Contracts

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

Contracts

example																	
Range	1	1	1	1	^	↑	1	↑	^	↑	↑	↑	^	↑	^	1	^
Domain			<u></u>	•	•	•	<u></u>	:	•	•	:	:	•	•	:	•	<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	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):	
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	Pyret Code
5 x 10		
8 + (5 x 10)		
0 + (3 x 10)		
(8 + 2) - (5 x 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	Pyret Code
Round 1	(3 * 7) - (1 + 2)		
Round 2	3 - (1 + 2)		
Round 3	3 - (1 + (5 * 6))		
Round 4			

Fast Functions			
#		>	
name	domain	range	
examples:			
() is		
() is		
end			
Fun ():		end
			-
#	:	->	
name		range	
examples:			
() is		
(
end			
fun ():		end
#	:	->	
name	domain	range	
examples:			
() is		
(\ ia		
end			
fun ():		end
T 0111 \	/ •		_ = ===================================

Fast Functions			
#	:	>	
name	domain	range	_
examples:			
() is		
(, '		
end			
fun () •		end
(/ •		
#		->	
name		range	_
examples:			
() is		
(\ I		
end			
):		end
(/ •		
#	:	->	
name	domain	range	
examples:			
() is	·	
(\		
end ·	<i></i>		
fun ():		end
(/ •		

	•	•	-	
 · · · · · · · · · · · · · · · · · · ·	-	-	-	

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.

I. Contrac	t+Purpose Statement	
Every contract h		
•		
;	·	>
name	Domain	Range
•		
,	What does the function do?	
	What does the function do:	
II. Give Exc	amples	
On the compute	r, write an example of your function in action, using	EXAMPLE.
(EXAMPLE	()
•	the user types	,
_)
	which should become	,
(EXAMPLE	()
(11232 3111 1111	the user types	/
	71	
)
_	which should become	,
III Dogwikio		
III. Definitio	1 e definition, giving variable names to all your inpu	tvalues
vville ille	s definition, giving variable harnes to all your inpo	i values.
(define	()
	function name variable names	
)
-	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.

I. Contract	+Purpose Statement			
Every contract ha	as three parts:			
•	•		->	
Name	•	Domain	Range	
_				
;	Wh	at does the function do?		
		at does the function do:		
II. Give Exa		your function in action, using EX	(AMDI E	
on the computer,			AMPLL	
(EXAMPLE (_		ys)	
	the user say	/S		
)	
		Racket replies		
(EXAMPLE (_)	
	the user say	/S		
)	
		Racket turns that into		
III. Definition				
Write the	definition, giving var	iable names to all your input v	alues.	
(define (1	
(define (function name	variable names	/	
)
	and the computer	does this		<i>'</i>

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. Contra	ct+Purpose Statement		
	has three parts:		
•	·	->	
name			Range
;			
	What does the function	on do?	
	amples		
On the comput	er, write an example of your function i	n action, using EXAMPLE.	
(EXAMPLE	()	
`	Use the function here		
			1
	find another way to g	get the same result here)
			_
(EXAMPLE	(1	
(LXAMFLL	Use the function here	/	
	مريد مراجع المراجع المراجع	vat the same vanilt have)
	find another way to g	get the same result here	
III. Definiti			
Write th	ne definition, giving variable names t	o all your input values.	
(define (1	
(define (function name		
			1
	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.

I. Contra	ct+Purpose Statement			
Every contract	has three parts:			
•	•		->	
name	v	Domain	R	ange
•				
,	What does	the function do?		
u Chia Fa	amonlos			
	amples er, write an example of your fu	unction in action, usir	ng EXAMPLE.	
(EXAMPLE	Use the function he)	
	ose the function he			
-)
	find anothe	er way to get the same res	sult here	
(EXAMPLE	llas the forestion he)	
	Use the function he	ere		
-)
	find anothe	er way to get the same res	sult here	
III. Definitio				
Write th	e definition, giving variable	names to all your inp	out values.	
(define (_			`	
(define (_	function name	variable names		
				1
	and the computer does th	 nis		/

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 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	
Gue die fanction here	
find another way to get the same result here)
Tind another way to get the same result here	
(EXAMPLE ()	
Use the function here	
	1
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	
	,
and the computer does this)

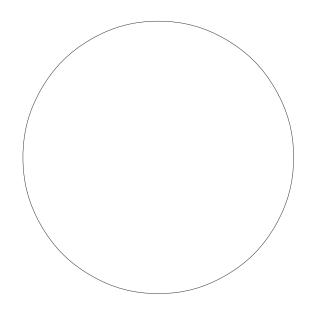
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

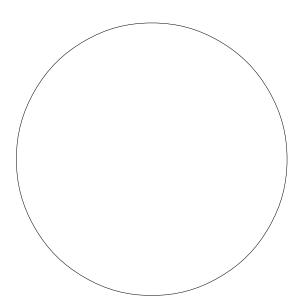
1. A piece of Sam is still visible on the left as long as...

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 does the function do?	
Give Examples	ın example of your function in action, us	ing EXAMPLE
·	,	
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
. Definition		
	n, giving variable names to all your input	values.
wille the deliminor		
define (1

...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.

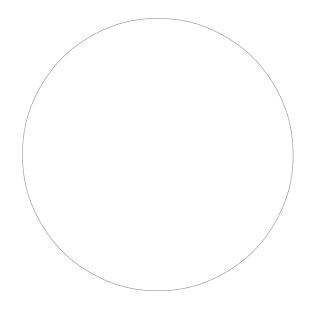
	ıct+Purpose Statement		
Every contract	has three parts:		
•	•	->	
name	•	 Range	-
name	Domain	Nullge	
·			_
•	What does the function do?		
II Give F	xamples		
	ter, write an example of your function in action, using EXAM	MPLE.	
(EVALABLE	-	,	
(EXAMPLE	Use the function here)	
	ose the function here		
)	
	find another way to get the same result here	,	
(EXAMPLE	()	
(Use the function here	/	
	find another way to get the same result here)	
	find another way to get the same result here		
III. Definit			
Write t	he definition, giving variable names to all your input val	ues.	
(4-6: (\	
(define (function name)	
	function name variable names		
)

...and the computer does this

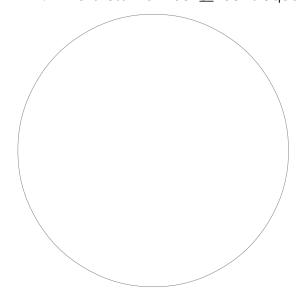
and / or

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 <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. Contro	act+Purpose Statement		
Every contract	t has three parts:		
•	•		
name	•	> Range	_
name	Domain	Range	
•			
,	What does the function do?		_
U Char F			
	xamples ter, write an example of your function in action, ι	using FXAMPI F	
on the compa			
(EXAMPLE)	
	Use the function here		
		•	
	find another way to get the same	result here	
	This unotice way to get the same	resuce here	
(EXAMPLE	()	
	Use the function here		
		,	
	find another way to get the same	result here	
III. Definit			
write t	he definition, giving variable names to all your	input values.	
(dofina (`	
(define (function name variable nam		
	runction name valiable flat	IIC3	
)

...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 Statem 	ent	
, •	Domain	> Range
II. Give Examples		
On the computer, write an exam	nple of your function for $\underline{\epsilon}$	each topping, using EXAMPLE.
(EXAMPLE (cost)
Use the function	on nere	What should the function produce?
(EXAMPLE (on here	What should the function produce?
(EXAMPLE ())
Use the function	on here	What should the function produce?
(EXAMPLE (on here	What should the function produce?
III. Definition		
(define ()
function name	variable	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.

Contro	act+Purpose Statement			
. Comic				
name	;		Domain	-> Range
	xamples o examples we've started t	for you,	and make tw	vo more
(EXAMPLE	(<u>update-player</u> Use the function here	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	ion			
(define	function name		variable na	mes)

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.

. Contr Every contract	act+Purpose Stater t has three parts:	nent					
name	:			omain	>	Range	
(EXAMPLE	(line-length Use the functi	10 on here	5)	<u>(-</u> 10 What should the fur)
(EXAMPLE	(line-length Use the function	2 on here	8)	<u>(-</u> 8 What should the fur	2) nction produce?)
write (define	the definition, givin)		
)							

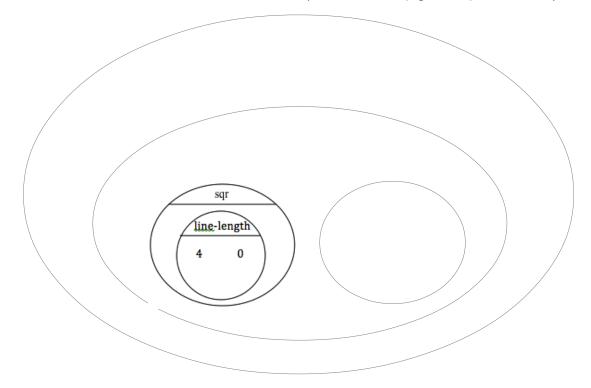
...and the computer does this

The Distance Formula (an example)

The distance between the points (0, 0) and (4, 3) is given by:

$$\sqrt{(line-length \ 4\ 0)^2 + (line-length \ 3\ 0)^2}$$

the formula above into a Circle of Evaluation. (We've already gotten you started!)



Convert the Circle of Evaluation into Pyret code:

Write a function	distance,	which	takes	FOUR	inputs:
------------------	-----------	-------	-------	------	---------

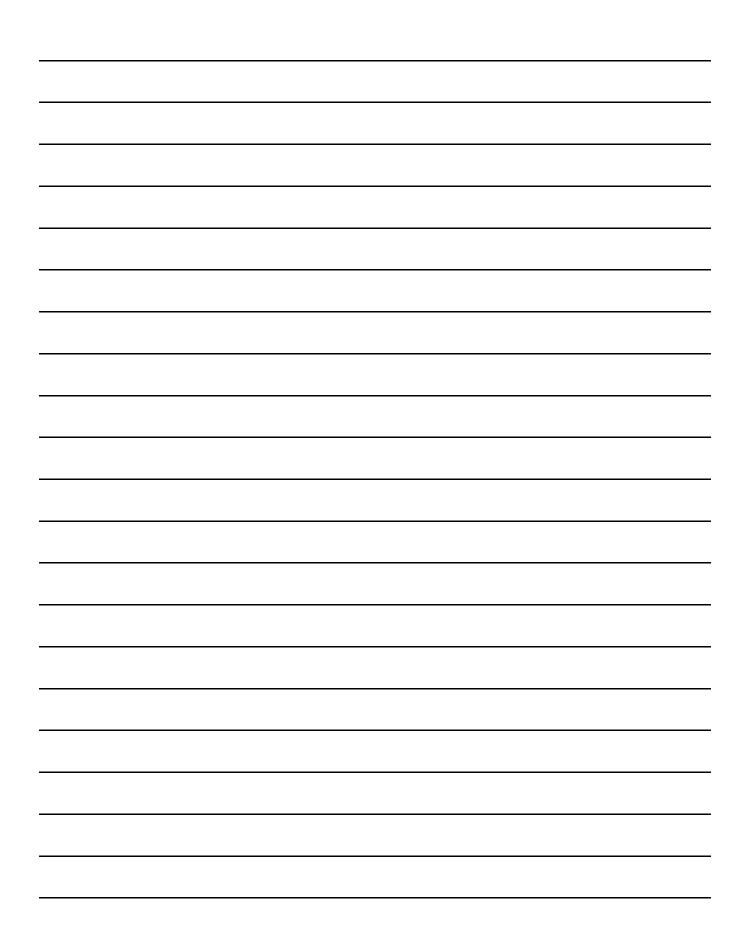
- □ px: The x-coordinate of the player
- py: The y-coordinate of the player
- □ cx: The x-coordinate of another game character
- cy: The y-coordinate of another game character

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

I. Contract+Purpo	se Statement			
;	•	Davida	>	
name •		Domain	Range	
,		oes the function do?		
II. Give Examples				
(EXAMPLE (Use the function	n here)	
	find and	other way to get the same res	sult here)
(EXAMPLE (Use the function	n here)	
	ose the function	in nere		
	find and	other way to get the same res	sult here)
III. Definition	Tina and	other way to get the same res	suit here	
			`	
	n name	variable names)	
)

□ px: The x-c □ py: The y-c □ cx: The x-c □ cy: The y-c It should re coordinate	nction collide?, which takes FOUR inputs: coordinate of the player coordinate of the player coordinate of another game character coordinate of another game character eturn true if the coordinates of the player are within 50 es of the other character. Otherwise, false. Purpose Statement	pixels of the	
i. Comider			
name	Domain	Range	
;	What does the function do?		
II. Give Exam	Use the function here)	
	find another way to get the same result here)	
(EXAMPLE (Use the function here)	
 III. Definition	find another way to get the same 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? No way! Definitely! 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!

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. Contract+Purpose Statement		
••	Domain	-> Range
• • • • • • • • • • • • • • • • • • •	nat does the function do	ś
II. Give Examples Write some examples of red-shape below	. The first one has alre	eady been done for you.
(EXAMPLE <u>(red-shape</u> "cir	<u>'cle")</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	:le 50 "solid" "red")

Translating into Algebra

Value Definitions

Pyret Code	Algebra
x = 10	x = 10
y = x * 2	y = x*2
z = x / y	
w = num-sqrt(num-sqr(x) + 1)	
days = (age * 12) * 30	
y = (v * x) + x0	
y = ((0.5 * a) * num-sqr(x)) + y0	

Function Definitions

Pyret Code	Algebra
<pre>fun area(length, width): length * width end</pre>	area(length, width) = length * width
<pre>fun circle-area(radius): pi * radius end</pre>	
<pre>fun distance(x1, y1, x2, y2): num-sqrt(num-sqr(x1 - x2) + num-sqr(y1 - y2)) end</pre>	

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.

#D:		->
name	Domain	Range
<i>T</i>	What does the function do?	
I. Give Examples Write an example of your	function for <u>some sample inputs</u>	
D(1) is		
Use the function here	What should the function produce?	
D(2)= is		
Jse the function here	What should the function produce?	
D() is		
Jse the function here	What should the function produce?	
is		
Jse the function here	What should the function produce?	
II. Definition		
Write the function, giving	variable names to all your input values.	
fun D():		en

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*.

I. Contract+Purpose Since Every contract has three po		
# :		->
	Domain	Range
π	What does the function do?	
II. Give Examples Write an example of your fu	unction for <u>some sample inputs</u>	
is	onenen j <u>eme sample in pele</u>	
Use the function here	What should the function produce?	
is		
Use the function here	What should the function produce?	
is		
Use the function here	What should the function produce?	
is		
Use the function here	What should the function produce?	
III. Definition		
write the function, giving vi	ariable names to all your input values.	
fun ():	end

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?

 Contract+Purpose 		
Every contract has three	e parts:	
#:		->
name	Domain	Range
#		
	What does the function do?	
II. Give Examples		
Write an example of you	ur function for some sample inputs	
is		
Use the function here	What should the function produce?	
	·	
is		
Use the function here	What should the function produce?	
is		
Use the function here	What should the function produce?	
ic		
Use the function here	What should the function produce?	
III. Definition	a variable names to all vour input values	
wille the function, giving	g variable names to all your input values.	
fun ()•	end
(J•	CIIG

Every contract has three	, paris.	
#:		>
name #	Domain	Range
	What does the function do?	
I. Give Examples		
	ur function for <u>some sample inputs</u>	
<u>is</u>		
Use the function here	What should the function produce?	
is		
Use the function here	What should the function produce?	
is		
Use the function here	What should the function produce?	
is		
Use the function here	What should the function produce?	
III. Definition	_	
	g variable names to all your input values.	
fun ():	end