

BATTLE SHEET · CHAPTER 11

Radicals and More Functions

MathBound Standard Algebra 1 · Island 11: Skyglass Observatory

Name _____ Class _____ Date _____

The foes of Skyglass Observatory 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



Carrot Bundler

Only bundles carrots of the same kind: adding and subtracting like radicals.

Problems 1–2 · Lesson 11.1 · Battle it online: **play.mathbound.org/alg1/?practice=r9.add-and-subtract-square-roots**



Root Grafter

Grafts roots together: multiplying square roots.

Problems 3–5 · Lesson 11.2 · Battle it online: **play.mathbound.org/alg1/?practice=r9.multiply-square-roots**



Stump Puller

Hauls a stump out roots and all: solving radical equations.

Problems 6–8 · Lesson 11.3 · Battle it online: **play.mathbound.org/alg1/?practice=r9.solve-radical-equations**



Family-Tree Fern

Keeps a locket of family portraits: parent functions.

Problems 9–10 · Lesson 11.4 · Battle it online: **play.mathbound.org/alg1/?practice=fn.families**



Hopscotch Hattie

Flat squares, then a jump: step functions.

Problems 11–12 · Lesson 11.5 · Battle it online: **play.mathbound.org/alg1/?practice=fn.step**



Mash-Up Marlo

Cranks two hoppers into one grinder: operations with functions.

Problems 13–14 · Lesson 11.6 · Battle it online: **play.mathbound.org/alg1/?practice=fn.operations**

> **For teachers.** 14 problems from MathBound's own question engine, on chapter 11 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 6

Carrot Bundler

Only bundles carrots of the same kind: adding and subtracting like radicals. Lesson 11.1. Battle it:
play.mathbound.org/alg1/?practice=r9.add-and-subtract-square-roots

1 Lesson 11.1

Simplify: $3\sqrt{14} + 5\sqrt{14} - \sqrt{14}$

A. $9\sqrt{14}$ **B.** $7\sqrt{14}$

C. $-3\sqrt{14}$ **D.** $7\sqrt{42}$

WORK

2 Lesson 11.1

Simplify: $\sqrt{3x^3} - 2x\sqrt{27x}$

A. $7x\sqrt{3x}$ **B.** $-5x\sqrt{3x}$

C. $5x\sqrt{3x}$ **D.** $-x\sqrt{3x}$

WORK



FOE 2 OF 6

Root Grafter

Grafts roots together: multiplying square roots. Lesson 11.2. Battle it:
play.mathbound.org/alg1/?practice=r9.multiply-square-roots

3 Lesson 11.2

Multiply: $\sqrt{3} \cdot \sqrt{7}$

A. $\sqrt{21}$ **B.** 21

C. $3\sqrt{7}$ **D.** $\sqrt{10}$

WORK

4 Lesson 11.2

Multiply: $-4\sqrt{21} \cdot 2\sqrt{33}$

A. $-24\sqrt{77}$ **B.** $-8\sqrt{693}$

C. $24\sqrt{77}$ **D.** $-72\sqrt{77}$

WORK

5 Lesson 11.2

Multiply: $(\sqrt{y} - 2)^2$

A. $y + 4\sqrt{y} + 4$ **B.** $y - 4$ **C.** $y - 2\sqrt{y} + 4$ **D.** $y - 4\sqrt{y} + 4$

WORK

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FOE 3 OF 6

Stump Puller

Hauls a stump out roots and all: solving radical equations. Lesson 11.3. Battle it: play.mathbound.org/alg1/?practice=r9.solve-radical-equations

6 Lesson 11.3

Solve: $\sqrt{x} = \frac{3}{5}$

A. $x = \frac{9}{25}$ **B.** $x = \frac{3}{25}$

C. $x = \frac{9}{5}$ **D.** $x = \frac{3}{5}$

WORK

7 Lesson 11.3

Solve: $\sqrt{5x - 11} + 1 = x$

A. $x = 3$ or $x = 4$ **B.** $x = 2$ or $x = 3$

C. $x = 4$ **D.** $x = 3$

WORK

8 Lesson 11.3

Solve: $\sqrt{2x - 17} = \sqrt{x} + 2$

A. $x = 49$ **B.** $x = 49$ or $x = 9$ **C.** $x = 7$ **D.** $x = 9$

WORK



FOE 4 OF 6

Family-Tree Fern

Keeps a locket of family portraits: parent functions. Lesson 11.4. Battle it: play.mathbound.org/alg1/?practice=fn.families

9 Lesson 11.4

Its graph is a V-shape with a sharp corner at its vertex. Which parent function is it?

A. absolute value **B.** cube root

C. square root **D.** cubic

WORK

10 Lesson 11.4

$f(x) = x^3$ and $g(x) = f(x + 2) - 3$. What is the center of the graph of g?

A. $(-3, -2)$ **B.** $(-2, -3)$

C. $(-2, 3)$ **D.** $(2, -3)$

WORK

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FOE 5 OF 6

Hopscotch Hattie

Flat squares, then a jump: step functions. Lesson 11.5. Battle it: **play.mathbound.org/alg1/?practice=fn.step**

11 Lesson 11.5

The number of full teams of 9 that n players can make is $T(n) = \lfloor \frac{n}{9} \rfloor$. Find $T(83)$.

A. 9 **B.** 8

C. 9.22 **D.** 10

WORK

12 Lesson 11.5

A garage charges \$4 for each hour or part of an hour. Jonah works out the charge for 2 hours 45 minutes as \$11.00. What should it be?

A. \$8 **B.** \$11.00

C. \$12 **D.** \$16

WORK



FOE 6 OF 6

Mash-Up Marlo

Cranks two hoppers into one grinder: operations with functions. Lesson 11.6. Battle it: **play.mathbound.org/alg1/?practice=fn.operations**

13 Lesson 11.6

$f(x) = -2x + 7$ and $g(x) = -6x + 2$. Find $(g - f)(x)$.

A. $-8x + 9$ **B.** $-4x + 9$

C. $4x + 5$ **D.** $-4x - 5$

WORK

14 Lesson 11.6

$f(x) = -2x + 8$ and $g(x) = 6x - 9$. For what value of x is $(f + g)(x) = -9$?

A. -2 **B.** -2.5

C. -8 **D.** 2

WORK

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Answer key · Chapter 11: Radicals and More Functions

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

Carrot Bundler

1. B: $7\sqrt{14}$

1. The radicands match, so combine the coefficients only.
2. $3 + 5 - 1 = 7$.

2. B: $-5x\sqrt{3x}$

1. $\sqrt{3x^3} = x\sqrt{3x}$ and $2x\sqrt{27x} = 6x\sqrt{3x}$.
2. $1 - 6 = -5$, so the result is $-5x\sqrt{3x}$.

Root Grafter

3. A: $\sqrt{21}$

1. Roots multiply straight across: $3 \cdot 7 = 21$.
2. 21 has no square factor, so $\sqrt{21}$ is fully simplified.

4. A: $-24\sqrt{77}$

1. Coefficients: $-4 \cdot 2 = -8$. Roots: $\sqrt{693} = 3\sqrt{77}$.
2. $-8 \cdot 3\sqrt{77} = -24\sqrt{77}$.

5. D: $y - 4\sqrt{y} + 4$

1. The middle term is twice the product, and it is negative: $-4\sqrt{y}$.
2. The last term is positive, since a negative squared is positive: 4.

Stump Puller

6. A: $x = \dfrac{9}{25}$

1. Square both sides: $x = (\frac{3}{5})^2$.
2. Square the top and the bottom: $\dfrac{9}{25}$.

7. A: $x = 3$ or $x = 4$

1. Isolate: $\sqrt{5x - 11} = x - 1$.
2. Square: $5x - 11 = (x - 1)^2$, so $x^2 - 7x + 12 = 0$.
3. That factors as $(x - 3)(x - 4) = 0$, and both roots check.

8. A: $x = 49$

1. Square: $2x + -17 = x + 4\sqrt{x} + 4$, so $x - 21 = 4\sqrt{x}$.
2. In terms of $\sqrt{x}$: $(\sqrt{x})^2 - 4\sqrt{x} - 21 = 0$, so $\sqrt{x} = 7$ or -3.
3. A square root is never negative, so $\sqrt{x} = 7$ and $x = 49$.

Family-Tree Fern

9. A: absolute value

1. Match the description to the shape of each parent.
2. It describes the absolute value parent.

10. B: $(-2, -3)$

1. $g(x) = (x + 2)^3 - 3$: the graph of f moved left 2 and down 3.
2. $(0, 0)$ moves to $(-2, -3)$.

Hopscotch Hattie

11. A: 9

1. $\dfrac{83}{9}$ is about 9.22.
2. The greatest integer rounds it down: $T(83) = 9$. The players left over do not make a team.

12. C: \$12

1. Jonah charged for the exact time. A part of an hour counts as a whole hour.
2. 2 hours 45 minutes counts as 3 hours: $3 \cdot 4 = 12$.

Mash-Up Marlo

13. D: $-4x - 5$

1. $(g - f)(x)$ is $g(x) - f(x)$, in that order: $(-6x + 2) - (-2x + 7)$.
2. Combine like terms: $-4x - 5$.

14. A: -2

1. $(f + g)(x) = 4x - 1$.
2. Solve $4x - 1 = -9$: $x = -2$.

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