Radicals AND RESTRICTIONS

- Restrictions state values that variables are NOT allowed to be. They are also referred to as
- You can NOT take the square root of a negative #, so, for example:

$\sqrt{x}$ ... the restriction is that x must be greater than or equal to zero. We write that as:

$x \geq 0$

$\sqrt{x+4}$ ... well, the radicand, $x+4$, must be greater than or equal to zero. So:

$x + 4 \geq 0$ Now solve for x

$-4 \quad -4$

$\boxed{x \geq -4}$ this is the domain for x or the restriction on x so that the radicand is always positive

$\sqrt{2x+7} = \sqrt{x-3}$

restriction:	restriction
$2x+7 \geq 0$	$x-3 \geq 0$
$-7 \quad -7$	$+3 \quad +3$
$\frac{2x}{2} \geq \frac{-7}{2}$	$x \geq 3$
$x \geq \frac{-7}{2}$	

The overall restriction for this question is $x \geq 3$

If we used $x \geq -\frac{7}{2}$, then some of the #'s would cause problems in the other radical; so we use the most restrictive restriction

SOLVING RADICAL EQUATIONS

Type I : ONE RADICAL TERM

Restrictions

$x \geq -\frac{1}{2}$

from:

$2x+1 \geq 0$
$-1 \quad -1$

$\frac{2x}{2} \geq \frac{-1}{2}$

$x \geq -\frac{1}{2}$

$$\left(\sqrt{2x+1}\right)^2 = 3^2$$

$$2x+1 = 9$$
$$-1 \quad -1$$

$$2x = 8$$

$$x = 4$$

* State restrictions

STEPS

① Square both sides

② Then solve it

③ Check the answer

$\sqrt{2(4)+1} \stackrel{?}{=} 3$

$\sqrt{8+1}$

$\sqrt{9} \stackrel{\checkmark}{=} 3$

Why we check:

$$\left(\sqrt{2x+1}\right)^2 = (-3)^2$$

$$2x+1 = 9$$
$$-1 \quad -1$$

$$\cancel{2x = 8}$$

$$\cancel{x = 4}$$

$\sqrt{2x+1} = -3$

$\sqrt{2(4)+1} \stackrel{?}{=} -3$

$+\sqrt{9} \; \cancel{\stackrel{?}{=}} \; -3$

$+\sqrt{9} = 3$

"Extraneous Root"

↓

Shows up in the math but leads to an impossible answer

Type II Two Radicals, No other terms

Ex 1 $\left(\sqrt{2-x}\right)^2 = \left(\sqrt{x-2}\right)^2$

$2 - \cancel{x} = x - \cancel{2}$

$+2 \ \cancel{+x} \qquad +x \ \cancel{+2}$

$4 = 2x$

$x = 2$

Check:

$\sqrt{2-2} \overset{?}{=} \sqrt{2-2}$ ✓

Square both sides!

& then

Solve

and check.

Restrictions:

$\sqrt{2-x}$ $\quad 2-x \geq 0$

$-2 \qquad -2$

$-x \geq -2$

$\overline{-1} \qquad \overline{-1}$

$x \leq 2$

(when you divide both sides of an INEQUALITY by a negative #, the inequality changes direction)

$\sqrt{x-2}$ $\quad x-2 \geq 0$

$+2 \quad +2$

$x \geq 2$

So, x must be less than or equal to 2 AND greater than or equal to 2...

$2 \leq x \leq 2$ ... LOL, so I guess x must be $\underline{\underline{2}}$

Normally the restrictions would end up something like:

$-3 \leq x \leq 2$ or $x \geq 7$

... This question was unusual.