Steps to Solve Radical Equations	1	**Isolate** the radical on one side of the equation
	2	**Raise each side of the equation to the power of the index** to eliminate the radical sign ** For equation of the form $x^{\frac{m}{n}} = k$, raise each side to the reciprocal power (n/m)
	3	**Solve** the remaining equation
	4	**Check** for extraneous solutions

Directions: Solve each equation. Be sure to check for extraneous solutions.

1. $\sqrt{x} - 5 = 12$

$(\sqrt{x})^2 = (17)^2$

$\boxed{X = 289}$

$\sqrt{289} - 5 = 12$
$17 - 5 = 12$
$12 = 12 \checkmark$

2. $3 - \sqrt[4]{m} = 0$

$(3)^4 = (\sqrt[4]{m})^4$

$\boxed{81 = m}$

$3 - \sqrt[4]{81} = 0$
$3 - 3 = 0 \checkmark$
$0 = 0 \checkmark$

3. $10 + \sqrt{a + 7} = 11$

$(\sqrt{a+7})^2 = (1)^2$

$a + 7 = 1$

$\boxed{a = -6}$

$10 + \sqrt{-6+7} = 11$
$10 + \sqrt{1} = 11$
$10 + 1 = 11$
$11 = 11 \checkmark$

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

$(\sqrt{6w-5})^2 = (-7)^2$

$6w - 5 = 49$
$6w = 54$
$W = 9$

extraneous
$\boxed{\text{no solution}}$

$\sqrt{6(9)-5} + 10 = 3$
$\sqrt{54-5} + 10 = 3$
$\sqrt{49} + 10 = 3$
$7 + 10 = 3$
$17 = 3 \quad X$

5. $\dfrac{-36}{-9} = \dfrac{-9(x - 12)^{\frac{1}{2}}}{-9}$

$\left[4\right]^{2/1} = \left[(x-12)^{1/2}\right]^{2/1}$

$4^2 = X - 12$
$16 = X - 12$
$\boxed{28 = X}$

$-36 = -9(28-12)^{1/2}$
$-36 = -9(16)^{1/2}$
$-36 = -9(4)$
$-36 = -36 \checkmark$

6. $(7p - 1)^{\frac{1}{3}} + 11 = 7$

$\left[(7p-1)^{1/3} = -4\right]^{3/1}$

$7p - 1 = (-4)^3$
$7p - 1 = -64$
$7p = -63$
$\boxed{P = -9}$

$(7(-9)-1)^{1/3} + 11 = 7$
$(-63-1)^{1/3} + 11 = 7$
$(-64)^{1/3} + 11 = 7$
$-4 + 11 = 7$
$7 = 7 \checkmark$

7. $-4\sqrt{43-3x}+18=-2$

$-4\sqrt{43-3x}=-20$

$(\sqrt{43-3x}=5)^2$

$43-3x=25$

$-3x=-18$

$\boxed{x=6}$

$-4\sqrt{43-3(6)}+18=-2$

$-4\sqrt{43-18}+18=-2$

$-4\sqrt{25}+18=-2$

$-4(5)+18=-2$

$-20+18=-2$

$-2=-2$ ✓

8. $\left(\sqrt{x-8}=\sqrt{43-2x}\right)^2$

$x-8=43-2x$

$3x=51$

$x=17$

$\sqrt{17-8}=\sqrt{43-2(17)}$

$\sqrt{9}=\sqrt{43-34}$

$\sqrt{9}=\sqrt{9}$ ✓

9. $(\sqrt{6m-38})^2=(m-5)^2$

$6m-38=(m-5)(m-5)$

$6m-38=m^2-10m+25$

$0=m^2-16m+63$

$0=(m-9)(m-7)$

$\boxed{m=9 \quad m=7}$ ✓ ✓

$\sqrt{6(9)-38}=9-5$

$\sqrt{54-38}=4$

$\sqrt{16}=4$

$4=4$ ✓

$\sqrt{6(7)-38}=7-5$

$\sqrt{42-38}=2$

$\sqrt{4}=2$

$2=2$ ✓

10. $(\sqrt{51-5y})^2=(y-11)^2$

$51-5y=(y-11)(y-11)$

$51-5y=y^2-22y+121$

$0=y^2-17y+70$

$0=(y-10)(y-7)$

$y=10 \quad y=7$

extr.   extr.

$\boxed{\text{no solutions}}$

$\sqrt{51-50}=10-11$

$\sqrt{1}=-1$

$1\neq-1$

$\sqrt{51-35}=7-11$

$\sqrt{16}=-4$

$4=-4$ ✗

11. $(\sqrt{x+9})^2=(\sqrt{x}-1)^2$

$x+9=(\sqrt{x}-1)(\sqrt{x}-1)$

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

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

$8=-2\sqrt{x}$

$(-4)^2=(\sqrt{x})^2$

$16=x$

extraneous

$\sqrt{16+9}=\sqrt{16}-1$

$\sqrt{25}=4-1$

$5=3$ ✗

$\boxed{\text{no solutions}}$

12. $\sqrt{5x+4}-\sqrt{x}=4$

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

$5x+4=(4+\sqrt{x})(4+\sqrt{x})$

$5x+4=16+4\sqrt{x}+4\sqrt{x}+x$

$5x+4=16+8\sqrt{x}+x$

$\dfrac{4x-12}{4}=\dfrac{8\sqrt{x}}{4}$

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

$x^2-6x+9=4x$

$x^2-10x+9=0$

$(x-9)(x-1)=0$

$\boxed{x=9} \quad x=1 \text{ extraneous}$

$\sqrt{45+4}-\sqrt{9}=4$

$7-3=4$

$4=4$ ✓

$\sqrt{5+4}-\sqrt{1}=4$

$3-1=4$

✗

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

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

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

$3x+1=4+2\sqrt{x+1}+2\sqrt{x+1}+x+1$

$3x+1=5+x+4\sqrt{x+1}$

$\dfrac{2x-4}{2}=\dfrac{4\sqrt{x+1}}{2}$

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

$x^2-4x+4=4(x+1)$

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

$x^2-8x=0$

$x(x-8)=0$

$x=0 \quad \boxed{x=8}$

$\sqrt{0+1}-\sqrt{0+1}=2$

$1-1=2$

$0\neq2$

$\sqrt{24+1}-\sqrt{9}=2$

$\sqrt{25}-3=2$

$5-3=2$

$2=2$ ✓

$\boxed{x=8}$