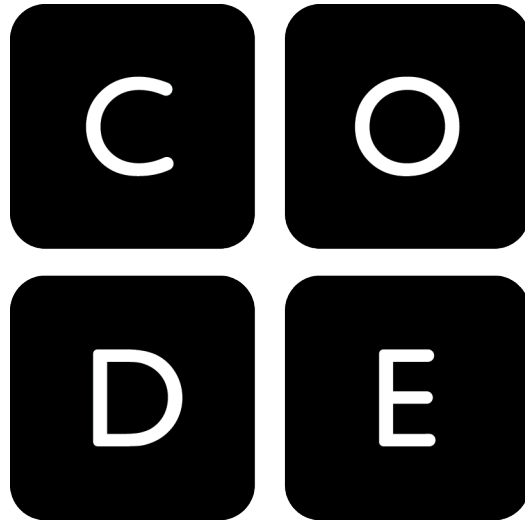Name: _____    Course: _____
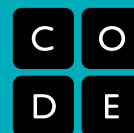


# CS in Algebra
*powered by Bootstrap*

# Student Workbook

Name: _____     Date:_____     Per: _____
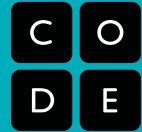
# Reverse Engineering

Code.org CS in Algebra - Stage 1

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

Name: _____     Date:_____     Per: _____

# Video Game Planning

**Code.org CS in Algebra - Stage 1**

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

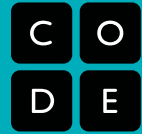## The player is a:

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 Block Tips!

**Code.org CS in Algebra**

## Save Time with Copy & Paste

Quickly duplicate a selected block of code with these keyboard shortcuts.

| Windows | | Mac |
|---|---|---|
| Ctrl  C | **Copy** | ⌘ Cmd  C |
| Ctrl  V | **Paste** | ⌘ Cmd  V |

## Quickly Identify Type with Color

Each block is color coded to tell you both the types that it takes in, and the type that it returns.

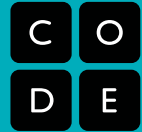| Number | String | Image | Boolean |
|---|---|---|---|

## Make Room with Zoom

Get more room to work with large programs with these keyboard shortcuts.

| Windows | | Mac |
|---|---|---|
| Ctrl  +/= | **Zoom in** | ⌘ Cmd  +/= |
| Ctrl  −/- | **Zoom out** | ⌘ Cmd  −/- |

Name: _____     Date:_____     Per: _____

# Fast Functions!

_____ : _____ -> _____
*name*                              *domain*                                          *range*

**Example**: _____ ( _____ ) = _____

**Example**: _____ ( _____ ) = _____

**Define**:    _____ ( _____ ) = _____


_____ : _____ -> _____
*name*                              *domain*                                          *range*

**Example**: _____ ( _____ ) = _____

**Example**: _____ ( _____ ) = _____

**Define**:    _____ ( _____ ) = _____


_____ : _____ -> _____
*name*                              *domain*                                          *range*

**Example**: _____ ( _____ ) = _____

**Example**: _____ ( _____ ) = _____

**Define**:    _____ ( _____ ) = _____


_____ : _____ -> _____
*name*                              *domain*                                          *range*

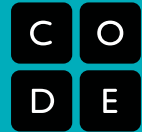**Example**: _____ ( _____ ) = _____

**Example**: _____ ( _____ ) = _____

**Define**:    _____ ( _____ ) = _____

# The Design Recipe

Code.org CS 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*

## word problem
# rocket-height
### Code.org CS in Algebra - Stage 10

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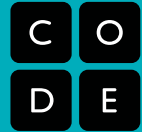                    *function name*              *input(s)*                    *what the function produces*

## Definition

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

**Define**: _____ ( _____ ) =
                  *function name*              *variables*

_____
                        *what the function does with those variables*

## word problem
# update-target

C O
D E

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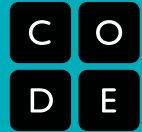              *function name*         *input(s)*            *what the function produces*

## Definition

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

**Define**: _____ ( _____ ) =
            *function name*         *variables*

_____
                        *what the function does with those variables*

## word problem
# update-danger

C O
D E
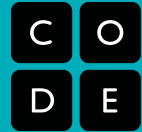
Code.org CS in Algebra - Stage 12

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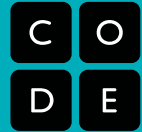                *function name*            *input(s)*               *what the function produces*

## Definition

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

**Define**: _____ ( _____ ) =
             *function name*           *variables*

_____
*what the function does with those variables*

## word problem
# safe-left?

C O
D E

Code.org CS in Algebra - Stage 15

**Description**: Write a function 'safe-left?', which takes in an x-coordinate and checks to see if it is greater than -50.

## 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*
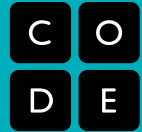
## Definition

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

**Define**: _____ ( _____ ) =
    *function name*     *variables*

_____
       *what the function does with those variables*

**word problem**
# safe-right?

Code.org CS in Algebra - Stage 15

C O
D E

**Description**: Write a function 'safe-right?', which takes in an x-coordinate and checks to see if it is less than 450.

## 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*

## word problem
# onscreen?

C O
D E

Code.org CS in Algebra - Stage 15

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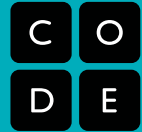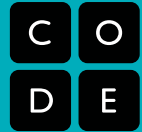             *function name*             *input(s)*                *what the function produces*

## Definition

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

**Define**: _____ ( _____ ) =
           *function name*              *variables*

_____
                        *what the function does with those variables*

# word problem
# update-player

**Directions**: Write a function called update-player, which takes in the player's y-coordinate and the keycode of the key pressed, 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*__ ( __128   38__ ) = _____
        *function name*         *input(s)*         *what the function produces*
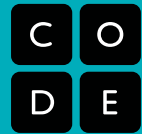
**Example**: __*update-player*__ ( __128   40__ ) = _____
        *function name*         *input(s)*         *what the function produces*

## Definition

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

**Define**: _____ ( _____ ) =
        *function name*         *variables*

_____     _____

_____     _____

_____

Name: _____     Date:_____     Per: _____

# Key Code Reference

**Code.org CS in Algebra - Stage 16**

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.
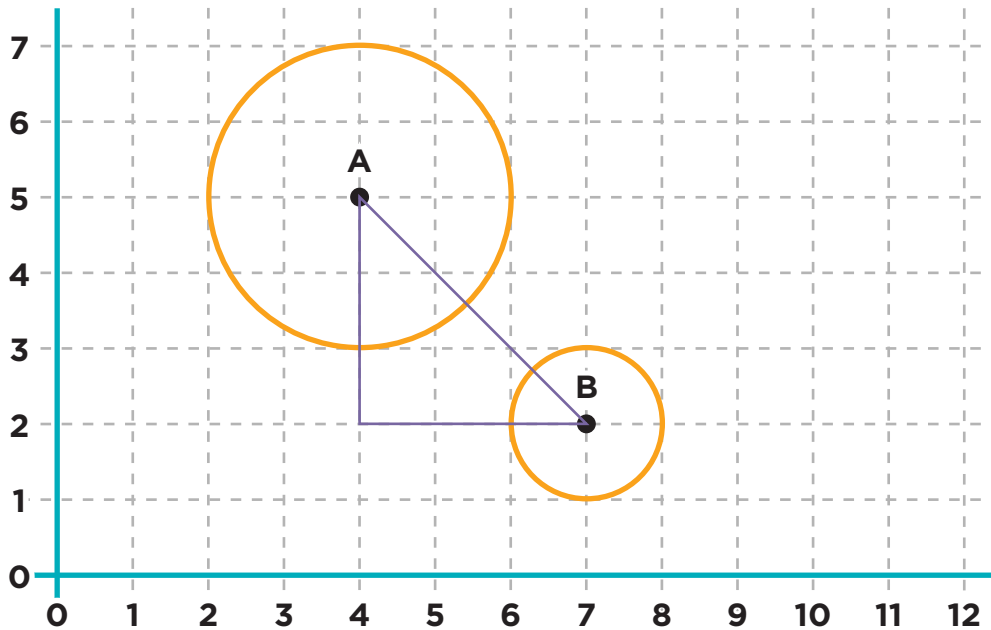
| Key | Code | Key | Code |
|---|---|---|---|
| left arrow | 37 | G | 71 |
| up arrow | 38 | H | 72 |
| right arrow | 39 | I | 73 |
| down arrow | 40 | J | 74 |
| 0 | 48 | K | 75 |
| 1 | 49 | L | 76 |
| 2 | 50 | M | 77 |
| 3 | 51 | N | 78 |
| 4 | 52 | O | 79 |
| 5 | 53 | P | 80 |
| 6 | 54 | Q | 81 |
| 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 |

# Collision Detection
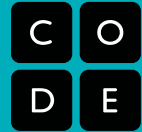
CODE

**Code.org CS in Algebra - Stage 19**

## Graph #1

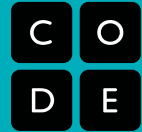

**On the graph:**

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 $a^2 + b^2$ _____

# Collision Detection

**CODE**

Code.org CS in Algebra - Stage 19

## 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

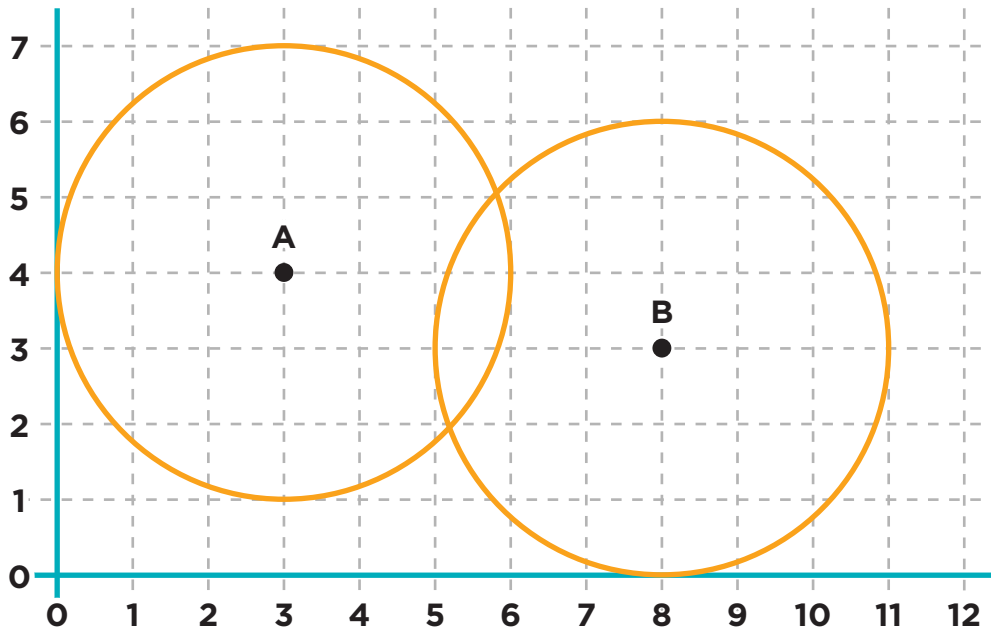Label segment AC as b

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 $a^2 + b^2$  _____

# Collision Detection

**Code.org CS in Algebra - Stage 19**

## 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.
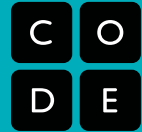
Label the right angle as C

Label segment AC as b

Label segment CB as a

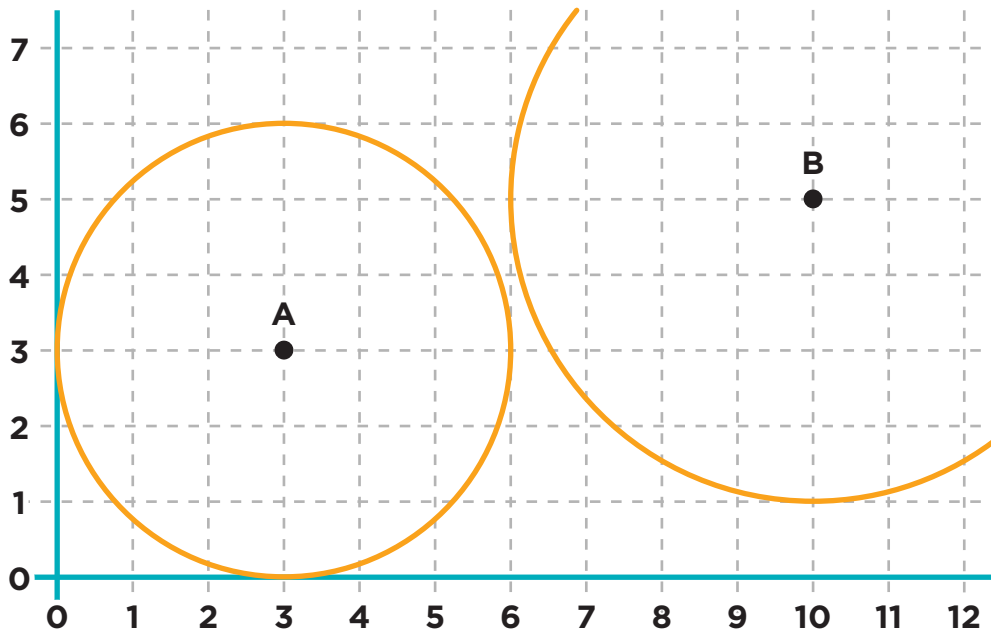1. What is the radius of circle A?            _____

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 $a^2 + b^2$            _____

# word problem
# line-length
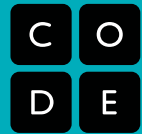
Code.org CS in Algebra - Stage 20

**Directions**: 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*

_____          _____

_____          _____

_____

# word problem
# distance

Code.org CS in Algebra - Stage 20

C O
D E

**Directions**: Write a function 'distance', which 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*

## word problem
# collide?

**Directions**: Write a function 'distance?', which 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**: _____ ( _____ ) = _____
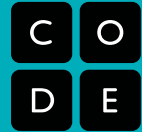         *function name*          *input(s)*          *what the function produces*

## 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 |
|------|--------|-------|---------|
|  |  |  |  |
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|  |  |  |  |

# Contract Log

| Name | Domain | Range | Example |
|------|--------|-------|---------|
|      |        |       |         |
|      |        |       |         |
|      |        |       |         |
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|      |        |       |         |
|      |        |       |         |