# Contracts

Name	Domain	Range	Example
	"	<b>&lt;-</b>	
	<b>"</b>	<b>~</b> -	
	::	<b>^-</b>	
	"	<b>^-</b>	
	<b>"</b>	<b>^-</b>	
	"	<b>&lt;-</b>	
	#	<b>&lt;-</b>	
	::	<b>^-</b>	
	::	<b>^-</b>	
	::	<b>^-</b>	
	<b>"</b>	<b>^-</b>	
	<b>"</b>	<b>^-</b>	
	::	<b>&lt;-</b>	
	::	->	
	::	<b>-</b>	
	::	->	
	::	<b>^</b>	

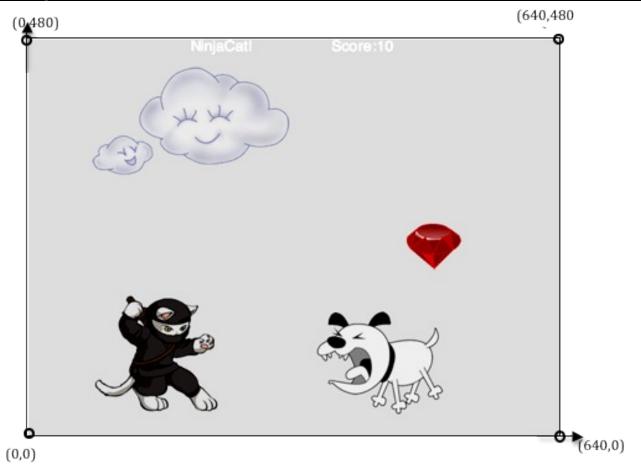
# Contracts

Name	Domain	Range	Example
	"	<b>&lt;-</b>	
	<b>"</b>	<b>~</b> -	
	::	<b>^-</b>	
	"	<b>^-</b>	
	<b>"</b>	<b>^-</b>	
	"	<b>&lt;-</b>	
	#	<b>&lt;-</b>	
	::	<b>^-</b>	
	::	<b>^-</b>	
	::	<b>^-</b>	
	<b>"</b>	<b>^-</b>	
	<b>"</b>	<b>^-</b>	
	::	<b>&lt;-</b>	
	::	->	
	::	<b>-</b>	
	::	->	
	::	<b>^</b>	

#### 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 Function	ons					
		::		->		
name		do	omain		range	
examples:						
	(		) is			
	(		) is			
end						
fun	(	):				end
	_ `					
		::		->	>	
name		(	domain		range	
examples:						
	(		_) is			
	(		_) is			
end						
fun	(	):				end
		_::			>	
name		(	domain		range	
examples:						
	(		_) is			
	(		_) is			
end						
fun	(	):				end
						<del></del>

Fast Functions		
	::	->
name	domain	range
examples:		
(	) is	
(		
end		
fun (	):	end
	:::	->
name	domain	range
examples:		
(	) is	
(		
end		
fun (	):	end
	::	
name	domain	range
examples:		
(	) is	
(	) is	
end		
<b>fun</b> (	):	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.

Contract+Purpose State	ment	
ery contract has three parts:		
·		>
name	Domain	Range
	What does the function do?	
Give Examples		
the computer, write an exam	ple of your function in action, using E	EXAMPLE.
EXAMPLE (		)
the	user types	
HALLEED	See persolve	a alkat
ONOSED —	See pages/ro	ocket-)
	which should become	,
<del>heiaht.scr</del> t	<del>)</del>	
	-	
EXAMPLE (		)
the	user types	/
che	aser types	
		)
	which should become	
D. C. 11.		
Definition Write the definition giving	variable names to all your input value	
write the definition, giving	variable flames to all your input value	55.
define (		)
function name	variable names	
and the co	omputer does this	
and the co	mpacer aces ans	

#### 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. Contract	+Purpose Statement			
Every contract h	as three parts:			
•	•		->	
,Name	•		Range	
Name		Domain	Nange	
•				
•	Wha	t does the function do?		
II. Give Exa	mples			
		our function in action, using EXA	NPLE	
(EVAMDLE (			1	
(EXAMPLE (_	the user say:	S	)	
UNUS	SFD - S6	ee pages/red	1_	
			)	
Sana	re scrbl	Racket replies		
<del>- oquu</del>	<del>I O I O I N I</del>			
(EXAMPLE (_		S	)	
	the user says	5		
			1	
<del></del> -		Racket turns that into		
III. Definitio	2			
		e names to all your input values.		
		•		
(define (_			)	
` \_	function name	variable names		
				)
	and the computer of	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 !)

. Contract+Purpo				
Every contract has three	parts:			
	•		>	
name		Domain	Range	
·	What	does the function do?		
. Give Examples				
	an example of yo	our function in action, using EX	AMPLE.	
EVALADIE /			,	
EXAMPLE (	Use the funct	cion here	)	
	المانية	another way to get the same result her	)	
	TING 6	diother way to get the same result her	e	
LIMILICE			1/10	
<b>UNUSE</b> I	7 – 2e	ee pages/lav	MU-	
EXAMPLE (	Ise the funct	ion here	)	
area.sci	D pac the function	non nere		
			)	
	find a	another way to get the same result her	e	
I. Definition				
Write the definition	n, giving variable	e names to all your input values.		
define (			)	
function	n name	variable names	/	
				)
	and the computer d	nes 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 S	tatement	
Every contract has three par	ts:	
;:_		->
, •	Domain	Range
		-
• • · · · · · · · · · · · · · · · · · ·		
	What does the function do?	
II. Give Examples		
On the computer, write an e	example of your function in action, using	EXAMPLE.
(EXAMPLE (		)
(	Use the function here	
<b>LINUSED</b> -	- See pages/ul find another way to get the same result	odate- \
ONOGED	find another way to get the same result	here
danger sc	<del>rhl ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '</del>	
dangono		
/EVAMDLE /		,
(EXAMPLE (	Use the function here	)
		)
	find another way to get the same result	here
III. Definition		
Write the definition, g	iving variable names to all your input valu	es.
(define (		\
(define (		)
ranction han	variable names	
		`
	the computer does this	)
anu i	and computer does tills	

#### 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.

The state of the same result here    Sive Examples			
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  Use the function here  What does the function, using EXAMPLE.  EXAMPLE  Use the function here  Use the same result here  find another way to get the same result here  target.scrb  find another way to get the same result here  Definition  Write the definition, giving variable names to all your input values.  define (			Range
What does the function do?  Give Examples I the computer, write an example of your function in action, using EXAMPLE.  XAMPLE (  Use the function here   What does the function in action, using EXAMPLE.  I use the function here  Use the same result here  Unuse the function here  Unuse the function here  I use the function here  Unuse the function here  What does the function in action, using EXAMPLE.  I use the function here  I use the same result here  I ind another way to get the same result here  Definition  Write the definition, giving variable names to all your input values.  I define (  I use the function here  I us			
XAMPLE (			
XAMPLE (	Give Examples		
Tind another way to get the same result here  Use the function here  UNUSED — See pages/update-  Tind another way to get the same result here  Definition  Write the definition, giving variable names to all your input values.  Define (	the computer, write an exam	nple of your function in action, using EXAMPI	E.
find another way to get the same result here  Use the function here  UNUSED — See pages/update- target.scrb find another way to get the same result here  Definition Write the definition, giving variable names to all your input values.  define (	XAMPLE (		)
UNUSED — See pages/update- target.scrb  find another way to get the same result here  Definition Write the definition, giving variable names to all your input values.  define (	Use	e the function here	,
Use the function here  UNUSED — See pages/update- target.scrb  find another way to get the same result here  Definition  Write the definition, giving variable names to all your input values.  define (			
UNUSED — See pages/update- target.scrol find another way to get the same result here Definition Write the definition, giving variable names to all your input values.  define (			)
UNUSED — See pages/update- target.scrb  find another way to get the same result here  Definition Write the definition, giving variable names to all your input values.  define (		find another way to get the same result here	,
UNUSED – See pages/update- target.scrb  find another way to get the same result here  Write the definition, giving variable names to all your input values.  define ()			
UNUSED — See pages/update- target.scrb  find another way to get the same result here  Definition Write the definition, giving variable names to all your input values.  define (			
UNUSED – See pages/update- target.scrb  find another way to get the same result here  Definition Write the definition, giving variable names to all your input values.  define (		a the function have	)
find another way to get the same result here  Definition  Write the definition, giving variable names to all your input values.  Define ()			
find another way to get the same result here  Definition  Write the definition, giving variable names to all your input values.  Define ()	UNUSED –	· See pages/upd	late-
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 ()		Tind another way to get the same result here	
define ()		y variable names to all your input values	
	-	,	
	define (		)
			•
	and the c	omputer does this	

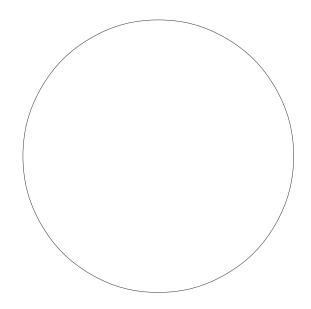
Sam is in a 640 x 480 yard. How far he can go to the left and right before he's out of sight?

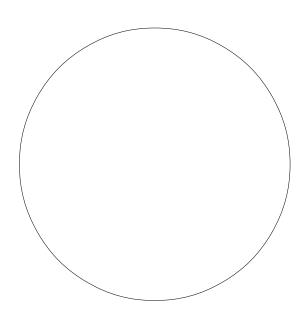
1. A piece of Sam is still visible on the left as long as...

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.

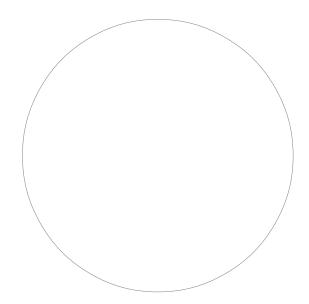
•	•		>	
name		Domain	Range	
· ;				
		t does the function do?		
II. Give Example On the computer, wr		our function in action, using E	XAMPLE.	
(EXAMPLE (			)	
,	Use the fund	ction here	,	
UNU <u>S</u> I	ED – Se	ee pages/s another way to get the same resul	safe-left.so	crb
(EXAMPLE (	Use the fund	ction here	)	
	find	another way to get the same resul	t here	
		another way to get the same resul		

Word Problem: safe-right?

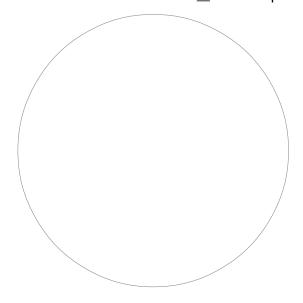
Use the Design Recipe to write a function <u>safe-right?</u>, which takes in an x-coordinate and checks to see if it is less than 690.

I. Contract+Pu	urpose Statement			
Every contract has t	hree parts:			
•	<b>:</b>		->	
name	•	Domain	Range	
•				
,	What	does the function do?		_
		does the function do.		
On the computer, w		our function in action, using	FXAMPI F	
. ,	. ,	, 5	L/WWW LL.	
(EXAMPLE (	Use the funct	vian hara	)	
UNUSE	ED – Se	e pages/sa	afe-	
			)	
right.so	cro find a	another way to get the same result		
3				
(EXAMPLE (	lles the Const	·····	)	
	Use the funct	non nere		
			)	
	find a	another way to get the same result	: here	
III. Definition				
Write the def	inition, giving variable	e names to all your input valu	les.	
(define (			)	
	nction name	variable names	/	
				)

## 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.

		>_	
name	Domain		Range
	What does the function do	o?	
Give Examples the computer, write	an example of your function in ac	ction, using EXAMPLE.	
EXAMPLE (	Use the function here		)
	Use the function here		-/
			)
		ne same result here	)
	D – See find another way to get the nscreen.scl	ne same result here	)
UNU <u>SEI</u> <del>pages/o</del>	D - See find another way to get the second s		)
UNU <u>SEI</u> <del>pages/o</del>			)
UNU <u>SEI</u> <del>pages/o</del>	D – See find another way to get the second s		)
UNU <u>SEI</u> <del>pages/o</del>	find another way to get the secretary of		)
UNUSEI pages/o	D – See find another way to get the second s		)
UNUSEI pages/o EXAMPLE (	find another way to get the secretary of	ne same result here	)
UNUSEI pages/o  XAMPLE (	find another way to get the state of the function here	ne same result here ur input values.	)

...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+Purpose Stateme	nt	
		_>
name •	Domain	Range
II. Give Examples		
On the computer, write an example o	f your function for each top	<u>oping</u> , using EXAMPLE.
(EXAMPLE(cost "p	pepperoni" )	)
Use the function h	iere	What should the function produce?
(EXAMPLE(	)	
	)	
Use the function h	iere	What should the function produce?
(EXAMPLE(	)	
Use the function h	) nere	What should the function produce?
	1	
(EXAMPLE(	/	
Use the function h	iere	What should the function produce?
III. Definition		
/ .l . f' /		`
(define (		)
function name	variable names	
-	<del></del>	
HMHSED	Saa naa	ocloost sorbl
ONOSED -	- See pay	es/cost.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.

name Domain  Give Examples  nish the two examples we've started for you, and make two response to the function here  EXAMPLE (update-player 128 "up")  Use the function here	Range  Mhat should the function produce?
Give Examples  nish the two examples we've started for you, and make two re  EXAMPLE (update-player 128 "up")  Use the function here	more
nish the two examples we've started for you, and make two response to the function here	
EXAMPLE ( <u>update-player 128 "up"</u> )	
Use the function here	What should the function produce?
Use the function here	What should the function produce?
Use the function here  Definition	What should the function produce?
define (	)
UNUSED – See pag player.scrbl	ges/update-

-			

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	nent					
Every contract	ct has three parts:						
•	•				->		
name	<b>:</b>		Dom	ain		Range	
II. Give	Examples						
(EXAMPLE	(line-length Use the functi	10 5 on here	<u>5</u>		(- 10 What should the fu	5) Inction produce?	)
(EXAMPLE	(line-length Use the functi	2 { on here	3	)	(- 8 What should the fu	2) Inction produce?	)
III. Defin	ition the definition, giving	variable nan	nes to all	vour inni	ıt values		
(define	function name		V	ariable naı	) mes		
	JSED – jth.scrk		_		s/line-		-

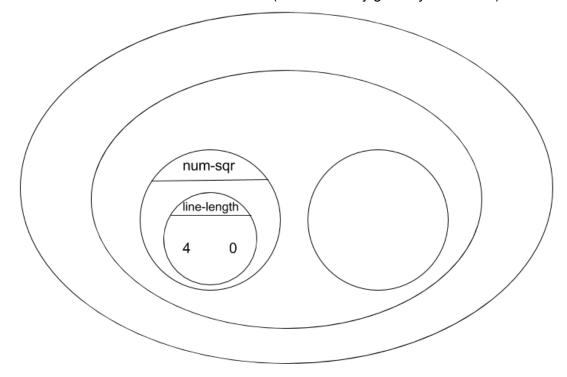
...and the computer does this

## The Distance Formula (an example)

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

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

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



Convert the Circle of Evaluation into Pyret code:

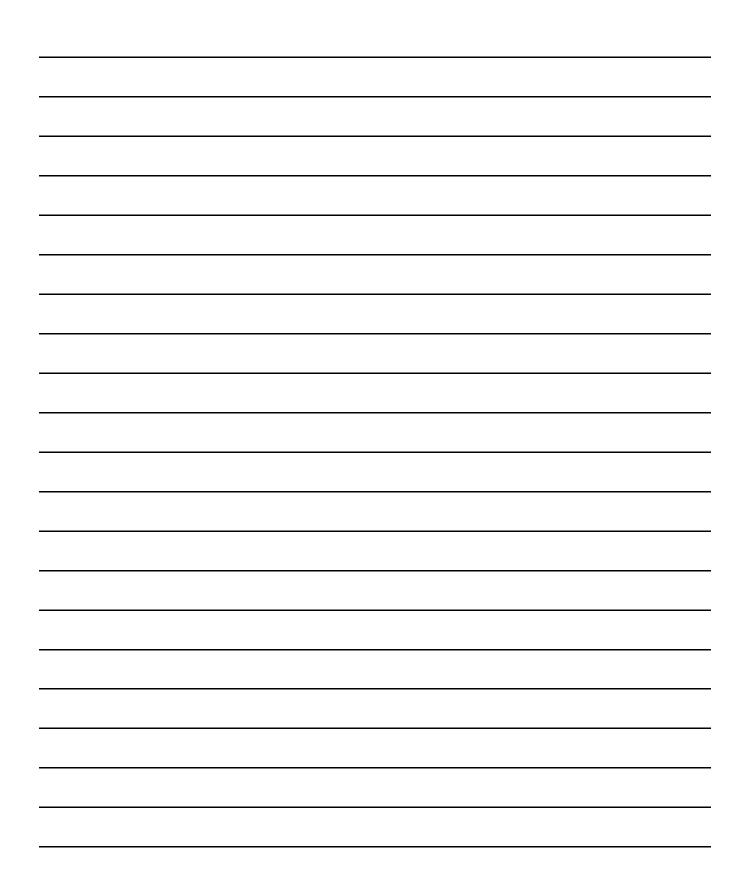
Write a function <u>distance</u>, which takes FOUR inputs:

	• Domain	->
name	Domain	Range
	What does the function do?	
Give Example	es	
XAMPLE (	Use the function here	)
	Use the function here  See pages he same re	
UNUSE		distance.sc
UNUSE	ED — See pages le same le	distance.sc
UNUSE	ED — See pages le same le	distance.sc
UNUSE	Use the function here	distance.sc
UNUSE	Use the function here	distance.sc

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

I. Contract+Purpose	Statement			
name • _		Domain	<b>-&gt;</b> Range	
•				
, —————————————————————————————————————	What does the fur	nction do?		
II. Give Examples				
(EXAMPLE (	Use the function here		)	
UNUSED	- See pa	ages/co	ollide.so	crbl
	find another way	to get the same result he	ere	
(EXAMPLE (			)	
	Use the function here			
			)	
	find another way	to get the same result h	ere ,	
III. Definition				
			1	
(define (			)	

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.

Contract an	d Pu	ırpose Sta	te	mer	nt
Every contract has three	e parts				
	::				->
function name	<del></del> , -			do	omain range
#					
				what d	loes the function do?
Examples					
Write some examples, t	hen circi	e and label what ch	nange	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, give	en variab	le names to all you	ır inpi	ut value	es
fun		(		):	
function name		variables		_ :	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 **distance** D that the rocket has traveled, as a function of **time** t.

l.			urpose S		ent		
Every	contra	ct has	three par	ts:			
	D		•			->	
	name		_ •		Domain	Range	-
#							_
					What does the function do?		
II.		Exam		otion f	ior come comple inpute		
vvrite	an exa	mpie o	t your tun	Ction i	or some sample inputs		
	D(	1)	is				
Use the	function	n here			What should the function produce?		
	D(	2 )	is				
Use the	function	n here			What should the function produce?		
	D(	,	is				
Use the	function	n here			What should the function produce?		_
-			_		·		
l loo the	. ftin		is		NA/legat of could the function must be 2		
Use the	function	i nere			What should the function produce?		
III.	Defin						
Write	the fun	ction, (	giving var	iable n	ames to all your input values.		
fun	D (			1	:		
_	. `			,	•		
end	L						

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	Statement	
Every contract has three pa		
_		_
<u> </u>		
name	Domain	Range
#	What does the function do?	
II. Give Examples		
	unction 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?	
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?

	ct+Purpose Sta has three parts:		
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	•	-	->
name		Domain	Range
#			
		What does the function do?	
	xamples	ion for <u>some sample inputs</u>	
vviile ali exalli	pie or your furice	ion for <u>some sample inputs</u>	
	is		
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Use the function h		What should the function produce?	
III. Definiti	ion		
		ole names to all your input values.	
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end	`	, -	

I. Contract+F	Purpose Sta	atement	
Every contract has	three parts:		
	:		->
name #		Domain	Range
<i></i>		What does the function do?	
II. Give Exam Write an example of		ion for <u>some sample inputs</u>	
	is		
Use the function here		What should the function produce?	
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Use the function here		What should the function produce?	
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Use the function here		What should the function produce?	
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Use the function here		What should the function produce?	
III. Definition	aivina varial	ole names to all your input values.	
vviite the fulletion,	giving varial	or harnes to all your input values.	
fun end	(	):	