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)		
5 x 10 8 - 2		
0 - 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	(1 + (5 * 6)) - 3		

Fast Functions					
:			>		
name		domain			
examples:					
()	is			
()	is			
end	,				
	١.				end
fun(_)·				enu
			->		
name	··		>	_	
examples:		domani		range	
(,	ie			
()	is			
end					
fun():				end
	· ·		>		
name		domain		range	
examples:					
()	is			
(
end	,				
	١.				and
fun():				end

Fast Functions				
::		->		
_	dom		range	
examples:				
() is			
(•			
end				
				o no d
fun():				end
		->		
name	dor	main	range	
examples:				
() is	S		
() is	S		
end				
fun()	<u>.</u>			end
()				_ 0.1.6.
::		->		
name	dor	——————————————————————————————————————	range	
examples:			J	
() is	.		
() 18			
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.

	Domain	->
name	Domain	Range
	What does the function do?	
Give Examples	example of your function in action, t	ising EVAMDLE
the computer, write an e	example of your function in action, t	ISING EXAMPLE.
EVAMDIE /		1
th	he user types	/
	•	
IIMIISED	- See pageswhich should become	s/rocket.
ONOSLD	- Jee pages	3/104Ket
haiaht sa	which should become	
neightis	CIDI	
EXAMPLE ()
th	he user types	<i>)</i>
	which should become)
	which should become	
	diving variable names to all your ind	out values.
. Definition Write the definition, g	,g	
Write the definition, g	,g	,
)

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
ivame	Domain	Range
;	What does the function do?	
II. Give Examples	What ages the fullction ag.	
On the computer, write an ex	cample of your function in action,	using EXAMPLE
(EXAMPLE(e user says)
UNUSED	- See page crblRacket replies	s/red-
	Racket replies	<u></u>
<u>square.s</u>	Crol	
(EXAMPLE(e user says)
uie	e user says	
		١
	Racket turns that into	/
III. Definition		
	ving variable names to all your ir	•
(define (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 !)

Contract Burnese Stat	romont	
I. Contract+Purpose Stat Every contract has three parts:	ement	
Every contract has three parts.		
		_
;;	·	·>
name	Domain	Range
_		
· ·		
	What does the function do?	
II Givo Evamples		
II. Give Examples On the computer, write an exam	unle of your function in action in	sing EXAMPLE
On the computer, write an exam	iple of your full clott in action, u.	Sing EXAMILE.
(EXAMPLE(1
(LAAMIF LL (e function here	/
OSC LIN	e runction here	
		,
		<u> </u>
	find another way to get the same resu	It here
		_
UNUSED - (EXAMPLE) area.scrb	Saa nadag	://awn_
ONOSLD -	see pages) iavii-
(EXAMPLE()
area.scro	e function here	
)
	find another way to get the same resu	It here
III. Definition		the values
write the definition, giving	g variable names to all your inpu	it values.
/		`
(define (_)
function name	variable names	
		\
		
and the com	puter does this	

DESIGN RECIPE

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+Purpose S		
Every contract has three part	ts:	
;::		->
name	Domain	Range
;		
	What does the function do?	
II. Give Examples		' EVANDLE
On the computer, write an ex	kample of your function in action, u	ISING EXAMPLE.
(EXAMPLE()
Use	e the function here	/
UNUSED -	find another way to get the same results	/undate-
OHO <u>SEB</u>	find another way to get the same resu	ult here
danger sc	rh - ´ ˙	
aangense		
/EVAMDLE/		\
(EXAMPLE (e the function here)
	End another was to set the same)
	find another way to get the same resu	lit nere
III. Definition		
Write the definition, give	ving variable names to all your inp	ut values.
(define ()
function name	variable names	/
)
and the	computer does this	

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.

Every contract has three parts:		
;::		>
name	Domain	Range
,	What does the function do?	
II. Give Examples		
On the computer, write an exan	nple of your function in action, us	ing EXAMPLE.
/EVAMDLE/		1
Use th	ne function here)
		1
	find another way to get the same result	t here
(EXAMPLE)		1
(EXAMPLE (ne function here	<i>'</i>
HAULCED		/adata
ONOSED -	See pages	/upgate-
taract cor	nother way to get the same result) t here
target.scr	DI '	
III. Definition Write the definition, givin	g variable names to all your inpu	t values.
_	• • •	
(define ()
function name	variable names	
		,
and the con	nputer does this)
and the con	riputer does triis	

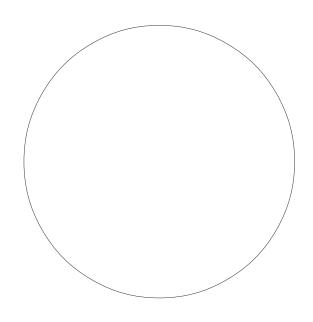
Sam is in a 640×480 yard. How far he can go to the left and right before he's out of sight?

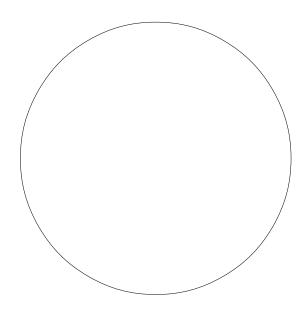
1. A piece of Sam is still visible on the left as long as...

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.

What does the function do? Give Examples In the computer, write an example of your function in action, using EXAMPLE. EXAMPLE(::		>
Give Examples In the computer, write an example of your function in action, using EXAMPLE. EXAMPLE(name	Domain	Range
n the computer, write an example of your function in action, using EXAMPLE. EXAMPLE(W() 1 1 5 1 1 2	
In the computer, write an example of your function in action, using EXAMPLE. SAMPLE(what does the function do?	
Use the function here The same result here	I. Give Examples On the computer, write an e	xample of your function in action	on, using EXAMPLE.
UNUSED – See pages/safe- find another way to get the same result here EXAMPLE(EXAMPLE()
Definition	U	se the function 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 ()	HMHICED	Soo nad	oc/cofo-
Use the function here The same result here	ONOSED	find another way to get the same	e result here
find another way to get the same result here Definition	left.scrb	inia another way to get the same	- Tesait Here
Ose the function here)	EVAMDLE/		1
II. Definition Write the definition, giving variable names to all your input values. (define ()		se the function here	/
II. Definition 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 ()		find another way to get the same	e result here
(define ()		iving variable names to all you	r innut values
	_	iving variable names to an you	
)

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.

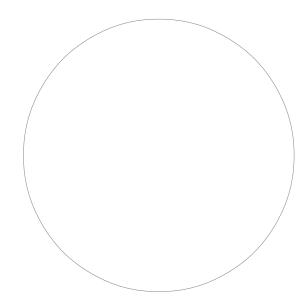
::		>
name	Domain	Range
	What does the function do?	
Circ Francisco	what does the function do:	
 Give Examples n the computer, write an ex 	ample of your function in actior	n, using EXAMPLE.
EXAMPLE()
Use	the function here	,
UNUSED -	See page	s/safe-
	find another way to get the same	j j
<u>ignerser a</u>		
EXAMPLE(1
Use	the function here	/
)
	find another way to get the same	result here
I. Definition Write the definition, given	ving variable names to all your	input values.
define ()

...and the computer does this

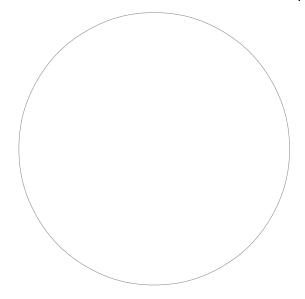
and / or

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 onscreen?, which takes in an x-coordinate and checks to see if Sam is safe on the left and safe on the right.

::		->
name	Domain	Range
	What does the function do?	
I. Give Examples	ample of your function in action, ι	ıcina EYAMDI E
·		ISING EXAMPLE.
EXAMPLE (e the function here)
USE	e the function here	
UNUSED	- See find another way to get the same rest SCREEN.SCR	\
·	find another way to get the same res	<i>)</i> ult <u>h</u> ere
pages/on	screen.scr k)
EXAMPLE ()
Use	e the function here	
)
	find another way to get the same res	ult here
II. Definition Write the definition gives	ving variable names to all your inp	ut values
_	onig variable names to an your mp	ac values.
(define ()
function name	variable names	

DESIGN RECIPE

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. Contract+Purpose Sta	tement	
		->
name •	Domain	Range
II. Give Examples		and tourism with a EVAMBLE
On the computer, write an exar	npie of your function for $\underline{\epsilon}$	each topping, using EXAMPLE.
(EXAMPLE (cost Use the function	<u>"pepperoni"</u>) <u> </u> on here	What should the function produce?
(EXAMPLE (on here) What should the function produce?
(EXAMPLE (on here) What should the function produce?
(EXAMPLE (on here) What should the function produce?
III. Definition		
(define (variable na	ames)
UNUSED pages/ce	- See ost.scrbl	
<u> </u>		
)		

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.

. Contract+Pu	rpose Statemei	nt		
name			Domain	> Range
	NG.		Domain	Kange
I. Give Example inish the two examp		d for you	ı, and make	two more
(EXAMPLE (<u>updat</u>	e-player	128	<u>"up"</u>)	
Us	se the function here			What should the function produce?
(EXAMPLE (<u>updat</u>	e-player	451	"down")	
Us	se the function here			What should the function produce?
(EXAMPLE(se the function here)	What should the function produce?
(EXAMPLE (se the function here)) What should the function produce?
III. Definition				
(define (on name		variable na	mes)
UNUS	SED -	Se	e pa	ages/update
<u>_</u>	er.scrl	_		
playe	31.3C1 k			
<u> </u>				

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.

I. Contract+Purpose Statement	t		
Every contract has three parts:			
: :			->
name	Dom	ain	Range
II. Give Examples			
(EXAMPLE (line-length 10 5)) Use the function here	5		(- 10 What should the function produce?
(EXAMPLE (line-length 2 2)) Use the function here	8		(- 8 What should the function produce?
Write the definition, giving varia	ble names	to all you	r input values.
(define (V	ariable nam	e s
UNUSED - Solength.scrbl	_	ag	es/line-
)			

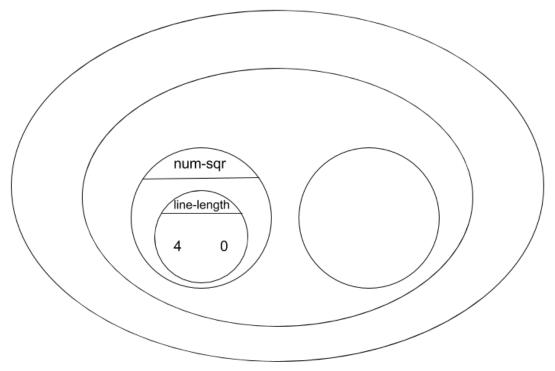
...and the computer does this

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!)

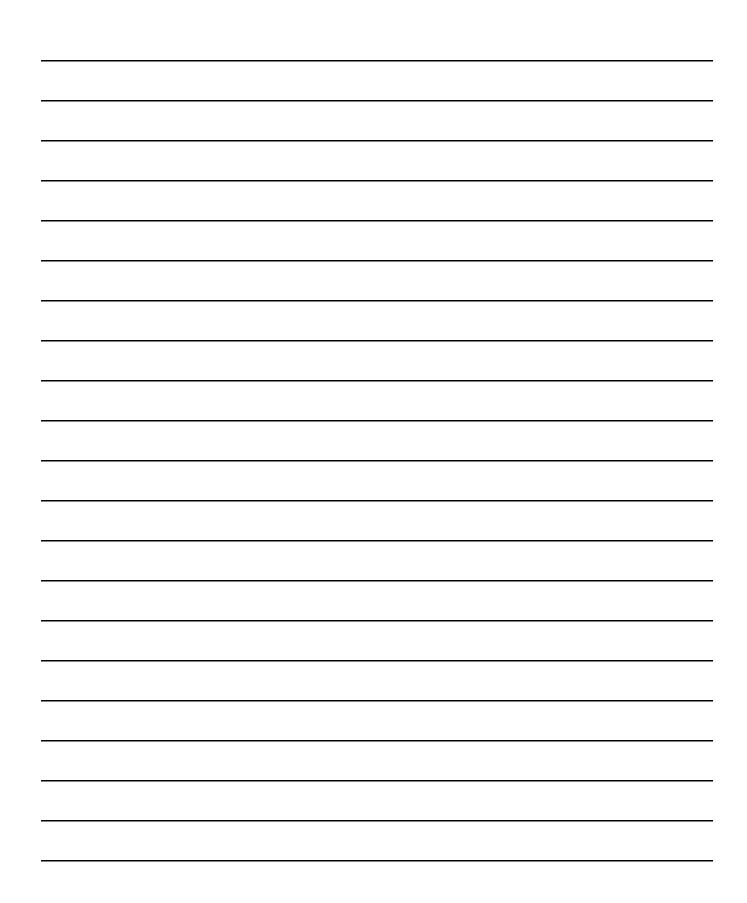


Convert the Circle of Evaluation into Pyret code:

	of the player	
It should return the distance what you did on page 27!)	e between the two, using the Distance f	ormula. (HINT: look at
I. Contract+Purpose	Statement	
; :		Range
;	What does the function do?	
II. Give Examples		
(EXAMPLE(Use the function here	_)
UNUSED	find another way to get the same result he) ere
pages/di	Use the function here	_)
	find another way to get the same result he) ere
III. Definition		
(define (e variable names	_)

 px: The x-coordinate of py: The y-coordinate of cx: The x-coordinate of cy: The y-coordinate of lt should return true if t 	the player another game character	:hin 50 pixels of the
I. Contract+Purpose St	atement	
	->	>
name •		Range
1	What does the function do?	
II. Give Examples		
/EVAMDLE/		
(EXAMPLE (the function here	
UNUSED -	Soo	
ONOSED -	- 366)
pages/co	find the result l	nere ,
 		
/EVANDLE/		•
(EXAMPLE (the function here)
)
	find another way to get the same result l	nere ,
III. Definition		
(define (1
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! 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 fits best.

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

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Did they make eye contact? No way! A little. Definitely!

Word Problem: red-shape

Directions: Write a function called "red-shape", which takes in the name of a shape and draws that shape (solid and red). Add an otherwise clause that produces a sensible output.

Every contract has thre	ee parts				
	::				->
function name				do	omain range
#					
				what o	does the function do?
Examples					
Write some examples,	then circ	le and label what c	hange	es	
examples:					
red-shape	("circle")	is	circle(50, "solid", "red")
function name		input(s)			what the function produces
	()	is	
function name		input(s)			what the function produces
	()	is	
function name		input(s)			what the function produces
)	is	
function name		input(s)			what the function produces
	()	is	
function name		input(s)			what the function produces
end					
Definition					
Write the definition, giv	en variab	ole names to all you	ur inpu	ıt value] ⊋S
fun		():	
function name		variables			
if				_ :	circle(50, "solid", "red")
else if					:
else if					:
else if					·
else:				=	
end					

end

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
fun area(length, width): length * width end	area(length, width) = length * width
<pre>pi = 3.1415926 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 $\underline{\textbf{distance}}\ D$ that the rocket has traveled, as a function of $\underline{\textbf{time}}\ t$.

١.							atement			
Every	contr	act	has	thre	е ра	rts:				
	D			:				->		
	name						Domain		Range	
#										
							What does the function do?			•
П.	Give	ΕX	ami	ples						
					ur fu	nct	ion for <u>some sample inputs</u>			
	_ ,	_								
	_D (<u>1 </u>)	<u>is</u>						
Use th	e functi	ion I	nere				What should the function produce?			
	D (2)	is						
Use th	e functi		nere	<u> </u>			What should the function produce?			
-							·			
	<u>D (</u>)	<u>is</u>						
Use th	e functi	ion l	nere				What should the function produce?			
				is_						
Use th	e functi	ion l	nere	<u> 15</u>			What should the function produce?			
							Timat Should the fulletion producer			
Ш.	Defi									
Write	the fu	ınc	tion,	givir	ng va	aria	ble names to all your input value	es.		
_	D /	,				`				
Iur.	D()	:			
end	l									

A rocket is traveling from Earth to Mars at 80 miles per second. Write a function that describes the <u>time</u> the rocket has been traveling, as a function of <u>distance</u>.

	•	->	
name		Domain	Range
#		What does the function do?	
II. Give Ex	amples		
	ple of your fo	unction for <u>some sample inputs</u>	
	is		
Use the function h		What should the function produce?	
	is		
Use the function h		What should the function produce?	
	is		
Use the function h		What should the function produce?	
	is		
Use the function h		What should the function produce?	
	on		
III. Definiti		ariable names to all your input values.	
	ion, giving v	anable names to an your input values.	
	ion, giving v () :	

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?

I. Contract+Purp	ose Statement	
Every contract has thr	ee parts:	
_		
:	<u> </u>	>
name	Domain	Range
#		
	What does the function do?	_
II. Give Examples		
	ur function 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?	
ose the function here	What should the fulletion produce.	
III. Definition		
Write the function, giv	ng variable names to all your input value	S.
C /	,	
fun ():	
end		

Every contract has three parts::name	Domain	-> Range
::	Domain	
· •	Domain	
name	Bomain	range
#		
	What does the function do?	
II. Give Examples		
Write an example of your function	n for <u>some sample inputs</u>	
±		
is_ Use the function here \	What should the function produce?	
ose the ranction here	white should the fulletion produce.	
is		
Use the function here	What should the function produce?	
is		
	What should the function produce?	
<u>is</u>		
Use the function here	What should the function produce?	
III. Definition		
Write the function, giving variable	e names to all your input valu	ues.
fun ():	
end		