

General Quadratic Example

Math 130 *Kovitz*

Solve for x .

$$0.3x^2 + 0.5x - 5 = 0.$$

Decide on a method (or methods) of solution. Then either leave the x terms isolated on the left side (if completing the square) or set the right side to 0 (if factoring or using the quadratic formula).

Do not divide both sides by the coefficient after factoring out an x . That's definitely not correct; it is not a linear equation, so methods for solving a linear equation are not applicable.

It is always a good idea to check the solutions in the *original* equation, using a calculator if necessary.

Factoring.

$$10(0.3)x^2 + 10(0.5x) - (10)5 = 0.$$

Multiply each term by 10. Then try to factor by grouping (or use trial and error).

$$3x^2 + 5x - 50 = 0.$$

Split the x term. The sum will be 5 and the product will be $-150 = 3(-50)$.

$$3x^2 - 10x + 15x - 50 = 0.$$

The splitting numbers are -10 and 15 . Always put the plus as the third term, if possible.

$$x(3x - 10) + 5(3x - 10) = 0.$$

From both pairs of terms, factor out the largest common factor.

$$(x + 5)(3x - 10) = 0.$$

Factor by grouping. Then set each factor to 0.

(It's possible to go from line two directly to this step by trial and error.)

$$x = -5 \quad \text{or} \quad x = 10/3 \approx 3.333333.$$

Quadratic formula.

$$\begin{aligned} x &= \frac{-0.5 \pm \sqrt{.5^2 - 4(.3)(-5)}}{2(0.3)} = \frac{-0.5 \pm \sqrt{6.25}}{0.6} \\ &= \frac{-0.5 \pm 2.5}{0.6} = 2/0.6 \text{ and } -3/0.6. \end{aligned}$$

The answers are $10/3$ and -5 , as before.

Completing the Square.

$$0.3x^2 + 0.5x = 5.$$

Bring number to the right side.

$$x^2 + 5/3x = 50/3.$$

Divide each term by the coefficient of x^2 .

$$x^2 + 5/3x + 25/36 = 50/3 + 25/36 = 600/36 + 25/36 = 625/36.$$

The completing number is half the coefficient of the x , squared.

$$(x + 5/6)^2 = 625/36.$$

$$(x + 5/6) = \pm 25/6.$$

Don't forget the plus or minus.

$$x = -5/6 \pm 25/6.$$

So $x = 20/6 = 10/3$ and $x = -30/6 = -5$, just as in both previous methods.

Check the answers.

$$0.3(10/3)^2 + .5(10/3) - 5 = 30/9 + 5/3 - 5 = 10/3 + 5/3 - 15/3 = 0. \quad \text{It checks.}$$

and

$$0.3 \times (-5)^2 + 0.5 \times (-5) - 5 = 7.5 - 2.5 - 5 = 0.$$

So, both answers check. A calculator could optionally be used to check $10/3$ numerically.