

Parabola Power

Solve, write, and interpret quadratic relationships.

HIGH SCHOOL • MA.912.AR.3

MA.912.AR.3 "Write, solve and graph quadratic equations, functions and inequalities in one and two variables."

NAME _____

DATE _____

QUADRATIC MOVES

To solve a quadratic equation, write one side as 0, factor when possible, and set each factor equal to 0. For a function in vertex form, $y = a(x-h)^2+k$, the vertex is (h, k) , and the sign of a tells whether the parabola opens up or down. For a quadratic inequality in two variables, graph the boundary parabola, then shade the points that make the inequality true.

WORKED EXAMPLE

Solve $x^2 + 17x + 72 = 0$.

1. Factor: $x^2 + 17x + 72 = (x + 8)(x + 9)$.
2. Set each factor equal to 0: $x + 8 = 0$ or $x + 9 = 0$.
3. Solve: $x = -8$ or $x = -9$.

Answer: $x = -8$ or $x = -9$

PRACTICE 6 problems

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

ANSWER _____

2 Solve $x^2 = 25$.

ANSWER _____

3 For $y = (x - 2)^2 - 5$, state the vertex, axis of symmetry, and opening direction.

ANSWER _____

4 Solve $x^2 - x - 6 > 0$. Give your answer in interval notation.

ANSWER _____

5 For $y \leq -x^2 + 6x - 5$, describe the boundary parabola and the shading.

ANSWER _____

6 Write a quadratic function with roots -1 and 6 and a leading coefficient of 1.

ANSWER _____

APPLY IT Show your work

- 1** A soccer ball's height is modeled by $h(t) = -t^2 + 6t + 7$, where h is in feet and t is in seconds. What is the ball's maximum height, and when does it hit the ground?

WORK SPACE

ANSWER _____

- 2** A student club sells custom sticker packs. Its profit, in dollars, is modeled by $P(x) = -x^2 + 14x - 40$, where x is the number of packs sold. For which whole-number values of x is the club making a profit?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A quadratic function has x -intercepts at -2 and 6 and passes through $(0, -12)$. Write the function in standard form, then state its vertex.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Solve $x^2 - 5x + 4 = 0$.	$x = 1$ or $x = 4$
2	Solve $x^2 = 25$.	$x = -5$ or $x = 5$
3	For $y = (x - 2)^2 - 5$, state the vertex, axis of symmetry, and opening direction.	Vertex: (2, -5); axis of symmetry: $x = 2$; opens up
4	Solve $x^2 - x - 6 > 0$. Give your answer in interval notation.	$(-\infty, -2) \cup (3, \infty)$
5	For $y \leq -x^2 + 6x - 5$, describe the boundary parabola and the shading.	Use a solid parabola with vertex (3, 4) that opens down, and shade below the parabola.
6	Write a quadratic function with roots -1 and 6 and a leading coefficient of 1.	$y = x^2 - 5x - 6$

PART 2 • APPLY IT

- Maximum height: 16 feet at 3 seconds; it hits the ground at 7 seconds.** The vertex occurs at $t = 3$, and $h(3) = 16$. Set $h(t) = 0$ and factor $t^2 - 6t - 7 = 0$ to get $t = 7$ or $t = -1$, so the physical time is 7 seconds.
- $x = 5, 6, 7, 8, \text{ or } 9$** Solve $-x^2 + 14x - 40 > 0$. The zeros are 4 and 10, and the parabola is positive between them, so the whole-number values are 5 through 9.

CHALLENGE

$y = x^2 - 4x - 12$; vertex: (2, -16)

Accept equivalent factored and expanded forms for quadratic functions. For the inequality and graph description, accept equivalent interval notation and accurate descriptions of the solid boundary and shaded region.