# 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) 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)		
F v 10		
5 x 10 8 - 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	
#:>	
name domain range	
examples:	
()	
()	
end	
fun()	end
#:>	
name domain range	
examples:	
()	
()	
end	
fun()	end
"	
#> range	
name domain range examples:	
( )	
/	
//	
end	1
fun()	end

Fast Functions		
#:	>	
name	domain	range
examples:		
(	)	
(	)	
end		
fun ( )		end
#	:>	
name	domain	range
examples:		
(	)	
(	)	
end		
fun(_	)	end
#	:>	
name	domain	range
examples:		
(	)	
(	)	
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 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 EXAMPL	_E.	
/EXAMPLE /	\	
(EXAMPLE (the user types	)	
the user types		
	`	
which should become	)	
willen stiddta become		
(EXAMPLE (	)	
the user types		
	)	
which should become		
III. Definition		
Write the definition, giving variable names to all your input value	S.	
(define (	)	
function name variable names		
		)
and the computer does this		_/

### Word Problem: red-square

Use the Design Recipe to write a function  $\underline{red-square}$ , which takes in a number (the size of the square) and outputs a solid red rectangle whose length and width are the same size.

	Purpose Statement		
Every contract has	three parts:		
•	•		->
, ————————————————————————————————————	•	 Domain	Range
Nume		Domain	Nange
•			
•	Wha	at does the function do?	
II. Give Exan	nples		
		your function in action, using EXA/	MPLE
(EVALABLE (			`
(EXAMPLE (	the user say	<u> </u>	)
	the user say	<b>3</b>	
			)
		Racket replies	,
(EXAMPLE (			)
(======================================	the user say	S	/
		Racket turns that into	)
		Nacket turns that into	
III. Definition			
Write the o	definition, giving vari	able names to all your input val	ues.
(dofina (			`
(define (	function name	variable names	)
,	Tunction name	variable names	
	and the computer		
	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. Contra	ct+Purpose Stateme	nt	
Every contract	has three parts:		
•	•	_	>
name	•	 Domain	Range
			,
<b>;</b>			·
		What does the function do?	
	xamples		
On the comput	ter, write an example	of your function in action, using EXAMP	PLE.
(EXAMPLE	(		)
(	Use the	function here	
			,
		find another way to get the same result here	)
		, 5	
(EVAMDI E	1		1
(EXAMPLE	Use the	function here	)
		find another way to get the same result have	)
		find another way to get the same result here	
III. Definiti			
Write t	ne definition, giving \	variable names to all your input value	es.
(define (			1
(derine (	function name	variable names	<b></b> )
			1
	and the compu	iter 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 Statemen	t		
Every contract has	s three parts:			
•	•	_	>	
name	•	 Domain	Range	_
			J	
<b>;</b>				_
	W	Vhat does the function do?		
II. Give Exan	nples			
On the computer,	write an example o	of your function in action, using EXAMP	LE.	
(EXAMPLE (			)	
(LXXIII LL (	Use the fo	unction here	/	
			)	
	TI	ind another way to get the same result here		
(EXAMPLE (_			)	
	Use the fo	unction here		
			)	
	fi	ind another way to get the same result here	,	
III. Definition				
	definition, giving vo	ariable names to all your input value	es.	
(define (			)	
,	function name	variable names	ŕ	
_				)
	and the comput	er 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. Contrac	ct+Purpose Statemer	nt		
	has three parts:			
•	·		->	
name		Domain	Range	
•				
,		What does the function do?		
II. Give Ex	camples er, write an example o	of your function in action, using EXA	MPLE.	
(EXAMPLE (				
	Use the	function here	<i>)</i>	
			1	
-		find another way to get the same result here	/ :	
(EXAMPLE	(		)	
	Use the	function here	<b></b> ,	
			)	
-	1	find another way to get the same result here		
III. Definitio	on			
		ariable names to all your input va	lues.	
(			`	
(define (_	function name	variable names	)	
	runction name	variable names		
				١
	and the compu	ter does this		<i>!</i>

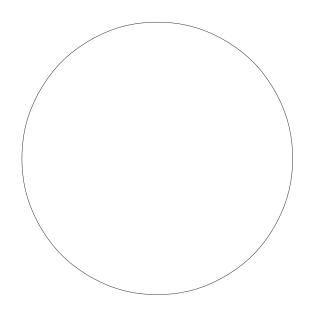
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

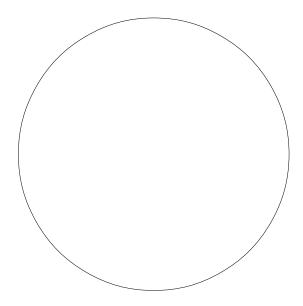
1. A piece of Sam is still visible on the left as long as...

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.

I. Contract	+Purpose Statement			
Every contract	nas three parts:			
•	•			
	·	 Domain	> Range	_
name		Domain	Range	
•				
,		does the function do?		_
U Chan Fara				
On the comput		your function in action, us	sing EXAMPLE	
On the compon				
(EXAMPLE (_		on here	)	
	Use the function	on here		
			,	
	find ar	nother way to get the same result	<i>)</i> here	
(EXAMPLE (_			)	
	Use the function	on here		
			1	
	find ar	nother way to get the same result	here	
III. Definition		ole names to all your input	tvaluos	
wille ille	delininon, giving vanai	ole names to all your impor	r values.	
(define (_			1	
(define (_	function name	variable names	/	
		. 33		
				`
				)

...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.

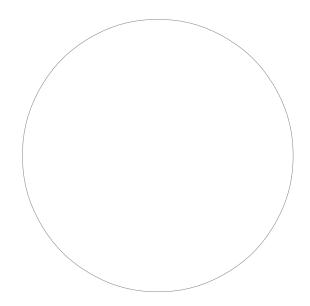
	•			
name	•	 Domain	<b>-&gt;</b> Range	
			J	
	What	does the function do?		
. Give Examples				
		our function in action, using E	XAMPLE.	
EXAMPLE (			)	
L/00/11 LL (	Use the functi	ion here	<b></b> /	
			)	
	find a	nother way to get the same result h	ere /	
EXAMPLE (	Use the functi	ion horo	)	
	ose the functi	ion nere		
	find a	nother way to get the same result h	) oro	
	Tilla a	mother way to get the same result h	ere	
I. Definition  Write the defin	ition aiving varia	ble names to all your input	values	
		, ,	values.	
define (			)	
ueille (	on name	variable names		

...and the computer does this

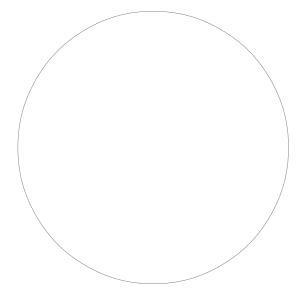
### and / or

### Write the Circles of Evaluation for these statements, and then convert them to Racket

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 contrac	t has three parts:		
•	•	_	
<b>,</b>	- : - : - : - : - : - : - : - : - : - :		
name	Domain	Range	
•			
,	What does the function do?		
	xamples		
On the compu	ter, write an example of your function in action, using EXAMP	LC.	
(EXAMPLE	Use the function here	)	
	Use the function here		
		)	
	find another way to get the same result here		
(EXAMPLE	(	)	
(2/0 0/11 22	Use the function here	/	
		)	
	find another way to get the same result here		
III. Definit	ion		
	the definition, giving variable names to all your input value	es.	
(define (		)	
(	function name variable names		
			1
			<i>J</i>

...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 Statement	t	
•		->
•	Domain	
. Give Examples		
On the computer, write an example	e of your function for <u>each top</u>	<u>ping</u> , using EXAMPLE.
EXAMPLE ( <u>cost</u> "p	pepperoni" )What	should the function produce?
EXAMPLE (	lere What	should the function produce?
EXAMPLE (	)	should the function produce?
(EXAMPLE (	)	should the function produce?
II. Definition		
(define (	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	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. 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.

I. Contract	ract+Purpose State ct has three parts:	ment					
				Domain	>	Range	
	(line-length  Use the funct	10 ion here	5	)	(- 10 What should the fun		)
(EXAMPLE	(line-length Use the funct	2 cion here	8	).	(- 8 What should the fun	2) ction produce?	)
Write (define	the definition, givin			•	)		
)							

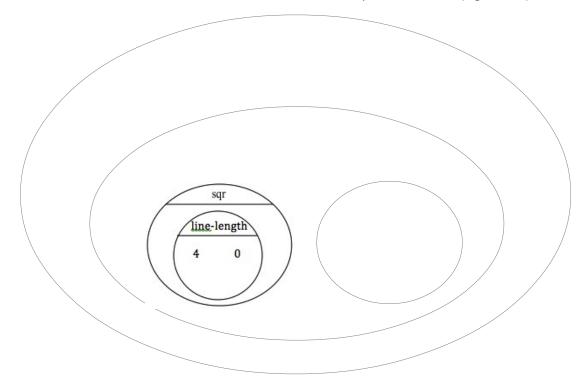
...and the computer does this

### The Distance Formula (an example)

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

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

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



Convert the Circle of Evaluation into Racket code:

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

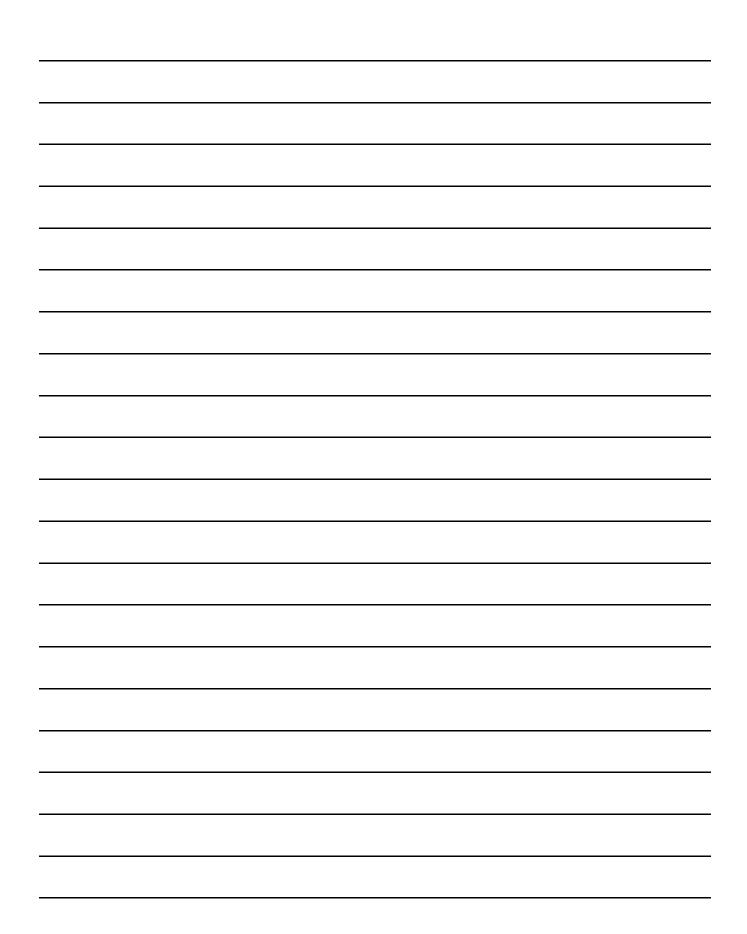
- f px: The x-coordinate of the player
- py: The y-coordinate of the player
- □ cx: The x-coordinate of another game character
- □ cy: The y-coordinate of another game character

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

••			->	
name • -		Domain	Range	_
•				
,		es the function do?		_
II. Give Examples				
(EXAMPLE (		here	)	
	Use the function	here		
	find anot	her way to get the same resul	t here	)
(EXAMPLE (		here	)	
	Use the function	here		
				,
	find anot	ther way to get the same resul	t here	)
III. Definition				
(define (			1	
function n	 ame	variable names	)	
				)

□ px: The x-c □ py: The y-c □ cx: The x-c □ cy: The y-c lt 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.	<b>pixels</b> of the	
i. Comitaci+	roipose sidiemem		
name	• = =	->Range	-
;	What does the function do?		
II. Give Exan	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:	
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! Definitely! A little. 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 Stateme	nt	
i. Somiaci i orpose siaiemei	,,,	
;:		->
name	Domain	Range
<b>;</b>		
	What does the function d	o?
II. Give Examples		
Write some examples of red-shape b	elow. The first one has a	llready been done for you.
(EXAMPLE <u>(red-shape</u>	"circle"	(circle 50 "solid" "red")
Use the function h		What should the function produce?
(EXAMPLE (	)	)
Use the function h	nere	What should the function produce?
(EXAMPLE (	,	,
Use the function h	nere	What should the function produce?
(EVAMDIE (	,	,
(EXAMPLE (		What should the function produce?
III		
III. Definition		
(define (		)
function name	variable	names /
<u>(cond</u>		
	(cir	ccle 50 "solid" "red")
	(011	

### 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>D</u> : _		>
name	Domain	Range
	What does the function do?	
Give Examples		
	function for <u>some sample inputs</u>	
. ,	<del></del>	
<u>D(1)</u> =		
e function here	What should the function produce?	
D(2) =		
e function here	What should the function produce?	
D( ) =		
e function here	What should the function produce?	_
=		
e function here	What should the function produce?	
	·	
Definition		
	ariable names to all your input values.	

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*.

<u> </u>		
name	Domain	Range
	What does the function do?	
Give Examples e an example of your fu	unction for <u>some sample inputs</u>	
=		
ne function here	What should the function produce?	
=		
ne function here	What should the function produce?	
=		
= ne function here	What should the function produce?	
	What should the function produce?	
ne function here	What should the function produce?  What should the function produce?	
ne function here  = ne function here  Definition		

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 p		
# <b>:</b> _		->
name	Domain	Range
	What does the function do?	
. Give Examples		
Vrite an example of your	function for <u>some sample inputs</u>	
=		
Ise the function here	What should the function produce?	
=		
lse the function here	What should the function produce?	
=		
se the function here	What should the function produce?	
=		
Ise the function here	What should the function produce?	
II. Definition		
	variable names to all your input values.	
=		

·		->
name	Domain	Range
	What does the function do?	
Give Examples ite an example of your fu	inction for <u>some sample inputs</u>	
=		
the function here	What should the function produce?	
=		
the function here	What should the function produce?	
	What should the function produce?	
the function here	What should the function produce?  What should the function produce?	
the function here	·	
the function here  = the function here	·	
the function here  = the function here =	What should the function produce?	