

The Quadratic Formula and Discriminant

Quadratic equations have just one unknown, but contain a square term as well as linear terms.

For example, $2x^2 + x = 3$ is a quadratic equation in x

$7t = 5t^2 + 1$ is a quadratic equation in t .

There is a formula for finding the unknown value, but before it can be used the equation must be written with all of its terms at one side of the equation i.e. in the form _____ where a , b and c are known _____ or _____ numbers and x is the _____ value.

The Quadratic Formula

The solutions of the equation _____ are:

This formula gives _____ possible values for x . Usually in practical situations it will be obvious which answer is the correct one, but in some contexts both answers give possible solutions.

Example 1 Solve the equation $2x^2 + x = 3$

How to do it...

Rearrange the equation so all terms are at one side:

Write down the values of a , b and c :

Substitute these values into the formula:

Work out the values in the square root and denominator first:

Take the square root (note it is not always a round number):

Split the formula into two, using + in one and - in the other: _____ or _____

Work out the answers: _____ or _____

The solutions are $x =$ _____ and _____

Check each answer in the original equation:

Example 2 Solve the equation $7t = 5t^2 + 1$

How to do it...

The working is usually easier if the squared term is positive.

Take care when writing down the values of a , b and c :



Substitute these values into the formula:

Work out the values in the square root and denominator:

When the square root is not exact, round it to about 4 figures:

Split the formula into two:

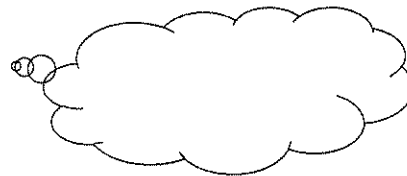
or

Work out the answers:

or

The solutions are $t = \underline{\hspace{2cm}}$ or $\underline{\hspace{2cm}}$

Check each answer in the original equation:



Quadratic Formula Practice

Simplify the following

1. $\frac{10+\sqrt{50}}{5}$

2. $\frac{-2+\sqrt{12}}{4}$

3. $\frac{8+\sqrt{18}}{6}$

4. $\frac{11+\sqrt{121}}{11}$

5. $\frac{5+\sqrt{24}}{4}$

Use the quadratic formula to solve the following.

6. $x^2 - 4x = 7$

7. $3x^2 + x - 2 = 0$

8. $3x^2 + 5x = 0$

9. $x^2 + 8 = 9x$

10. $3x^2 + 15x - 12$

11. $5x^2 + 9x + 4 = 0$

12. $5x^2 + 10x - 40 = 0$

13. $3x^2 - 2x = 5$

14. $x^2 - 2x - 2 = 0$

15. $2x^2 + 8x - 3 = 0$

16. $x^2 - 8x + 15 = 0$

17. $8x^2 = -4x + 5$

More Practice:

1 $x^2 + 2x = 8$

2 $3 + 7x + 2x^2 = 0$

3 $22t = t^2 + 21$

4 $t^2 - 7 = 6t$

5 $5x^2 = 2 - 9x$

6 $6p^2 + 5 = 17p$

7 $y^2 - 2y = 4$

8 $2r^2 + 6r = 3$

9 $3q = 2q^2 - 7$

10 $20 = 3r^2 + 5r$

11 $5 - 2x = x^2$

12 $3t^2 = 14t - 5$