A radical equation features a variable in a radicand (or in the "radical house"). Follow these steps to solve an equation with one radical:

Step 1- Get the radical term by itself on one side of the equation
Step 2- Square or cube (or whatever it takes) both sides of the equation so the radical will disappear
Step 3- Solve the resulting equation
Step 4- Check the solution(s) to make sure they really work. You may end up with extraneous solutions that you need to toss out.

Example 1 – Solve $\sqrt[3]{3x+7}+6=4$

Step 1- Get radical term by itself

$$\sqrt[3]{3x+7}+6=4$$
$$\sqrt[3]{3x+7}=-2$$

Step 2- Cube (because the radical is a cube root) both sides

$$\sqrt[3]{3x+7}=-2$$
$$\left(\sqrt[3]{3x+7}\right)^3=(-2)^3$$
$$3x+7=-8$$

Step 3- Solve the resulting equation

$$3x+7=-8$$
$$3x=-15$$
$$x=-5$$

Step 4- Check solution

$$\sqrt[3]{3(-5)+7}+6=4$$
$$\sqrt[3]{-15+7}+6=4$$
$$\sqrt[3]{-8}+6=4$$
$$-2+6=4$$
$$4=4$$

$$\boxed{x=-5}$$

Example 2 – Solve $x = 4 + 3\sqrt{x}$

Step 1- Get radical term by itself

$$x = 4 + 3\sqrt{x}$$
$$x - 4 = 3\sqrt{x}$$

Don't worry about the 3 in front of $\sqrt{x}$- since it is being multiplied, we're going to be OK when we square both sides.

Step 2- Square (because the radical is a square root) both sides

$$x - 4 = 3\sqrt{x}$$
$$(x - 4)^2 = (3\sqrt{x})^2$$
$$x^2 - 8x + 16 = 9x$$

Step 3- Solve the resulting equation

$$x^2 - 8x + 16 = 9x$$
$$x^2 - 17x + 16 = 0$$
$$(x - 16)(x - 1) = 0$$
$$x = 16, 1$$

Step 4- Check solutions

Check $x = 16$

$$(16) = 4 + 3\sqrt{(16)}$$
$$16 = 4 + 3(4)$$
$$16 = 4 + 12$$
$$16 = 16$$

Check $x = 1$

$$(1) = 4 + 3\sqrt{(1)}$$
$$1 = 4 + 3(1)$$
$$1 = 4 + 3$$
$$1 = 7$$

$$\boxed{x = 16}$$

Example 3 – Solve $x\sqrt{2} + 5 = 17$

This is a trick! This is NOT a radical equation because there are no variables in the radicand (the "radical house"). Solve this like any other equation you've been solving for years (just get x by itself).

$$x\sqrt{2} + 5 = 17$$

$$x\sqrt{2} = 12$$

$$\frac{x\sqrt{2}}{\sqrt{2}} = \frac{12}{\sqrt{2}}$$

$$x = \frac{12}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{12\sqrt{2}}{2} = 6\sqrt{2}$$

$$\boxed{x = 6\sqrt{2}}$$