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) ar	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)		
(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 Co		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	(1 + (5 * 6)) - 3		

Fast Functions			
#	<u>:</u>	>	
name	domain	range	
examples:			
() is		
() is		
end			
fun():		end
#	:	>	
name	domain	range	
examples:			
(_) is		
(_	\		
end			
fun():		end
#	<u>:</u>	>	
name	domain	range	
examples:			
() is		
(_) is		
end			
fun():		end

Fast Functions			
#	<u>:</u>	->	
name	domain	range	
examples:			
() is		
(\		
end			
fun():		_ end
#	;	>	_
name	domain	range	
examples:			
() is		
() is		
end			
fun():		end
#	:	>	_
name	domain	range	
examples:			
() is		
() is		
end			
fun():		end

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. Contract+Pu	urpose Statement	
Every contract has t		
·	_:>	
name	Domain	Range
·		
	What does the function do?	
. 0: -		
II. Give Examp	ICS	
On the computer, w	rite an example of your function in action, using EXAMPLE.	
(EXAMPLE ()
·	the user types	<u> </u>
)
	which should become	/
(EXAMPLE (_)
	the user types	
)
	which should become	,
D. C. 11		
III. Definition	finition of vine verice leading to all very input velves	
write the de	efinition, giving variable names to all your input values.	
(define ()
	nction name variable names	
Tui	randott 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.

. Contract+Purpose Every contract has three pa		
•		->
Name	Domain	Range
		_
	What does the function do?	
	What does the function do.	
I. Give Examples On the computer, write an	example of your function in action, using E	ΧΔΜΡΙ Ε
EXAMPLE (the user says)
	the user says	
	D. I !!)
	Racket replies	
TVAMDLE (,
EXAMPLE (the user says)
	Racket turns that into)
	Nacket turns that into	
II. Definition	, giving variable names to all your input	values
wille the deliminor	, giving variable names to all your input	values.
(define ()
function na	me 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!)

I. Contrac	t+Purpose Statement	
Every contract h		
•	•	->
name	•	
name	Joina.ii	
• •		
	What does the function do?	
II. Give Ex	amples	
	r, write an example of your function in action, us	ing EXAMPLE.
/EV/AMBLE /		,
(EXAMPLE (Use the function here)
	ose the function here	
)
_	find another way to get the same re	esult here
(EXAMPLE ()
(EXOTITE (Use the function here	<i>)</i>
_)
	find another way to get the same re	esult here
III. Definitio	n	
Write the	e definition, giving variable names to all your ir	nput values.
(al		,
(define (_	·)
	function name variable name	S
)
	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. Contract+Purp	ose Statement			
Every contract has thre	e parts:			
•	•		->	
name	. •	Domain	 Ra	ange
•				
,	What o	does the function do?		
II. Give Examples On the computer, write	e an example of vo	our function in action, using	ø FXAMPI F.	
(EXAMPLE (Use the function	ion horo)	
	ose the function	on here		
)
	find ar	nother way to get the same resul	lt here	
(EXAMPLE (Use the function)	
	Ose the function	on nere		
)
	find ar	nother way to get the same resul	lt here	
III. Definition				
Write the defin	ition, giving varial	ble names to all your inpu	ut values.	
(define ()	
	on name	variable names	/	
)
	and the computer do	bes 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.

I. Contrac	ct+Purpose Stateme	ent		
	has three parts:			
•	•		->	
name		Domain	Range	
•				
,		What does the function do?		
II. Give Ex	amples	of according to action to a FVA	WDI F	
		of your function in action, using EXA		
(EXAMPLE	Use the	e function here)	
	Ose the	Tuneton here		
-		find another was to get the come was the)	
		find another way to get the same result here		
(EXAMPLE	1)	
	Use the	e function here	/	
			,	
-		find another way to get the same result here	<i></i>	
III. Definitio	- n			
		variable names to all your input vo	alues.	
		,		
(define (_)	
	function name	variable names		
				`
	and the comp	uter does this)
	and the comp	מנכו מטכז נוווז		

DESIGN RECIPE

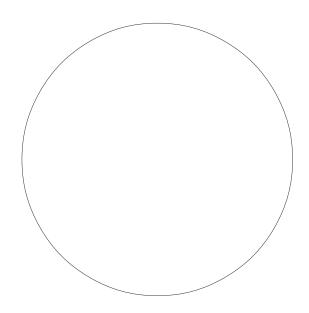
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

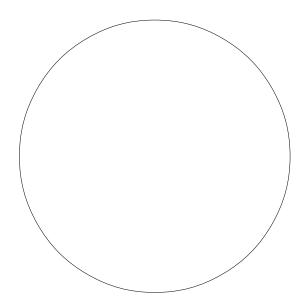
1. A piece of Sam is still visible on the left as long as...

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	are evenerale of vol	ur function in pation	Sin or EVALABLE
n the computer, write			
EXAMPLE (Use the function he	ere)
	ose the ranction he		
			,
	find anothe	er way to get the same result) here
EXAMPLE ()
	Use the function he	re	
)
	find anothe	er way to get the same result	nere
			harala a
	n aivina variabla	names to all valur input	
	n, giving variable ı	names to all your input	values.
Write the definitio	n, giving variable ı	names to all your input)

...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.

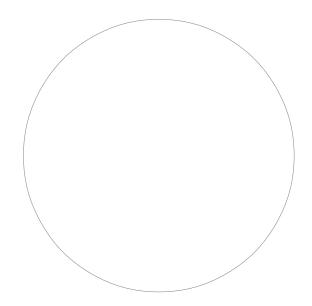
	•		>
name		Domain	Range
		does the function do?	
. Give Example	s		
•		our function in action, using EX	
EXAMPLE ()
	Use the funct	ion here	
)
	find a	another way to get the same result he	ere ,
EXAMPLE (Use the funct	ion hara)
	Ose the funct	ion nere	
)
	find a	another way to get the same result he	ere
II. Definition			
	nition, giving varic	able names to all your input v	ralues.
Write the defir	nition, giving vario		alues.

...and the computer does this

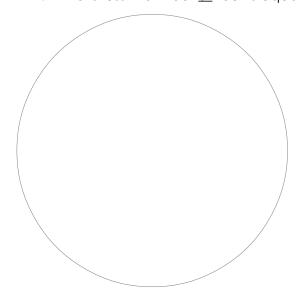
and / or

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. Contra	ct+Purpose Statemen	t		
Every contract	has three parts:			
•	·		->	
name		Domain	Range	
•				
,		What does the function do?		
	xamples ter, write an example o	of your function in action, using EXAM	APLF.	
•	•	, -		
(EXAMPLE	(unction here)	
	OSC CHC II	unction riere		
)	
	T1	ind another way to get the same result here		
/EVAMBLE	1		1	
(EXAMPLE	Use the f	unction here)	
			,	
		ind another way to get the same result here)	
		and another way to get the same result here		
III. Definiti Write t		ariable names to all your input valu	les	
***************************************			JO3.	
(define ()	
,	function name	variable names		
)

...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	ent	
•name	Domain	-> Range
I. Give Examples		
On the computer, write an exam	ple of your function for <u>eact</u>	h topping, using EXAMPLE.
(EXAMPLE (<u>cost</u>	(pepperoni''))
Use the function		What should the function produce?
(EXAMPLE ()	What should the function produce?
use the function	n nere	what should the function produce?
(EXAMPLE (What should the function produce?
ese me ionener	111010	That should the terrement produce.
(EXAMPLE ())	What should the function produce?
II Definition		
II. Definition		
(define ()
function name	variable nam	es /

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. Contra	ct+Purpose Statement			
	·			->
name			Domain	Range
	camples examples we've started	for you,	and make tv	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	451	<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. Definition	on			
(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.

name	amples			Domain	>	Range	
name	amples			Domain	>	Range	
II. Give Ex						50	
(EXAMPLE <u>(</u>	line-length Use the functi	10 on here	<u>5</u>)	(- 10 What should the fur	5) nction produce?)
(EXAMPLE <u>(</u>	line-length Use the functi	2 on here	8)	(- 8 What should the fur	2) nction produce?)
II. Definition	on e definition, givin	a variat	ole nam	nes to all vou	rinnut values		
	_				•		
(define (_	function name			variable na	mes)		
)							

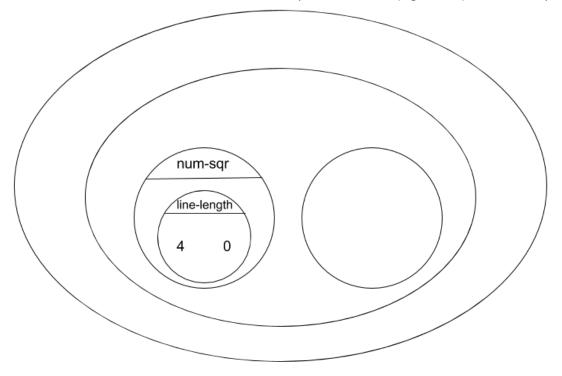
...and the computer does this

The Distance Formula (an example)

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

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

Turn 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:
----------------------------	--------------------------

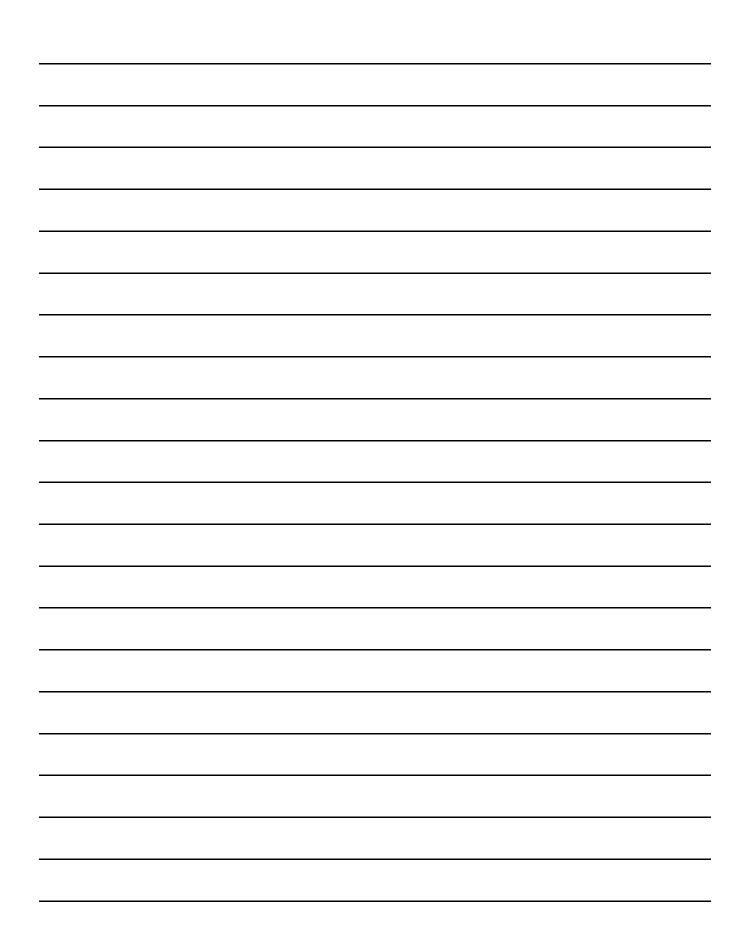
- f px: The x-coordinate of the player
- py: The y-coordinate of the player
- □ cx: The x-coordinate of another game character
- cy: The y-coordinate of another game character

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

I. Contract+Purpe				
name	•	Domain	> Range	_
•				_
•		oes the function do?		
II. Give Examples				
(EXAMPLE (Use the functio	n here)	
)
	find an	other way to get the same resul	lt here	/
(EXAMPLE (,	
(LXXIII LL (Use the functio	n here	,	
				,
	find an	other way to get the same resul	lt here	/
III. Definition				
(define ()	
function	on name	variable names		
				1

□ px: Th □ py: Th □ cx: Th □ cy: Th lt shou	e x-coordinate of the se y-coordinate of the e x-coordinate of anothe y-coordinate of anothe sturn true if the inates of the other ch	player ther game character ther game character coordinates of the player are within 50 aracter. Otherwise, false.) pixels of the	
i. Conii	act+Purpose Stateme	e ni		
name	: :	Domain	->Range	-
;		What does the function do?		-
II. Give I (EXAMPLE	(Use the	e function here)	
		find another way to get the same result here)	
(EXAMPLE	(Use the	e function here)	
		find another way to get the same result here)	
III. Defini	lion			
(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 fits best.

Definitely! Was the introduction catchy? No way! A little. 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!

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	:	
;:		>
name •	Domain	Range
,	What does the function do)
II. Give Examples Write some examples of red-shape belonger	low. The first one has a	lready been done for you.
(EXAMPLE <u>(red-shape</u> "Use the function he		(circle 50 "solid" "red") What should the function produce?
(EXAMPLE (re)	What should the function produce?
(EXAMPLE (re)	What should the function produce?
(EXAMPLE ()	What should the function produce?
III. Definition		
(define (variable r)
(cond	variable i	iames
	(cir	cle 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.

<u></u> • _		>
name	Domain	Range
	What does the function do?	
Give Examples		
in example of your t	function for <u>some sample inputs</u>	
D(1) is		
function here	What should the function produce?	
D(2) = is		
function here	What should the function produce?	
D() is		
function here	What should the function produce?	
is		
function here	What should the function produce?	
Definition		

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 S	tatement	
Every contract has three p		
#:		->
	Domain	Range
<i>"</i>	What does the function do?	
II. Give Examples		
Write an example of your f	unction for <u>some sample inputs</u>	
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?	
is		
Use the function here	What should the function produce?	
III. Definition		
Write the function, giving v	variable 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+Put 	ırpose Staten	nent			
Every contract has	three parts:				
#	:		->		
name		Domain		Range	
#					
		What does the function do?			
II. Give Examp	les				
		on for <u>some sample inputs</u>			
	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?			
	is				
Use the function here		What should the function produce?			
III. Definition					
Write the function,	giving variab	ole names to all your input values.			
£ /	\.				اء مرم
fun ():				ena

I. Contract+Pur	pose Stater	ment		
Every contract has t	three parts:			
#	:		->	
name #		Domain	Range	
		What does the function do?		
II. Give Exampl	es			
		ion for <u>some sample inputs</u>		
	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?		
	is			
Use the function here		What should the function produce?		
III. Definition				
Write the function, g	giving variak	ole names to all your input values.		
fun	()•	4	-nd