



www.MathWorksheetsGo.com

On Twitter: twitter.com/mathprintables

- I. Model Problems.
- II. Practice
- III. Challenge Problems
- IV. Answer Key

Web Resources

[Different Methods for Solving Quadratic Equations](#)

[Quadratic Equation Grapher](#)

[Quadratic Formula Solver](#)

© www.MathWorksheetsGo.com All Rights Reserved
Commercial Use Prohibited

Terms of Use: By downloading this file you are agreeing to the Terms of Use Described at
<http://www.mathworksheetsgo.com/downloads/terms-of-use.php> .

Graph Paper Maker (free): www.mathworksheetsgo.com/paper/

Online Graphing Calculator(free): www.mathworksheetsgo.com/calculator/

Solving Quadratic Equations with the Quadratic Formula: Complex Solutions

For any quadratic equation $ax^2 + bx + c = 0$, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Complex numbers are written in the form $a + bi$ where $i^2 = -1$, $i = \sqrt{-1}$. Complex numbers include the set of Real and Imaginary numbers.

I. Model Problems

In the following examples you will solve quadratic equations with the quadratic formula over the set complex numbers.

Example 1: Solve: $x^2 - 5x + 10 = 0$.

Write down the equation.

Identify the values of a , b , and c .

Write down Quadratic Formula.

Substitute.

Simplify.

Simplify the radical and reduce.

The solution is:

You can also write the answer as two separate expressions.

$$\begin{aligned}x^2 - 5x + 10 &= 0 \\a = 1 \quad b = -5 \quad c = 10 \\x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\x &= \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(10)}}{2(1)} \\x &= \frac{5 \pm \sqrt{25 - 40}}{2} \\x &= \frac{5 \pm \sqrt{-15}}{2} \\x &= \frac{5 \pm i\sqrt{15}}{2} \\x &= \frac{5 \pm i\sqrt{15}}{2} \\x &= \frac{5 - i\sqrt{15}}{2}, \frac{5 + i\sqrt{15}}{2}\end{aligned}$$

Example 2: Solve: $-2x^2 + 4x + 6 = 15$. Write your solutions as an exact answer(s).

Write down the equation.

Rearrange so the equation is equal to zero.

Identify the values of a , b , and c .

Write down Quadratic Formula

Substitute.

Simplify.

Simplify the radical and reduce. The solution is: \emptyset

$$\begin{aligned}-2x^2 + 4x + 6 &= 15 \\-2x^2 + 4x - 9 &= 0 \\a = -2 \quad b = 4 \quad c = -9 \\x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\x &= \frac{-(-4) \pm \sqrt{(4)^2 - 4(-2)(-9)}}{2(-2)} \\x &= \frac{-4 \pm \sqrt{-56}}{-4} \\x &= \frac{2 \pm i\sqrt{14}}{2}\end{aligned}$$

II. Practice solving quadratics with the quadratic formula over the set of Complex numbers.

1. $x^2 - 4x - 7 = 0$

2. $x^2 + 6x + 13 = 0$

3. $a^2 - 7a - 10 = 0$

4. $x^2 + 4x + 2 = 0$

5. $a^2 - 5a + 8 = 0$

6. $x^2 - 3x + 10 = 0$

7. $b^2 - 7b - 3 = 0$

8. $3a^2 - 4a - 4 = 0$

9. $-c^2 - 6c + 8 = 0$

10. $2a^2 - 6a - 3 = 0$

11. $3d^2 - 5d + 6 = 0$

12. $4x^2 + 11x = 3x - 10$

13. $14 - 3a^2 = 2a$

14. $7 - 8z^2 = 6z + 16$

15. $3x^2 - 11x = 8 - 14x$

16. $2t^2 + 15 = 6t^2 - 5t$

17. $10x^2 - 11x + 9 = 13x - 6x^2$

18. $3t^2 + 8t + 5 = -2t^2$

III. Challenge Problems

19. $x^4 + 13x^2 + 36 = 0$

20. $x^4 + 16x^2 - 225 = 0$

21. The height of a ball in feet can be found by the function $h(t) = -16t^2 + 80t + 5$ where t is the elapsed time in seconds. Find the time or times that the ball is 34 feet high to the nearest tenth of a second.

22. The height of a rocket in meters can be found by the function $h(t) = -4.9t^2 + 540t + 25$ where t is the elapsed time in seconds. Find the time or times that the rocket is 750 meters high to the nearest tenth of a second.

23. What value(s) of the discriminant result in one unique real solution?

24. What value(s) of the discriminant result in two unique imaginary solutions?

IV. Answer Key

1. $x = 2 \pm \sqrt{11}$

2. $x = -3 \pm 2i$

3. $a = \frac{7 \pm \sqrt{89}}{2}$

4. $x = -2 \pm \sqrt{2}$

5. $a = \frac{5 \pm i\sqrt{7}}{2}$

6. $x = \frac{3 \pm i\sqrt{31}}{2}$

7. $b = \frac{7 \pm \sqrt{61}}{2}$

8. $a = 3$ or $-\frac{2}{3}$

9. $d = \frac{-5 \pm 4\sqrt{6}}{6}$

10. $a = \frac{3 \pm \sqrt{15}}{2}$

11. $d = \frac{5 \pm i\sqrt{47}}{6}$

12. $x = \frac{-2 \pm i\sqrt{6}}{2}$

13. $a = \frac{1 \pm \sqrt{43}}{3}$

14. $z = \frac{-3 \pm 3\sqrt{7}}{8}$

15. $x = \frac{-3 \pm \sqrt{105}}{6}$

16. $t = \frac{5 \pm \sqrt{265}}{8}$

17. $x = \frac{3}{4}$

18. $t = \frac{-4 \pm 3i}{5}$

19. $x = \pm 3i, \pm 2i$

20. $x = \pm 3, \pm 5i$

21. 0.39 sec and 4.61 sec

22. 1.36 sec and 108.84 sec

23. The discriminant is positive.

24. The discriminant is zero.

25. The discriminant is negative.