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		range	
examples:					
()	is			
		io			
end	/				
					-
fun():					end
		d i	>		
name		domain		range	
examples:					
()	is			
()				
end					
fun ():	:				end
::			->		
name		domain		range	
examples:					
_ ()	is			
	′	is			
	/	T2			
end					
fun ():	:				end

Fast Functions				
::		->		
name		domain ——	range	
examples:				
()	is		
	_)	<u> </u>		
end	_′			
fun():				end
:		->		
name		domain	range	
examples:				
()	is		
()	is		
end				
fun ():				end
				-
::		->		
name		domain	range	
examples:				
- (١	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+Purpose Sta	atement	
Every contract has three parts:		
		_
;::		>
name	Domain	Range
•		
,	What does the function do?	
II. Give Examples	lo of voir function in action voice [TVAMDI E
on the computer, write an example	le of your function in action, using E	EXAMPLE.
(EXAMPLE ()
the u	iser types	·
HMHICED -	- See page	s/rocket-
ONOSED -	- See page	S/IUCKEL-
height.sc	which should become	
neignt.sc	roi	
(EXAMPLE ()
the u	iser types	
)
	which should become	
III. Definition		
Write the definition, givi	ing variable names to all your in	put values.
(define (1
function name	variable names	/
ranction name	variable names	
		1
	pout or doce this)
and the con	nputer 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.

		>
Name	Domain	Range
	What does the function do?	
Give Examples the computer, write an e	example of your function in action,	using EXAMPLE
•	,	J
XAMPLE (the user says)
IINIIICEI	Soo noe	voc/rod
ONUSEL	7 - See pag	<u>jes/reu-</u>
square.	ScrblRacket replies	
EXAMPLE (the user says)
(the user says	,
	Racket turns that int)
Definition	Nacket turns that int	
DefinitionWrite the definition	n, giving variable names to all y	our input values.
define ()

Word Problem: yard-area Use the Design Recipe to write a function $\underline{ward-area}$, which takes in the width and length of a yard, and returns the area of the yard.

(Don't forget: area = length * width !)

	•		->
name	. •	Domain	Range
	What do	oes the function do?	
Give Exampl	es		
the computer, write	an example of your	r function in action, using EXA	MPLE.
XAMPLE ()
/	Use the function	n here	
			,
	find and	other way to get the same result her	/ е
UNUSI	ED - So	ee pages	/lawn-
XAMPLE ()
area.s	C restre function	n here	
			`
	find and	other way to get the same result her	<i>)</i>
		other way to get the same result her	

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 Statem	ent		
Every contract has	three parts:			
•	•		->	
name	•	Domain	Range	
;				
	Wha	t does the function do?		
II. Give Exan				
On the computer, w	rite an example of y	our function in action, using	EXAMPLE.	
(EXAMPLE ()	
(2700711 22 (Use the func	tion here	<i>)</i>	
PINILE	FD - S	ee pages another way to get the same resul	s/undate	
01403	find	another way to get the same resul	5/upugice	
danas	recrh	another way to get the same result	t nere	
uange				
(EXAMPLE ()	
	Use the func	tion nere		
)	
	find	another way to get the same resul	t here	
III. Definition				
Write the d		riable names to all your i	nput values.	
(1 6 • (
(define ()	
fu	ınction name	variable names		
				_)
	and the computer of	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.

l. Contract	+Purpose Statem	nent	
Every contract has	three parts:		
•	•		->
name		Domain	Range
•			
,	Wha	at does the function do?	
U Civo Eva	malos		
II. Give Exa On the computer,		our function in action, using EXAMF	PLE.
•		•	
(EXAMPLE (Use the fund	ction here)
	ose the fund	ction here	
)
	find	another way to get the same result here	
(EXAMPLE (llee the fun	stion have)
	Use the fund		
UNUS	SED - S	See pages/	update-
	_	_)
targe	et.scrb	nother way to get the same result here	
III. Definitio	n		
Write the	definition, giving va	ariable names to all your input v	'alues.
(define ()
•	function name	variable names	/
)
-	and the computer	does this	/

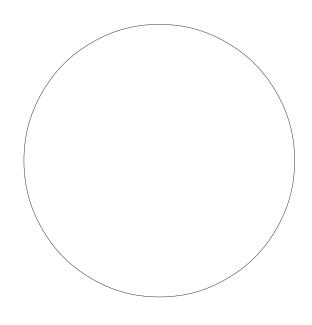
Sam is in a 640×480 yard. How far he can go to the left and right before he's out of sight?

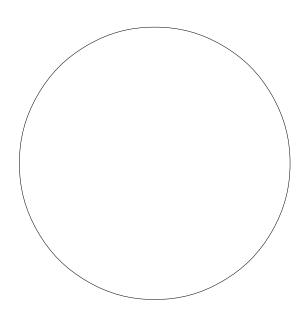
1. A piece of Sam is still visible on the left as long as...

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.

I. Contract+Purpose State	ement	
Every contract has three parts:		
•		->
, •	Domain	-> Range
Harric	Domain	Nange
•		
,	What does the function do?	
II. Give Examples		
On the computer, write an examp	ple of your function in action, usi	ng EXAMPLE.
		,
(EXAMPLE (function here)
ose the i	runction here	
HALLICED		1 C-
UNUSED -	See pages	/sate-
f	find another way to get the same result here	,
left.scrbl		
(EXAMPLE ()
Use the f	function here	
)
•	find another way to get the same result here	1
III. Definition		
Write the definition, giving	variable names to all your input	values.
(define (1
function name	variable names)
ranction name	variable fames	
		,
)
	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.

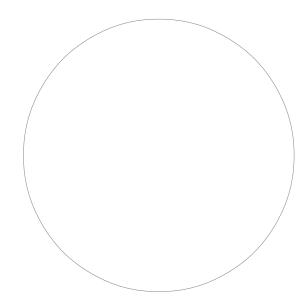
I. Contract+	Purpose Sta	tement		
Every contract has	three parts:			
•	•		>	
name	•	Domain		
				5
;				
		What does the function do?		
II. Give Exan				
On the computer, w	rite an example	of your function in action,	using EXAMPLE.	
(EXAMPLE ()	
(270-0711 EE (Use the	e function here	<i></i>	
	EB	C		_
UNUS	ED -	See pag	es/sate	2-
				_)
rignt.	<u>SCrDI</u>	find another way to get the same	e result here	
(E)(A)(B) E (,	
(EXAMPLE (Use the	e function here)	
	OSC CINC	Tanetion nere		
				_)
		find another way to get the same	e result here	
III. Definition				
Write the d	lefinition, givin	g variable names to all y	our input values.	
(define (1	
•	ınction name	variable na	<i>)</i> mes	
				1
				/

...and the computer does this

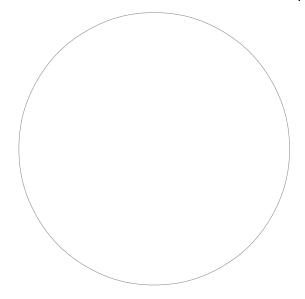
and / or

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.

I. Contract+Pu	rpose Statement			
Every contract has thre				
;	•		->	
name		Domain	Range	_
•				
,	What doe	s the function do?		_
II. Civo Evernolo	_			
II. Give Example On the computer, write		function in action, using	EXAMPLE.	
•	•	_		
(EXAMPLE (Use the function	here)	
	ose the function i	nere		
HMHC	ID _ Sa	20		
014021	find anot	her way to get the same result	hara	
nades	ONSCR	A A A S C C	niere.	
pages	Olisci	CCIIISCI		
(EVAMBLE (•	
(EXAMPLE (Use the function I)	
			,	
	find anot	her way to get the same result	here	
	Tind diloci	ner way to get the same resuct	Tiere	
III. Definition Write the defin	ition, giving variab	ole names to all your in	nput values.	
		, , , ,	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
(define ()	
functio	n name	variable names		
				,
)

...and the computer does this

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 Finish 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.

	ract+Purpose S	tateme	nt				
Every contrac	ct has three parts:						
;	•				>		
name				Domain		Range	
II. Give	Examples						
(EXAMPLE	(line-length Use the funct	10 cion here	5)	(- 10 What should the fu	5) Inction produce?)
(EXAMPLE	(line-length Use the funct	2 cion here	8)	(- 8 What should the fu	2) Inction produce?)
	nition the definition, given	ving vari	ahle nar	mes to all v	our innut values		
	_	_		_	·	·•	
(define	function name			variable na)		
	runction name			variable na	mes		
UN	USED	- S	ee	pag	ges/lir	1e-	_
	gth.sc						_
							_
							_
_							_
J							

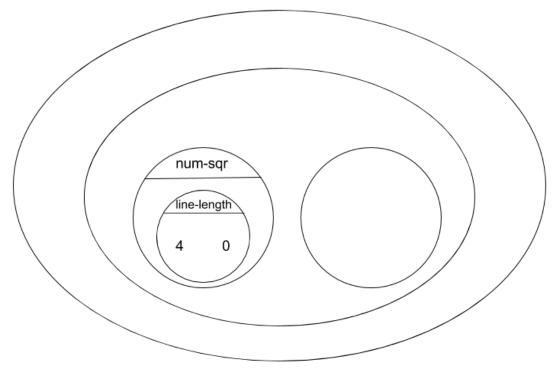
...and the computer does this

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 functic	n <u>distance</u> ,	which takes	FOUR	inputs:
-----------------	---------------------	-------------	------	---------

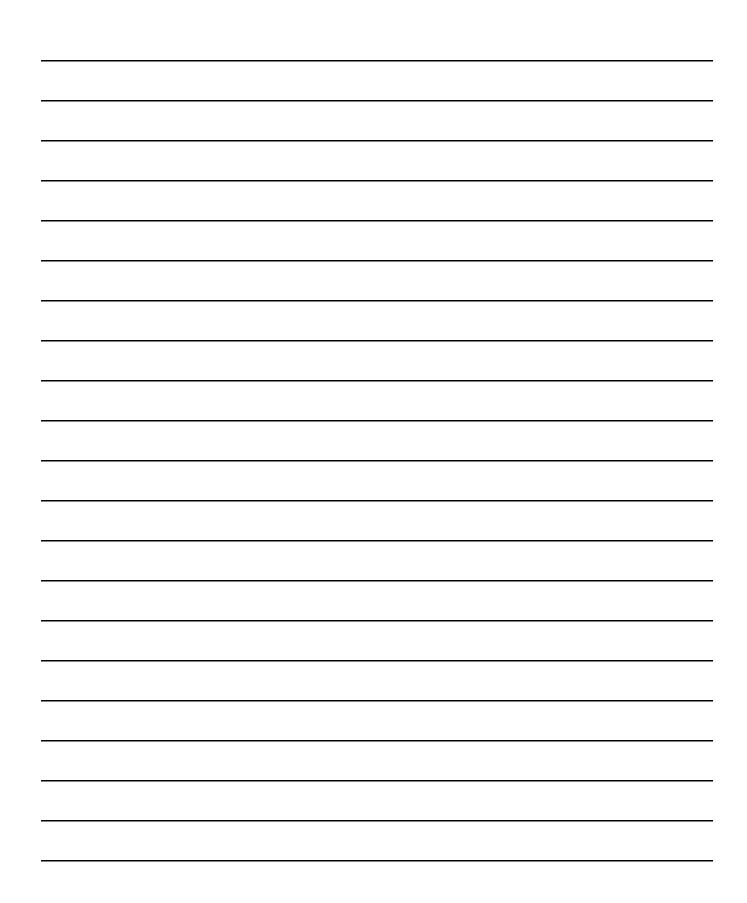
- px: The x-coordinate of the playerpy: The y-coordinate of the player
- □ cx: The x-coordinate of another game character
- □ cy: The y-coordinate of another game character

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

I. Contract+Pur	pose Statemen	t		
name	:	Domain	> Range	
;	What do	pes the function do?		
II. Give Example	S			
(EXAMPLE (Use the function	n here)	
		other way to get the same res)
pages/	distar	nce.scr	bl	
	ose the function)
	find anot	other way to get the same res	sult here	•
III. Definition				
(define (1 name	variable names)	
)

□ px: The □ py: The □ cx: The □ cy: The □ lt shoul	ex-coordinate of the ey-coordinate of the ex-coordinate of ano ey-coordinate of ano d return true if the	player ther game character	pixels of the	
I. Contr	act+Purpose Sta	tement		
name	<u> </u>	 Domain	-> Range	
;		What does the function do?		
II. Give I	Examples			
(EXAMPLE	(e function here)	
	JSED - es/col	See)	
(EXAMPLE		e function here)	
		find another way to get the same result here)	
III. Defini	tion			
(define (<u>.</u>	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!

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

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
<pre>fun area(length, width): length * width end</pre>	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 $\underline{\textbf{time}}\ t$.

I. Contract+Purp	ose Statemei	nt		
Every contract has thre	e parts:			
<u>D</u> :			->	
name		Domain	Range	
#				
		t does the function do?		
II. Give Examples				
Write an example of you	ur function for	some sample inputs		
D (1)				
$\underline{D(1)}$ is	\//b a+ 4	should the function produce?		
ose the function here	vviidus	should the function produce:		
D(2) is				
Use the function here	What	should the function produce?		
D() is	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	ah ay lal tha five ation are dynas?		
Use the function here	wnats	should the function produce?		
is_				
Use the function here	What	should the function produce?		
III. Definition				
III. Definition Write the function givin	na variahle nar	nes to all your input values		
Write the function, givin	ig variable har	nes to an your input values	•	
fun D() •			
,	, •			
end				

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>.

I. Contract+Purpose		
Every contract has three pa	rts:	
:	->	>
name	Domain	Range
#	What does the function do?	
II Givo Evamples		
II. Give Examples Write an example of your fu	nction for <u>some sample inputs</u>	
is		
Use the function here	What should the function produce?	
<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?	
III. Definition		
Write the function, giving va	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?

I. Contr	act+Purpose	Statement	
Every contra	ct has three p	arts:	
	:		>
name		Domain	Range
#			
		What does the function do?	
II. Give I	Examples		
		unction for <u>some sample inputs</u>	
	<u>is</u>		
Use the function	n here	What should the function produce?	
	is		
Use the function		What should the function produce?	
	<u>is</u>		
Use the function	n here	What should the function produce?	
	is		
Use the function		What should the function produce?	
III. Defin		ariable names to all your input value	
write the full	iction, giving v	anable names to all your input value	· · · · · · · · · · · · · · · · · · ·
fun	() •	
_	1	/ •	
end			

I. Contract+ Every contract has		e Statement parts:	
	•	-	->
name #		Domain	Range
		What does the function do?	
II. Give Exam Write an example	ples of your	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?	
	<u>is</u>		
Use the function here		What should the function produce?	
III. Definition			
Write the function	, giving	variable names to all your input values.	
fun	():	
end			