$\sqrt{4}, 9, 16, 25, 36, 49, 64, 81$

$\sqrt{4} \leftrightarrow 2$

$(7 \cdot 7)$

7^2

$2\sqrt{2} \rightarrow \sqrt{2(2^2)} \rightarrow \sqrt{2 \cdot 4} = \sqrt{8}$

simplify

$\sqrt{x^3} \rightarrow \sqrt{x\,x\,x}$

$x\sqrt{x}$

---

add

add/subtract "same" things.

$3x + x = 4x$

$3x + y = 3x + y$

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

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

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

---

multiply/divide

$2\sqrt{2}\left(\sqrt{3} + 2\right)$

$$2\sqrt{2(3)} + 2(2)\sqrt{2}$$
$$2\sqrt{6} + 4\sqrt{2}$$

$$\frac{3\sqrt{4}}{6\sqrt{2}} = \frac{1}{2}\sqrt{\frac{4}{2}} = \frac{1}{2}\sqrt{\frac{2}{1}} = \frac{\sqrt{2}}{2}$$

we don't like radical bottoms.

$$\frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{\sqrt{2\cdot 2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$$

$\frac{\sqrt{2}}{\sqrt{2}} \rightarrow = 1$

Conjugate

$$\frac{1}{1+\sqrt{2}} \cdot \left(\frac{1-\sqrt{2}}{1-\sqrt{2}}\right) = \frac{1-\sqrt{2}}{1-\sqrt{2}+\sqrt{2}-2}$$

$-\sqrt{2}+\sqrt{2}$ → cancel

$$= \frac{1-\sqrt{2}}{1-2} = \frac{1-\sqrt{2}}{-1}$$

$$= \sqrt{2}-1$$

$$\frac{1-\sqrt{2}}{-1}$$

$$= -(1-\sqrt{2})$$
$$= -1+\sqrt{2}$$
$$= \sqrt{2}-1$$

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:

$\sqrt{4-x}$ → is positive

$4 - x \geq 0$

$4 \geq x$

↑ one additional rule multiply by (-1) then flip the sign.

$\sqrt{2-3x}$)

$2 - 3x \geq 0$

$-3x \geq -2$

$x \leq \frac{-2}{-3}$

$x \leq \frac{2}{3}$

Solve:

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

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)

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

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

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

$x+1=4$

$x=4-1$

$x=3$

check

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

$\sqrt{4}+3=5$

$2+3=5$ ✓ ✓

$x+1\geq 0$

$x\geq -1$

$(x-2)(x-2)$

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

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

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

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

$x=6,-1$

restriction

$x+10\geq 0$

$x\geq -10$

check

$6=\sqrt{6+10}+2$

$6=\sqrt{16}+2$

$6=4+2$

$x = 6$ ✓

$-1 = \sqrt{-1+10} + 2$

$-1 = \sqrt{9} + 2$

$-1 = 3 + 2$

extraneous

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!

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

$x = 2$

Quiz next class.

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