Solving a Quadratic by Factoring with the AC method

Solve $2x^2 = 2x + 4$

First we notice that there is an equals sign, so that means we will be SOLVING. Our answer will look like x= …..

To solve this we will factor, so put all terms on one side of the equality.
$2x^2 - 2x - 4 = 0$ To do this I subtracted 2x from both sides and I subtracted 4 from both sides.

Now I notice that all three terms have a GCF of 2, so I factor that out and get:
$2(x^2 - x - 2) = 0$

Now, I can divide both sides by 2 and since we have zero on the right side, the 0/2 on the right becomes zero. So now we have
$x^2 - x - 2 = 0$ Notice $a = 1$, $b = -1$, $c = -2$

I assume it will factor like normal so I set up my parenthesis:
$(\quad)(\quad) = 0$

I know that the product of the first two term (the F in FOIL) will give me x squared, so I plunk down an x in the first place of each binomial:
$(x\quad)(x\quad) = 0$

Back this $x^2 - x - 2 = 0$ Notice $a = 1$, $b = -1$, $c = -2$. I look at ac = (1)(-2)= -2. I need to find two terms whose product is ac= -2 and whose sum is b= -1. When I hand write this I use little trays, but since I am typing Ill try to show you with underlines
_____ * _____ = -2 ac
_____ + _____ = -1 b

We see that (-2)*(1) = -2 and (-2) + (1) = -1. So we now take the middle term of the trinomial
$x^2 - x - 2 = 0$ (middle term -1x) and we rewrite it as (-2x + 1x), so our polynomial is now:
$x^2 - 2x + 1x - 2 = 0$

Now I will factor the first two terms (in red) and the second two terms (in green)
$x^2 - 2x + 1x - 2 = 0$
$x(x - 2) + 1(x - 2) = 0$
Notice that the GCF of the second set was just 1, but I still put that 1 in front of the binomial (x-2). We need to use that 1 in a minute.

Now we factor out the binomial (x-2) and we will be left behind with x+1

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$x(x-2)+1(x-2)=0$

$(x-2)(x+1)=0$

Now we can use the zero product property that says if we multiply two or more things and the answer is zero, then one of them must be zero. Which means either x-2 is zero or x+1 is zero. In this class, both will work:

$(x-2)(x+1)=0$

$x-2=0$ or $x+1=0$

$x=2$ or $x=-1$

So that's our answer $x=2$ or $x=-1$