

BATTLE SHEET · CHAPTER 4

Functions

MathBound Standard Algebra 1 · Island 4: Cogspire Heights

Name _____ Class _____ Date _____

The foes of Cogspire Heights 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



Grid Mole

Pops up at a point on the grid: plotting and reading coordinates, and the distances and figures between them.
Problems 1–3 · Lesson 4.1 · Battle it online: **play.mathbound.org/alg1/?practice=r4.rectangular-coordinate-system**



Vending Vic

Press one button, get one snack: is it a function? Domain and range.
Problems 4–6 · Lesson 4.2 · Battle it online: **play.mathbound.org/alg1/?practice=fn.relations**



Number Mill

Grinds an input into its output: function notation, and one relationship as a rule, a table, a graph and a story.
Problems 7–8 · Lessons 4.3, 4.4 · Battle it online: **play.mathbound.org/alg1/?practice=fn.notation**



Peak Peeper

Spots the peaks, valleys and zeros of a graph: reading graphs of functions.
Problems 9–10 · Lessons 4.3, 4.7 · Battle it online: **play.mathbound.org/alg1/?practice=fn.graphs**



Pace Snail

Leaves an even mark at every step: rate of change.
Problems 11–12 · Lesson 4.5 · Battle it online: **play.mathbound.org/alg1/?practice=fn.rate-of-change**



Add-a-Car Train

Adds the same car every stop: arithmetic sequences.
Problems 13–14 · Lesson 4.6 · Battle it online: **play.mathbound.org/alg1/?practice=seq.arithmetic**

> **For teachers.** 14 problems from MathBound's own question engine, on chapter 4 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

Grid Mole

Pops up at a point on the grid: plotting and reading coordinates, and the distances and figures between them. Lesson 4.1. Battle it: **play.mathbound.org/alg1/?practice=r4.rectangular-coordinate-system**

1 Lesson 4.1

Starting at the origin, which point do you reach by moving 5 units left and 1 unit down?

A. $(-1, -5)$ **B.** $(-5, 1)$

C. $(-5, -1)$ **D.** $(5, -1)$

WORK

2 Lesson 4.1

For $x + y = 11$, what is x when $y = 2$?

A. 11 **B.** 2

C. 9 **D.** 13

WORK

3 Lesson 4.1

The table lists points on a line. What goes in the gap?

x	0	1	3	6
y	6	2	-6	?

A. 6 **B.** -18 **C.** -10 **D.** -14

WORK



FOE 2 OF 6

Vending Vic

Press one button, get one snack: is it a function? Domain and range. Lesson 4.2. Battle it: **play.mathbound.org/alg1/?practice=fn.relations**

4 Lesson 4.2

The graph shows a relation. Is it a function?

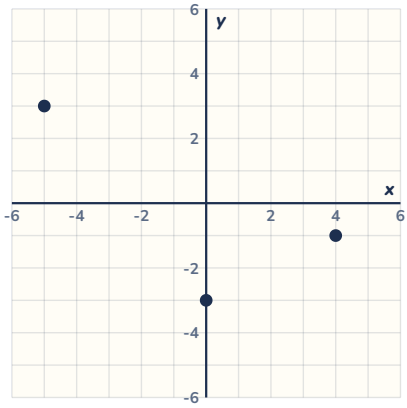
A. No: the input 4 has two outputs

B. Yes: each input has exactly one output

C. No: the input 0 has two outputs

D. No: the input -5 has two outputs

WORK



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FOE 2 OF 6

Vending Vic (continued)

Press one button, get one snack: is it a function? Domain and range. Lesson 4.2. Battle it:
play.mathbound.org/alg1/?practice=fn.relations

5 Lesson 4.2

Which relation has range $\{-2, 2, 4\}$?

A. $\{(-5, 3), (1, 9), (6, 6), (-4, 9)\}$

B. $\{(-4, 4), (9, -2), (-6, 2), (2, -2)\}$

C. $\{(-4, 4), (9, -2), (-6, 2), (2, -1)\}$

D. $\{(4, -4), (-2, 9), (2, -6), (-2, 2)\}$

WORK

6 Lesson 4.2

What is the range of the relation graphed?

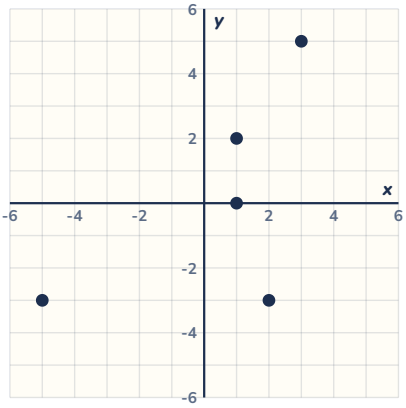
A. $\{-5, -3, 0, 1, 2, 3, 5\}$

B. $\{-3, 0, 2, 5\}$

C. $\{-3, -3, 0, 2, 5\}$

D. $\{-5, 1, 2, 3\}$

WORK





FOE 3 OF 6

Number Mill

Grinds an input into its output: function notation, and one relationship as a rule, a table, a graph and a story. Lessons 4.3, 4.4.
Battle it: play.mathbound.org/alg1/?practice=fn.notation

7 Lesson 4.3

The function f multiplies its input by -5 and then subtracts 2. What is $f(7)$?

A. -33

B. -37

C. 0

D. -25

WORK

8 Lesson 4.4

Is $\frac{y}{2} = -x - 7$ a linear function?

A. No: x is an exponent

B. No: x is in a denominator

C. No: x is squared

D. Yes: it can be written as $y = mx + b$

WORK

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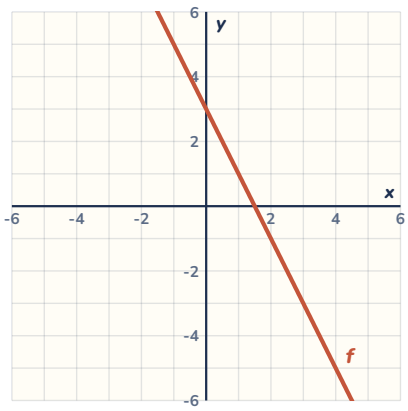
FOE 4 OF 6

Peak Peeper

Spots the peaks, valleys and zeros of a graph: reading graphs of functions. Lessons 4.3, 4.7. Battle it: **play.mathbound.org/alg1/?practice=fn.graphs**

9 Lesson 4.3

The graph of f is shown. What is $f(4)$?



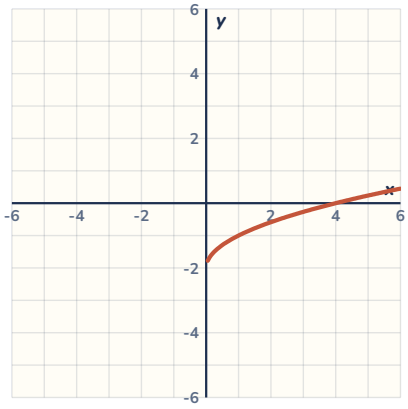
A. -5 **B.** 4

C. 5 **D.** -4

WORK

10 Lesson 4.7

Over which interval is the function increasing?



A. $x > -2$ **B.** $y > -2$

C. $x > 0$ **D.** $x < 0$

WORK



FOE 5 OF 6

Pace Snail

Leaves an even mark at every step: rate of change. Lesson 4.5. Battle it: **play.mathbound.org/alg1/?practice=fn.rate-of-change**

11 Lesson 4.5

What is the rate of change of the function in the table?

x	2	4	6	8
y	4	-2	-8	-14

A. -6 **B.** -3 **C.** 4 **D.** 3

WORK

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FOE 5 OF 6

Pace Snail (continued)

Leaves an even mark at every step: rate of change. Lesson 4.5. Battle it: **play.mathbound.org/alg1/?practice=fn.rate-of-change**

12 Lesson 4.5

What is the rate of change of the function in the table?

x	0	3	6	12
y	4	2	0	-4

A. $\frac{-2}{3}$ **B.** -2 **C.** $\frac{2}{3}$ **D.** $\frac{-3}{2}$

WORK



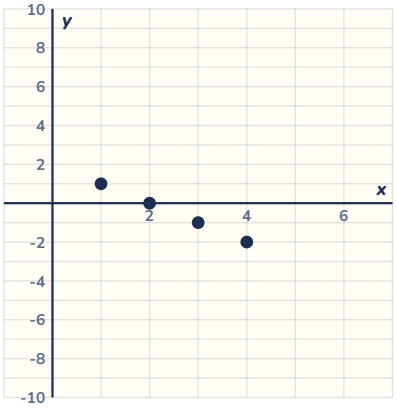
FOE 6 OF 6

Add-a-Car Train

Adds the same car every stop: arithmetic sequences. Lesson 4.6. Battle it: **play.mathbound.org/alg1/?practice=seq.arithmetic**

13 Lesson 4.6

The graph shows the first four terms of an arithmetic sequence. What is the fifth term?



A. -3 **B.** -4

C. 5 **D.** -1

WORK

14 Lesson 4.6

A gym charges 40 dollars to join plus 6 dollars a month. Write a rule for the total cost a_n, in dollars, of the first n months.

A. $a_n = 40n + 6$ **B.** $a_n = 6n + 40$ **C.** $a_n = 6n + 34$ **D.** $a_n = 6n + 46$

WORK

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Answer key · Chapter 4: Functions

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

Grid Mole

1. C: $(-5, -1)$

1. The first coordinate is the horizontal move, the second the vertical.
2. That gives $(-5, -1)$.

2. C: 9

1. Substitute $y = 2$: $x + 2 = 11$.
2. $x = 9$.

3. B: -18

1. From $x = 0$ to 1, y changes by -4: the slope is -4.
2. From $x = 3$ to 6 is 3 steps of 1, so y changes by -12: $y = -18$.

Vending Vic

4. B: Yes: each input has exactly one output

1. Look for two points on the same vertical line: one input with two outputs.
2. No vertical line meets two points, so it is a function.

5. B: $\{(-4, 4), (9, -2), (-6, 2), (2, -2)\}$

1. The range lists every y-value once.
2. $\{(-4, 4), (9, -2), (-6, 2), (2, -2)\}$ has range$\{-2, 2, 4\}$.

6. B: $\{-3, 0, 2, 5\}$

1. This relation is not a function: an input repeats. The range still lists each y-value once.
2. The range is the set of outputs, the y-values. An output that appears twice is listed once: $\{-3, 0, 2, 5\}$.

Number Mill

7. B: -37

1. As a rule, $f(x) = -5x - 2$.
2. $f(7) = -5 \cdot 7 - 2 = -37$.

8. D: Yes: it can be written as $y = mx + b$

1. Rearrange it as far as it goes: a linear function becomes $y = mx + b$, with x to the first power only.
2. $\frac{y}{2} = -x - 7$ can be: it is linear.

Peak Peeper

9. A: -5

1. Find $x = 4$ on the x-axis and go up or down to the graph.
2. The graph passes through $(4, -5)$, so the value is -5.

10. C: $x > 0$

1. The graph starts at $x = 0$; nothing is drawn to its left.
2. From there it rises for every larger x: it is increasing for $x > 0$.

Pace Snail

11. B: -3

1. Each time x goes up by 2, y changes by -6.
2. Rate of change $= \frac{-6}{2} = -3$.

12. A: $\frac{-2}{3}$

1. Each time x goes up by 3, y changes by -2.
2. Rate of change $= \frac{-2}{3} = \frac{-2}{3}$.

Add-a-Car Train

13. A: -3

1. The points go down by 1 at each step: $d = -1$.
2. $-2 - 1 = -3$.

14. B: $a_n = 6n + 40$

1. The total starts at 40 and rises 6 for each unit, so after n units it is $40 + 6n$.
2. So $a_n = 6n + 40$. Check $n = 1$: $6 + 40 = 46$.

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