Computer Science
in Algebra
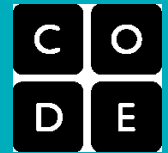*powered by* **BOOTSTRAP**

Student Workbook

Name: _____ Date: _____ Per: _____

Reverse Engineering
Code.org Computer Science in Algebra

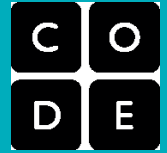| Thing in the game...	What changes about it?	More Specifically...

Name: _____   Date: _____   Per: _____

Video Game Planning
Code.org Computer Science in Algebra

Use this form to plan out your video game. Once your game is complete, the player will move up and down, the target and danger will move from left and right, and you will earn points by touching the target, and lose points by touching the danger.

Created by:

The game takes place in:
(This will be the background image in your game)

The player is a:
(The player moves up and down)
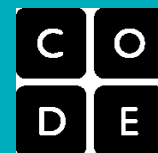
The target is a:
(The Target moves left and right)

The danger is a:
(The Danger moves left and right)

Evaluation Blocks

Code.org Computer Science in Algebra

Complete the evaluation blocks for the provided equations.

2 * 5		32 / 3	
4 - (3 / 2)		25 + 14 - 12	
(3 + 12) * 16		23 * 14 * (3 + 2)	
1 + (15 * 5)		19 - (12 + 11)	
(2 + 17) * (12 - 8)		4 - (6 - 17)	
9 * (17 + 2)		12 * 4 / 3	

Name: _____ Date: _____ Per: _____

Fast Functions!

Code.org Computer Science in Algebra

CODE

_____ : _____ -> _____
name   domain   range

Example: _____ (_____) = _____

Example: _____ (_____) = _____

Define: _____ (_____) = _____

_____ : _____ -> _____
name   domain   range

Example: _____ (_____) = _____

Example: _____ (_____) = _____

Define: _____ (_____) = _____

_____ : _____ -> _____
name   domain   range

Example: _____ (_____) = _____

Example: _____ (_____) = _____

Define: _____ (_____) = _____

_____ : _____ -> _____
name   domain   range

Example: _____ (_____) = _____

Example: _____ (_____) = _____

Define: _____ (_____) = _____

D

Design Recipe

The Design Recipe
Code.org Computer Science in Algebra

C O D E

Description:

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
  function name   domain   range

_____
                          what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
              function name   input(s)   what the function produces

Example: _____ (_____) = _____
              function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
            function name   variables

_____
              what the function does with those variables

D
Design Recipe

The Design Recipe
Code.org Computer Science in Algebra

Description:

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
                    function name   input(s)   what the function produces

Example: _____ (_____) = _____
                    function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
                    function name   variables

_____
what the function does with those variables

D

Design
Recipe

The Design Recipe
Code.org Computer Science in Algebra

C O
D E

Description:

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
    function name   domain   range

_____
                    what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

---

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
          function name   variables

_____
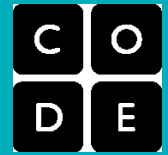   what the function does with those variables

10

Stage 10

rocket-height (word problem)

Code.org Computer Science in Algebra

C O
D E
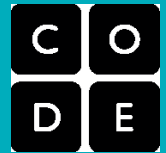
Description: A rocket blasts off, traveling at 15 meters per second. Write a function called 'rocket-height' that takes in the number of seconds that have passed since the rocket took off, and which produces the height of the rocket at that time.

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
    function name   domain   range

_____
                       what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
          function name   variables

_____
   what the function does with those variables

12

Stage 12

update-target (word problem)

Code.org Computer Science in Algebra
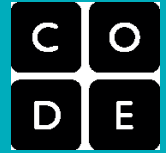
Description: Use the Design Recipe to write a function 'update-target' which takes in the target's x-coordinate and produces the next x-coordinate, which is 10 pixels to the right.

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
     function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
              function name   input(s)   what the function produces

Example: _____ (_____) = _____
              function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
           function name   variables

_____
what the function does with those variables

update-danger (word problem)
Code.org Computer Science in Algebra
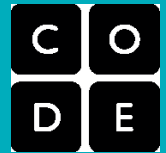
Description: Use the Design Recipe to write a function 'update-danger' which takes in the danger's *x*-coordinate and produces the next *x*-coordinate, which is 10 pixels to the left.

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
    function name   domain   range

_____
                          what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
             function name   input(s)   what the function produces

Example: _____ (_____) = _____
             function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
          function name   variables

_____
                  what the function does with those variables

15

Stage 15

safe-left? (word problem)

Code.org Computer Science in Algebra

Description: Write a function 'safe-left?', which takes in an x-coordinate and checks to see if it is greater than -25.

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
function name   input(s)   what the function produces

Example: _____ (_____) = _____
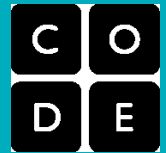function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
function name   variables

_____
what the function does with those variables

15

safe-right? (word problem)

Code.org Computer Science in Algebra

Description: Write a function 'safe-right?', which takes in an x-coordinate and checks to see if it is less than 425.

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
    function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
          function name   input(s)   what the function produces

Example: _____ (_____) = _____
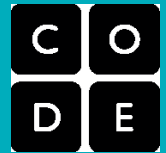   function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
        function name   variables

_____
what the function does with those variables

Name: _____   Date: _____   Per: _____

onscreen? (word problem)

Code.org Computer Science in Algebra

C O
D E

Description: Write a function 'onscreen?', which takes in a character's x-coordinate and checks to see if it is safe on the left and on the right.

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
    function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

Example: _____ (_____) = _____
           function name   input(s)   what the function produces
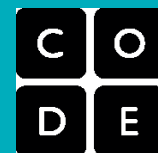
Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
         function name   variables

_____
what the function does with those variables

cost   (word problem)

Code.org Computer Science in Algebra

Description: Luigi's Pizza has hired you as a programmer. They offer Pepperoni ($10.50), Cheese ($9.00), Chicken ($11.25), and Broccoli ($10.25). Write a function called cost which takes in the name of a topping and outputs the cost of a pizza with that topping.

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
    function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____

Example: _____ (_____) = _____

Example: _____ (_____) = _____

Example: _____ (_____) = _____

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
        function name   variables

_____   _____

_____   _____

_____   _____

_____   _____

_____   _____

update-player (word problem)

Code.org Computer Science in Algebra
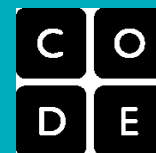
Description: Write a function called update-player, which takes in the key code of the key pressed and the player's y-coordinate, and returns the new y-coordinate.

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _update-player_ (___38___ ___240___) = _____240 + 10_____

Example: _update-player_ (___40___ ___240___) = _____240 − 10_____

Example: _update-player_ (___38___ ___250___) = _____

Example: _update-player_ (___40___ ___250___) = _____

Definition

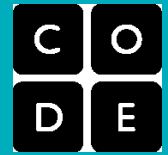*Write the definition, giving variable names to all your input values*

Define: _____ (_____) =
function name   variables

_____   _____

_____   _____

_____   _____

_____   _____

16

Stage 16

Key Code Reference
Code.org Computer Science in Algebra

When you press a key on your keyboard, a unique numeric code is sent to your computer, which is then translated into a letter, number, or command. Use this handy key code reference sheet to make your Player sprite respond to different key presses.

Key	Code	Key	Code
left arrow	37	G	71
up arrow	38	H	72
right arrow	39	I	73
down arrow	40	J	74
0	48	K	75
1	49	L	76
2	50	M	77
3	51	N	78
4	52	O	79
5	53	P	80
6	54	Q	81
7	55	R	82
8	56	S	83
9	57	T	84
A	65	U	85
B	66	V	86
C	67	W	87
D	68	X	88
E	69	Y	89
F	70	Z	90

Name: _____   Date: _____   Per: _____

Collision Detection
Code.org Computer Science in Algebra
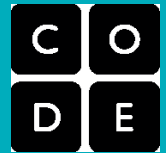
Graph #1
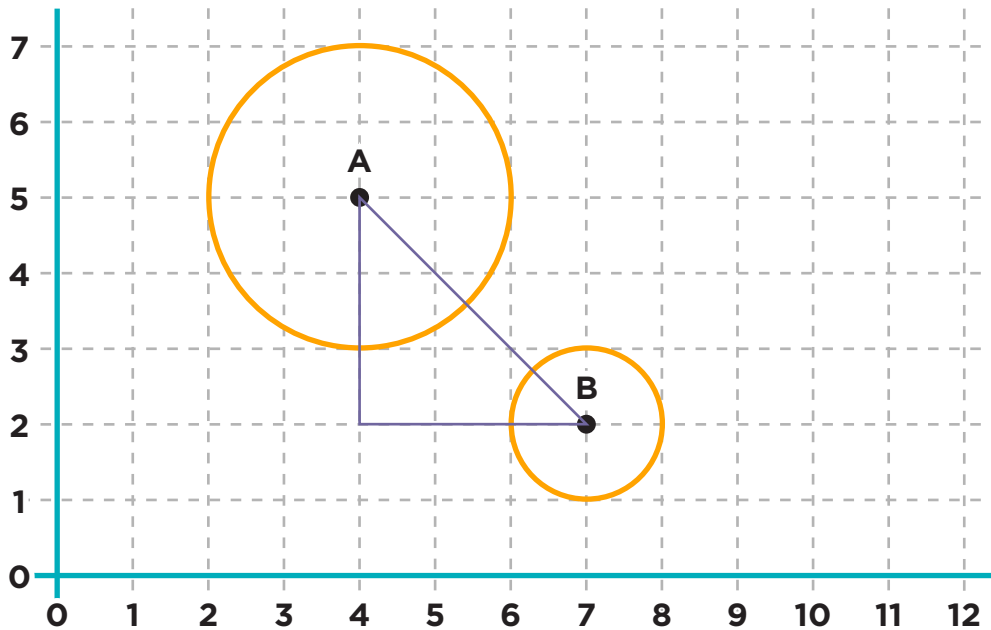
On the graph:

Label the right angle as C

Label segment AB as c

Label segment AC as b

Label segment CB as a

1. What is the radius of circle A? _____

2. What is the radius of circle B? _____

3. What is Radius A + Radius B _____

4. Do the circles overlap? (true/false) _____

5. What is the length of side a? _____

6. What is the length of side b? _____

7. Estimate the length of side c? _____

8. What is $a^2 + b^2$ _____

19

Stage 19

Collision Detection
Code.org Computer Science in Algebra

C O
D E

Graph #2

On the graph:

Draw a segment from point A to point B

Label segment AB as c

Draw a right triangle using segment c as the hypotenuse.

Label the right angle as C
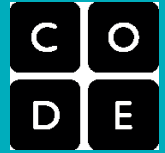
Label segment AC as b

Label segment CB as a
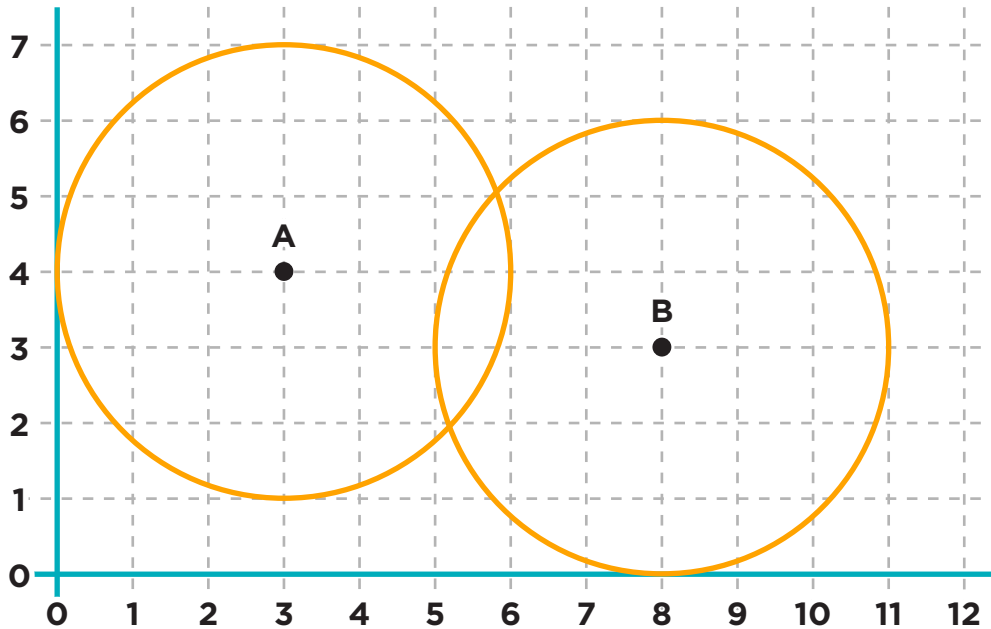
1. What is the radius of circle A?   _____

2. What is the radius of circle B?   _____

3. What is Radius A + Radius B   _____

4. Do the circles overlap? (true/false)   _____

5. What is the length of side a?   _____

6. What is the length of side b?   _____

7. Estimate the length of side c?   _____

8. What is $a^2 + b^2$ _____

19

Stage 19

Collision Detection
Code.org Computer Science in Algebra

C O
D E

Graph #3

On the graph:

Draw a segment from point A to point B

Label segment AB as c

Draw a right triangle using segment c as the hypotenuse.

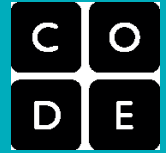Label the right angle as C

Label segment AC as b

Label segment CB as a

1. What is the radius of circle A?   _____
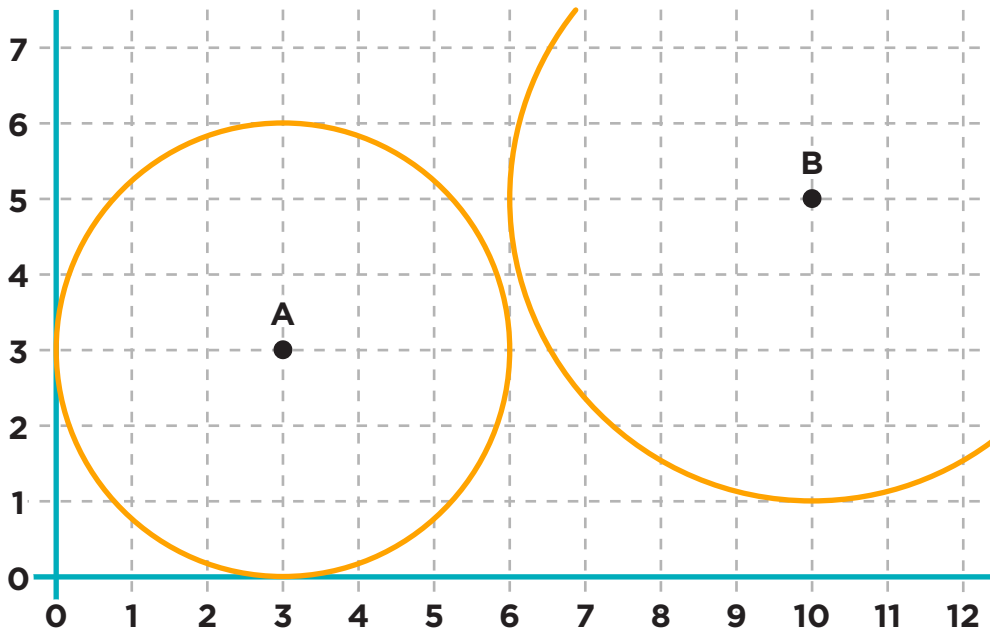
2. What is the radius of circle B?   _____

3. What is Radius A + Radius B   _____

4. Do the circles overlap? (true/false)   _____

5. What is the length of side a?   _____

6. What is the length of side b?   _____

7. Estimate the length of side c?   _____

8. What is $a^2 + b^2$ _____

line-length (word problem)
Code.org Computer Science in Algebra

Name: _____ Date: _____ Per: _____
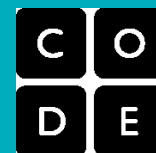
Description: Write a function called 'line-length', which takes in two numbers and returns the difference between them. It should always subtract the smaller number from the bigger one

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _*line-length*_ (___10___ 5) = _____10 – 5_____
function name   input(s)   what the function produces

Example: _*line-length*_ (___2___ 8) = _____8 – 2_____
function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
function name   variables

_____   _____

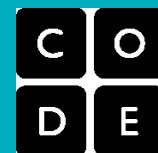_____   _____

_____   _____

_____   _____

_____

20

Stage 20

distance (word problem)

Code.org Computer Science in Algebra

C O
D E

Description: Write a function 'distance', which takes four inputs:
- px: The x-coordinate of the player
- py: The y-coordinate of the player
- cx: The x-coordinate of another game character
- cy: The y-coordinate of another game character

It should use the Distance formula to return the distance between both points

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
    function name   domain   range

_____
                      what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
        function name   variables

_____
              what the function does with those variables

20

Stage 20

collide?   (word problem)

Code.org Computer Science in Algebra

C O
D E
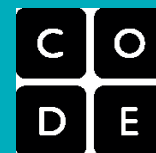
Description: Write a function 'collide?', which takes four inputs:
- px: The x-coordinate of the player
- py: The y-coordinate of the player
- cx: The x-coordinate of another game character
- cy: The y-coordinate of another game character

Is the player's x and y within 100 pixels of the other character's x and y

Contract and Purpose Statement

Every contract has three parts...

_____ : _____ -> _____
   function name   domain   range

_____
what does the function do?

Examples

Write some examples for your function in action...

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

Example: _____ (_____) = _____
           function name   input(s)   what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: _____ (_____) =
          function name   variables

_____
what the function does with those variables

Contract Log

Name	Domain	Range	Example

Contract Log

Name	Domain	Range	Example