



BATTLE SHEET · CHAPTER 10

Solving Quadratic Equations

MathBound Standard Algebra 1 · Island 10: Copperroot Hollow

Name _____ Class _____ Date _____

The foes of Copperroot Hollow are out, and each one fights with its own kind of Algebra 1 problem. **Defeat each foe by solving its problems.** Show your work in the space on each card, then circle the letter of your answer.

The foes on this sheet



Wishbone Bot

A wishbone that splits into plus and minus: the square root property.

Problems 1–3 · Lesson 10.1 · Battle it online: **play.mathbound.org/alg1/?practice=r10.square-root-property**



Corner Patcher

Patches the missing corner of a square: completing the square.

Problems 4–6 · Lesson 10.2 · Battle it online: **play.mathbound.org/alg1/?practice=r10.complete-the-square**



Plus-Minus Pendulum

Swings to both sides: the quadratic formula and the discriminant.

Problems 7–9 · Lesson 10.3 · Battle it online: **play.mathbound.org/alg1/?practice=r10.quadratic-formula**



Catapult Kit

Lobs a ball in a perfect arc: projectile and area problems.

Problems 10–12 · Lesson 10.4 · Battle it online: **play.mathbound.org/alg1/?practice=r10.quadratic-applications**



Swingline Spider

One straight thread, one swinging arc: a line and a parabola.

Problems 13–14 · Lesson 10.5 · Battle it online: **play.mathbound.org/alg1/?practice=quad.systems**

> **For teachers.** 14 problems from MathBound's own question engine, on chapter 10 of MathBound Standard Algebra 1. The answer key, with worked steps, is at the end. Free to copy for your classes.
>
> Every foe here is also a battle in MathBound, the Algebra 1 adventure game: free for students, no sign-up, at **play.mathbound.org**. The link under each foe opens practice battles with it. Classes, progress by skill and assignments: **mathbound.org/teachers**.

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FOE 1 OF 5

Wishbone Bot

A wishbone that splits into plus and minus: the square root property. Lesson 10.1. Battle it:
play.mathbound.org/alg1/?practice=r10.square-root-property

1 Lesson 10.1

Solve: $x^2 = \frac{49}{16}$

A. $x = \pm\frac{49}{4}$ **B.** $x = \pm\frac{7}{16}$

C. $x = \frac{7}{4}$ **D.** $x = \pm\frac{7}{4}$

WORK

2 Lesson 10.1

Solve: $(x+8)^2 = 80$

A. $x = 8 \pm 4\sqrt{5}$ **B.** $x = -8 \pm 16\sqrt{5}$

C. $x = -8 \pm 4\sqrt{5}$ **D.** $x = -8 + 4\sqrt{5}$

WORK

3 Lesson 10.1

Two squares have a total area of 45 square centimeters. The side of the larger is 2 times the side of the smaller. How long, in centimeters, is a side of the smaller square?

A. 6 **B.** 9 **C.** ± 3 **D.** 3

WORK



FOE 2 OF 5

Corner Patcher

Patches the missing corner of a square: completing the square. Lesson 10.2. Battle it:
play.mathbound.org/alg1/?practice=r10.complete-the-square

4 Lesson 10.2

What constant completes the square for $x^2 + \frac{2}{7}x$?

A. $\frac{1}{49}$ **B.** $\frac{2}{7}$

C. $\frac{4}{49}$ **D.** $\frac{1}{7}$

WORK

5 Lesson 10.2

Solve by completing the square:
$3x^2 - 27x + 60 = 0$

A. $x = 5$

B. $x = -5$ or $x = -4$

C. $x = 15$ or $x = 12$

D. $x = 5$ or $x = 4$

WORK

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FOE 2 OF 5

Corner Patcher (continued)

Patches the missing corner of a square: completing the square. Lesson 10.2. Battle it:
play.mathbound.org/alg1/?practice=r10.complete-the-square

6 Lesson 10.2

Solve by completing the square: $x\,(x-4) = -2x + 9$

A. $x = 2 \pm \sqrt{13}$ **B.** $x = 1 \pm 2\sqrt{2}$ **C.** $x = -1 \pm \sqrt{10}$ **D.** $x = 1 \pm \sqrt{10}$

WORK



FOE 3 OF 5

Plus-Minus Pendulum

Swings to both sides: the quadratic formula and the discriminant. Lesson 10.3. Battle it:
play.mathbound.org/alg1/?practice=r10.quadratic-formula

7 Lesson 10.3

For $6x^2 - 2x - 6 = 0$, name a, b and c.

A. $a = 6, b = -6, c = -2$

B. $a = 6, b = 2, c = -6$

C. $a = -2, b = 6, c = -6$

D. $a = 6, b = -2, c = -6$

WORK

8 Lesson 10.3

Solve: $\frac{x^2}{4} - \frac{5}{4}x = -1$

A. $x = 16$ or $x = 4$

B. $x = 4$

C. $x = 4$ or $x = 1$

D. $x = -1$ or $x = -4$

WORK

9 Lesson 10.3

For what value of k does $kx^2 - 72x + 9 = 0$ have exactly one real solution?

A. 576 **B.** -144 **C.** 36 **D.** 144

WORK

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FOE 4 OF 5

Catapult Kit

Lobs a ball in a perfect arc: projectile and area problems. Lesson 10.4. Battle it:
play.mathbound.org/alg1/?practice=r10.quadratic-applications

10 Lesson 10.4

The product of two consecutive positive integers is 89 more than their sum. Find them.

A. 10 and 11 **B.** 11 and 12

C. 9 and 10 **D.** 44 and 45

WORK

11 Lesson 10.4

One leg of a right triangle is 3 units long. The hypotenuse is 1 unit longer than the other leg. How long is the hypotenuse?

A. 4 units **B.** 5 units

C. 6 units **D.** 7 units

WORK

12 Lesson 10.4

An arrow is shot upward. Its height in feet after t seconds is $h = -16t^2 + 96t + 29$. To the nearest tenth of a second, when does it first reach a height of 121 feet?

A. 3 seconds **B.** 0.8 seconds **C.** 4.8 seconds **D.** 1.2 seconds

WORK



FOE 5 OF 5

Swingline Spider

One straight thread, one swinging arc: a line and a parabola. Lesson 10.5. Battle it:
play.mathbound.org/alg1/?practice=quad.systems

13 Lesson 10.5

A quadratic f and a linear g take these values. For which values of x is $f(x) = g(x)$?

x	1	2	3	4	5	6
$f(x)$	1	3	3	1	-3	-9
$g(x)$	1	2	3	4	5	6

A. $x = 1$ **B.** $x = 1$ and $x = 3$ **C.** $x = 3$ **D.** $x = 2$ and $x = 4$

WORK

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Swingline Spider (continued)

One straight thread, one swinging arc: a line and a parabola. Lesson 10.5. Battle it:
play.mathbound.org/alg1/?practice=quad.systems

14 Lesson 10.5

Setting $y = 3x^2 + 8x + 4$ equal to $y = 4x$ gives a quadratic equation. What is its discriminant?

A. -8 **B.** 64 **C.** 16 **D.** -32

WORK

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Answer key · Chapter 10: Solving Quadratic Equations

Each answer is followed by its worked steps, as the game shows them after a battle.

Wishbone Bot

1. D: $x = \pm\frac{7}{4}$

1. Take the square root of both sides, top and bottom separately.
2. $\sqrt{49} = 7$ and $\sqrt{16} = 4$, so $x = \pm\frac{7}{4}$.

2. C: $x = -8 \pm 4\sqrt{5}$

1. Take the root of both sides: $x + 8 = \pm\sqrt{80}$.
2. $\sqrt{80}$ simplifies to $4\sqrt{5}$.
3. So $x = -8 \pm 4\sqrt{5}$.

3. D: 3

1. With the smaller side x, the larger is $2x$, so $x^2 + (2x)^2 = 45$.
2. $5x^2 = 45$, so $x^2 = 9$ and $x = \pm 3$.
3. A length is positive, so the side is 3 centimeters.

Corner Patcher

4. A: $\frac{1}{49}$

1. Half of $\frac{2}{7}$ is $\frac{1}{7}$.
2. Then square it: $\left(\frac{1}{7}\right)^2 = \frac{1}{49}$.

5. D: $x = 5$ or $x = 4$

1. Divide every term by 3: $x^2 - 9x + 20 = 0$.
2. Move 20 across and add $\frac{81}{4}$: $\left(x - \frac{9}{2}\right)^2 = \frac{1}{4}$.
3. That gives $x = 5$ or $x = 4$.

6. D: $x = 1 \pm \sqrt{10}$

1. Expand and gather: $x^2 - 2x = 9$.
2. Add 1 to both sides: $(x - 1)^2 = 10$.
3. Take the root and simplify: $x = 1 \pm \sqrt{10}$.

Plus-Minus Pendulum

7. D: $a = 6, b = -2, c = -6$

1. a is the coefficient of x^2, b the coefficient of x, c the constant.
2. The sign belongs to the coefficient, so $b = -2$ and $c = -6$.

8. C: $x = 4$ or $x = 1$

1. Multiply every term by 4: $x^2 - 5x = -4$.
2. Bring it across: $x^2 - 5x + 4 = 0$.
3. That factors, so $x = 4$ or $x = 1$.

9. D: 144

1. One solution means the discriminant is zero: $(-72)^2 - 4 \cdot k \cdot 9 = 0$.
2. $5184 = 36k$, so $k = \frac{5184}{36} = 144$.

Catapult Kit

10. A: 10 and 11

1. $n(n + 1) = n + (n + 1) + 89$.
2. That is $n^2 - n - 90 = 0$, giving $n = 10$.
3. The integers are 10 and 11.

11. B: 5 units

1. Let the other leg be x: $3^2 + x^2 = (x + 1)^2$.
2. The x^2 terms cancel: $9 = 2x + 1$, so $x = 4$.
3. The hypotenuse is $4 + 1 = 5$ units.

12. D: 1.2 seconds

1. Set $h = 121$ and bring it across: $-16t^2 + 96t - 92 = 0$.
2. $t = \frac{-96 \pm \sqrt{3328}}{-32}$, so $t \approx 1.2$ or $t \approx 4.8$.
3. It first reaches that height on the way up, at about 1.2 seconds.

Swingline Spider

13. B: $x = 1$ and $x = 3$

1. Look along the table for columns where $f(x)$ and $g(x)$ are equal.
2. $f(1) = g(1) = 1$ and $f(3) = g(3) = 3$.
3. So $x = 1$ and $x = 3$.

14. D: -32

1. Set them equal and collect: $3x^2 + 4x + 4 = 0$.
2. $b^2 - 4ac = 16 - 48 = -32$.

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