SPARK Hybrid Education Center

Mathematics Unit Test | January - Quadratic Equations | Upper Level

Name: _____ **Date:** _____ **Score:** _____ / 100

SECTION 1: Multiple Choice (1 point each = 10 points)

1. In y = ax^2 + bx + c, the parabola opens DOWNWARD when:

A) a > 0

B) a < 0

C) b > 0

D) c < 0

2. The vertex of y = x^2 - 6x + 11 is:

A) (3, 2)

B) (-3, 2)

C) (3, -2)

D) (6, 11)

3. Which is a correct factoring of x^2 + 7x + 12?

A) (x+3)(x+4)

B) (x+2)(x+6)

C) (x+1)(x+12)

D) (x-3)(x-4)

4. The quadratic formula gives the solutions to ax^2 + bx + c = 0. What is under the square root?

A) b^2 + 4ac

B) b^2 - 4ac

C) 2a - b

D) -b

5. If the discriminant equals 0, how many real solutions does the quadratic have?

A) 0

B) 1

C) 2

D) 3

6. Solve: x^2 - 9 = 0

A) x = 9

B) x = 3 only

C) x = 3 or x = -3

D) x = -3 only

7. The axis of symmetry for y = 2x^2 - 8x + 3 is:

A) x = -2

B) x = 2

C) x = 4

D) x = 8

8. Which equation is in vertex form?

A) y = x^2 + 4x + 4

B) y = 2(x-3)^2 + 1

C) y = x^2 - 9

D) y = (x)(x+4)

9. A ball is thrown from height 0. Its height is h(t) = -16t^2 + 64t. When does it hit the ground (t > 0)?

A) t = 1

B) t = 2

C) t = 4

D) t = 64

10. Solve by factoring: x^2 - 5x + 6 = 0

A) x = 2 or x = 3

B) x = -2 or x = -3

C) x = 1 or x = 6

D) x = 5 or x = 1

SECTION 2: Matching (2 points each = 10 points)

COLUMN A (Terms)	COLUMN B (Definitions)
1. ____ Discriminant	a. b^2 - 4ac; tells number of real solutions
2. ____ Vertex form	b. y = a(x-h)^2 + k
3. ____ Zero product property	c. If ab = 0, then a = 0 or b = 0
4. ____ Axis of symmetry	d. Vertical line x = -b/2a through the vertex
5. ____ Parabola	e. The U-shaped graph of a quadratic function

SECTION 3: Show Your Work (4 points each = 20 points)

1. Find the vertex and axis of symmetry for y = x^2 - 4x + 7. SHOW YOUR WORK:

2. Solve by factoring: x^2 - 2x - 15 = 0. SHOW YOUR WORK:

3. Use the quadratic formula to solve: 2x^2 + 3x - 5 = 0. SHOW YOUR WORK:

4. Find the discriminant for x^2 + 4x + 5. How many real solutions? SHOW YOUR WORK:

5. A ball: h(t) = -16t^2 + 96t. Find the time of max height and the max height. SHOW YOUR WORK:

SECTION 4: Word Problems (20 points each = 60 points)

Problem 1. (20 pts)

A rectangular garden has a perimeter of 60 feet. If the length is x and the width is (30-x), write an equation for the area. Find the dimensions that maximize the area. Show all work.

Problem 2. (20 pts)

A company's profit is modeled by P = -3x^2 + 120x - 800 where x is the number of items sold. (a) Find the number of items that maximizes profit. (b) Find the maximum profit. Show all work.

Problem 3. (20 pts)

A ball is kicked from the ground. Its height is h(t) = -16t^2 + 80t. (a) When does it reach max height? (b) What is the max height? (c) When does it return to the ground? Show all work.

TEACHER ANSWER KEY | January - Quadratic Equations | Upper Level

Section 1: Multiple Choice

1. B
2. A
3. B
4. A
5. B
6. A
7. B
8. A
9. B
10. A

Section 2: Matching

1. Discriminant = a
2. Vertex form = b
3. Zero product property = c
4. Axis of symmetry = d
5. Parabola = e

Sections 3 & 4: Use professional judgment to award partial credit.

Award full points for correct final answer with clear work shown. Award half credit for correct process with a computation error. Deduct points for missing steps even when the answer is correct. Word problems: 20 pts = 8 setup + 8 work + 4 answer/label.