Contracts

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

Contracts

example																	
Range	1	1	1	1	↑	↑	↑	↑	↑	↑	1	↑	↑	↑	↑	↑	1
Domain					•	•	•	:	•	•		:	•	•	•	•	<u></u>
Name	••	••	••	••	••	••	••	••	••	••	••	•	••	••	••	:	••

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-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)		
<u>5 x 10</u> 8 - 2		
0 - 2		

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

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

	Fast Funct	ions	
;:		>	_
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	<u>:</u>	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	<u>:</u>	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
·	:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())

	Fast Funct	ions	
;		>	_
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	<u>:</u>	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	:	->	
name	domain	range	
(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.

	Domain	Range
What do	pes the function do?	
Give Examples the computer, write an example of you	r function in action, using EXA	MPLE.
EXAMPLE ()
the user types		
)
	which should become	,
EXAMPLE ()
the user types		/
	which should become)

.....and the computer 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.

 Contract+Purpose State 	ement	
Every contract has three parts:		
		_
;::		->
Name	Domain	Range
•		
,	What does the function do?	
II. Give Examples	and of very fraction in action raise EVAA	ADI E
On the computer, write an exam	nple of your function in action, using EXAM	MPLE
(EXAMPLE ()
the	e user says	
)
	Racket replies	
(EXAMPLE ()
the	e user says	/
)
	Racket turns that into	
III. Definition		
	ing variable names to all your input val	ues.
(define ()
function name	variable names	
		1
	computer does this	/

DESIGN RECIPE

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. Contro	act+Purpose Stateme	ent		
Every contract	t has three parts:			
•	:		->	
name	·	Domain	Range	
_				
;		What does the function do?		
		What does the function do:		
	xamples	of your function in action using EVAA	ADI E	
On the compu		of your function in action, using EXAM	WPLE.	
(EXAMPLE	()	
	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. Definit	ion			
		variable names to all your input val	ues.	
(define (_)	
	function name	variable names		
				`
	and the course	utor does this)
	and the comp	uter uoes tilis		

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	-
•				
,		hat does the function do?		-
	camples er, write an example of	f your function in action, using EXA	AMPLE.	
(EXAMPLE	Use the fu	nction here)	
	030 4.10 14			
-	fir	nd another way to get the same result her)	
	111	another way to get the same result her		
(EXAMPLE	(,	
(LAAMPLL	Use the fu	nction here	<i>'</i>	
			,	
-	fir	nd another way to get the same result her	<i>)</i>	
D		, ,		
III. Definition Write the		ariable names to all your input vo	alues.	
	, , , , , , , , , , , , , , , , , , , ,	,		
(define (_)	
	function name	variable names		
)
	and the compute	er does this		

DESIGN RECIPE

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. Contract	+Purpose Statement	
Every contract ha		
•	•	->
name	•	
		9
·		
	What does the function do?	
II. Give Exa	imples (
	r, write an example of your function in action, usin	ng EXAMPLE.
(EXAMPLE (_)
(2/0-4/11 22 (_	Use the function here	/
	find another way to get the come rec)
	find another way to get the same res	utt nere
(EXAMPLE (_	Has the five-time have)
	Use the function here	
)
	find another way to get the same res	ult here
III. Definition	1	
	e definition, giving variable names to all your inp	out values.
(define ()
	function name variable names	
)
	and the computer does this	,

Finding Coordinates

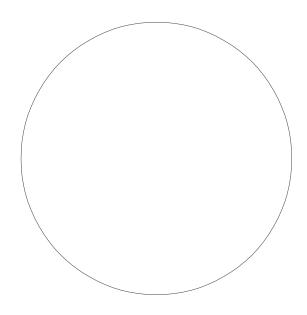
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

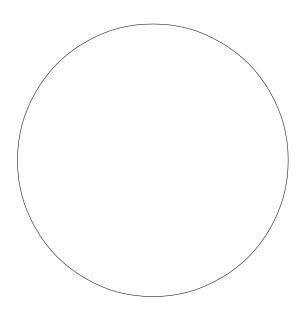
1. A piece of Sam is still visible on the left as long as...

(> 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+Purpose	Statement	
Every contract has three	parts:	
•		
• •	Domain	> Range
name	Domain	Ralige
•		
,	What does the function do?	
II Cive Evamples		
II. Give Examples On the computer, write or	n example of your function in action, us	sing FXAMPIF.
·	,	_
(EXAMPLE ()
	Use the function here	
)
	find another way to get the same result	here
/EVAMDLE /		,
(EXAMPLE (Use the function here)
)
	find another way to get the same result	here
III. Definition		
	, giving variable names to all your input	values.
(define (me variable names)
function na	me variable names	
)

...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.

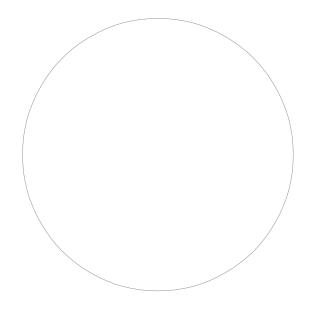
	act+Purpose Statement			
	t has three parts:			
•	•		->	
name	<u> </u>	 Domain	Range	
Hame		Domain	Nange	
;				
•	What does the fu	ınction do?		
II Give I	xamples			
	ter, write an example of your functi	on in action, using EXAM	MPLE.	
· · · · · · · · · · · · · · · · · · ·		, -		
(EXAMPLE	Use the function here)	
	ose the function here			
)	
	find another way	to get the same result here	,	
(EXAMPLE	()	
(LXX-XXII LL	Use the function here		/	
	find another way)	
	find another way	to get the same result here		
III. Defini				
Write	the definition, giving variable nam	es to all your input valu	ues.	
(,		•	
(define ()	
	function name	variable names		
				,
)

...and the computer does this

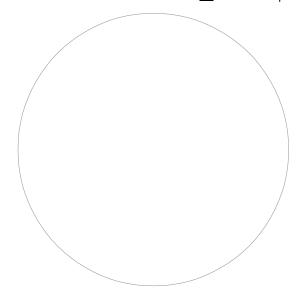
and / or

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.



DESIGN RECIPE

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.

I. Contract+Purpose Statement	
Every contract has three parts:	
•	
,·	
name Domain Range	
:	
What does the function do?	
II. Give Examples	
On the computer, write an example of your function in action, using EXAMPLE.	
(EXAMPLE () Use the 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. Definition	
Write the definition, giving variable names to all your input values.	
(define ()	
function name variable names	
	١
; 	_J

...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.

Contract+Purpose Stateme	nt	
•		->
name	Domain	Range
l. Give Examples		
On the computer, write an examp	ole of your function for <u>e</u>	each topping, using EXAMPLE.
(EXAMPLE (<u>cost</u> "	pepperoni''_)	What should the function produce
(EXAMPLE (here	What should the function produce:
(EXAMPLE ())	What should the function produce:
(EXAMPLE ()	What should the function produce:
II. Definition		
(define (variable r	names
	-	

DESIGN RECIPE

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. Contro	act+Purpose Statement			
,	<u>.</u>		Domain	> Range
	xamples examples we've started	for you	and make tv	vo more
	•	128	<u>"up"</u>) _	What should the function produce?
(EXAMPLE	(<u>update-player</u> Use the function here	<u>451 '</u>	<u>'down"</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?
III. Definit			variable na	imes)

	·		_

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.

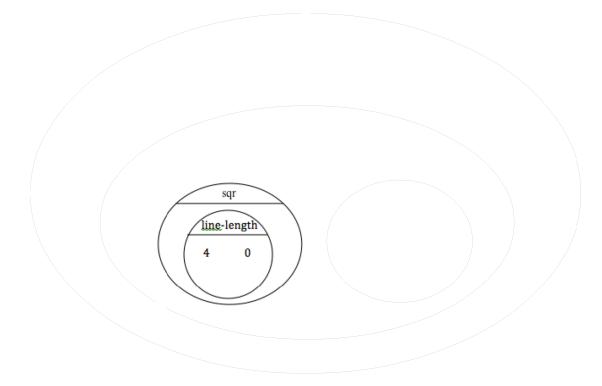
	act+Purpose State	ment					
Every contrac	ct has three parts:						
name	:			omain	>	Range	
II. Give	Examples						
(EXAMPLE	(line-length Use the func	10 tion here	5)	(- 10 What should the fu)
(EXAMPLE	(line-length Use the func	2 tion here	8)	<u>(- 8</u> What should the fu	2) nction produce?)
III. Defini	i <mark>tion</mark> the definition, givi	ng variable	namo	s to all you	ur input valuos		
(define	_			·)		
)							

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):

DESIGN RECIPE

Write a function distan	e, which takes	FOUR inp	outs:
-------------------------	----------------	----------	-------

- □ 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

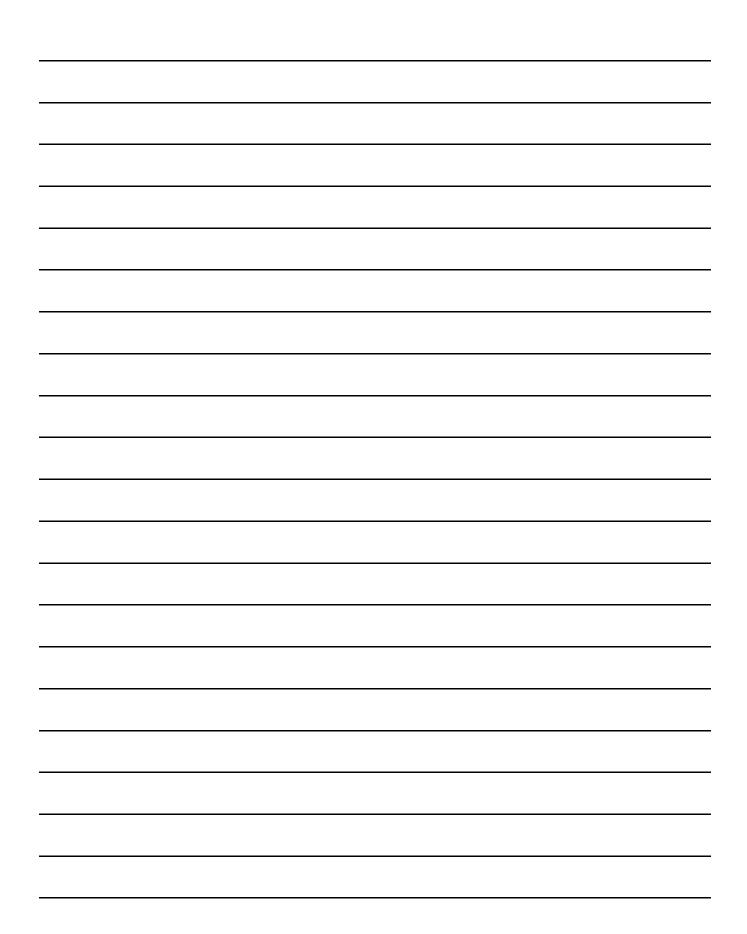
It should return the distance between the two, using the Distance formula. (HINT: look at what you did on page 27!)

, • _		Domain	> Range	_
•				
,		oes the function do?		_
II. Give Examples				
(EXAMPLE ()	
(Use the function	n here	,	
	find and	other way to get the same result	t here	
	Tilla alla	other way to get the same result	t here	
(EVAMBLE (`	
(EXAMPLE (Use the function	n here)	
	find and	other way to get the same result	t here	
III. Definition				
(define ()	
function na	ame	variable names	/	
				`
)

DESIGN RECIPE

	px: The y py: The y cx: The y cy: The y It should coordina	a-coordinate of the a-coordinate of the a-coordinate of ano a-coordinate of ano a-cturn true if the	player ther game character ther game character coordinates of the player are within 50 paracter. Otherwise, false.	pixels of the	
				_	
,	name	•	Domain	-> Range	
;			What does the function do?		
II. (EXA	Give Exc		e function here)	
	_		find another way to get the same result here)	
(EXA	MPLE (Use th	e function here)	
	_		find another way to get the same result here)	
III.	Definitio	n			
(def	fine (_ 	function name	variable names))

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! 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! Definitely! A little. Did they speak loudly enough? No way! Definitely! A little. 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

Contract	Durnasa Statement		
i. Confract	Purpose Statement		
•	•		->
name	·	Domain	
•		Domain	Kango
	What does th	e function do	
	,,,,,a, a,ee,,,,,	io romenom de	•
I. Give Exan	nples		
Write some examp	oles of red-shape below. The firs	st one has al	ready been done for you.
(EXAMPLE <u>(re</u>	ed-shape "circle")	(circle 50 "solid" "red"))
· -	Use the function here		What should the function produce?
EVAMBLE (1	
(EXAMPLE (_	Use the function here	/ <u> </u>	What should the function produce?
			, , , , , , , , , , , , , , , ,
(EXAMPLE (<u> </u>)	
	Use the function here		What should the function produce?
(EXAMPLE ()	
(Use the function here		What should the function produce?
III. Definition			
iii. Deiiiiiiioii			
(define ()
,	function name	variable na	/ ames
(cond			
		(circ	cle 50 "solid" "red")

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 <u>distance</u> D that the rocket has traveled, as a function of <u>time</u> t.

<u>D</u> :		->
name	Domain	Range
	What does the function do?	
Give Examples		
rite an example of your to	unction for <u>some sample inputs</u>	
D(1) =		
e the function here	What should the function produce?	
D(2)=		
e the function here	What should the function produce?	
D() =		
e the function here	What should the function produce?	
=		
e the function here	What should the function produce?	
Definition		
	ariable names to all your input values.	

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
	What does the function do?	
Give Examples an example of your func	ction 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?	
le function here		
Definition	able 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		
e an example of your	function for <u>some sample inputs</u>	
e function here	What should the function produce?	
=		
e function here	What should the function produce?	
=		
e function here	What should the function produce?	_
=		
= e function here	What should the function produce?	
	What should the function produce?	

• <u></u>	>	
name	Domain	Range
	What does the function do?	
Give Examples	unction for <u>some sample inputs</u>	
=	metion for <u>some sample inputs</u>	
e the function here	What should the function produce?	
e the function here =	What should the function produce?	
	What should the function produce? What should the function produce?	
=		
= the function here		
= the function here	What should the function produce?	
= the function here = the function here	What should the function produce?	