Name:	Course:	



Computer Science in Algebra

powered by BOOTSTRAP



Student Workbook

Draft

Name:

Date:		
Date.		

Per: _____

1 Stage 1

Reverse Engineering



Thing in the game	What changes about it?	More Specifically

1
Stage 1

Name: Date:	Per:
-------------	------

Video Game Planning



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)			

Stage 2

Evaluation Blocks

Code.org Computer Science in Algebra



Create the evaluation blocks for the provided equations.

2 * 5	*
4 - (3 / 2)	4 /
(3 + 12) * 16	*
1 + (15 * 5)	+
(2 + 17) * (12 - 8)	*
9 * (17 + 2)	

32/3 (25 + 14) - 12(23 * 14) * (3 + 2)19 - (12 + 11) 4 - (6 - 17) (12 * 4) / 3

	9	
_		

Name:	Date:	Per:	

Fast Functions!



			->	
name ·	domain		~	range
Example:	() =		
Example:	_ () =		
Define:	_() =		
::			->	
name	domain		 -	range
Example:	() =		
Example:	_ () =		
Define:	() =		
	_ `			
name :				range
::::::	domain		->	range
name Example:	domain () =	->	range
:::	domain () =	->	range
name ::::::::	<i>domain</i> ((() =	>	range
name ::::::::	<i>domain</i> ((() =	>	range
name ::::::::	<i>domain</i> ((() =	>	range
name ::::::::	<i>domain</i> ((() =	>	range
name Example: Example: Define:	domain ((domain) =	>	range
name Example: Example: Define: : name Example:	domain) =	>	range
name Example: Example: Define: : name	domain) =	>	range

1	
D	
Design	
Desima	

Name:	Date:	Per:
-------	-------	------

The Design Recipe



, 100,000				
Description:				
Contract and	Purpose	Statemen	t	
Every contract has th	ree parts			
function name	:			>
function name		dom	ain	range
	wha	at does the fu	nction d	0?
Examples				
Write some examples	for your fun	ction in actio	n	
Example:	(input(s))=	what the function produces
Example:	(input(c)) = _	what the function produces
Tunction	larrie	πρατ(s)		what the function produces
D (1.11)				
Definition				
Write the definition, g	giving variab	le names to a	ll your in	nput values
Define:	(me		_)=	
function nai	me	variables		

1	
D	
Design	
Desima	

Name:	Date:	Per:
-------	-------	------

The Design Recipe



Descr	iption:			
Contr	act and Purp	ose Stateme	ent	
Every con	tract has three pa	rts		
functio	: n name	d	main	->
TUTICLIO	ппатте	ac	IIIaIII	range
			· · · · ·	
		what does the	function c	do?
Exam	ples			
Write som	e examples for yo	ur function in act	ion	
Example:		_() = _	what the function produces
	function name	input(s)		what the function produces
Example:		_() = _	what the function produces
	function name	input(s)		what the function produces
Defini	tion			
Write the	definition, giving v	/ariable names to	all vour ir	nput values
			9	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Define:		() =	
	function name	variables	/	

1	
D	
Design	
Desires	

Name:	Date:	Per:
-------	-------	------

The Design Recipe



Desci	ription:		
	ract and Purpo	ose Statement	
	·	domain	> range
		what does the function	do?
Exam	ples		
Write son	ne examples for you	ır function in action	
			what the function produces
Example:	function name	_ () =) =	what the function produces
Defin	ition		
Write the	definition, giving v	ariable names to all your i	input values
Define: _	function name	() = variables	

10	
Stage 10	

Name:	Date:	Per:

rocket-height (word problem)



Code.org Computer Science in Algebra

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.

the hei	the height of the rocket at that time.				
Contr	act and Purp	ose S	Statemen	it	
Every con	tract has three pai	rts			
	::				> range
functio	n name		dom	ain	range
			t does the fu	ınction d	lo?
Exam	ples				
Write som	e examples for you	ur fund	ction in actio	n	
Example:		() =	
					what the function produces
Example:	function name	_(input(s))=_	what the function produces
Defini	ition				
Write the	definition, giving v	/ariabl	e names to a	ıll your ir	nput values
Define:	function name	(,	variables	_) =	

	1 0
Ŀ	LZ

Name:	Date:	Per:	

update-target (word problem)



Code.org Computer Science in Algebra Stage 12

Description: 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... domain function name what does the function do? **Examples** Write some examples for your function in action... **Example**: _____ (_____) = ____ metalon name input(s) what the function produces **Definition** Write the definition, giving variable names to all your input values

1	

Name:	Date:	Per:

update-danger (word problem)



Stage 12

Code.org Computer Science in Algebra

Description: Write a function update-danger which takes in the danger's x-coordinate and produces the next x-coordinate, which is

10 pixe	els to the left.				
Contr	act and Purp	ose	Statemen	t	
-	tract has three pai				
functio	n name		dom	ain	> range
		wha	at does the fu	nction d	lo?
Exam	ples				
Write som	e examples for you	ur fun	ction in actio	n	
Example:	function name	_(input(s))=_	what the function produces
					what the function produces
Defini		. ,	, ,	,, ;	
Write the	definition, giving v	/ariab	le names to a	II your ir	nput values
Define:	function name	(variables	_)=	

1 [
15	

Name:	Date:	Per:

safe-left? (word problem)



Stage 15

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 50.

Contr	act and Purpo	ose S	Statemen	t	
Every cor	ntract has three par	ts			
	:				->
functio	on name		dom	ain	> range
		wha	t does the fu	unction d	lo?
		WIIG	t does the ro	inction d	0:
Exam	ples				
Write son	ne examples for you	ır fund	ction in actio	n	
Evample:		(\ -	
Example.	function name	_ (input(s)) = _	what the function produces
Example:		_() = _	what the function produces
	function name		input(s)		what the function produces
Defin	ition				
	definition, giving v	ariahl	e names to a	ıll vour ir	anut values
vviite tile	deminerally giving v	ariabi	e mannes to a	n your m	pat varaes
Define: _	function name	(_)=	
	runction name	·	variabies		

1 -	
15	

Name:	Date:	Per:

safe-right? (word problem)



Stage 15 Co

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 350.

x-coordinate and checks to see if it is less than 350. **Contract and Purpose Statement** Every contract has three parts... domain function name what does the function do? **Examples** Write some examples for your function in action... **Example**: _____ (_____) = ____ metalon name input(s) what the function produces **Example**: _____ (______) = ____ metather function name input(s) what the function produces Definition Write the definition, giving variable names to all your input values

1	_	
_		

Stage 15

Name:	Date:	Per:

onscreen? (word problem)



Code.org Computer Science in Algebra

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... domain function name what does the function do? **Examples** Write some examples for your function in action... **Example**: _____ (_____) = ____ metalon name input(s) what the function produces **Example**: _____ (______) = ____ metather function name input(s) what the function produces **Definition** Write the definition, giving variable names to all your input values **Define**: ____ (____) = function name variables

L	LB	

Name:	Date:	Per:
-------	-------	------

cost (word problem)

Code.org Computer Science in Algebra Stage 16



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 i that topping.	n the name of a to	opping and outputs the cos	st of a pizza with
Contract and Purp	oose Stateme	nt	
Every contract has three p	arts		
:		>	
function name		main	range
	what does the	function do?	
Examples			
Write some examples for y	our function in act	ion	
Example:	() =	
Example:	() =	
Example:	() =	
Example:	() =	
Definition			
Write the definition, giving	variable names to	all your input values	
Define:function name	_ (variables) =	

Name:			

ate:			
ate.			

Per: _



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.

		Code
37	G	71
38	Н	72
39	1	73
40	J	74
48	K	75
49	L	76
50	М	77
51	N	78
52	0	79
53	Р	80
54	Q	81
55	R	82
56	S	83
57	Т	84
65	U	85
66	V	86
67	W	87
68	X	88
69	Y	89
70	Z	90
	38 39 40 48 49 50 51 52 53 54 55 56 57 65 66 67 68 69	38 H 39 I 40 J 48 K 49 L 50 M 51 N 52 O 53 P 54 Q 55 R 56 S 57 T 65 U 66 V 67 W 68 X 69 Y

1	
	5

Name: Date:	Per:
-------------	------

update-player (word problem)



Stage 16

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	Stateme	ent		
Every contract has three parts				
<u> </u>				
function name	do	omain		range
wl	hat does the	function do?		
Examples				
Write some examples for your fu	ınction in ac	tion		
Example: <u>update-player</u> (_	38 <i>2</i>	<u>40</u>)=	240 + 10	
Example: <u>update-player</u> (_	40 2	<u> </u>	240 - 10	
Example: <u>update-player</u> (_	38 2	<u>50</u>) =		
Example: <u>update-player</u> (_	40 25	(60 <u> </u>		
Definition				
Write the definition, giving varia	ble names to	o all your input va	alues	
Define:(variables) =		

1	9

Stage 19

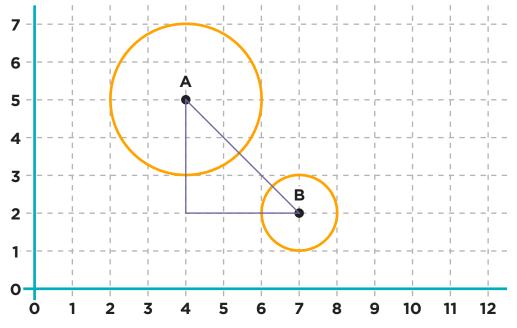
Name: _____ Date: ____ Per: ____

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 $a^2 + b^2$

9	

Name: _____ Date: ____ Per: _

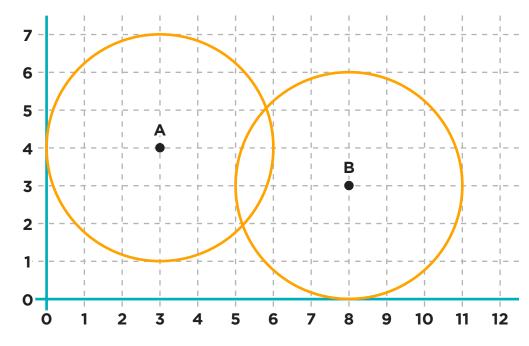
Collision Detection

Code.org Computer Science in Algebra



Graph #2

Stage 19



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 $a^2 + b^2$

L 9	

Name: ____ Date: ____

Date: _____ Pe

Per: ___

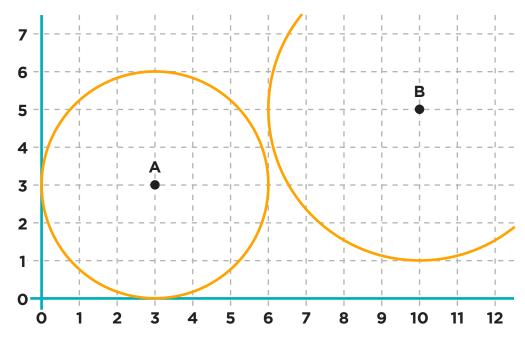
Stage 19

Collision Detection

C O E

Code.org Computer Science in Algebra

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 $a^2 + b^2$

2	0	

Name:	Date:	Per:

line-length (word problem)



Stage 20

Code.org Computer Science in Algebra

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 Purp	Contract and Purpose Statement						
Every contract has three pa	rts						
:::	domain	->					
Turiction name	domain	range					
	what does the function	do?					
Examples							
Write some examples for yo	our function in action						
Example: line-length function name	(vhat the function produces					
		8 – 2 what the function produces					
Definition							
Write the definition, giving v	variable names to all your in	nput values					
Define: function name	() =) =						

20	

Name:	Date:	Per:

The Distance Formula

C O D E

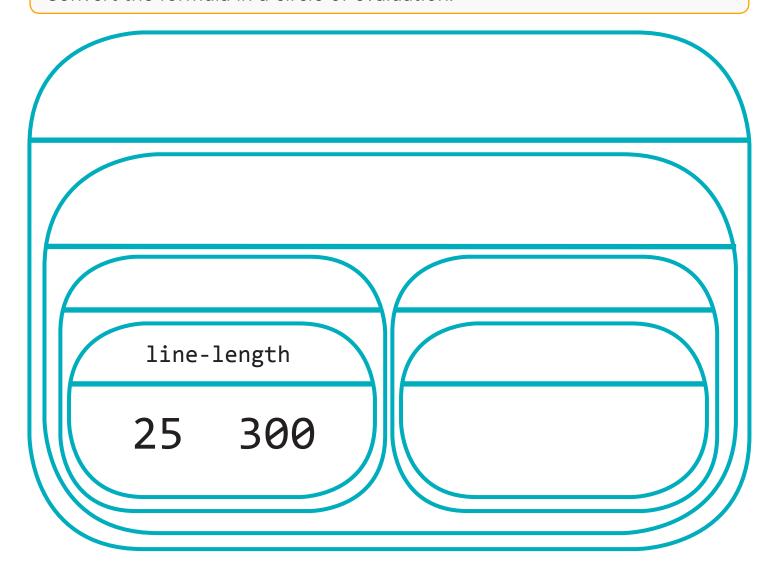
Stage 20

Code.org Computer Science in Algebra

The distance between two points (25, 50) and (300, 400) can be calculated with the distance formula as

$$\sqrt{\text{line-length}(25, 300)^2 + \text{line-length}(50, 400)^2}$$

Convert the formula in a circle of evaluation.



2	0

Stage 20

Name:	Date:	Per:

distance (word problem)

Code.org Computer Science in Algebra



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 cor	ntract has three pa	rts				
function	::: on name		don	nain	> range	
		wha	t does the f	unction c	do?	
Exam	ples					
Write son	ne examples for yo	ur func	tion in actio	n		
Example:		_()=_	what the function produces	
Example:	function name	_ (input(s))=	what the function produces	
Defin	ition					
Write the definition, giving variable names to all your input values						
Define: _	function name	(/ariables) =		

2	0

Name:	Date:	Per:

collide? (word problem)

C O E

Stage 20 Code.org Computer Science in Algebra

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?

is the player 3 x and y within 100 pixers of the other character 3 x and y:						
Contract and Purpose Statement						
Every cor	ntract has three par	ts				
function	:: on name		dom		->	
Tunctic	патте		don	ldl[]	range	
		wha	nt does the fu	unction c	lo?	
Exam	ples					
Write son	ne examples for you	ur fun	ction in actio	n		
	,					
Example:		_() = _		
	function name		input(s)		what the function produces	
Example:		() =		
	function name	_ \	input(s)	/ _	what the function produces	
Defin	ition					
Defili	ition					
Write the	definition, giving v	rariabi	le names to a	all your ir	nput values	
Define: _	function name	()=		
	function name		variables			

Example Contract Log Range Domain Name

Example Contract Log Range Domain Name