Contracts

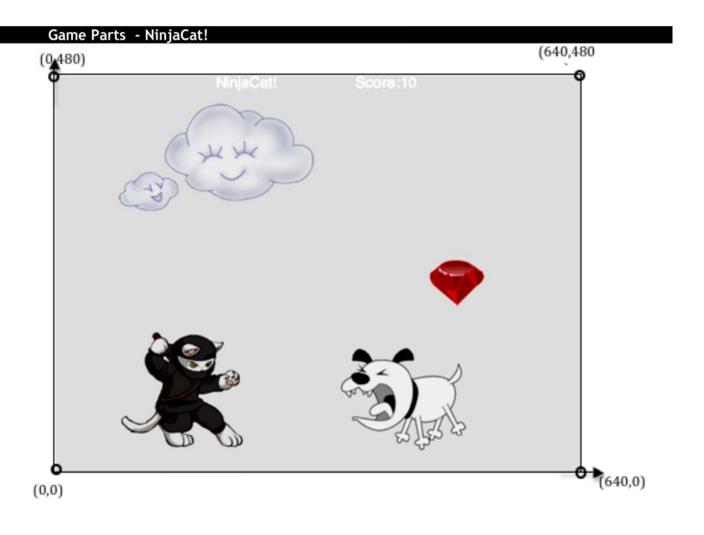
Name	Domain	Range	example
••	•	↑	
•	•	↑	
;	•	↑	
••	:	↑	
••	•	↑	
•	•	↑	
••	•	↑	
•	:	↑	
••		^	
••		↑	
••	:	↑	
••	:	↑	
.,		↑	
••		↑	
••		↑	
••	:	↑	
••		↑	

Contracts

Name	Domain	Range	example
••	:	→	
••	:	+	
••	:	→	
•	:	→	
••	:	→	
••	:	→	
•	:	→	
•6	•	→	
•	:	↑	
•	:	→	
•	:	→	
•6	•	→	
••	:	↑	
••		↑	

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) are:	(,)	
	<i>x-cool</i>	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 terms for operations!

Math	Circle of Evaluation	Pyret 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	Pyret Code
Round 1		Circle or Evaluation	Pyret Code
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 ())
;	::	->		
(EXAMPLE ())
(EXAMPLE ())
(define ())
;	:	>		
(EXAMPLE ())
(EXAMPLE ())
(define ())

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.

	 Domain	> Range
name	Domain	Range
	What does the function do?	
II. Give Examples	nple of your function in action, using E	YAMDI F
•		
th	e user types	/
)
	which should become	
(EXAMPLE (th	e user types)
	which should become)
III. Definition		
_	ing variable names to all your input val	ues.
(define (variable names)
runetion name	variable hames	

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. Contrac	t+Purpose Statement			
Every contract	has three parts:			
•	:		->	
Name	·	Domain	Range	
			J	
· /				
	What does the	e function do?		
II. Give Ex			VAMPLE.	
On the comput	er, write an example of your fun	iction in action, using Ex	XAMPLE	
(EXAMPLE	the user says)	
•	the user says		,	
)	
•	R	Racket replies	/	
(EXAMPLE	()	
•	the user says		,	
)	
•	R	Racket turns that into	/	
III. Definiti	on			
	ne definition, giving variable nan	nes to all your input val	ues.	
/ al a £ ! a _ /			`	
(define (_	function name	variable names)	
	runction name	variable names		
				`
	and the computer does this			/
	ana me compater aces tills			

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 !)

	t+Purpose Statement			
Every contract	has three parts:			
_				
	:		>	
name		Domain	Range	
•				
/	What	does the function do?		
	What	does the falletion do.		
II. Give Ex				
On the comput	er, write an example of yo	our function in action, using EXA	AMPLE.	
(EXAMPLE	(1	
(LAAIVII LL	Use the funct	ion here	/	
)	
	find a	nother way to get the same result her	re	
/EVANIDLE	<i>(</i>		,	
(EXAMPLE	Use the funct	ion here)	
	OSC THE PURIET	ion nere		
)	
•	find a	another way to get the same result her	re	
III D - 6' '4'				
III. Definiti		ole names to all your input value	20	
WillCi	ic definition, giving variab	ne names to an your input value	<i>U</i> 3.	
(define ()	
(define (_	function name	variable names	/	
	, and the manner	Tallable hamee		
				`
)
	and the computer do	oes 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.

name	Domain	Range
	What does the function do?	
II. Give Examples On the computer, write an	example of your function in action, using E	EXAMPLE.
(EXAMPLE (Use the function here)
	ose the function here	
)
	find another way to get the same result	here
(EXAMPLE (Use the function here)
	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 va	lues.
		`
function na	me variable names)

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.

			>
name		Domain	Range
· /		at does the function do?	
U. Chua Fuana			
II. Give Exam On the computer,	write an example of	your function in action, using Ελ	(AMPLE.
(EXAMPLE (١
(LXAIVIFLL (Use the fun	ction here)
)
	fino	another way to get the same result he	ere
/ //			
(EXAMPLE (Use the fun	ction here)
			,
	finc	d another way to get the same result he	
III. Definition			
	definition, giving varia	able names to all your input valu	ies.
(define (£)

.....and the computer does this

IV. Protecting Sam

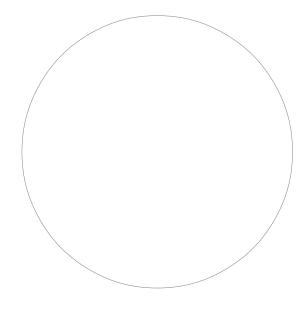
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

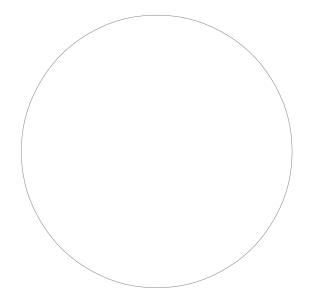
1. A piece of Sam is still visible on the left as long as...

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

	 Domain	Range
name	Domain	Range
	What does the function do?	
Give Examples		
n the computer, write an example	e of your function in action, using EXAN	IPLE.
EXAMPLE (e function here)
Use th	e function here	
	- <u>-</u>)
	find another way to get the same result here	
EXAMPLE ()
Use th	ne function here	/
)
	find another way to get the same result here	,
I. Definition		
Write the definition, giving	variable names to all your input values	
define ()

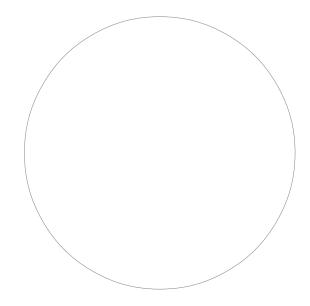
IV. Design Recipe

Word Problem: safe-right?

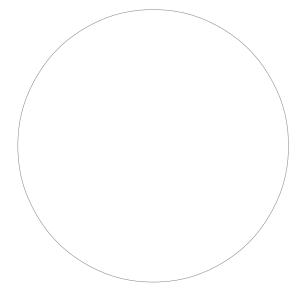
Use the Design Recipe to write a function <u>safe-right?</u>, which takes in an x-coordinate and checks to see if it is less than 690.

I. Contr	act+Purpose Statem	nent		
Every contract	t has three parts:			
•		_	_	
name	:	_ Domain	> Range	_
			·······g-	
		What does the function do?		
II. Give E	xamples			
On the comp	iter, write an examp	ole of your function in action, using EXAMP	LE.	
/EVAMDLE	(`	
(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	/	
	A!			
III. Defin i Write		g variable names to all your input values.		
Willo	the definition, givin	g variable names to an your input values.		
(define)	
`	function name	variable names		
)
				/
		and the computer does this		

Write the Circles of Evaluation for these statements, and then convert them to Pyret 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 an x-coordinate and checks to see if Sam is safe on the left \underline{and} safe on the right.

<i>'</i>	·		>	
name		Domain	Range	
		does the function do?		
II. Give Exar On the computer	mples r, write an example of y	our function in action, using E	XAMPLE.	
(FXAMPLE ()	
(L)((()() LL (_	Use the funct	tion here	/	
)	
	Tind a	another way to get the same result h	iere	
(EXAMPLE (_)	
	Use the funct	tion here		
			,	
	find a	another way to get the same result h) nere	
III. Definition		, 0		
		ole names to all your input va	lues.	
(define ()	
			/	

...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. Contra	act+Purpose Statement			
name	:	omain	> Range	
	xamples uter, write an example of your function	for each to	opping, using EXAMPLE.	
(EXAMPLE	(cost "pepperoni" 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?	_)
(EXAMPLE	Use the function here)	What should the function produce?	_)
III. Defini	tion			
(define (function name	variable nar	mes)	

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. Contr	act+Purpose Statement		
,name	:	 Domain	-> Range
II. Give E	Examples o examples we've started for you		·
(EXAMPLE	(update-player 128 Use the function here	<u>"up"</u>) _	What should the function produce?
(EXAMPLE	(update-player 451 Use the function here	<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. Defini	ition		
(define	function name	variable n	ames)
, –			

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.

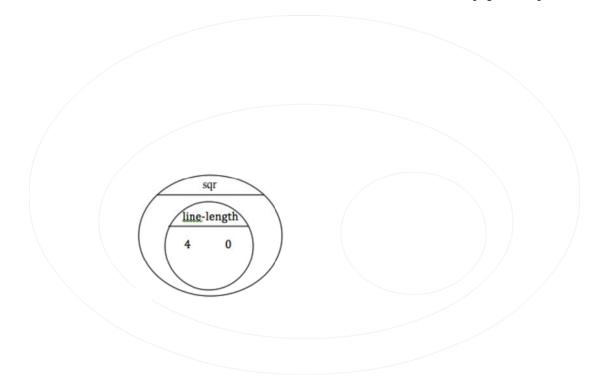
Every contract	act+Purpose State et has three parts:	ment					
name	:			Domain	>	Range	
II. Give E	Examples						
(EXAMPLE	(line-length Use the func	10 tion here	5)	(- 10 What should the fu	5) unction produce?	
	(line-length Use the func	2 tion here	8)	(- 8 What should the fo	2) unction produce?)
III. Defini Write	the definition, givi	ng variabl	le name	s to all your i	nput values.		
(define	function name			variable na	ames)		_

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 Pyret code:

Word Problem: distance

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

It should return the what you did on page. Contract+Purpose S		ance formula. (HINT: look at
name :	Domain	> Range
·	What does the function do?	
II. Give Examples (EXAMPLE (Use the function here)
	find another way to get the same result I	nere
(EXAMPLE (Use the function here)
	find another way to get the same result I	here
(define (me variable names)

DESIGN RECIPE

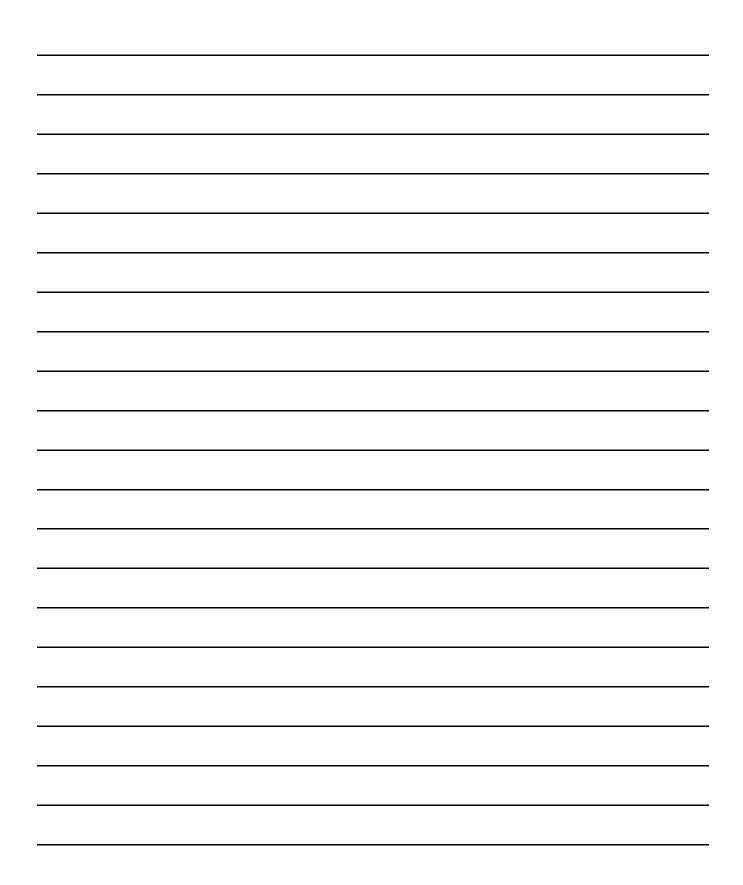
Word Problem: collide?

Write a function collide?, which takes FOUR inputs:

□ px: The x-coordinate of the player

It shou	e y-coordinate of another game character Id return true if the coordinates of the player are within 50 prinates of the other character. Otherwise, false.	pixels of the
I. Contra	act+Purpose Statement	
name		Range
	What does the function do?	
(EXAMPLE)
	find another way to get the same result here)
(EXAMPLE	Use the function here)
ll Dasini	find another way to get the same result here)
III. Defini (define (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 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	t 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
II. Give I Write some e	Examples xamples of red-shape below. The f	irst one has al	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)
(con	function name	variable na	ames
		(ci	ircle 50 "solid" "red")
\			

Translating into Algebra...

Values: Translate the F	Pyret Code into Algebra
Pyret 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	Racket Code into Algebra
<pre>(define (double x) (* x 2))</pre>	double(x) = x*2
(define (area length width) (* length width))	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 that the rocket has traveled, as a function of time t

I. Contract+Pu Every contract has	urpose Statem three parts:	ent		
; <u>D</u>	:_	 Domain	> Range	
II. Give Examp	les	Domain	Kange	
		n for <u>some sample inputs</u>		
<u>D(1)</u>	=			
Use the function here		What should the function produce?		
<u>D(2)</u> =				
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	rmula giving v	variable names to all your input valu	es.	
write the re	illiaia, givilig	variable hames to all your input valu		
D() =				

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 Examples		
rite an example of your fund	tion for <u>some sample inputs</u>	
=		
se the function here	What should the function produce?	
=	What about 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?	
se the function here	What should the function produce:	
I. Definition		

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
II. Give Examples		
Write an example of your fu	unction 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, o	giving variable names to all your input values.	
=		

Word Problem

Domain e inputs		Range	
e inputs			
e inputs			
function produce?			
function produce?			
function produce?			
function produce?			
	values		
f	function produce? function produce? function produce?	function produce?	function produce? function produce? function produce?