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Solving quadratic equations by completing the square

Solve $2X^2 + 7X - 4 = 0$

Step 1

Make sure that you have only two variables on the left side of the equation. To do that we are going to move the **-4** to the right.

That produces

$2X^2 + 7X = 4$

Step 2

Simplify the equation to equal the first coefficient to **1** by dividing all the variables in the equation by **2**

$$\frac{2X^2}{2} + \frac{7X}{2} = \frac{4}{2}$$

That produces $X^2 + \frac{7X}{2} = 2$

Step 3

Now divide the coefficient of the second variable of the equation by **2** and square it.

That becomes $\frac{7}{2} \cdot \frac{}{2}$ that becomes $\frac{7}{2} \times \frac{1}{2} = \left(\frac{7}{4}\right)^2$

Now square $\left(\dfrac{7}{4}\right)^2$ = $\dfrac{49}{16}$

Step 4

Add $\dfrac{49}{16}$ to both sides of the equation = $X^2 + \dfrac{7X}{2} + \dfrac{49}{16} = 2 + \dfrac{49}{16}$

Now add $\dfrac{2}{1} + \dfrac{49}{16}$

$\dfrac{32 + 49}{16}$ = $\dfrac{81}{16}$

So it becomes $X^2 + \dfrac{7X}{2} + \dfrac{49}{16} = \dfrac{81}{16}$

Step 5

Complete the square. To complete the square, we simply take the **X**, add the sign next to it in this question is + then add the number we squared which is **$\dfrac{7}{4}$** and then bring the number on the right side of the equation.

That becomes $\left(X + \dfrac{7}{4}\right)^2$ = $\dfrac{81}{16}$

Step 6

Remove the square by placing a square root on both sides of the equation

That becomes

$$\sqrt{\left(X + \frac{7}{4}\right)^2} = \sqrt{\frac{81}{16}}$$

That becomes

$$X + \frac{7}{4} = \pm \frac{9}{4}$$

Step 7

Now solve for X

$$X = \frac{9}{4} - \frac{7}{4}$$

$$\frac{9 - 7}{4} = \frac{2}{4} = \frac{1}{2} \qquad \text{So } X = \frac{1}{2} \qquad \text{or}$$

$$X = \frac{-9}{4} - \frac{7}{4} \qquad\qquad\qquad \text{So X is } \frac{1}{2} \text{ or -4}$$

$$\frac{-9 - 7}{4} = \frac{-16}{4} \qquad X = -4$$