# 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>	

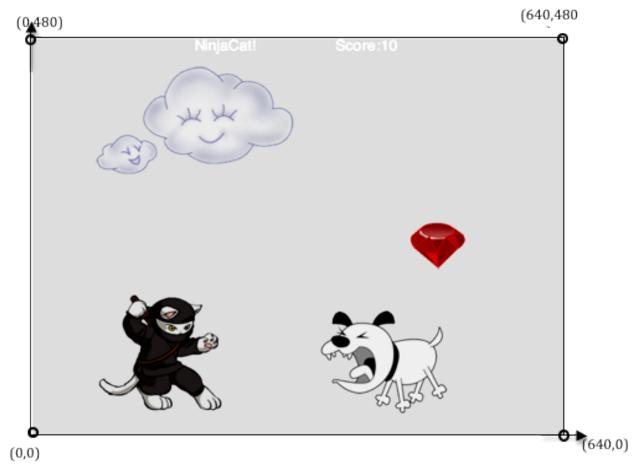
# **Contracts**

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.	
<b>The Target</b> 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 Co	mpetition	Time: 5
	minutes Math	Circle of Evaluation	Pyret Code
Round 1		Circle of Evaluation	r yret code
Round 2	3 - (1 + 2)		
Round 3	3 - (1 + (5 * 6))		
Round 4	(1 + (5 * 6)) - 3		

Fast Functions				
::		>		
name	domain			
examples:				
(	) is			
(	•			
end				
				اد د د
fun():				end
		>		
name	domain		range	
examples:				
(	) is			
(	) is			
end				
fun()	:			end
(	-			_
::		->		
name	domain		range	
examples:			J	
(	) is			
(	) 15			
end				
fun()				_ end

Fast Functions					
::			>		
name		domain			
examples:					
(	)	is			
(	-				
end	/				
					and
fun()	:				end
			_		
:			>		
name		domain		range	
examples:					
(	)	is			
(	)	is			
end					
fun()	:				end
::			->		
name		domain		range	
examples:					
(	)	is			
(	)	15			
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	-> Range
name	Domain	Range
	What does the function do?	
Civo Evamples	What does the function do:	
. <b>Give Examples</b> n the computer, write an ex	xample of your function in action, u	using EXAMPLE.
(EVAMDLE (		,
	e user types	/
		,
UNUSED	- See pageswhich should become	s/rocket-
haight sc	which should become	
neightist		
(EXAMPLE (	e user types	)
Life	e user types	
		•
	which should become	)
I. Definition		
	iving variable names to all your inp	out values.
		,
/ al a <b>- C</b> /		<b>\</b>
(define (	variable names	)

#### 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.

<b>:</b>	 Domain	<b>-&gt;</b> Range
		, and the second
	What does the function do?	
. Give Examples		
n the computer, write an o	example of your function in actio	n, using EXAMPLE
EXAMPLE(		)
-/V N'II		
t	he user says	
t		as/rad-
UNUSED	- See page	,
UNUSED	- See page	· · · · · · · · · · · · · · · · · · ·
UNUSED		,
UNUSED square.s	- See page	
UNUSED square.s	- See page	
UNUSED square.s	- See page	
UNUSED square.s	- See page	
UNUSED square.s	- See page	
UNUSED Square.s  EXAMPLE(	- See page crbRacket replies the user says	)
UNUSED Square.s  EXAMPLE(	- See page CrbRacket replies	)
UNUSED Square.s  EXAMPLE(	- See page crbRacket replies the user says	)

## 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	comont	
I. Contract+Purpose Stat Every contract has three parts:	ement	
Every contract has timee parts.		
		_
; ·		·>
name	Domain	Range
_		
· 		
	What does the function do?	
II. Give Examples		
On the computer, write an exam	onle of your function in action up	sing EXAMPLE
on the computer, write an exam	iple of your function in action, us	BITY EXAMILE.
(EXAMPLE(		1
(LAAMFLL)	e function here	/
USE LIN	e function here	
		•
		)
	find another way to get the same resu	It here
IIMIICED _	Soo nados	·/lawn-
ONOSED -	see pages	) I a WII-
UNUSED - (EXAMPLE) area.scrb		)
area.scr	e function here	
ai caisti si		
		)
	find another way to get the same resu	It here
III. Definition		
Write the definition, giving	g variable names to all your inpu	ıt 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+Purpos			
Every contract has three	parts:		
;::		->	
name •	Doma	<del></del>	Range
			J
· /			
	What does the function	on do?	
II. Give Examples			
On the computer, write a	n example of your function	on in action, using	EXAMPLE.
/E\/ANADLE/			`
(EXAMPLE(	Use the function here		.)
	ose the function here		
IIIIICEB			and the second
UNU <u>SED</u> <del>danger.</del> s	- See pa	ades/u	pgate-
•	find another way to g	et the same result here	e e
<del>danaer.s</del>	<del>crbl</del>		
9 - 11 - 1			
(EXAMPLE(			1
(LXAMITLL (	Use the function here		.)
			)
	find another way to g	get the same result here	е
III. Definition			
Write the definition	, giving variable names	to all your input va	lues.
/ d o £' o o /			\
(define (		- de la la company	_)
function na	me va	ariable 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.

I. Contract+Purpose Stat	tement	
Every contract has three parts:		
		_
; :	<b>-</b>	>
name	Domain	Range
_		
· /		
	What does the function do?	
II. Give Examples		
On the computer, write an exam	nple of your function in action, us	ing EXAMPLE.
(EXAMPLE(	e function here	)
Use th	e function here	
		)
	find another way to get the same result	here
(EXAMPLE (		)
Use th	e function here	
HAULCED		
ONOSED -	See pages	/upaate-
target.scr	nother way to get the same result	r here
III. Definition		
	g variable names to all your inpu	t values.
_	•	
(define (		1
function name		/
Tunction name	valiable liailles	
		)
and the com	nputer does this	

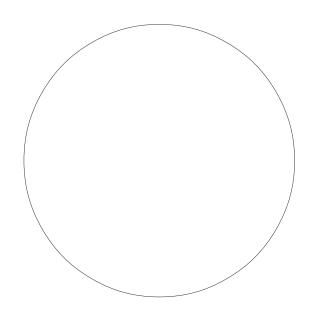
Sam is in a  $640 \times 480$  yard. How far he can go to the left and right before he's out of sight?

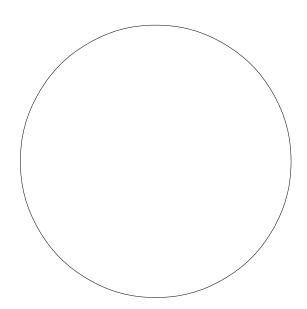
1. A piece of Sam is still visible on the left as long as...

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.

Contract+Purpose St very contract has three parts	S:	
::		->
name	Domain	Range
	What does the function do?	
. Give Examples		
on the computer, write an exa	ample of your function in action, u	ısing EXAMPLE.
EXAMPLE(		)
Use	the function here	
HMHICED	Saa naga	closfo
ONOSED.	<u>- See pages</u>	5/5aje-
loft scrhl	- See pages find another way to get the same resu	uit nere
icitistibi		
EXAMPLE(		)
Use	the function here	
		)
	find another way to get the same resu	ult here
II. Definition	· · · · · · · · · · · · · · · · · · ·	
Write the definition, giv	ing variable names to all your inp	ut values.
define (		)
function name	variable names	<del></del> -
		)
	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.

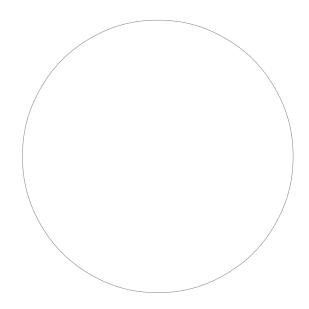
:		>
name	Domain	Range
	What does the function do?	
Circ Erramata	what does the function do:	
<b>Give Examples</b> the computer, write an exa	ample of your function in actio	n, using EXAMPLE.
(AMPLE (		)
Use	the function here	/
INUSED -	See page	s/safe
		j j
ignt.scro	find another way to get the same	Tesate fiere
KAMPLE(		)
Use	the function here	
		,
	find another way to get the same	result here
Definition		
	ing variable names to all your	input values.
efine (		)
efine (	variable name	/ S

...and the computer does this

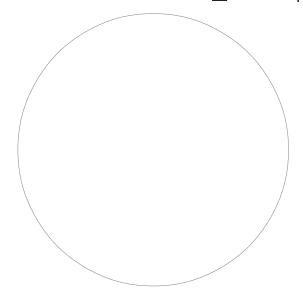
# and / or

# Write the Circles of Evaluation for these statements, and then convert them to <a href="Pyret">Pyret</a>

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?	
. <b>Give Examples</b> n the computer, write an e	example of your function in action, u	using EXAMPLE.
EXAMPLE(		)
U	se the function here	
HAHICED	- <b>S</b> 00	
ONOSED	find another way to get the same res	ult here
<del>pages/or</del>	- See find another way to get the same res	<b>3</b>
EXAMPLE(	se the function here	)
		)
	find another way to get the same res	ult here
I. Definition	viving variable names to all your inn	out values
write the definition, <u>c</u>	giving variable names to all your inp	out values.
define (	·····	)
function name	variable names	

#### 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 On the computer, write an exam	nple of your function for <u>e</u>	ach topping, using EXAMPLE.
(EXAMPLE (cost Use the function	<u>"pepperoni"</u> )	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	nmes )
UNUSED pages/co	- See ost.scrbl	
)		

## 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+Purpose Stateme	ent		
<b>:</b>		Domain	> Range
I. Give Examples Finish the two examples we've starte	ed for vo	u. and make	two more
(EXAMPLE ( <u>update-player</u>	128	<u>"up"</u> )	
Use the function her	e		What should the function produce?
(EXAMPLE ( <u>update-player</u>	451	"down")	
Use the function her	re		What should the function produce?
(EXAMPLE (	e	)	) What should the function produce?
(EXAMPLE (	e	)	) What should the function produce?
III. Definition			
(define (		variable na	mes
<b>UNUSED</b> -	Se	e pa	ages/update
player.scr	bl		

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 Statemen	nt		
Every contract has three parts:  • •			->
name .	Do	omain	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	able name	es to all yo	our input values.
(define (		variable na	ames )
UNUSED - Solength.scrbl		pag	jes/line-
)			

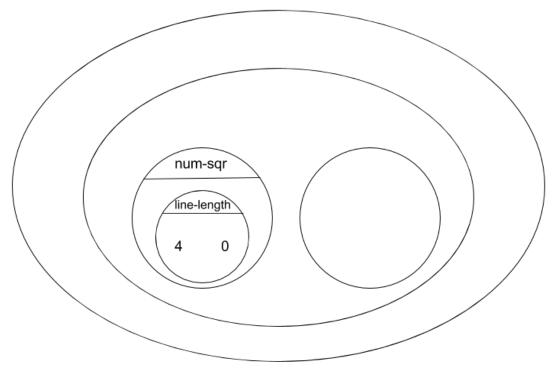
...and the computer does this

# 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!)

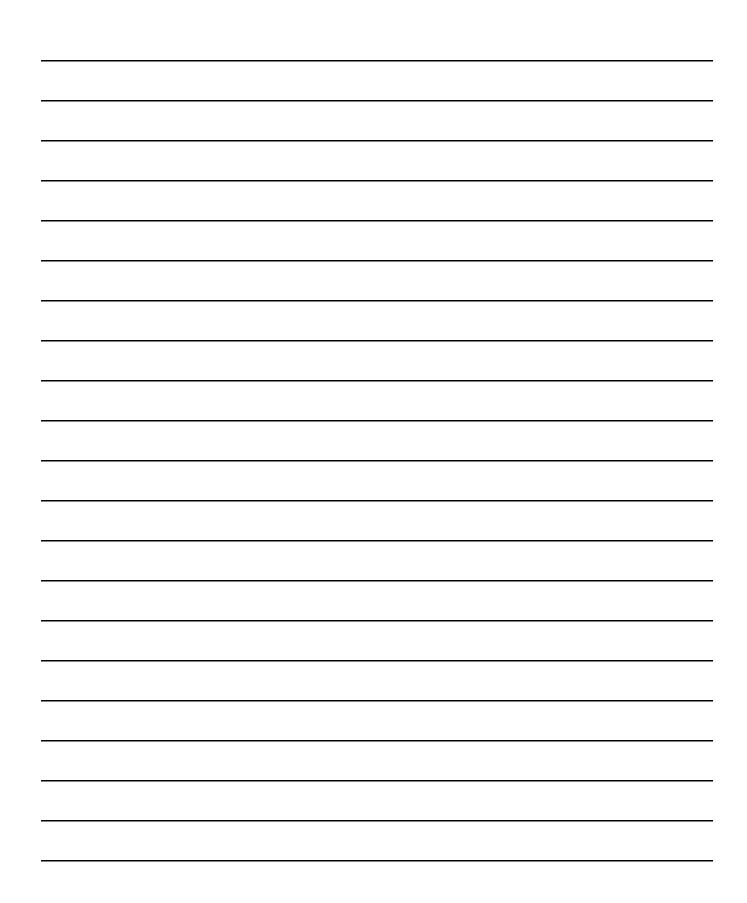


Convert the Circle of Evaluation into Pyret code:

	e of the player	
It should return the distant what you did on page 27!)	ce between the two, using the Distance i	formula. (HINT: look at
I. Contract+Purpose	e Statement	
; :		Range
; II. Give Examples	What does the function do?	
(EXAMPLE(	Use the function here	_)
	find another way to get the same result h	ere )
(EXAMPLE)	Use the function here	_)
	find another way to get the same result h	ere )
(define (	ne variable names	)

<ul> <li>px: The x-coordinate of</li> <li>py: The y-coordinate of</li> <li>cx: The x-coordinate of</li> <li>cy: The y-coordinate of</li> <li>It should return true if t</li> </ul>	the player another game character	thin 50 <b>pixels</b> of the
I. Contract+Purpose St	atement	
	-;	>
name	Domain	Range
•		
<i>'</i>	What does the function do?	
II. Give Examples		
(EXAMPLE(		1
Use Use	the function here	/
UNUSED - pages/col	- See	here
puges, co.		
(EXAMPLE(	the function here	)
	find another way to get the same result	here )
III. Definition		
(define (	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 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.

Contract and	<b>Purpose State</b>	ement		
Every contract has three	e parts			
	::		->	
function name			domain	range
#				
		wha	t does the function do?	
Examples				
Write some examples, ti	hen circle and label wha	at changes		
examples:				
red-shape	(	) 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	
function name	input(s)	) is	what the function produces	
ranelon hame	input(3)	\	what the function produces	
function name	input(s)	) is	what the function produces	
end				
Definition				
Write the definition, give	en variable names to all	vour input valı	ves	
fun	(	)		
function name	variabi		•	
if			: circle(50, "solid", "re	ed")
else if			·	
else if			:	
else if			:	
else:				

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
fun circle-area(radius):   pi * radius end	
<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.		Purpose Sta	tement		
Every	contract has	three parts:			
	D	:		->	
#	name		Domain	Range	
<i>''</i> _			What does the function do?		
II. Write	Give Example		on for <u>some sample inputs</u>		
Wilco	D/1)	_	on for <u>some sample inputs</u>		
Use th	D( I ) e function here	is	What should the function produce?		
	D(2)	is			
Use th	e function here		What should the function produce?		
	D( )	is			
Use th	e function here		What should the function produce?		
		is			
Use th	e function here		What should the function produce?		
III. Write	<b>Definition</b> the function,	giving variab	ole names to all your input value	es.	
fun enc		):			

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+Purpo	se Statemei	nt	
Every contract has three			
::			>
name #		Domain	Range
#	Wha	at does the function do?	
II. Give Examples			
Write an example of you	r function 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 s	should the function produce?	
is			
Use the function here	What	should the function produce?	
III. Definition			
Write the function, giving	g variable nar	mes to all your input value	es.
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?

	Purpose Sta	tement	
Every contract ha	s three parts:		
	·		->
name		Domain	Range
#			
		What does the function do?	
II. Give Exam	ples		
Write an example	of your functi	on for <u>some sample inputs</u>	
	is		
Use the function here	15	What should the function produce?	
	is		
Use the function here		What should the function produce?	
	is		
Use the function here	13	What should the function produce?	
	_	·	
	<u>is</u>		
Use the function here		What should the function produce?	
III. Definition			
Write the function	, giving variak	ole names to all your input valu	es.
•			
fun (	):		
end			

	t+Purpose S		
Every contract l	has three par	ts:	
	:	->	
name		Domain	Range
		What does the function do?	
II. Give Exa	amples		
Write an examp	le of your fur	nction for <u>some sample inputs</u>	
	is		
Use the function he		What should the function produce?	
	is		
Use the function he	ere	What should the function produce?	
	is		
Use the function he	ere	What should the function produce?	
	is		
Use the function he	ere	What should the function produce?	
III. Definition Write the function		riable names to all your input values.	
fun end	(	):	