Name: _____



Student Workbook

\sim 1			
('10100'			
1 1/100			
Class:			





Workbook v2.7

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Bootstrap Units

01	Videogames and Coordinate Planes	06	Comparing Functions
02	Contracts, Strings, and Images	07	Conditional Branching
03	Intro to Definitions	08	Collision Detection
04	Design Recipe	09	Prepping for Launch
05	Game Animation	10	Additional Material

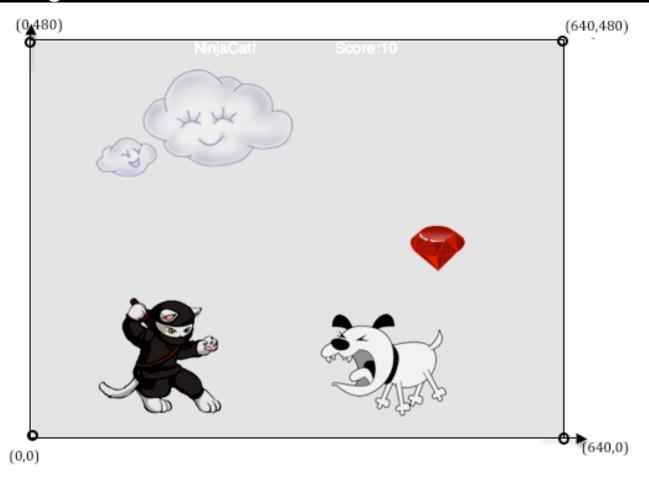


Lesson 1

Reverse-Engineering: How does NinjaCat work?

Thing in the game	What changes about it?	More specifically		
cloud	position	x-coordinate		

Finding Coordinates



The coordinates for the PLAYER (NinjaCat) are:	(,)
	X-C	oordinate y-co	ordinate
The coordinates for the DANGER (Dog) are:	(,)
The coordinates for the TARGET (Ruby) are:	(,)

Our Videogame

Created by (write your names):	
Background	
Our game takes place in:(space? the desert? a mall?)	
The Player	
The player is a	
The player moves only up and down.	
The Target Your player GAINS points when they hit the target.	
The Target is a	
The Target moves only to the left and right.	
The Danger Your player LOSES points when they hit the danger.	
The Danger is a	
The Danaer moves only to the left and right.	

Circle of Evaluation Practice Time: 5 minutes Don't forget to use the computer's symbols for things like multiply and divide!

Math	Circle of Evaluation	Racket Code
5 x 10		
8 + (5 × 10)		
0 1 (3 X 10)		
(8 + 2) - (5 × 10)		
<u>5 x 10</u> 8 - 2		
8 - 2		



C	ircles Com	Time: 5 minutes	
	Math	Round 1 -Circle of Evaluation	Round 2 - Racket Code
Challenge A	(3 * 7) - (1 + 2)		
Challenge B	3 - (1 + 2)		
Challenge C	3 - (1 + (5 * 6))		
Challenge D	(1 + (5 * 6)) - 3		



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Fast Functions name domain range (EXAMPLE ((EXAMPLE ((define (name domain range (EXAMPLE (____ (EXAMPLE ((define () domain name range (EXAMPLE (EXAMPLE ((define () name domain range (EXAMPLE (EXAMPLE (____) (define (_____) _____)



Word Problem: rocket-height

Directions: A rocket blasts off, traveling at 7 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 a	and Purpose S	tatement			
Every contract ha	s three parts				
· ,	:		\rightarrow		
function nar	те	domain		range	
;					
		what does the	function do?		
Examples	;				
Write some exam	ples, then circle and lab	el what changes			
(EXAMPLE())
	function name	input(s)	what the function produces		
(EXAMPLE())
	function name	input(s)	what the function produces		
Definition					
Write the definition	n, given variable names	to all your input values			
(define()			
f	unction name	variables			
)	

what the function does with those variables

12

Word Problem: lawn-area

Directions: Use the Design Recipe to write a function 'lawn-area', which takes in the width and length of a lawn, and returns the area of the lawn. (Don't forget: area = length * width!)

Contract a	and Purpose	Statement		
Every contract has	s three parts			
•	:		\rightarrow	
function nam	ne	domain		range
• •				
-		what does th	e function do?	
Examples				
Write some examp	oles, then circle and la	abel what changes		
(EXAMPLE())
	function name	input(s)	what the function produces	
(EXAMPLE())
	function name	input(s)	what the function produces	
Definition				
Write the definition	n, given variable name	es to all your input values		
(define()		
fu	ınction name	variables		
)
		what the function does v	with those variables	

Word Problem: red-square

Directions: Use the Design Recipe to write a function 'red-square', which takes in a number (the length of each side of the square) and outputs a solid red rectangle whose length and width are the same size.

Contract a	and Purpose S	Statement				
Every contract ha	as three parts					
•	:			\rightarrow		
function nar	me	doma	ain		range	
<u></u>		what doe	es the function do?			
Examples	;					
	nples, then circle and lab	bel what changes				
(EXAMPLE()			
	function name	input(s)				
)
		what the function produces				<u>_</u>
(EXAMPLE()			
· <u> </u>	function name	input(s)	<u> </u>			
)
		what the function produc	ces			
Definition						
	n, given variable name:	s to all your input value:	S			
(define()				
` .	function name	variables				
)	
		what the function do	oes with those variables			

target



Game Animation

Word Problem: update-danger

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 50 pixels to the left.

Contract a	and Purpose	Statement				
Every contract has	s three parts					
•	:			\rightarrow		
function nam	пе	a	domain		range	
;						
		what	t does the function do	?		
Examples						
Write some examp	oles, then circle and	label what changes				
(EXAMPLE())
	function name	input(s)		what the function produces		
(EXAMPLE())
	function name	input(s)		what the function produces		
Definition						
Write the definition	n, given variable nam	nes to all your input va	lues			
(define()			
fu	ınction name	variables	-			
)	
		what the function	on does with those va	riables		

Word Problem: update-target

Directions: Write a function 'update-target', which takes in the target's x-coordinate and produces the next x-coordinate, which is 50 pixels to the right.

Contract a	nd Purpose	Statement				
Every contract has	three parts					
•	:			\rightarrow		
function name	e e	1	domain		range	
;						
		wha	at does the function d	0?		
Examples						
Write some examp	les, then circle and l	label what changes				
(EXAMPLE())
	function name	input(s)		what the function produces		
(EXAMPLE())
	function name	input(s)		what the function produces		
Definition						
Write the definition	, given variable nam	nes to all your input va	alues			
(define()			
fur	nction name	variables	_			
)	
		what the functi	on does with those va	ariables		



"safe-left?"

Comparing Functions

Sam the Butterfly

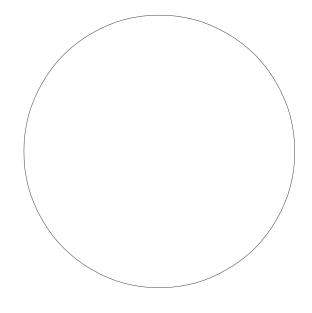
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

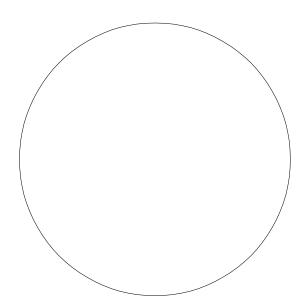
1. A piece of Sam is still visible on the left as long as...

(> x -50)

2. A piece of Sam is still visible on the right as long as...

3. Draw the Circle of Evaluation for these two expressions in the circles below:





Word Problem: safe-left?

Directions: Use the Design Recipe to write a function 'safe-left?', which takes in an x-coordinate and checks to see if it is greater than -50

Contract a	and Purpose	Statement				
Every contract has	s three parts					
•	:			\rightarrow		
function nam	пе	a	domain		range	
;						
		what	t does the function do	?		
Examples						
Write some examp	oles, then circle and	label what changes				
(EXAMPLE())
	function name	input(s)		what the function produces		
(EXAMPLE())
	function name	input(s)		what the function produces		
Definition						
Write the definition	n, given variable nam	nes to all your input va	lues			
(define()			
fu	ınction name	variables	-			
)	
		what the function	on does with those va	riables		

Word Problem: safe-right?

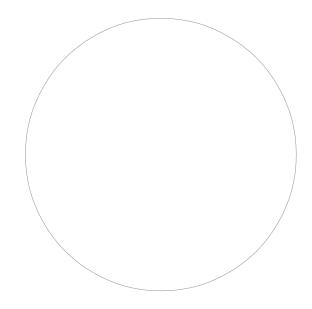
Directions: Use the Design Recipe to write a function 'safe-right?', which takes in an x-coordinate and checks to see if it is less than 690.

Contract a	ind Purpose	Statement				
Every contract has	s three parts					
;	:			\rightarrow		
function nam	ne	(domain		range	
;						
		wha	at does the function	do?		
Examples						
Write some examp	oles, then circle and I	label what changes				
(EXAMPLE())
	function name	input(s)		what the function produces		
(EXAMPLE())
	function name	input(s)		what the function produces		
Definition						
Write the definition	n, given variable nam	es to all your input va	alues			
(define()			
fu	nction name	variables	_			
)	
		what the function	on does with those	variables		

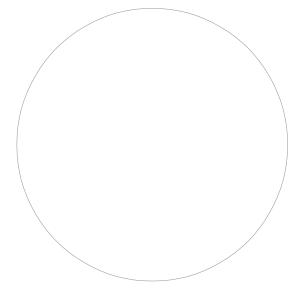
and / or

Write the Circles of Evaluation for these statements, and then convert them to Racket

1. Two is less than five, <u>and</u> zero is equal to six.



2. Two is less than four <u>or</u> four is equal to six.



Word Problem: onscreen?

Directions: Use the Design Recipe to write a function 'onscreen?', which takes in the x-coordinate and checks to see if Sam is safe on the left AND safe on the right.

Contract a	and Purpose S	tatement				
Every contract has	s three parts					
•	:			\rightarrow		
function nam	пе	dor	main		range	
•						
		what d	loes the function do?			
Examples						
_	oles, then circle and labe	el what changes				
(EXAMPLE()			
<u> </u>	function name	input(s)				
)
		what the fu	nction produces			
(EXAMPLE()			
	function name	input(s)				
)
		what the	e function produces			
Definition						
	n, given variable names	to all your input valu	es			
(define()			
· -	unction name	variables	,			
)	
					,	

what the function does with those variables

7 Conditional Branching



Word Problem: cost

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

na Purpose	Statement			
three parts				
:			\rightarrow	
;	doma	ain		range
	what do	es the function	do?	
les, then circle and la	abel what changes			
cost	"cheese"))
function name	input(s)		what the function produces	
))
function name	input(s)		what the function produces	
))
function name	input(s)		what the function produces	_
))
function name	input(s)		what the function produces	_
, given variable name	es to all your input value	S		
)			
action name	variables			
				1
				1
				<u> </u>
				1
		_		
				1
				<u>-</u>
]
	three parts : des, then circle and laccost function name function name function name function name	what do les, then circle and label what changes COST "Cheese" function name input(s) function name input(s) function name input(s) given variable names to all your input value)	three parts Cost Cheese Cost Cost Cheese Cost C	three parts i domain what does the function do? les, then circle and label what changes cost "cheese") function name input(s) what the function produces function name input(s) what the function produces

Word Problem: update-player

Directions: Write a function called update-player, which takes in the player's y-coordinate and the name of the key pressed, and returns the new y-coordinate.

Contract a	and Purpose S	Statement			
Every contract ha	s three parts				
	:			\rightarrow	
function nar	me	dom	ain		range
		what do	es the function	do?	
Examples	;				
Write some exam	pples, then circle and lab	bel what changes			
(EXAMPLE(update-player	320 "up"))
_	function name	input(s)		what the function produces	
EXAMPLE(update-player	100 "up"))
	function name	input(s)		what the function produces	
EXAMPLE())
	function name	input(s)		what the function produces	
EXAMPLE())
	function name	input(s)		what the function produces	
Definition					
Nrite the definitio	n, given variable names	s to all your input value	'S		
define()			
fi	function name	variables			
(
[]
[]
					_
[else:					

O8 Collision Detection

collision



Word Problem: line-length

Directions: Write a function called 'line-length', which takes in two numbers and returns the *positive difference* between them. It should always subtract the smaller number from the bigger one, and if they are equal it should return zero.

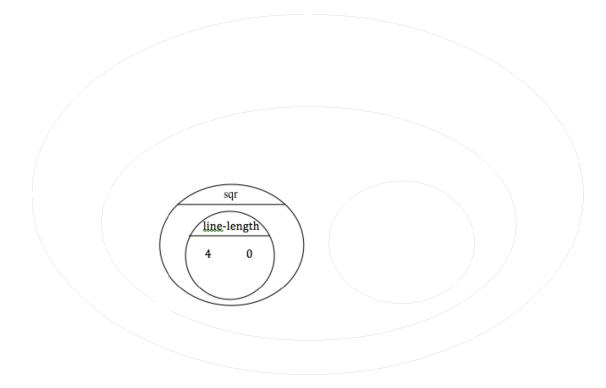
Contract a	and Purpose	Statement					
Every contract ha	s three parts						
•	:				\rightarrow		
function nar	me	dom	ain			range	
;							
		what do	es the fur	nction do?			
Examples							
Write some exam	ples, then circle and	label what changes					
(EXAMPLE(line-length	10 5)	(- 10 5))
	function name	input(s)		what the fur	nction produces		
(EXAMPLE(line-length	2 8)	(- 8 2))
	function name	input(s)		what the fur	nction produces		
Definition							
Write the definition	n, given variable nar	mes to all your input value	 €S				
(define()					
fu	unction name	variables					
(cond							
	_						
[]
[])]

The Distance Formula (an example)

The distance between the points (0, 0) and (4, 3) is given by:

$$\sqrt{(line-length \ 4\ 0)^2 + (line-length \ 3\ 0)^2}$$

Convert the formula above into a Circle of Evaluation. (We've already gotten you started!)



Convert the Circle of Evaluation to code, then label the numbers with (x1,y1) & (y1,y2):

Word Problem: distance

Directions: 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 return the distance between the two, using the Distance formula. (HINT: look at what you did on the previous page!)

Contract a	ind Purpose	Statement				
Every contract has	s three parts					
	:			\rightarrow		
function nam	ne		domain		range	
<u> </u>		wha	at does the function do?			
Examples						
Write some examp	oles, then circle and l	abel what changes				
(EXAMPLE()			
	function name	input(s)				
)
			what the function produc	es		
(EXAMPLE()			
	function name	input(s)				
)
			what the function produc	es		
Definition						
Write the definition	n, given variable nam	es to all your input va	alues			
(define()			
fu	nction name	variables	_			
)	
		what the functi	on does with those variables			

Word Problem: collide?

Directions: 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

Are the coordinates of the player within 50 pixels of the coordinates of the other character?

Contract a	and Purpose	Statement				
Every contract has	s three parts					
•	:			\rightarrow		
function nam	ne	do	omain		range	
		what	does the function do?			
Examples						
Write some examp	oles, then circle and l	abel what changes				
(EXAMPLE()			
	function name	input(s)				
)
		what the function produ	uces			
(EXAMPLE()			
	function name	input(s)				
)
		what the function produ	uces			<u> </u>
Definition						
Write the definition	n, given variable nam	es to all your input valu	ues			
(define()			
fu	unction name	variables	-			
)	
		what the function	n does with those variables			



Presentation Preparation



Lesson 9

Catchy Intro:	
Name, Age, Grade:	
Game Title:	
Back Story:	
Characters:	
Explain a piece of your code:	

Presentation Feedback

For each question, circle the answer that fits best.

Was the introduction catchy? No way! Definitely! A little. Did they talk about their characters? No way! A little. Definitely! Did they explain the code well? No way! A little. Definitely! Did they speak slowly enough? No way! Definitely! A little. Did they speak loudly enough? No way! A little. Definitely! Were they standing confidently? No way! A little. Definitely! Did they make eye contact? No way! A little. Definitely!

Presentation Feedback

For each question, circle the answer that fits best.

Was the introduction catchy? No way! Definitely! A little. Did they talk about their characters? No way! A little. Definitely! Did they explain the code well? No way! A little. Definitely! Did they speak slowly enough? No way! Definitely! A little. Did they speak loudly enough? No way! A little. Definitely! Were they standing confidently? No way! A little. Definitely! Did they make eye contact? No way! A little. Definitely!

Word Problem: red-shape

Directions: Write a function called red-shape, which takes in the name of a shape and draws that shape (solid and red). Add an else clause that produces a sensible output.

Every contract ha	s three parts						
•	:				\rightarrow		
function nam	me	domain			_	range	
•							
		what does	the fur	action do?			
Examples							
Write some exam	ples, then circle and lab	el what changes					
(EXAMPLE(red-shape	"circle")	(circle 50 "solid"	"red"))
_	function name	input(s)		what the function	produces		
(EXAMPLE()				
	function name	input(s)	_				
)
	ı	what the function produces					
(EXAMPLE()				
_	function name	input(s)	_				
)
		what the function produces					
(EXAMPLE()				
_	function name	input(s)	_				
)
		what the function produces					

Definition

Translating into Algebra

Value Definitions

Racket Code	Algebra
(define x 10)	x = 10
(define y (* x 2))	y = x*2
(define z (+ x y))	
(define age 14)	
(define months (* age 12))	
(define days (* months 30))	
(define hours (* days 24))	
(define minutes (* hours 60))	

Function Definitions

Racket Code	Algebra					
<pre>(define (area length width) (* length width))</pre>	area(length, width) = length * width					
(define (circle-area radius) (* pi (sqr radius)))						
(define (distance x1 y1 x2 y2) (sqrt (+ (sqr (- x1 x2))						

A rocket is flying from Earth to Mars at 80 miles per second. Write a function that describes the **distance** D that the rocket has traveled, as a function of **time** t.

name i Give Examples	Domain What does the function do?	Range
	What does the function do?	
Write an example of your function	for some sample inputs	
D(1) =	TOT <u>some sample inputs</u>	
Use the function here	What should the function produce?	
D(2)=		
Use the function here	What should the function produce?	
D() =		
Use the function here	What should the function produce?	
=		
Use the function here	What should the function produce?	

A rocket is traveling from Earth to Mars at 80 miles per second. Write a function that describes the <u>time</u> the rocket has been traveling, as a function of <u>distance</u>.

I. Contract+Purpose S	Statement		
Every contract has three p	parts:		
·		>	
name	Domain	Range	
•			
,	What does the function do?		
II. Give Examples			
	function for <u>some sample inputs</u>		
=			
Use the function here	What should the function produce?		
=			
Use the function here	What should the function produce?		
=			
Use the function here	What should the function produce?		
=			
Use the function here	What should the function produce?		
III. Definition			
Write the Formula, giving v	variable names to all your input values.		
=			

A rocket leaves Earth, headed for Mars at 80 miles per second. **At the exact same time**, an asteroid leaves Mars traveling towards Earth, moving at 70 miles per second. If the distance from the Earth to Mars is 50,000,000 miles, how long will it take for them to meet?

•		>
name	Domain	Range
	What does the function do?	
Give Examples	function for come communication uto	
nite an example of your	function for <u>some sample inputs</u>	
=		
e the function here	What should the function produce?	
=		
e the function here	What should the function produce?	
=		
e the function here	What should the function produce?	
=		
e the function here	What should the function produce?	
. Definition		

I. Contract+Purpose S	Statement		
Every contract has three par			
;:_		->	
name	Domain	Range	
•			
,	What does the function do?		
II. Give Examples			
	nction for <u>some sample inputs</u>		
write an example of your ra	nection for <u>some sample inputs</u>		
=			
Use the function here	What should the function produce?		
Use the function here	What should the function produce?		
ose the function here	What should the function produce:		
=			
Use the function here	What should the function produce?		
=	We all the control of		
Use the function here	What should the function produce?		
III. Definition			
	variable names to all your input values.		
3 3			
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	:	
•		->
name	Domain	Range
	What does the function do?	
Give Examples		
e an example of your func	tion for <u>some sample inputs</u>	
=		
ne function here	What should the function produce?	
=		
ne function here	What should the function produce?	
_		
= = e function here	What should the function produce?	
ne function here	What should the function produce?	
	What should the function produce? What should the function produce?	

Contracts

example	•																	
Range	^	↑	^	^	^	^												
Domain			:		:	:	:	:	:	:	:	:	:		:	:	:	:
Name		••	•	••	•	•	••	•	•	•	•	•	•	•	•	•	•	••

Contracts

example	•																	
Range	^	↑	^	^	^	^												
Domain			:		:	:	:	:	:	:	:	:	:		:	:	:	:
Name		••	•	••	•	•	••	•	•	•	•	•	•	•	•	•	•	••