alone on one side of the equation
2. Square both sides
  - This gets rid of the radical. Back to easy mode after this!
3. Solve for x
4. Check for extraneous roots
  - Sometimes you may find answers that are not allowed. Non Permissible Values (NPV)

$$\begin{aligned} \sqrt{x+1} &= 5 - 3 \\ (\sqrt{x+1})^2 &= (2)^2 \\ x+1 &= 4 \\ x &= 3 \end{aligned}$$



$$\begin{aligned} (x-2)(x-2) \\ x^2 - 2x - 2x + 4 \\ x^2 - 4x + 4 \end{aligned}$$

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

$$(x-2)^2 = (\sqrt{x+10})^2$$

$$x^2 - 4x + 4 = x + 10$$

$$x^2 - 4x - x - 10 = 0$$

$$x^2 - 5x - 6 = 0$$

$$\begin{array}{r} x^2 - 6x + x - 6 \\ \underline{\phantom{x^2 - 6x} + x} \quad \underline{\phantom{x^2 - 6x} - 6} \end{array}$$

$$\begin{aligned} \star x+10 &\geq 0 \\ x &\geq -10 \end{aligned}$$

$$\begin{aligned} -6 \\ -5 \\ \hline -6,1 \end{aligned}$$

$$\underline{\underline{x = 6}}$$

$$x(x-6) + (x-6) = 0$$

$$(x-6)(x+1) = 0$$

$$x-6=0 \quad \text{or} \quad x+1=0$$
$$x=6 \quad \text{or} \quad x=-1$$

When you square both sides of an equation, you are destroying information about the signs of the two sides. Now we have a new equation. Both answers may work in that equation, but we need to check our original equation to see that it works in there too!

$$x+2 \geq 0$$
$$x \geq -2$$

$$x - \sqrt{x+2} = 0$$

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

$$x^2 = x+2$$

$$x^2 - x - 2 = 0$$

$$x^2 - 2x + x - 2 = 0$$

$$x(x-2) + (x-2) = 0$$

$$(x-2)(x+1) = 0$$

$$x-2 = 0 \quad \text{or} \quad x+1 = 0$$
$$x = 2 \quad \text{or} \quad x = -1$$

-2  
-1

(-2, +)

HW: pg: 300  
#1,3-6,7ab,8,12