# Contracts

Name	Domain	Range	example
••	•	<b>↑</b>	
•	•	<b>↑</b>	
;	•	<b>↑</b>	
••	:	<b>↑</b>	
••	•	<b>↑</b>	
•	•	<b>↑</b>	
••	•	<b>↑</b>	
•	:	<b>↑</b>	
••	•	<b>^</b>	
••		<b>↑</b>	
••	:	<b>↑</b>	
••	:	<b>↑</b>	
.,		<b>↑</b>	
••		<b>↑</b>	
••		<b>↑</b>	
••	:	<b>↑</b>	
••		<b>↑</b>	

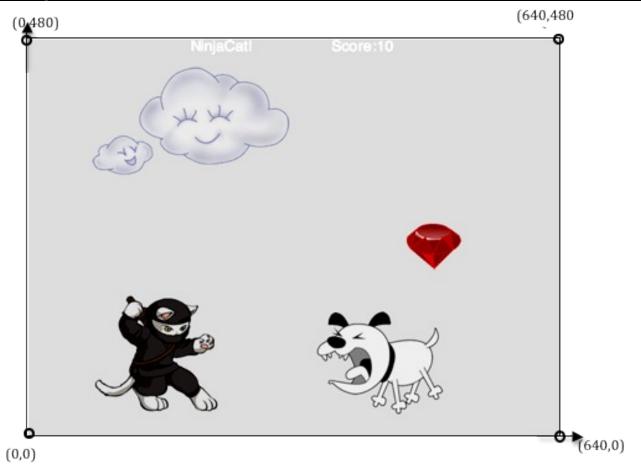
# **Contracts**

example																	
Range	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>^</b>	<b>↑</b>	<b>1</b>	<b>^</b>	<b>^</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>^</b>	<b>1</b>	<b>↑</b>
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: <b>(</b>	,		)
		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		

(draw Circles of Evaluation here if you need extra scratch paper)

	Circles Cor	npetition	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 Fund	ctions					
				->		
nan	ne		domain		range	
examples	:					
	(		) is			
	(		_ ) is			
end	·					
fun	(	):				end
	\	′ • .				
				->	<b>,</b>	
na	me		domain	· · · · · · · · · · · · · · · · · · ·	range	
examples	S:					
	(		) is			
	(		 ) is			
end	`					
fun	(	):				end
	\	/・				
				->	>	
na	me	"	domain	<del></del> -	range	
examples					Ŭ	
-	,		) is			
	`		, ) is			
end	\					<del> </del>
	1	١ -				1
fun	(	):				end

Fast Fund	ctions					
				-	>	
nam	ne		domain		range	
examples	:					
	(		) is			
	(		 ) is			
end	`					
fun	(	):				end
	\					
		::			->	
na	me		domain		range	
examples	5:					
	(		) is			
	(		 ) is			
end	<del></del> ` <u></u>		<u></u> ·			
fun	(	):				end
	\					
		::			->	
na	me		domain		range	
examples	5 <b>:</b>					
	(		) 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.

name Domain  What does the function do?	-> Range
name Domain  What does the function do?	Range
name Domain  What does the function do?	Range
name Domain  What does the function do?	
What does the function do?	
What does the function do?	
Civo Evamples	
<b>Give Examples</b> the computer, write an example of your function in action, using EX	AMPI F.
and compacer, write an example or your ranction in action, asing 200	- u.u. ==.
EXAMPLE (	)
比XAMPL比 (the user types	
	<b>\</b>
which should become	)
EXAMPLE (	)
the user types	
	)
which should become	
Definition	
Write the definition, giving variable names to all your input 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. Contrac	ct+Purpose Statement			
Every contract	has three parts:			
•	•		->	
Name	·	Domain	Range	
			5-	
<b>;</b>				
	Wh	at does the function do?		
II. Give Ex	amples			
		your function in action, using EXA	MPLE	
(EXAMPLE	(		)	
	the user say	ys	/	
-		Racket replies	)	
		Racket repties		
(EXAMPLE	46		)	
	the user say	ys		
_			)	
		Racket turns that into	,	
III. Definiti	on			
		ole names to all your input values.		
, I C			,	
(define (_			)	
	function name	variable names		
			<del></del>	)
	and the computer	does this		

#### 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. Contract-	Purpose Statement		
Every contract ha			
•	:		->
name	•	Domain	Range
•			
,	Wh:	at does the function do?	
		at does the function do.	
II. Give Exa		your function in action, using EX	AMDI F
•	•		
(EXAMPLE (_		ction here	)
	Use the fun	ction here	
			)
	fino	another way to get the same result he	re
(EXAMPLE (_			)
		ction here	,
			1
	find	d another way to get the same result he	<i>)</i> re
III. Definition			
		le names to all your input values.	
(define (			)
	function name	variable names	
			)
	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	+Purpose Statement		
Every contract h	as three parts:		
•	:	->	
name	Domain	Range	_
•			
,	What does the function do?		-
u o: -			
II. Give Exa On the computer	mples , write an example of your function in actio	n. using EXAMPLE.	
·		_	
(EXAMPLE (_	Use the function here	)	
	ose the function here		
		)	
	find another way to get the sa	ame result here	
(EXAMPLE (_		)	
	Use the function here		
		)	
	find another way to get the sa	ame result here	
III. Definitio	1		
Write the	definition, giving variable names to all your ir	iput values.	
(dofina (		,	
(define (_	function name variable	names	
	ranceion name variable	names	
			١
	and the computer does 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. Contract+Pu	rpose Statement			
Every contract has th	hree parts:			
• ·	•		>	
name		Domain	Range	
•				
<b>,</b>	24/1			
	wna	t does the function do?		
II. Give Exampl				
On the computer, wr	rite an example of y	our function in action, using I	EXAMPLE.	
/EVALADIE /			,	
(EXAMPLE (	Use the func	tion here	)	
	Ose the func	tion here		
			1	
	find	another way to get the same result	/ here	
		<i>.</i>		
(EXAMPLE (			)	
	Use the func	tion here		
			,	
	£: J		)	
	Tind	another way to get the same result	nere	
III. Definition				
Write the define	nition, giving variable	e names to all your input value	es.	
(define (			)	
fun	ction name	variable names		
				)
	and the computer of	does this		/

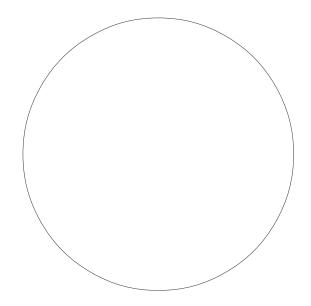
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

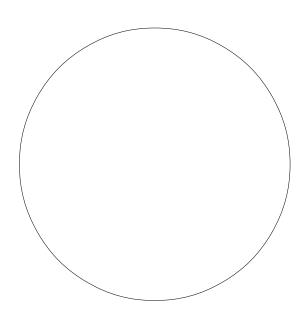
1. A piece of Sam is still visible on the left as long as...

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.

	oose Statement		
Every contract has thre	ee parts:		
·	- •	>	
name	Domain		Range
	What does the function do?	<b>?</b>	
l. Give Example	9		
On the computer, write	e an example of your function in action	n. usina EXAMPLE.	
•	•		
EXAMPLE (	Use the function here		
•	Use the function here	,	
			)
	find another way to get the	e same result here	
			_
EXAMPLE (			)
,	Use the function here	·	
			)
	find another way to get the	e same result here	·
II Definition			
II. Definition	tion, giving variable names to all your	r input values	
vviile lile deliili	tion, giving variable names to all your	iriput values.	
(dofina (		\	
(define (	<del> </del>	<i>_</i>	
funct	ion name variab	ole names	
			)
·			<i>)</i>

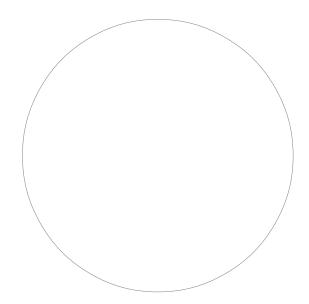
...and the computer does this

Word Problem: safe-right?

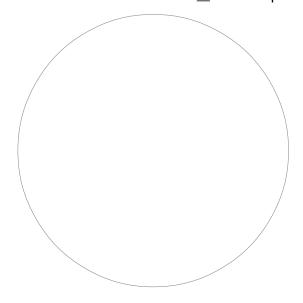
Use the Design Recipe to write a function <u>safe-right?</u>, which takes in an x-coordinate and checks to see if it is less than 690.

name	:		>
		Domain	Range
		pes the function do?	
Give Examples		r function in action, using	EYAMDI E
•		_	
EXAMPLE (	Use the function	n here	)
			)
	find and	other way to get the same result	here
			,
EXAMPLE (	Use the function	n here	)
			,
<del></del>	find and	ther way to get the same result	: here
. Definition			
	ion, giving variable n	ames to all your input valu	es.
			)

## 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 *or* 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. Contract+F	Purpose Statement			
Every contract has	three parts:			
•	•		->	
name	•	Domain	/ Range	
name		2 small	range	
· •				
	Wha	at does the function do?		
II. Give Exam	ples			
On the computer,	write an example of	your function in action, using EXA	AMPLE.	
(EVAMDLE (			1	
(EXAMPLE (	Use the fund	ction here	)	
			)	
	find	another way to get the same result her	e	
(EXAMPLE (		ction here	)	
	Use the fund	ction here		
			`	
	find	another way to get the same result her	<i>)</i> e	
		, ,		
III. Definition Write the de	efinition giving variab	le names to all your input values.		
		• •		
(define (	<del></del>		)	
f	unction name	variable names	/	
				)
				<u></u> /

...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. Contract+Purpo	se Statement		
:			->
name		Domain	Range
II. Give Examples			
On the computer, write a	n example of your fu	ınction for <u>each top</u>	<u>ping,</u> using EXAMPLE.
(EXAMPLE(cost	"pepper	oni" )	What should the function produce?
<u> </u>	o the famous more	)	What oriodia the fahiotion produce :
Us	e the function here		What should the function produce?
(EXAMPLE(		)	
Us	e the function here		What should the function produce?
(EXAMPLE(		)	
Us	e the function here		What should the function produce?
III. Definition			
(define (		variable names	)
	name	variable flames	

#### 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. Contract+Purpose Statement		
		->
name	Domain	n Range
II. Give Examples Finish the two examples we've started for	you, and make tv	two more
	28 "up") <sub>-</sub>	What should the function produce?
(EXAMPLE ( <u>update-player</u> 4 Use the function here	.51 "down") _	What should the function produce?
(EXAMPLE (	_)	) What should the function produce?
(EXAMPLE (	_)	) What should the function produce?
(define (	variable names	)

-			

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.

	act+Purpose State	ment					
Every contrac	t has three parts:						
· ,	• •				>		
name				Domain		Range	
II. Give I	Examples						
(EXAMPLE	(line-length Use the funct		5	)	(- 10 What should the fund	5) ction produce?	)
	(line-length Use the funct	2 ion here	8	)	(- 8 What should the fund	2) ction produce?	)
III. Defini	ition the definition, giving	variable	names t	o all vour inpu	it values.		
	function name				)		
							-
							-
							-
							_
)							

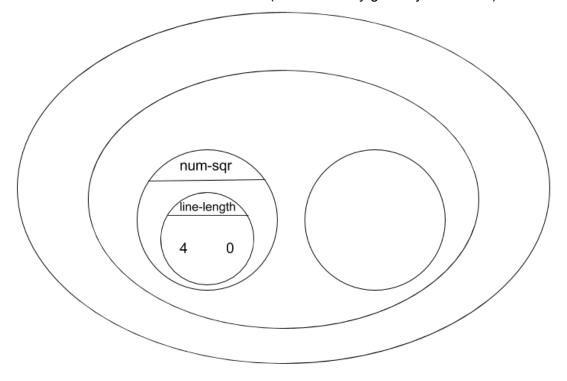
...and the computer does this

### 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:

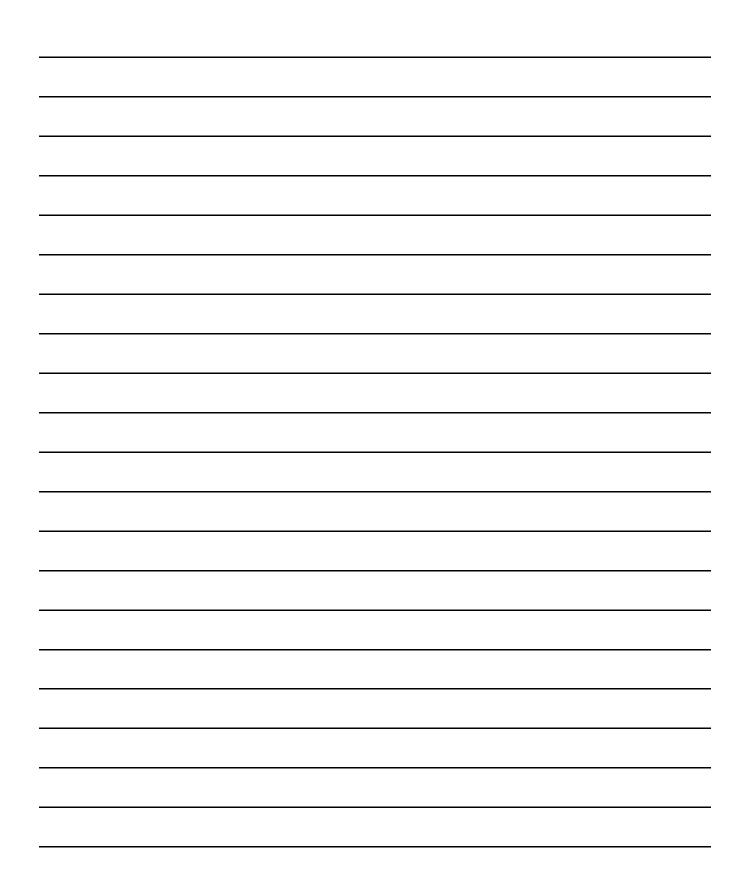
Write a function <u>distance</u>, which takes FOUR inputs:

<ul> <li>□ px: The x-coordin</li> <li>□ py: The y-coordin</li> <li>□ cx: The x-coordin</li> <li>□ cy: The y-coordin</li> </ul>	ate of the player ate of another game character ate of another game character nce between the two, using the Distance for	rmula. (HINT: look at what you did
, •	Domain	> Range
		nange
,	What does the function do?	
II. Give Examples		
(EXAMPLE (	Use the function here	)
	find another way to get the same res	ult here
(EXAMPLE (	Use the function here	)
III. Definition	find another way to get the same res	ult here
(define (	name variable names	)

Write a function collide?,which takes FOUR inputs:
px: The x-coordinate of the player

	ose Statement		
name	Domain	-> n Range	·
	What does the function d	0?	
I. Give Examples			
(EXAMPLE (	Use the function here	)	
	find another way to get t	he same result here	.)
EXAMPLE (		)	
(	Use the function here		
			)
	find another way to get t	he same result here	-,

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! No way! Did they speak loudly enough? A little. Definitely! Were they standing confidently? No way! Definitely! A little. No way! Did they make eye contact? Definitely! A little.

#### 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
,	t does the function do?	
II. Give Examples		
Write some examples of red-shape below.	The first one has already been done	for you.
(EXAMPLE <u>(red-shape</u> "circl		"solid" "red") ) function produce?
(EXAMPLE (		function produce?
(EXAMPLE (	)	function produce?
(EXAMPLE (	)	function produce?
III. Definition		
(define (	variable names	)
(cond	variable names	
	(circle 50 "sol	id" "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.

	ct+Purpose Sta	tement		
Every contract	has three parts:			
D	•		->	
name #	·	Domain	Range	
		What does the function do?		_
	camples	on for some comple inpute		
vviile an examp	is	on for <u>some sample inputs</u>		
Use the function h		What should the function produce?		
	<u> is</u>			
Use the function h	ere	What should the function produce?		
Use the function h	is ere	What should the function produce?		
	is			
Use the function h	ere	What should the function produce?		
III. Definiti Write the functi		ole names to all 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 *time* the rocket has been traveling, as a function of *distance*.

I. Contract+Purpose		
Every contract has three par	rts:	
•		->
name #	Domain	Range
#	What does the function do?	
II. Give Examples	nation for some sample inputs	
write an example of your ful	nction 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?	
is		
Use the function here	What should the function produce?	
III. Definition		
Write the function, giving var	riable 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?

·		>	
name µ	Domain	Range	
#	What does the function do?		
II. Give Examples			
Write an example of your fu	nction for some sample inputs		
is			
Use the function here	What should the function produce?		
is			
	What should the function produce?		
	What should the function produce?		
Use the function here	What should the function produce?  What should the function produce?		
Use the function here			
Use the function here  iS  Use the function here			
Use the function here  IS  Use the function here  IS	What should the function produce?		

I. Contract+Purpe	ose Statement	
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	
i	5	
Use the function here	What should the function produ	ce?
is		
Use the function here	What should the function produ	ce?
i	_	
Use the function here	What should the function produ	ce?
Use the function here	What should the function produ	re?
	what should the furnation produ	
III. Definition	e veriale e e e e e e e e e e e e e e e e e e	
vvrite the function, givin	g variable names to all your input value	S.
fun	( ).	end