

Quadratic Quest

Write and solve equations with real and complex solutions.

HIGH SCHOOL • MA.912.AR.3.2

MA.912.AR.3.2 "Given a mathematical or real-world context, write and solve one-variable quadratic equations over the real and complex number systems."

NAME _____

DATE _____

CHOOSE A METHOD

First write the quadratic equation in the form $ax^2 + bx + c = 0$. Factor when possible, or use $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. If $b^2 - 4ac$ is negative, the solutions include i , where $i^2 = -1$.

WORKED EXAMPLE

Solve $x^2 + x - 12 = 0$.

- Factor: $(x + 4)(x - 3) = 0$.
- Set each factor equal to zero: $x + 4 = 0$ or $x - 3 = 0$.
- Solve: $x = -4$ or $x = 3$.

Answer: $x = -4$ or $x = 3$

PRACTICE 6 problems

1 Solve $x^2 - 15x + 50 = 0$.

ANSWER _____

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

ANSWER _____

3 Solve $x^2 + 25 = 0$.

ANSWER _____

4 Solve $5x^2 - 35x + 50 = 0$.

ANSWER _____

5 Solve $x^2 - 8x - 9 = 0$.

ANSWER _____

6 Solve $7x^2 + 14x + 35 = 0$.

ANSWER _____

APPLY IT Show your work

- 1** A rectangular photo backdrop for a school dance has an area of 48 square feet. Its width is x feet, and its length is $x + 2$ feet. Write and solve an equation to find the dimensions of the backdrop.

WORK SPACE

ANSWER _____

- 2** A basketball's height h , in feet, t seconds after a shot is modeled by $h = -16t^2 + 48t + 4$. Write and solve an equation to find when the ball reaches the floor.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Solve $x^2 - 14x + 53 = 0$. Explain why the equation has no real solutions.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve $x^2 - 15x + 50 = 0$.	$x = 5$ or $x = 10$
2	Solve $2x^2 - 14x = 0$.	$x = 0$ or $x = 7$
3	Solve $x^2 + 25 = 0$.	$x = 5i$ or $x = -5i$
4	Solve $5x^2 - 35x + 50 = 0$.	$x = 2$ or $x = 5$
5	Solve $x^2 - 8x - 9 = 0$.	$x = 9$ or $x = -1$
6	Solve $7x^2 + 14x + 35 = 0$.	$x = -1 + 2i$ or $x = -1 - 2i$

PART 2 · APPLY IT

- Equation: $x(x + 2) = 48$, or $x^2 + 2x - 48 = 0$. Width = 6 ft and length = 8 ft.** Set width times length equal to the area. The solutions are $x = 6$ and $x = -8$, but only the positive value is a possible width.
- Equation: $-16t^2 + 48t + 4 = 0$. The ball reaches the floor at $t = (3 + \sqrt{10})/2$ seconds.** Set h equal to zero and use the quadratic formula. The other solution, $(3 - \sqrt{10})/2$, is negative, so it does not represent a time after the shot.

CHALLENGE

$x = 7 + 2i$ or $x = 7 - 2i$. The discriminant is $14^2 - 4(1)(53) = -16$, which is negative, so there are no real solutions.

Accept equivalent factored forms and equivalent complex-number forms, such as $-1 \pm 2i$. For context problems, accept only the positive value that makes sense for a measurement or time.