PAP Algebra 2
Explore: Solving radical equations

Type 1:

lve: $4\sqrt{2x+7}=12$

Step 1: Isolate the radical:

$$\frac{4\sqrt{2x+7}}{4}=\frac{12}{4}$$

Step 2: Square both sides.

$$(\sqrt{2x+7})^2=(3)^2$$

Step 3: Solve for x.

$$2x+7=9$$
$$-7 \quad -7$$
$$2x=2 \quad \boxed{x=1}$$

Step 4: Check your solution, by plugging it in the original equation and solving.

$$4\sqrt{2+7}=12 \checkmark$$

Now try these on your own:

1. $\sqrt{x}-9=-1$

$+9 \quad +9$

$\sqrt{x}=8$

$x=64$

Check: $\sqrt{64}-9=-1 \checkmark$

2. $(\sqrt{x+25})^2=(4)^2$

$x+25=16$

$-25 \quad -25$

$x=-9$

Check:

$\sqrt{-9+25}=4$

$\sqrt{16}=4 \checkmark$

3. $\frac{2\sqrt{x-3}}{2}=\frac{4}{2}$

$\sqrt{x-3}=2$

$x-3=4$

$+3 \quad +3$

$\boxed{x=7}$

Check:

$2\sqrt{7-3}=4$

$2\sqrt{4}=4 \checkmark$

Type 2:

1. Solve: $\sqrt{x}=-2$

$x=4$

Check your answer: $\sqrt{4}=-2$

Why doesn't your answer work? NO

2. Graph $\sqrt{x}=-2$ by putting $y_1=\sqrt{x}$ and $y_2=-2$
   a. At what point do the two graphs intersect? Never
   b. What does the intersection tell you about the solution to this problem?
   NO Solution
   c. Recall, $y_1=\sqrt{x}$ is the top half of the parabola. Enter $y_3=-\sqrt{x}$ so you see the bottom half of the parabola.
   d. Where does the bottom half of the parabola intersect $y_2=-2$?
   $(4,-2)$

Since the intersection occurs on the bottom half and the bottom half was not part of the original problem, this is called an "Extraneous" solution. Extraneous solutions are why you must always check your answers to see if they work in the problem or not.

Type 3:	**Type 4**:
Solve: $\left(\sqrt{x+2}\right)^2=\left(\sqrt{3-x}\right)^2$	Solve: $(x+1)^2=\left(\sqrt{7x+15}\right)^2$
Solve for x: $x+2=3-x$; $+x$ $+x$; $2x+2=3$; -2 -2; $2x=1$; $x=1/2$	$(x+1)(x+1)$ Solve for x: $x^2+x+x+1=7x+15$; $x^2+2x+1=7x+15$; $-7x-15$ $-7x$; $x^2-5x-14=0$; $(x-7)(x+2)=0$; $x=7$ $\cancel{x=-2}$ extraneous
Check your solution in the original equation: $\sqrt{1/2+2}=\sqrt{3-1/2}$; $\sqrt{2.5}=\sqrt{2.5}$	Check your answers: $7+1=\sqrt{49+15}$; $8=\sqrt{64}$ ✓ $-2+1=\sqrt{-14+15}$; $-1=\sqrt{1}$ X

Practice with cubes and cube roots.

☺ Cubes and Cube root equations don't have extraneous solutions!

1. $\left(\sqrt[3]{x}\right)^3=(8)^3$

$\boxed{x=512}$

^{3} 64 $\times 8$ = 512

2. $\left(\sqrt[3]{5x-1}\right)^3=(4)^3$

$5x-1=64$
$+1$ $+1$
$5x=65$
$\boxed{x=13}$

216 $\times 4$ = 64; $5\overline{)65}$ = 13; 5↓ 15

3. $\left(\sqrt[3]{x+2}\right)^3=\left(\sqrt[3]{3x+6}\right)^3$

$x+2=3x+6$
$-x-6$ $-x-6$
$\frac{-4}{2}=\frac{2x}{2}$
$\boxed{x=-2}$

$\sqrt[3]{0}=\sqrt[3]{0}$

4. $\sqrt[3]{(x+3)^3}=\sqrt[3]{64}$

$x+3=4$
-3 -3
$\boxed{x=1}$

Practice with rational exponents.

5. $x^{3/2} + 3 = 11$

$-3 \quad -3$

$(x^{3/2})^{2/3} = (8)^{2/3}$

$x = \sqrt[3]{8}^{2}$

$\boxed{x=4}$

6. $(x-6)^{2/3} + 4 = 8$

$-4 \quad -4$

$(x-6)^{2/3 \cdot 3/2} = 4^{3/2}$

$x-6 = \sqrt{4}^{3}$

$x-6 = 8$

$+6 \quad +6$

$\boxed{x=14}$

7. $2x^{\frac{3}{4}} = 16$

$\overline{2} \quad \overline{2}$

$(x^{3/4})^{4/3} = 8^{4/3}$

$x = \sqrt[3]{8}^{4}$

$x = 2^4$

$\boxed{x=16}$

8. $(x+2)^{2/5} + 12 = 16$

$-12 \quad -12$

$(x+2)^{2/5} = 4$

$x+2 = 4^{5/2}$

$x+2 = \sqrt{4}^{5}$

$x+2 = 2^5 \quad 32$

$-2 \quad -2$

$\boxed{x=30}$

Find the value of K.

9. $\sqrt{2x+3} = \sqrt{5x+K}$, given the solution is 3.

$x = 3$

$\sqrt{6+3} = \sqrt{15+k}$

$\sqrt{9} = \sqrt{15+k}$

$9 = 15 + k$

$-15 \quad -15$

$\boxed{-6 = k}$

10. $\sqrt[3]{Kx-2} = 2$, given the solution is 2.

$x = 2$

$(\sqrt[3]{2K-2})^3 = (2)^3$

$2K - 2 = 8$

$+2 \quad +2$

$2K = 10$

$\boxed{K=5}$

Solving Radical Equations HW Name________________________________

Solve each equation. Check for extraneous roots when applicable.

1. $\sqrt{-2x-5}=3$

$-2x-5=9$

$+5 \quad +5$

$-2x=14$

$\boxed{x=-7}$

2. $\sqrt{4x+1}=\sqrt{x+10}$

$4x+1=x+10$

$-x \quad -x$

$3x+1=10$

$-1 \quad -1$

$3x=9$

$\boxed{x=3}$

3. $x^2=\left(\sqrt{4x-3}\right)^2$

$x^2=4x\,3$

$x^2-4x+3=0$

$(x-3)(x-1)=0$

$x=3 \quad x=1$

4. $\left(\sqrt{10x+9}\right)^2=(x+3)^2$

$10x+9=x^2+3x+3x+9$

$-10x \; -9 \qquad -10x \; -9$

$0=x^2-4x$

$0=x(x-4)$

$\boxed{x=0 \quad x=4}$

$\sqrt{9}=3$ ✓ $\qquad \sqrt{49}=7$ ✓

5. $3\left(\frac{1}{3}x^3\right)=(9)3$

$x^3=27$

$x=\sqrt[3]{27}$

$\boxed{x=3}$

6. $(16x)^3+44=556$

$-44 \quad -44$

$(16x)^3=512$

$16x=\sqrt[3]{512}$

$16x=8$

$\boxed{x=1/2}$

7. $-4\sqrt[3]{x+10}+3=15$

$-3 \quad -3$

$\frac{-4\sqrt[3]{x+10}}{-4}=\frac{12}{-4}$

$(\sqrt[3]{x+10})^3=(-3)^3$

$x+10=-27$

$-10 \quad -10$

$\boxed{x=-37}$

8. $\sqrt[3]{4x-9}=\sqrt[3]{2x-4}$

$4x-9=2x-4$

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

$2x=5$

$\boxed{x=5/2}$

9. $x^{\frac{3}{2}}+3=11$

$-3 \quad -3$

$x^{3/2}=8$

$x=8^{2/3}$

$x=\sqrt[3]{8}^{\,2}$

$\boxed{x=4}$

10. $(\sqrt[3]{3x+9})^3=((x+6)^{\frac{1}{3}})^3$

$3x+9=x+6$

$-x \quad -x$

$2x+9=6$

$-9 \quad -9$

$2x=-3$

$\boxed{x=-3/2}$

Find the value of K.

11. $2\sqrt{3x+K}=16$, given the solution is 20.

$x=20$

$\frac{2\sqrt{60+k}}{2}=\frac{16}{2}$

$\sqrt{60+k}=8$

$60+k=64$

$-60 \quad -60$

$\boxed{k=4}$

12. $kx^3=9$, given the solution is 3.

$x=3$

$k3^3=9$

$\frac{k(27)}{27}=\frac{9}{27}$

$\boxed{k=1/3}$

13. $\frac{1}{2}(x-2)^{4/3}-20=\cancel{21}\ 20.5$

$+20 \quad +20$

$2\left(\frac{1}{2}(x-2)^{4/3}\right)=(40.5)2$

$(x-2)^{4/3}=81$