Contracts

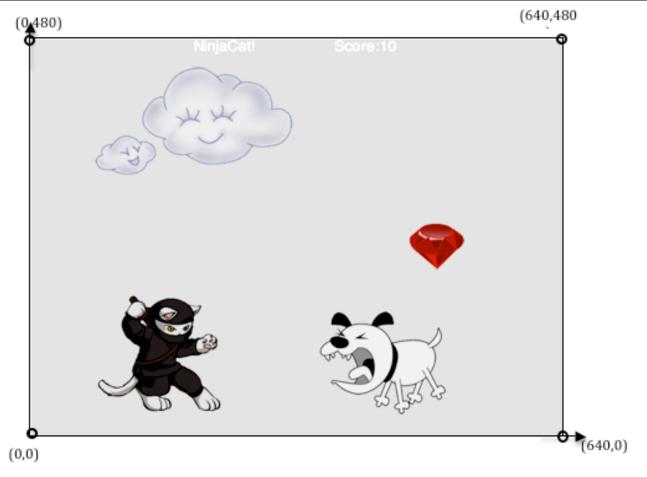
Name	Domain	Range	example
••	•	↑	
:	:	↑	
••	•	↑	
••		↑	
•	•	^	
••	•	^	
••	:	↑	
••		↑	
••	•	^	
•	•	↑	
••		↑	
••	:	↑	
;	•	^	
••		↑	
•			
••	:	↑	
•	•	↑	

Contracts

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

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

Finding Coordinates



The coordinates for the PLAYER (NinjaCat) are	e:	(,)	
		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):	
Our game takes place in:(space? the desert? a mall?)	
The player is a	
The player moves only up and down.	
Your player GAINS points when they hit the target.	
The Target is a	
The Target moves only to the left and right.	
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

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)		
(0 1 2) = (3 × 10)		
<u>5 x 10</u> 8 - 2		
8 - 2		

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

	Circles Co	mpetition	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 ())
•	:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ()))
,	:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())

Fast Functions			
;	:	>	
name	domain	range	
(EXAMPLE ()		_)
(EXAMPLE ())
(define ()		_)
;	:	>	
name	domain	range	
(EXAMPLE ())
(EXAMPLE ())
(define ())
•	:	>	
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.

·		>
name	Domain	Range
	What does the function do?	
	a of word from this price action, wais a FV	AAADI E
the computer, write an exampl	e of your function in action, using EX	AMPLE.
EXAMPLE ()
the us	ser types	
)
	which should become	
EXAMPLE (the u	ser types)
the d.	ser types	
		`
	which should become)
Write the definition, giving	g variable names to all your input v	alues.
define ()
function name	variable names	

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.

		>
Name	Domain	Range
	What does the function do?	
ho computer write an evam	uple of your function in action, using EX	AMDIE
•		
(AMPLE (e user says)
CHE	e user says	
	D. I !!)
	Racket replies	
KAMPLE (1
the	e user says	/
		\
	Racket turns that into)
Write the definition, givi	ing variable names to all your input v	alues.
. ,		
efine (variable names)

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!)

ery contract has	s three parts:		
	:		>
name		Domain	Range
	Wha	t does the function do?	
the computer,	write an example of y	our function in action, using EX	XAMPLE.
EXAMPLE ()
	Use the func	tion here	<i>)</i>
)
	find	another way to get the same result h	ere
EXAMPLE ()
`	Use the func	tion here	,
)
	find	another way to get the same result h	ere
Write the o	definition, giving vari	able names to all your input	values.
d - f: (\
define (function name	variable names)
	Tunction name	variable names	

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.

Every contract h	as three parts:			
•	•			
name	•	 Domain	-> Range	
name		Domain	Range	
·				
	W	hat does the function do?		
On the compute	r, write an example of	f your function in action, using EXAM	IPLE.	
(EXAMPLE ()	
(270-0711 22 (_	Use the fu	ınction here	/	
			,	
_	fi	nd another way to get the same result here)	
		and another may to get the same result here		
(EVAMDLE (`	
(EXAMPLE (Use the fu	ınction here)	
_	fi	nd another way to get the same result here)	
	111	nd another way to get the same result here		
\\/rita th	definition diving ve	riable names to all your input valu	100	
wille ine	e deliminori, giving vo	ariable names to all your input valu	Jes.	
(define (_)	
(466 (_	function name	variable names	/	
)
	and the compute	er does this		/

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.

Every contract h	has three parts:	
•	:	>
name	Domain	Range
•		
,	What does the function do?	
On the compute	er, write an example of your function in action, using Ex	KAMPLE.
(EXAMPLE (Use the function here)
	Use the function here	
_)
	find another way to get the same result h	ere
(EVAMDLE (,
(EXAMPLE (Use the function here)
)
_	find another way to get the same result h	ere
Write the	e definition, giving variable names to all your input v	values.
(define (_		1
(define (_	function name variable names)
)
	and the computer does this	

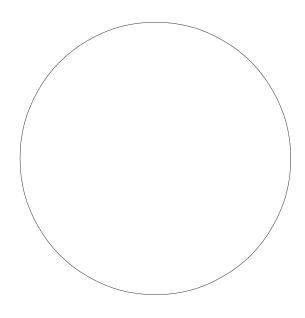
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

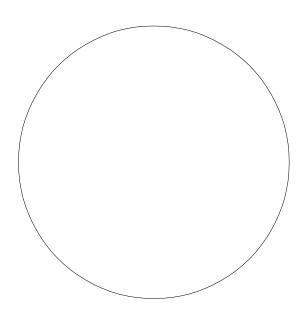
1. A piece of Sam is still visible on the left as long as...

(> 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.

name		Domain	Range	
			-	
	What do	pes the function do?		
the computer, write	e an example of y	our function in action, u	sing EXAMPLE.	
KAMPLE ()	
V-VIII EE (Use the function	n here	<i>,</i>	
)	
	find ano	other way to get the same result	here	
KAMPLE (Use the function	here)	
	ose the function	THEIC		
	find and	other way to get the same result)	
	Tilla allo	results way to get the same results	Here	
\A/-:\- \ - f:-:\	ion aivina variabl	le names to all your inpu	t values	
write the definit	ion, giring rando	io marries to all your impo	1 1 41003.	
)	

Word Problem: safe-right?

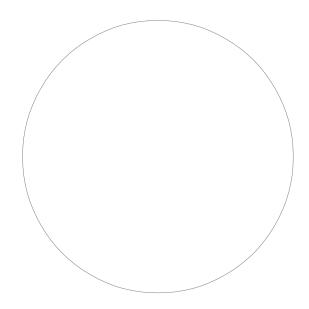
Use the Design Recipe to write a function <u>safe-right?</u>, which takes in an x-coordinate and checks to see if it is less than 690.

name Domain Range What does the function do? On the computer, write an example of your function in action, using EXAMPLE.				
What does the function do? What does the function do? On the computer, write an example of your function in action, using EXAMPLE. (EXAMPLE (Every contract h	nas three parts:		
What does the function do? What does the function do? On the computer, write an example of your function in action, using EXAMPLE. (EXAMPLE (-			
What does the function do? What does the function do? On the computer, write an example of your function in action, using EXAMPLE. (EXAMPLE (
What does the function do? On the computer, write an example of your function in action, using EXAMPLE. (EXAMPLE (•	·		
What does the function do? On the computer, write an example of your function in action, using EXAMPLE. (EXAMPLE (name		Domain	Range
What does the function do? On the computer, write an example of your function in action, using EXAMPLE. (EXAMPLE (•			
(EXAMPLE (,			
(EXAMPLE (
(EXAMPLE (On the compute	er write an example (of your function in action, using EXA	MPI F
(EXAMPLE ()	on the compate	ii, write air example t	or your runction in action, using Exam	VII LL.
find another way to get the same result here (EXAMPLE ((EXAMPLE ()
(EXAMPLE () Use the function here find another way to get the same result here Write the definition, giving variable names to all your input values. (define ()		Use the	function here	
(EXAMPLE () Use the function here find another way to get the same result here Write the definition, giving variable names to all your input values. (define ()				
(EXAMPLE () Use the function here find another way to get the same result here Write the definition, giving variable names to all your input values. (define ()				1
find another way to get the same result here Write the definition, giving variable names to all your input values. (define ()	_		find another way to get the same result here	/ :
find another way to get the same result here Write the definition, giving variable names to all your input values. (define ()				
find another way to get the same result here Write the definition, giving variable names to all your input values. (define ()				
find another way to get the same result here Write the definition, giving variable names to all your input values. (define ()	(EVAMDLE (1
find another way to get the same result here Write the definition, giving variable names to all your input values. (define ()	(EXAMPLE (Use the	function here)
Write the definition, giving variable names to all your input values. (define ()				
Write the definition, giving variable names to all your input values. (define ()				
Write the definition, giving variable names to all your input values. (define ()	_)
(define ()		1	find another way to get the same result here	2
(define ()				
(define () variable names	Write the	e definition, giving v	rariable names to all your input va	lues.
function name variable names				,
function name variable names	(define (_		· ·)
)		function name	variable names	
/				

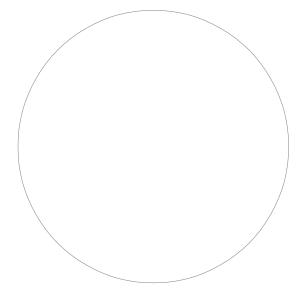
and / or

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?

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	
•				
,		t does the function do?		
On the computer wri	ite an example of w	our function in action, using	FYAMDI F	
(EXAMPLE (Use the func	tion here)	
)	
	find	another way to get the same resul	t here	
(EXAMPLE (1	
(LXAMI LL (Use the func	tion here	/	
)	
	find a	another way to get the same resul	t here	
Write the def	inition giving varia	able names to all your inpu	it values	
		,	or values.	
	-)	
(define (ction name	variable names	/	

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	
On the computer, write an example of your fo	unction for <u>ec</u>	ach topping, using EXAMPLE.
(EXAMPLE (<u>cost</u> " <u>peppero</u> Use the function here	<u>ni"</u>)	What should the function produce?
(EXAMPLE ()	What should the function produce?
(EXAMPLE ()	What should the function produce?
(EXAMPLE ()	What should the function produce?
(define (variable no	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.

<u>:</u>			->	
name	Do	omain	Range	
Finish the two examples we've started f	for you, an	d make two	o more	-
(EXAMPLE (<u>update-player</u>	128	<u>"up")</u>		١
Use the function here		 ,	What should the function produce?	,
(EXAMPLE (<u>update-player</u>	451 "d	lown")		•
Use the function here	431 0	<u> </u>	What should the function produce?	1
(EXAMPLE ()	1	-
(EXAMPLE (What should the function produce?	
(EXAMPLE ())	_
Use the function here			What should the function produce?	
(define ()	
function name		variable nam	nes	

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.

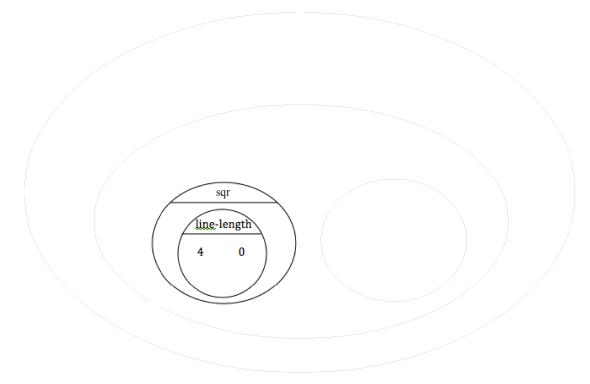
name	:			Domain	->	Range	
(EXAMPLE	(line-length Use the funct	10 ion here	5)	(- 10 What should the fun	5) action produce?	
(EXAMPLE	(line-length Use the funct	2 ion here	8)	<u>(</u> - 8 What should the fun	2) action produce?	
Write (define	the definition, givin	_	ole nam	variable na)		
	(_	ole nam)		

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!)



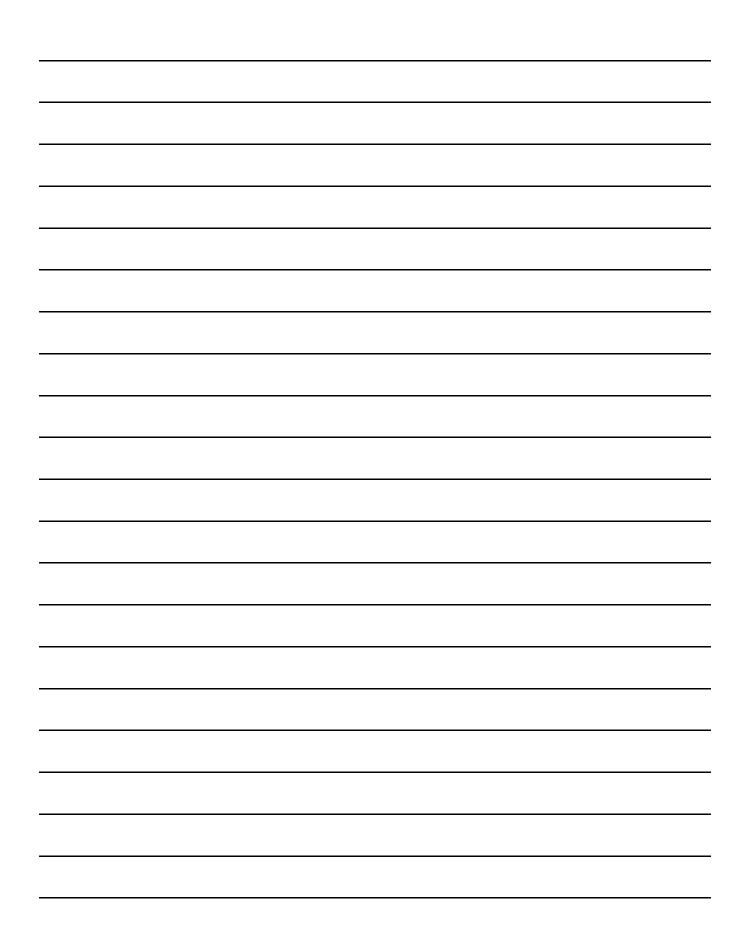
Convert the Circle of Evaluation into Racket code:

Write a function distance, which px: The x-coordinate of the py: The y-coordinate of the cx: The x-coordinate of and cy: The y-coordinate of and	e player e player other game character	
It should return the distance between you did on page 27!)	een the two, using the Distance fo	ormula. (HINT: look at what
;:		>
name	Domain	Range
;	What does the function do?	
(EXAMPLE (function here)
	find another way to get the same result her	e
, , , , , , , , , , , , , , , , , , , ,	function here)
	find another way to get the same result her	e
(define (variable names)

Write a function collide?, which takes FOUR inputs:

□ py: The □ cx: The □ cy: The It should	x-coordinate of the player y-coordinate of the player y-coordinate of another game character y-coordinate of another game character d return true if the coordinates of the player hates of the other character. Otherwise, fals	
name	• Domain	-> Range
;	What does the function do?	
(EXAMPLE (Use the function here)
-	find another way to get the sa	me result here
(EXAMPLE (Use the function here)
-	find another way to get the sa	me result here
(define (_	function name variable	names
)

Catchy Intro:
lame, 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? 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!

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!

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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

;:		->
name	Domain	Range
) Who	at does the function do	
Write some examples of red-shape below.	The first one has alr	ready been done for you.
(EXAMPLE <u>(red-shape</u> "circ	cle" <u>)</u>	(circle 50 "solid" "red") What should the function produce?
(EXAMPLE ()	What should the function produce?
(EXAMPLE ()	What should the function produce?
(EXAMPLE ()	What should the function produce?
III. Definition		
(define (variable na	ames)
	(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?	
/rite an example of your	function for <u>some sample inputs</u>	
D(1) =		
se the function here	What should the function produce?	
D(2)=		
se the function here	What should the function produce?	
D() =		
se the function here	What should the function produce?	
=		
se the function here	What should the function produce?	
Irita tha farmula aivina	variable 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*.

every contract has three p	parts:	
_		
•	>_	
name	Domain	Range
, ,	What does the function do?	
	what does the function do?	
Write an example of your t	function 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?	
Write the Formula, giving v	variable names to all your input values.	
3 3	•	
=		

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?

Every contract has three parts:		
•		>
name	Domain	Range
	Wile ark also as the first Keep als 2	
	What does the function do?	
Vrite an example of your	function for <u>some sample inputs</u>	
ville all example of your		
=		
Ise the function here	What should the function produce?	
se the function here	What should the function produce?	
30 mo fonction note	What should the folletion produce:	
=		
Ise the function here	What should the function produce?	
= Ise the function here	What should the function produce?	
se the function here	What should the function produce?	
	variable names to all your input values.	<u> </u>
Vrite the Formula, giving	variable flatties to all your import values.	
Vrite the Formula, giving	variable flatties to all your impor values.	

		·>
name	Domain	Range
	What does the function do?	
rite 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?	
	What should the function produce?	
e the function here	What should the function produce? What should the function produce?	