Contracts

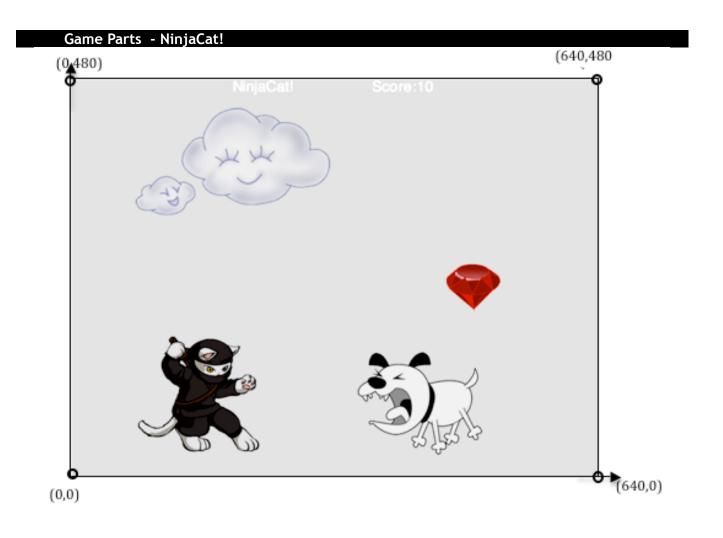
••	Domain :	Range →	example
		Λ Λ	
••		↑	
••		^	
••		↑	
•		↑	
••		↑	
••		^	
••		↑	
•		↑	
•		↑	
•		^	
••		↑	
••		↑	
••		1	
••		↑	

Contracts

Name	Domain	Range	example
	••	1	
		^	
	:	↑	
	:	^	
	:	^	
	:	↑	
	:	^	
	:	↑	
	:	^	
	:	↑	
	:		
	:	↑	
	:	^	
	:	↑	
	:	↑	
	:	↑	
	•	^	

Reverse-Engineering: How does NinjaCat work?

Thing in the game	What changes about it?	More specifically
Thing in the game Cloud	What changes about it? POSition	More specifically X-COORdinate



The coordinates for the PLAYER (NinjaCat) are:	<u> </u>	, rdinate y-coo) rdinate	
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 Danger 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 x 10)		
(8 + 2) - (5 x 10)		
<u>5 x 10</u> 8 - 2		

(draw Circles of Evaluation here if you need extra scratch paper)

	Circles Triathalon		Time: 5 minutes
	Math	Circle of Evaluation	Racket Code
Round 1	(3 * 7) - (1 + 2)		
Round 2	3 - (1 + 2)		
Round 3	3 - (1 + (5 * 6))		
Round 4	(1 + (5 * 6)) - 3		

Fast Functions! Fill out two examples for ea and function body by yourse	ach function, then try to write elf.	the contract, function header	PEED
;	:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	:	>	
name	domain	range	
(EXAMPLE ())
_(EXAMPLE ())
(define ())
,	<u>:</u>	>	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	:	>	
(EXAMPLE ())

(EXAMPLE (

(define (_

Fast Functions! Fill out two examples for eac and function body by yoursel		rite the contract, function header
;	:	->
name	domain	range
(EXAMPLE () _)
(EXAMPLE ())
(define ())
;	:	->
name	domain	range
(=)(1)151=(,	,

(2/04//11 22 (/
(define ())
;		->	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
,	:	->	
(EXAMPLE ())
(EXAMPLE ())
(define ())
•	<u>:</u>	->	
(EXAMPLE ())
(EXAMPLE ())
(define ())

DESIGN RECIPE

Word Problem: rocket-height

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.

• name	Domain	> Range
		50
	What does the function do?	
Give Examples		
the computer, write an exan	nple of your function in action, using EXA	AMPLE.
XAMPLE (e user types)
the	e user types	
	which should become)
XAMPLE (e user types)
Cir	e user types	
		,
	which should become)
Definition		
Write the Function Head	er, giving variable names to all your inpu	it values.
lefine ()
function name	variable names	/

Word Problem: red-square

Use the Design Recipe to write a function $\underline{red-square}$, which takes in a number (the size of the square) and outputs a solid red rectangle whose length and width are the same size.

•)	•		->	
Name	_ `	Domain	Range	
•				
		t does the function do?		
II. Give Examples	e an example of v	our function in action, using EX	AMPI F	
•				
(EXAMPLE (the user says	i)	
)	
		Racket replies	,	
(EXAMPLE ()	
(======================================	the user says			
)	
		Racket turns that into		
II. Definition Write the Func	tion Header, giving	g variable names to all your inp	ut values.	
(define (`	
ιαρτίαρι)	

Word Problem: yard-area

Use the Design Recipe to write a function <u>yard-area</u>, which takes in the width and length of a yard, and returns the area of the yard.

(Don't forget: area = length * width !)

name	Domain	Range
	What does the function do?	
	example of your function in action, us	ing EXAMPLE.
•		_
LXAMFLL (Use the function here	/
)
	find another way to get the same re	esult here
EXAMPLE ()
	Use the function here	
	find another way to get the same re) esult here
II. Definition		
	Header, giving variable names to all yo	ur input values.
define ()

.....and the computer does this

Word Problem: update-danger

Use the Design Recipe to write a function <u>update-danger</u>, which takes in the danger's x-coordinate and produces the next x-coordinate, which is 50 pixels to the left.

nama		>
name	Domain	Range
	What does the function do?	
Give Examples		
	ample of your function in action, usi	ing EXAMPLE.
XAMPLE ()
(Use the function here	
)
	find another way to get the same re	esult here
XAMPLE (Use the function here)
·	Use the function here	,
)
	find another way to get the same re	esult here
Definition		
Definition	dor giving variable names to all ve	ur input values.
Definition Write the Function Hea	ider, giving variable names to all you	
Write the Function Hea	——————————————————————————————————————	\ \

.....and the computer does this

Design Recipe: update-target

Word Problem: update-target

Write a function $\underline{update-target}$, which takes in the target's x-coordinate and produces the next x-coordinate, which is 50 pixels to the right.

nama		>
name	Domain	Range
	What does the function do?	
Give Examples		
	ample of your function in action, usi	ing EXAMPLE.
XAMPLE ()
(Use the function here	
)
	find another way to get the same re	esult here
XAMPLE (Use the function here)
·	Use the function here	,
)
	find another way to get the same re	esult here
Definition		
Definition	dor giving variable names to all ve	ur input values.
Definition Write the Function Hea	ider, giving variable names to all you	
Write the Function Hea	——————————————————————————————————————	\ \

.....and the computer does this

Protecting Sam

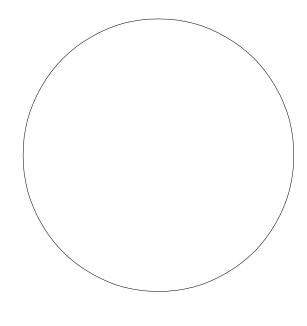
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

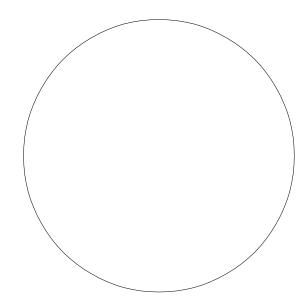
1. A piece of Sam is still visible on the left as long as...

(> 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?

Use the Design Recipe to write a function protect-left?, which takes in the target's x-coordinate and checks to see if it is greater than -50.

	•		>	
name		Domain	R	ange
		loes the function do?		
Give Examples				
the computer, write	an example of you	ır function in action, usir	ng EXAMPLE.	
XAMPLE (on here)	
·	Use the function	on here	,	
)
	find an	other way to get the same res	sult here	
XAMPLE (<u>-</u>)	
	Use the function	n nere		
)
	find an	other way to get the same res	sult here	
Definition				
Write the Function	on Header, giving v	variable names to all you	r input values.	
			`	
efine ()	

...and the computer does this

Word Problem: protect-right?

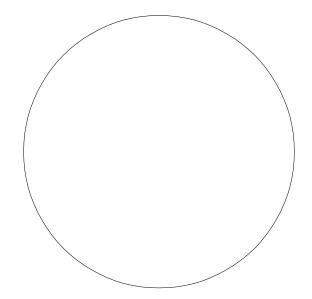
Use the Design Recipe to write a function $\underline{protect-right?}$, which takes in the target's x-coordinate and checks to see if it is less than 690.

find another way to get the same result here Definition Write the Function Header, giving variable names to all your input values.		•	->	
What does the function do? Give Examples In the computer, write an example of your function in action, using EXAMPLE. EXAMPLE Use the function here find another way to get the same result here Use the function here find another way to get the same result here Definition Write the Function Header, giving variable names to all your input values. define ()				Range
What does the function do? Give Examples In the computer, write an example of your function in action, using EXAMPLE. EXAMPLE Use the function here find another way to get the same result here Use the function here find another way to get the same result here Definition Write the Function Header, giving variable names to all your input values. define ()				
The the computer, write an example of your function in action, using EXAMPLE. Use the function here			1 do?	
Use the function here SAMPLE Use the function here Use the same result here	Give Examples			
find another way to get the same result here Use the function here find another way to get the same result here Definition Write the Function Header, giving variable names to all your input values. define ()	•	•		•
find another way to get the same result here EXAMPLE (Use the function here find another way to get the same result here I. Definition Write the Function Header, giving variable names to all your input values. define ()	EXAMPLE (_)
Use the function here Jefinition Write the Function Header, giving variable names to all your input values. Manual Control of the function of the f		Use the function here		
Use the function here find another way to get the same result here Definition Write the Function Header, giving variable names to all your input values. define ()				
Use the function here Set the function here)
I. Definition Write the Function Header, giving variable names to all your input values. define ()		find another way to ge	t the same result here	
I. Definition Write the Function Header, giving variable names to all your input values. define ()				
Use the function here				
find another way to get the same result here Definition Write the Function Header, giving variable names to all your input values. define ()	EXAMPLE (_)
. Definition Write the Function Header, giving variable names to all your input values. define ()		Use the function here		
Definition Write the Function Header, giving variable names to all your input values. define ()				
I. Definition Write the Function Header, giving variable names to all your input values. define ())
Write the Function Header, giving variable names to all your input values. define ()		find another way to ge	t the same result here	,
Write the Function Header, giving variable names to all your input values. define ()	I. Definition			
define ()	Write the Function	on Header, giving variable name	es to all your input valu	ies.
function name variable names	write the function			
				1

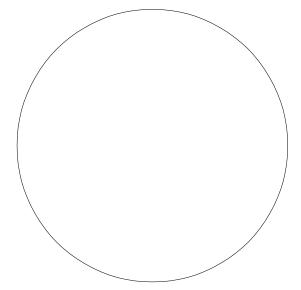
...and the computer does this

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?

Use the Design Recipe to write a function $\underline{onscreen?}$, which takes in the target's x-coordinate and checks to see if it Sam is protected on the left \underline{and} protected on the right.

	·		>	
name		Domain	R	ange
		t does the function do?		
Give Examples				
·	-	our function in action, using		
EXAMPLE (tion here)	
	Use the funct	tion here		
)
	find a	another way to get the same resul	lt here	
EXAMPLE ()	
	Use the funct	tion here		
)
	find a	another way to get the same resul	lt here	/
. Definition				
Write the Func	tion Header, giving	g variable names to all your	input values.	
d - f : (,	
define (ion name	variable names)	
,				

...and the computer does this

Word Problem: cost

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.

name		Domain	Range
l Give F	Examples		
	uter, write an example of your funct	ion for <u>each</u>	topping, using EXAMPLE.
(EXAMPLE	(cost "pepperon"	i <u>"</u>)_	What should the function produce?
(EXAMPLE	() _	•
	Use the function here		What should the function produce?
(EXAMPLE	Use the function here) _	What should the function produce?
(EXAMPLE	Use the function here) _	What should the function produce?
III. Defini	ition		
(define	function name	variable n	ames

Word Problem: update-player

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

I. Contra	act+Purpose Statement			
name	:	Domain	-> Range	
	Examples o examples we've started for yo	ou, and make two	more	
(EXAMPLE	(<u>update-player</u> 128 Use the function here	3 "up") _	What should the function produce?	
(EXAMPLE	(<u>update-player</u> 451 Use the function here	l "down") _	What should the function produce?	
(EXAMPLE	(Use the function here)	What should the function produce?)
(EXAMPLE	(Use the function here) _	What should the function produce?)
III. Defini (define		variable n	names	
)				

Word Problem: line-length

Write a function called <u>line-length</u>, which takes in two numbers and returns the difference between them. It should always subtract the smaller number from the bigger one.

	act+Purpose Statement has three parts:	nent					
name	:			Domain	->_	Range	
II. Give E	Examples						
(EXAMPLE	(line-length Use the functi	10 ion here	5)	(- 10 What should the fu)
(EXAMPLE	(line-length Use the functi	2 ion here	8)	(- 8 What should the fu)
III. Defini	ition the Function Heade	r giving v	/ariable	names to all	vour input values	that change	
						anac en anger	
	function name			variable na	mes		
							-
							-
							-
)							

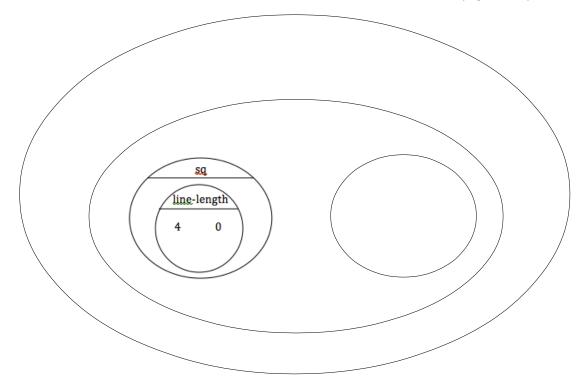
...and the computer does this

The Distance Formula, with Numbers

The distance between the points (4, 0) and (0, 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 into Racket code:

Word Problem: distance

Write a function <u>distance</u>, which takes FOUR inputs:

px: The x-coordinate of the player

py: The y-coordinate of the player

Contract+Purpo	se Statement	
name	•	> Range
		J
	What does the function do?	
Give Examples		
EXAMPLE ()
,	Use the function here	,
	find another way to get the same resu	ılt here
EXAMPLE ()
(Use the function here	,
	find another way to get the same resu	ult here
. Definition	Time amounts may to got the same root	
		,
define (n name variable names)

DESIGN RECIPE

Word Problem: collide?

Write a function collide?, which takes FOUR inputs:

px: The x-coordinate of the player
 py: The y-coordinate of the player

Domain	>
Domain	
20	Range
oes the function do?	
)
n here	
other way to get the same res	ult here
)
n here	
other way to get the same res)
	IIIT NOTO
	on here other way to get the same res

Catchy Intro:	
Jame, Age, Grade:	
Same Title:	
eack Story:	
Characters:	
xplain a piece of your code:	

_

Presentation Feedback For each question, circle the answer that fits best. Definitely! No way! A little. Was the introduction catchy? Definitely! Did they talk about their characters? No way! A little. Did they explain the code well? No way! Definitely! A little. Did they speak slowly enough? Definitely! No way! 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!

Drosontation Foodback			
Presentation Feedback For each question, circle the answer the	at fits best.		
Was the introduction catchy?	No way!	A little.	Definitely!
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!	A little.	Definitely!
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

Write a function called <u>red-shape</u>, which takes in the name of a shape ("circle", "triangle", "star" or "rectangle"), and draws that shape. All shapes should be solid and red, and can be whatever size you choose

i. Contr	act+Purpose Statement		
name	•	Domain	-> Range
	Examples xamples of red-shape below. The fi	rst one has alr	ready been done for you.
(EXAMPLE	(red-shape "circle" Use the function here)	(circle 50 "solid" "red")) What should the function produce?
(EXAMPLE	(Use the function here)	What should the function produce?
(EXAMPLE	(Use the function here)	What should the function produce?
(EXAMPLE	(Use the function here)	What should the function produce?
III. Defin	ition		
(define	function name	variable na	ames)
(con	<u>d</u>		
		(ci	ircle 50 "solid" "red")
)			

Translating into Algebra...

Values: Translate the R	acket Code into Algebra
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 (* age 30))	
(define hours (* days 24))	
(define minutes (* hours 60))	
Functions: Translate the	Racket Code into Algebra
<pre>(define (double x) (* x 2))</pre>	double(x) = x*2
<pre>(define (area length width) (* length width))</pre>	area(length, width) = length * width
<pre>(define (circle-area radius) (* pi (sq radius)))</pre>	
(define (distance x1 y1 x2 y2) (sqrt (+ (sq (- x1 x2)) (sq (- y1 y2))))	

Word Problem

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

I.	Contrac	t+Purp	ose Stateme	ent				
Every of	contract	has thre	ee parts:					
•	D		•			->		
,	name				Domain		Range	_
II.	Give Ex							
Write a	an examp	ole of yo	our function	for some sample	<u>e inputs</u>			
	D (4)							
	<u>D(1)</u>	=	=					
Use the	function h	ere		What should the	function produce?			
	D(2)							
	<u>D(Z)=</u>							
Use the	function h	ere		What should the	function produce?			
	D ()							
	D()	=	=					
Use the	function h	ere		What should the	function produce?			
			=					
Use the	function h	ere		What should the	function produce?			
III.	Definiti	on						
111.			ıla giving v	ariable names to	all your input v	aluos		
	WILLE LII	e ioiiii	ita, givilig v	מו ומטנכ וומווופט ננ	an your input v	atues.		
D (`							
υ ()	=						

Word Problem

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

	•		->
name		Domain	Range
Give Example	es		
ite an example of	your function	on for <u>some sample inputs</u>	
	=		
se the function here		What should the function produce?	
se the function here	<u>=</u>	What should the function produce?	
		·	
	=		
e the function here		What should the function produce?	
	=		
.1. 6 1		What should the function produce?	
se the function here			

Word Problem

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
I. Give Examples		
Write an example of your fu	unction for <u>some sample inputs</u>	
=		
Jse the function here	What should the function produce?	
=		
Jse the function here	What should the function produce?	
=		
Jse the function here	What should the function produce?	
=		
Jse the function here	What should the function produce?	
II. Definition		
	giving variable names to all your input values.	

Word Problem

	_ :		>
name		Domain	Range
. Give Examples			
/rite an example of yo	our function f	or <u>some sample inputs</u>	
=	=		
se the function here		What should the function produce?	
=	=		
se the function here		What should the function produce?	
se the function here	=	What should the function produce?	
_	=	What about 4 the five stiers are dues?	
		What should the function produce?	
se the function here			