## 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		••	••	••	••	••	••	••	••	••	••	•	••	••	••	:	••

Thing in the game	What changes about it?	More specifically
cloud	position	x-coordinate



The coordinates for the PLAYER (NinjaCat) are:	(	, ,	)	
		x-coordinate	y-coordinate	
The coordinates for the DANGER (Dog) are:	<b>T</b>	,	)	
The coordinates for the TARGET (Ruby) are:		,	)	

## Our Videogame

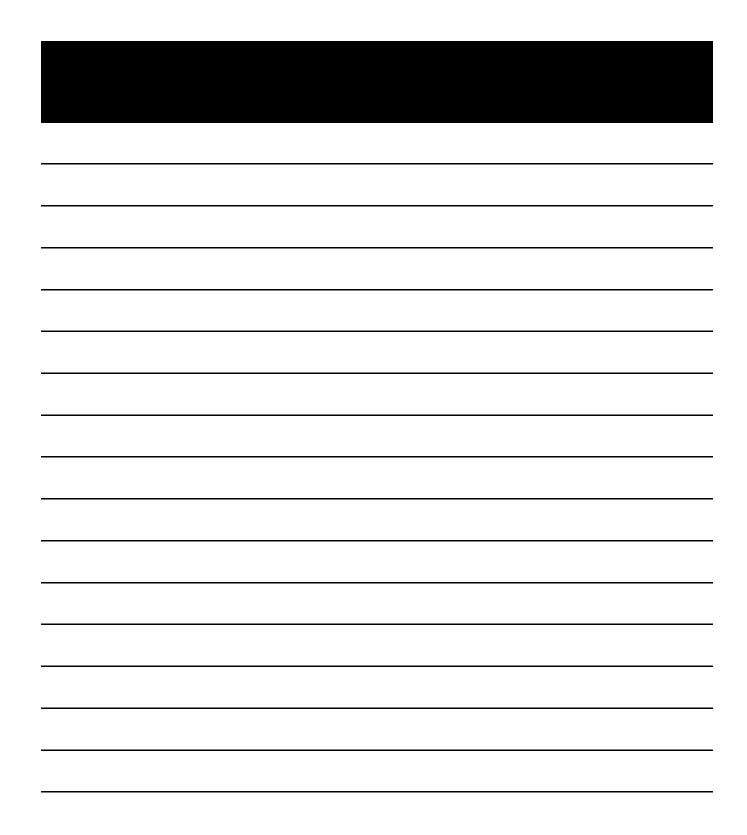
Created by (write your names):	
Our game takes place in:(space? the desert? a mall?)	
The player is a	
The player moves only up and down.	
Your player GAINS points when they hit the target.	
The Target is a	
The Target moves only to the left and right.	
Your player LOSES points when they hit the danger.	
The Danger is a	
The Danger moves only to the left and right.	

Don't forget to use the computer's symbols for things like multiply and divide!

Math	Circle of Evaluation	Racket Code
5 x 10		
8 + (5 x 10)		
,		
(8 + 2) - (5 x 10)		
5 v 10		
5 x 10 8 - 2		



	Math	Circle of Evaluation	Racket Code
Round 1	(3 * 7) - (1 + 2)		
Round 2	3 - (1 + 2)		
Round 3	3 - (1 + (5 * 6))		
Round 4			



,	: :	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)
;	<u>:</u>	>	_
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)
;	<u>:</u>	>	_
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)
;	;	>	_
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)

; :		->	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)
;	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)
;	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)
;	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)

(define	(	)		 )

#### 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.

ry contract has three parts:		
<b>:</b>		->
name	Domain	Range
	'hat does the function do?	
vv	nat does the function do:	
		101.5
the computer, write an example of	f your function in action, using EXAM	MPLE.
		,
EXAMPLE (	ypes	)
the user t	ypes	
		)
	which should become	
EXAMPLE (		)
the user t	ypes	
		`
	which should become	)
Write the definition giving ve	griable names to all your input val	LLOC
wille the deliminon, giving vo	ariable names to all your input val	ues.
define (		)
function name	variable names	
ranceion name		
ranction name		
Tanetian name		

#### 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.

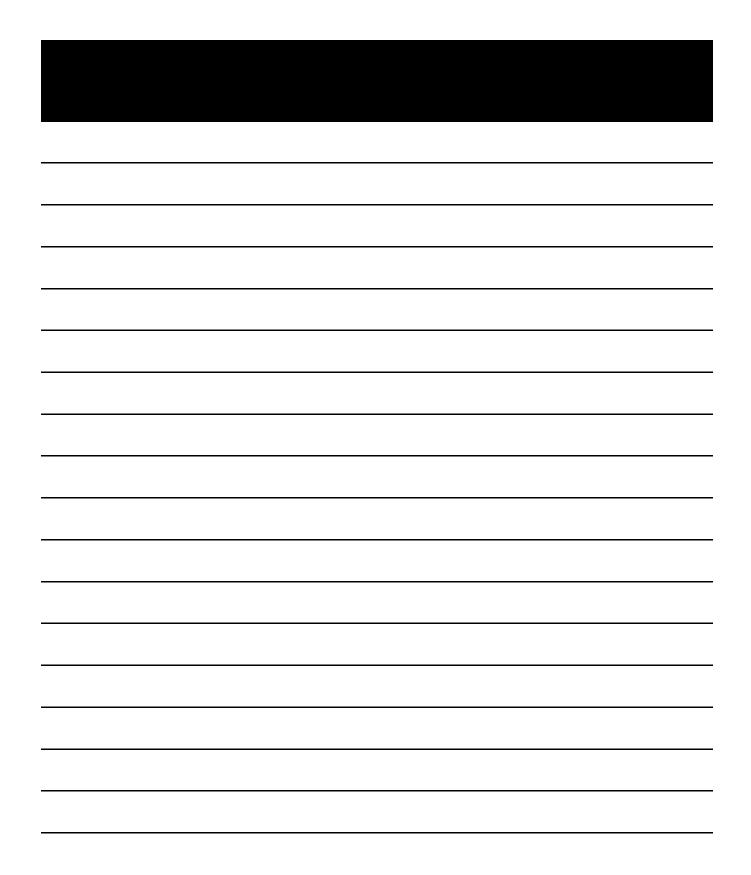
Cyamy cantuast has	thus a parts			
Every contract has	three parts:			
•	•		->	
9 Name	•	 Domain	_ ^ Range	
Name		Domain	Range	
•				
,	Wh	at does the function do?		
On the computer v	write an example of a	your function in action, using EXA	MDI F	
on the computer, v			IYIF LL	
(EXAMPLE (			)	
	the user say	/S	,	
			,	
		Dagkat raplica	)	
		Racket replies		
(EXAMPLE (			)	
	the user say	/s		
			`	
		Racket turns that into	)	
Write the c	letinition, giving vari	iable names to all your input va	lues.	
(			`	
(define (			)	
f	unction name	variable names		
				)
	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!)

very contract	has three parts:			
•	•	<u>-</u>	>	
name	•	Domain	Range	
•				
·	Wh	nat does the function do?		
On the compute	er, write an example of	your function in action, using EXAMP	LE.	
			1	
(EXAMPLE (	Use the fu	nction here	)	
			,	
_	fin	d another way to get the same result here	)	
(EXAMPLE (			)	
	Use the fu	nction here		
_			)	
	fin	d another way to get the same result here		
\				
write in	e definition, giving va	riable names to all your input value	<del>2</del> S.	
(define (_			)	
\ <u>\</u>	function name	variable names		
				)
	and the compute	r 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.

Every contract has thr	ee parts:		
• •		>	
name	Domain		Range
; ;	What does the function do	o?	
On the computer, writ	e an example of your function in ac	tion, using EXAMPLE.	
(EXAMPLE (		)	
<b>,</b>	Use the function here		
			)
	find another way to get th	ne same result here	
(EXAMPLE (		)	
(	Use the function here		
			)
	find another way to get th	ne same result here	
Write the defin	nition, giving variable names to al	Il vour input values	
wille the delif	illion, giving variable names to ai	ii your input values.	
(define (		)	
funct	ion name varia	able names	
			1
	and the computer does this		)

#### Word Problem: update-target

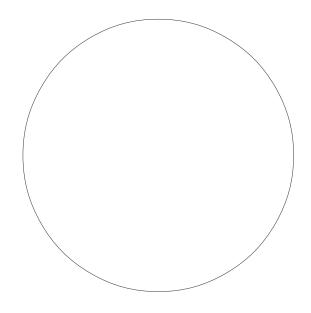
Write a function  $\underline{update-target}$ , which takes in the target's x-coordinate and produces the next x-coordinate, which is 50 pixels to the right.

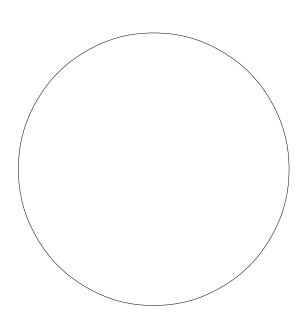
Every contract	t has three parts:		
•	· _	>	
name	Domain	Range	
· ,			
	What does the function do?		
On the compu	ter, write an example of your function in action, using EXAMPI	LE.	
(EXAMPLE	Use the function here	)	
	Use the function here		
		,	
	find another way to get the same result here	/	
(EXAMPLE		)	
	Use the function here		
		,	
	find another way to get the same result here	/	
Write t	he definition, giving variable names to all your input value	es.	
	, , , , , , , , , , , , , , , , , , , ,	`	
(define (	function name variable names	<u>_</u> )	
			`
	and the computer 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	Domai	11	Range
	What does the function of		
	what does the function (	10:	
computer, write a	n example of your function	in action, using EXAM	IPLE.
·		_	<b>)</b>
W LL (	Use the function here		,
			)
	find another way to get	the same result here	ŕ
NPLE (			`
·F LL (	Use the function here		,
			)
	find another way to get	the same result here	
A / .: 1 - 1 - 1 - 1 - 11	, giving variable names to a	your input values.	
write the definition			
	me var	,	)

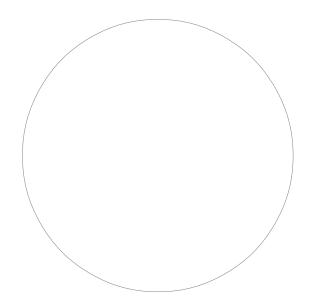
#### Word Problem: safe-right?

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.

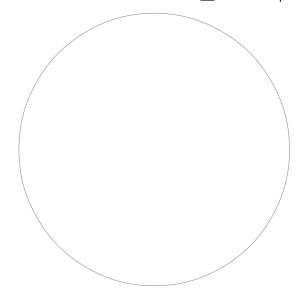
•		->
name •	Domain	Range
	What does the function do?	
In the computer, write a	n example of your function in action, using	EXAMPLE.
EXAMPLE (		)
	Use the function here	
		)
	find another way to get the same result	here
EXAMPLE (		,
LXAMIFEL (	Use the function here	)
		)
	find another way to get the same result	here
Write the definition	on, giving variable names to all your input	t values.
define (		)
		,

#### 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.



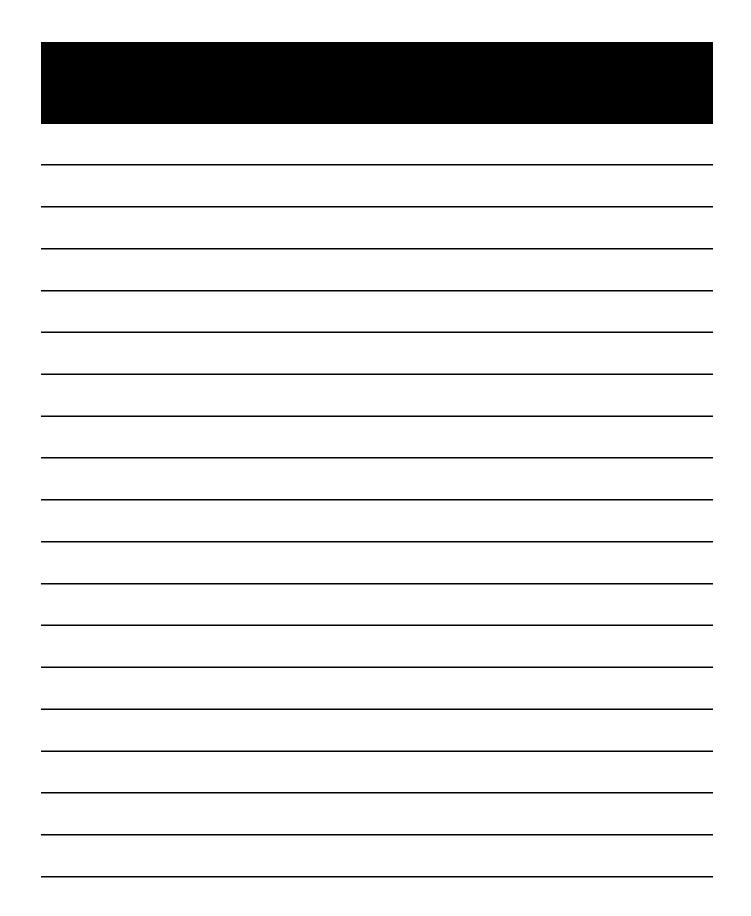
2. Two is less than four  $\underline{or}$  four is equal to six.



#### 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.

Every contract has th	ree parts:			
•	_ <b>:</b>		>	
name		Domain	Range	
•				
,	Wha	at does the function do?		_
On the computer, wri	te an example of y	our function in action, using	EXAMPLE.	
(EVAMDLE (			,	
(EXAMPLE (	Use the fund	ction here	)	
			,	
	find	another way to get the same result	<i>)</i> t here	
(EXAMPLE (			)	
(=/ 0 0 / 11	Use the fund	ction here		
			,	
	find	another way to get the same result	t here	
Write the def	nition, giving vari	able names to all your inpu	t values.	
( 1 6: (				
(define (	A		)	
func	tion name	variable names		
				`
				<i>)</i>



#### 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.

: :		->
name	Domain	Range
On the computer, write an example o	of your function for <u>ec</u>	ach topping, using EXAMPLE.
	pperoni" )	)
Use the function here	<u> </u>	What should the function produce?
(EXAMPLE (	)	What should the function produce?
Ose the fortellor field	,	What should the folicitors produce?
(EXAMPLE (	)	What should the function produce?
Ose the fortellor here	,	What should the folicitors produce?
(EXAMPLE (	)	)
Use the function here	<b>)</b>	What should the function produce?
(define (		)
function name	variable no	ames
	ı	

#### 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 Range  Finish the two examples we've started for you, and make two more
Finish the two examples we've started for you, and make two more
(EXAMPLE ( <u>update-player 128 "up"</u> )  Use the function here What should the function produce?
(EXAMPLE ( <u>update-player 451 "down"</u> )  Use the function here 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?
(define ())  function name variable names

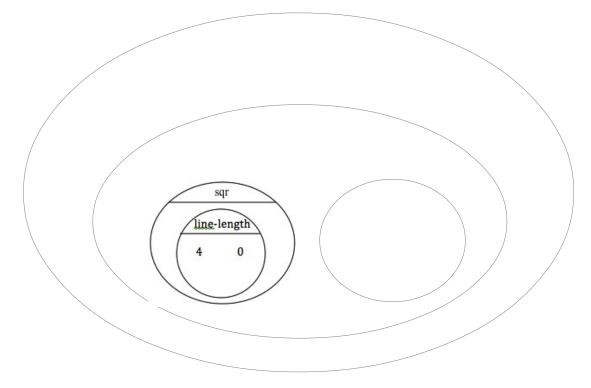
Write a function called <u>line-length</u>, which takes in two numbers and returns the difference between them. It should always subtract the smaller number from the bigger one.

	ct has three parts:					
name	:			Domain	> Range	
(EXAMPLE	(line-length Use the funct	10 ion here	5	)	(- 10 5) What should the function prod	) duce?
(EXAMPLE	(line-length Use the funct	2 ion here	8	)	(- 8 2) What should the function prod	) duce?
Write	the definition, givin	ng variak	ole nam	es to all you	r input values.	
Write (define	(	ng variak ——	ole nam		)	
	_	ng variak 	ole nam	es to all you variable na	)	
	(	ng variak	ole nam		)	
	(	ng variak	ole nam		)	
	(	ng variak	ble nam		)	
	(	ng variak	ole nam		)	
	(	ng variak	ble nam		)	

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:

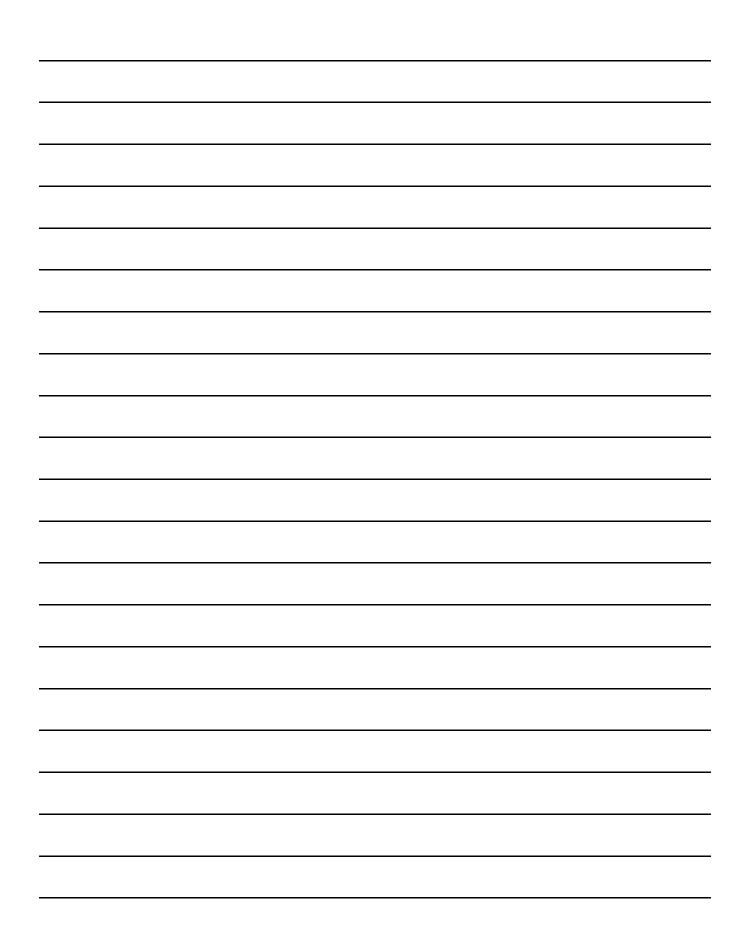
	of the player of another game character of another game character		
It should return the distance k you did on page 27!)	petween the two, using the Distance for	rmula. (HINT: look at what	
•••	Domain	_ <b>- &gt;</b> Range	
• •			
	What does the function do:		
(EXAMPLE (	se the function here	)	
	find another way to get the same result here	;	_)
(EXAMPLE (	se the function here	)	
	find another way to get the same result here	•	_)
(define (	variable names	)	
		)	

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

□ px: The x-coordinate of the player

□ px: The □ py: The □ cx: The □ cy: The It shou		ayer ayer er game character	50 <b>pixels</b> of the	
•	:		>	
name		Domain	Range	
;	WI	hat does the function do?		
(EXAMPLE	Use the fu	nction here	)	
	fir	nd another way to get the same result here	)	
(EXAMPLE	(Use the fu	nction here	)	
	fir	nd 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:



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!

For each question, circle the answ	ver that fits best.		
Was the introduction catchy?	No way!	A little.	Definitely!
Did they talk about their characte	ers? 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

;::		>
name E	Domain	Range
What does the	function do?	
Write some examples of red-shape below. The first (	one has already	been done for you.
(EXAMPLE <u>(red-shape</u> "circle" Use the function here		circle 50 "solid" "red") hat should the function produce?
(EXAMPLE (	)w	hat should the function produce?
(EXAMPLE (	)w	hat should the function produce?
(EXAMPLE (	)w	hat should the function produce?
III. Definition		
(define (		)
function name (cond	variable names	,
	(circle	50 "solid" "red")

## **Translating Value Definitions from Code to Algebra**

Racket Code	Algebra
(define x 10)	x = 10
(define y (* x 2))	y = x*2
(define z (+ x y))	
(define age 14)	
(define months (* age 12))	
(define days (* months 30))	
(define hours (* days 24))	
(define minutes (* hours 60))	

### **Translating Function Definitions from Code to Algebra**

Racket Code	Algebra
<pre>(define (area length width)   (* length width))</pre>	area(length, width) = length * width
<pre>(define (circle-area radius)   (* pi (sq radius)))</pre>	
(define (distance x1 y1 x2 y2) (sqrt (+ (sq (- x1 x2))	

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.

Every contract has three po	arts:	
; <u>D</u> ::		>
name	Domain	Range
<b>;</b>		
	What does the function do?	
Write an example of your fu	nction for <u>some sample inputs</u>	
D(1) -		
Use the function here	What should the function produce?	
	Title should the follower produce.	
D(2)=		
Use the function here	What should the function produce?	
D( ) -		
Use the function here	What should the function produce?	
ose the folietier fiere	What should the folicitors produces	
Use the function here	What should the function produce?	
Write the formula, aiving va	riable names to all your input values.	
D( ) =		

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>.

ery contract has three	parts:	
·	>_	
name	Domain	Range
	What does the function do?	
rite an example of your	function for <u>some sample inputs</u>	
=		
e the function here	What should the function produce?	
	, , , , , , , , , , , , , , , , , , ,	
e the function here	What should the function produce?	
=		
	What should the function produce?	
e the function here	What should the function produce?	
e the function here		
e the function here	What should the function produce?  What should the function produce?	
e the function here		
e the function here  = e the function here		
e the function here  = e the function here	What should the function produce?	

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	Domain	Range
	What does the function do?	
Vrita an avample of vour	function for some sample inputs	
ville an example of your	function for <u>some sample inputs</u>	
se the function here	What should the function produce?	
_		
se the function here	What should the function produce?	
<u>=</u>		
se the function here	What should the function produce?	
=		
se the function here	What should the function produce?	
Vrite the Formula, giving	variable names to all your input values.	
The file retificia, giving	randolo namos lo ali you impur valoes.	
=		

•		
•		->
name	Domain	Range
	What does the function do?	
a example of your fund	ction for <u>some sample inputs</u>	
=	ction for <u>some sample inputs</u>	
e function here	What should the function produce?	
=		
function here	What should the function produce?	
=		
e function here	What should the function produce?	
=		
e function here	What should the function produce?	