Contracts

Name	Domain	Range	example
•		^	
••	••	^	
••		^	
•	•	^	
•	:	*	
•	:	*	
•	:	^	
•	:		
•	:	^	
•	:	^	
•	:	*	
•	:	^	
•	:	*	
•	:	^	
•	:		
•	:	^	
•	:	^	
••		^	

Contracts

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

Reverse-Engineering: How does NinjaCat work?

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



The coordinates for the PLAYER (NinjaCat) ar	re:	(,)
		x-coordinate	y-coordinate
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)		
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!

· ,	:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	;	>	
;	: domain	> range	
;	.:domain	<u> </u>)
	_:domain))	<u> </u>)
(EXAMPLE (_:domain	<u> </u>)))
(EXAMPLE ()	<u> </u>))
(EXAMPLE ()	range))
(EXAMPLE ((EXAMPLE ((define (;)))	range ->)))
(EXAMPLE ((EXAMPLE ((define (; name (EXAMPLE ()))	range ->)))

Fast Functions!



,	_:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE () .)
(define ())
;	_:	>	
name	domain	range	
_(EXAMPLE ())
(EXAMPLE ())
(define ())
;	;	>	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	;	>	
(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
	What does the function do?	
Give Examples	What does the function do:	
the computer, write an examp	ole of your function in action, using EX	AMPLE.
EXAMPLE (the	user types)
	which should become)
EXAMPLE (the	user types)
	which should become)
Definition Write the definition givin	ag variable names to all your input v	aluos
wille the deliminor, givii	ng variable names to all your input v	aioes.
define (variable names)
	mputer does this	

Word Problem: red-square

Use the Design Recipe to write a function <u>red-square</u>, which takes in a number (the size of the square) and outputs a solid red rectangle whose length and width are the same size.

I. Contract+Purp	oose Statement			
Every contract has thr				
•	_ :		->	
Name	- ·	Domain		•
			_	
;				
	wna	t does the function do?		
II. Give Example			EVALIDIE	
On the computer, writ	te an example of y	our function in action, using	EXAMPLE	
(EXAMPLE (S)	
,	the user say	S	,	
)	
		Racket replies	/	
(EXAMPLE ()	
,	the user say	S	<i></i>	
)	
		Racket turns that into	/	
III. Definition				
	nition, giving vari	able names to all your input	t values.	
(define ()	
funct	tion name	variable names		
				`
		de ca de la)
	and the computer	aoes this		

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!)

I. Contrac	ct+Purpose Stateme	nt		
Every contract	has three parts:			
•	:		->	
name	•	Domain	Range	
•				
,		What does the function do?		
		what does the function do:		
	camples	of your function in action, using EXAA	MDI F	
on the compact	er, write an example	or your runction in action, using EXA	VII LL.	
(EXAMPLE	(function here)	
	Use the	function here		
)	
_		find another way to get the same result here	,	
(EXAMPLE	()	
	Use the	function here		
_)	
		find another way to get the same result here	,	
III. Definitio	on			
Write th	ne definition, giving v	variable names to all your input val	ues.	
(dofina (\	
(define (_	function name	variable names)	
	ranction name	variable names		
				`
	and the compu	iter does this		_J

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.

I. Contra	ct+Purpose Statement		
Every contract	has three parts:		
•		->	
name	•Domain	Range	_
;	What does the Gooding do		_
	What does the function do?		
	camples		
On the comput	er, write an example of your function in action	n, using EXAMPLE.	
(EXAMPLE	()	
(Use the function here	,	
		,	
-	find another way to get the sa		
	, 5		
(EVAMDLE	(1	
(EXAMPLE	Use the function here		
-	find another year to get the an)	
	find another way to get the sa	ime result here	
III. Definition			
Write tr	ne definition, giving variable names to all yo	our input values.	
(define (_		`	
(derine (_	function name variable		
			1
	and the computer does this		<i>J</i>

Design Recipe: update-target

Word Problem: update-target

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

I. Contrac	ct+Purpose Statemen	t		
Every contract	has three parts:			
•	•		->	
name	•	Domain	Range	
			J	
;				
	W	Vhat does the function do?		
	amples			
On the compute	er, write an example o	of your function in action, using EXA	MPLE.	
(EXAMPLE	()	
(Use the fo	unction here	/	
			`	
-		ind another way to get the same result here)	
(EXAMPLE	()	
	Use the fi	unction here	/	
			,	
-	fi	ind another way to get the same result here)	
		ind underer way to get the Jame result here		
III. Definition		ariable names to all your input va	luos	
wille ii	ie deliminori, giving vo	anable names to all your import va	iues.	
(define (_)	
(451116 (_	function name	variable names	/	
)
	and the comput	er does this		.,

Protecting Sam

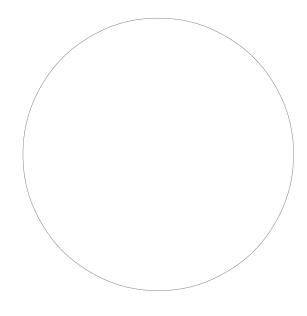
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

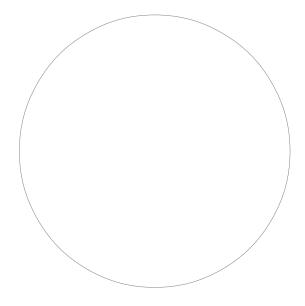
1. A piece of Sam is still visible on the left as long as...

(> 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 <code>safe-left?</code>, which takes in an x-coordinate and checks to see if it is greater than -50.

I. Contract+I	Purpose Statement		
Every contract ho	as three parts:		
•	:		>
name		Domain	Range
•			
,	W	hat does the function do?	
II. Give Exam			EVALUELE.
On the computer	r, write an example	e of your function in action, using	g EXAMPLE.
(EXAMPLE ()
(LXXXIII LL (Use the fu	inction here	/
)
	fir	nd another way to get the same result her	e
(EXAMPLE (inction hara)
(LXXXIII LL (Use the fu	inction here	/
)
	fir	nd another way to get the same result her	e
III. Definition			
	definition, giving vo	ariable names to all your input vo	alues.
(define (variable names)
, <u>, </u>	unction name	variable names	
			Y

...and the computer does this

Word Problem: safe-right?

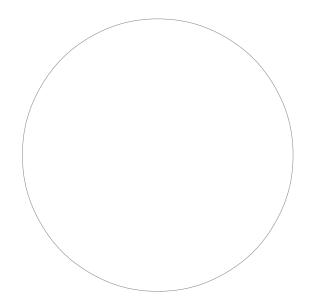
Use the Design Recipe to write a function <u>safe-right?</u>, which takes in an x-coordinate and checks to see if it is less than 690.

I. Contract+Purpo	se Statement		
Every contract has three			
•		-)	>
, • name			Range
name	DC	лпаш	Kange
•			
,	What does the funct	tion do?	
II. Give Examples		· · · · · · · · · · · · · · · · · · ·	-
On the computer, write	an example of your function	in action, using EXAMPL	-Ł.
(EYAMDIE (1
(EXAMPLE (Use the function here)
	ose the function here		
			1
	find another way to	get the same result here)
	- Time unionie: Way to	get the same result here	
(EXAMPLE ()
(======================================	Use the function here		/
)
	find another way to	get the same result here	<i>,</i>
> 0			
III. Definition		ha all carries and carries	
write the definiti	on, giving variable names	to all your input value	S.
(al a £: a a _ (`
(aetine (_)
function		variable names	
			1
			<i></i>

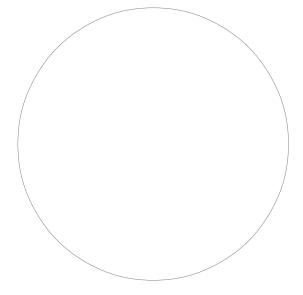
...and the computer does this

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 <u>onscreen?</u>, which takes in an x-coordinate and checks to see if Sam is safe on the left <u>and</u> safe on the right.

	•		>
name		Domain	Range
	What does th	he function do?	
Give Examples			
the computer, write	an example of your fu	nction in action, using EXA	MPLE.
XAMPLE ()
,	Use the function her	e	,
)
	find another	way to get the same result here	······/
EXAMPLE ()
	Use the function her	'e	
)
	find another	way to get the same result here	<u> </u>
 Definition	find another	way to get the same result here	
. Definition Write the defini		way to get the same result here	
Write the defini		names to all your input vo	

...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.

I. Contract+Purpose Statem	ent	
•	 Domain	> Range
	Bomain	Kango
II. Give Examples On the computer, write an exam	nale of your function for e	ach topping using EXAMPLE
		<u>acii ioppiiig</u> , osii ig 2,0 001 22.
(EXAMPLE (<u>cost</u> Use the function	<u>"pepperoni"</u>)	What should the function produce?
use the function	on nere	what should the function produces
(EXAMPLE ())
Use the function	on here	What should the function produce?
(EXAMPLE ())
Use the function	on here	What should the function produce?
(EXAMPLE (1	1
Use the function	on here	What should the function produce?
III. Definition		
m. Deminion		
(define ()
function name	variable r	names

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. Contract+Purpose Statemen	t		
:			->
name		Domain	Range
II. Give Examples			
Finish the two examples we've start	ed for you	, and make t	wo more
(EXAMPLE (<u>update-player</u> Use the function h	128 nere	<u>"up"</u>) _	What should the function produce?
(EXAMPLE (<u>update-player</u>		<u>"down"</u>) _)
Use the function h	nere		What should the function produce?
(EXAMPLE (nere)	What should the function produce?
(EXAMPLE (nere)	What should the function produce?
III. Definition			
(define ()
function name		variable no	ames

)

Lesson 8

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.

•	•					->		
name	·			Domain		<u> </u>	Range	
II. Give	Examples							
(EXAMPLE	(line-length Use the func	10 tion here	5)	<u>(</u> - What s		5) nction produce?)
(EXAMPLE	(line-length Use the func	2 tion here	8)	<u>(</u> - What s	8 should the fu	2) nction produce?	
III. Defini Write	i <mark>tion</mark> the definition, givi	na varial	ole nam	nes to all vou	ır input v	values.		
(define	_			variable na)		
								-
_								-
								-
)								-

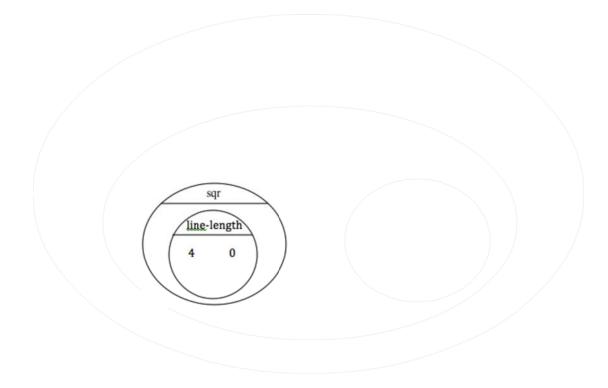
...and the computer does this

The Distance Formula, with Numbers

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 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
- □ 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 page 27!)

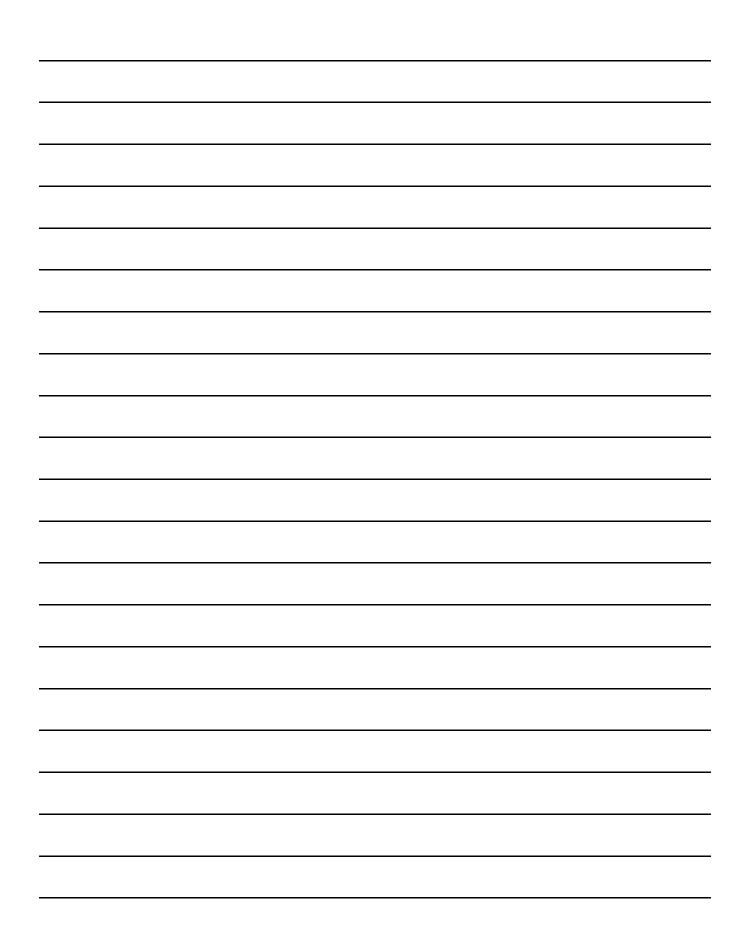
I. Contract+Purp	oose Statement			
name	·:	Domain	->	_
;	What does the f	unction do?		
II. Give Example	S			
(EXAMPLE (Use the function here)	
	ose the function here			
)
	find another wa	y to get the same result he	re	
(EXAMPLE ()	
(270-0411 22 (Use the function here		/	
				,
	find another wa	y to get the same result he	re)
III. Definition				
(define ()	
funct	ion name	variable names		
)

DESIGN RECIPE

Word Problem: collide?

 px: The x-coordinate py: The y-coordinate cx: The x-coordinate cy: The y-coordinate It should return true 		in 50 pixels of the
I. Contract+Purpose	Statement	
;		>
name	Domain	Range
·		
•	What does the function do?	
II. Give Examples		
(EXAMPLE (Use the function here)
	find another way to get the same result h) nere
(EXAMPLE (Use the function here)
	find another way to get the same result h) nere
III. Definition		
(define (me variable names)
)

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



Presentation Feedback

For each question, circle the answer that 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!

Presentation Feedback

For each question, circle the answer that 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. Contro	act+Purpose Statement		
;	•		>
name		Domain	Range
	xamples		
Write some ex	camples of red-shape below. The fi	rst one has al	ready been done for you.
(EXAMPLE	<u>(red-shape</u> "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. Definit	ion		
(define ()
(cond	function name	variable na	ames /
		(ciro	cle 50 "solid" "red")

Translating into Algebra...

Values: Translate the Ra	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 (* months 30))	
(define hours (* days 24))	
(define minutes (* hours 60))	
Functions: Translate the I	Racket Code into Algebra
(define (double x) (* x 2))	$double(x) = x^2$
(define (area length width) (* length width))	area(length, width) = length * width
(define (circle-area radius) (* pi (sq radius)))	
(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 that the rocket has traveled, as a function of **time** t.

I. Contract+P Every contract has t	urpose Stateme three parts:	ent	
; <u>D</u> name	:	Domain	> Range
II. Give Example o		for <u>some sample inputs</u>	
D(1) 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?	
III. Definition Write the fo	ormula, giving v	ariable names to all your input v	alues.
<u>D(</u>) =			

Word Problem

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+Pu	rpose Statem	ent	
Every contract has	three parts:		
•	•		->
name		Domain	Range
II Civo Everen	Jan		
II. Give Examp		n for a propagation of the	
wille an example of	or your function	n 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?	
	_		
Here the control to t		NAME OF THE PROPERTY OF THE PR	
Use the function here		What should the function produce?	
III. Definition			
	rmula, giving v	rariable names to all your input	values.
	-		
	=		

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
Give Examples		
an example of your for	unction for <u>some sample inputs</u>	
=		
ne function here	What should the function produce?	
=		
ne function here	What should the function produce?	
=		
ne function here	What should the function produce?	
=		
ne function here	What should the function produce?	
Definition		
	giving variable names to all your input value	0.5

Word Problem

•		->
name	Domain	Range
Give Examples		
rite an example of your fu	unction for <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?	
=		
se the function here	What should the function produce?	
I. Definition		
	giving variable names to all your input valu	es.