# Contracts

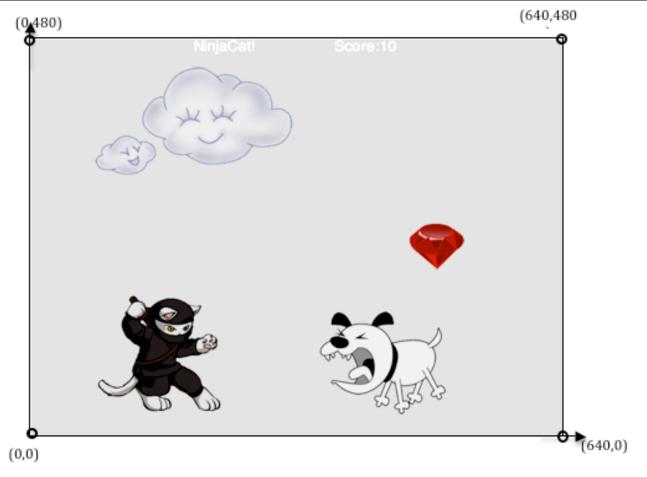
Name	Domain	Range	example
••	•	<b>↑</b>	
:	:	<b>↑</b>	
••	•	<b>↑</b>	
••		<b>↑</b>	
•	•	<b>^</b>	
••	•	<b>^</b>	
••	:	<b>↑</b>	
••		<b>↑</b>	
••	•	<b>^</b>	
•	•	<b>↑</b>	
••		<b>↑</b>	
••	:	<b>↑</b>	
;	•	<b>^</b>	
••		<b>↑</b>	
•		<b>+</b>	
••	:	<b>↑</b>	
•	•	<b>↑</b>	

# **Contracts**

example																	
Range	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>1</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>↑</b>	<b>1</b>
Domain					•	•	•	:	•	•		:	•	•	•	•	<u></u>
Name	••	••	••	••	••	••	••	••	••	••	••	•	••	••	••	:	••

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

### Finding Coordinates



The coordinates for the PLAYER (NinjaCat) are	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):	
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	

Circle of Evaluation Practice

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)		
(0 1 2) = (3 × 10)		
<u>5 x 10</u> 8 - 2		
8 - 2		

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

	Circles Co	mpetition	Time: 5 minutes
	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	(1 + (5 * 6)) - 3		

Fast Functions			
;	:	>	
name	domain	range	
(EXAMPLE (	)		_)
(EXAMPLE (	)		)
(define (	)		_)
;	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)
•	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	))		)
,	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)

Fast Functions			
;	:	>	
name	domain	range	
(EXAMPLE (	)		_)
(EXAMPLE (	)		)
(define (	)		_)
;	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)
•	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	))		)
,	:	>	
name	domain	range	
(EXAMPLE (	)		)
(EXAMPLE (	)		)
(define (	)		)

	•	•	-	
 · · · · · · · · · · · · · · · · · · ·	-	-	<del>-</del>	

### 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.

ery contract has three parts:		
·		->
name	Domain	Range
	What does the function do?	
the computer write an evenn	lo of your function in action using EVAL	MDI E
the computer, write an examp	le of your function in action, using EXA/	WPLE.
EXAMPLE (		)
the u	iser types	
		)
	which should become	,
EXAMPLE (		)
	iser types	
		)
	which should become	,
Write the definition, giving	g variable names to all your input val	lues.
		,
define (	variable names	)
runction name	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.

		>
Name	Domain	Range
	What does the function do?	
ho computer write an evam	uple of your function in action, using EX	AMDIE
•		
(AMPLE (	e user says	)
CHE	e user says	
	D. I !!	)
	Racket replies	
KAMPLE (		1
the	e user says	/
		\
	Racket turns that into	)
Write the definition, givi	ing variable names to all your input v	alues.
<b>.</b> ,		
efine (	variable names	)

### 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!)

name	Domain	Range
	What does the function do?	
ne computer, write an	example of your function in action, using I	EXAMPLE.
KAMPLE (		)
	Use the function here	
	find another way to get the same result	here
	This another way to get the same result	Tiere
KAMPLE (	Use the function here	)
	ose the function here	
		,
<del></del>	find another way to get the same result	here
Write the definition	n, giving variable names to all your input	values.
efine (		)

### 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.

·		>
name	Domain	Range
	What does the function do?	
n the computer, write an examp	ole of your function in action, using EXA	AMPLE.
EXAMPLE (	the function here	)
Use	the function here	
		)
	find another way to get the same result her	re
EVAMBLE (		`
EXAMPLE (	the function here	)
		`
	find another way to get the same result her	<i>)</i> re
Write the definition, givin	ng variable names to all your input vo	alues.
1 (. (		
define (	variable names	)
function name	variable names	

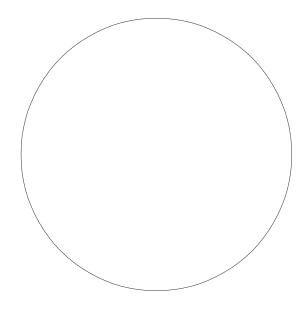
### Word Problem: update-target

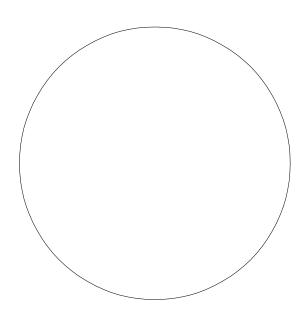
Write a function <u>update-target</u>, which takes in the target's x-coordinate and produces the next x-coordinate, which is 50 pixels to the right.

•	•		->	
name		Domain	Rar	nge
;				
•	What does	s the function do?		
On the computer, write	an example of your f	function in action, using	R EVAMPLE	
•				
(EXAMPLE (	Use the function h	nere	)	
				1
	find anoth	ner way to get the same resu	ılt here	)
(EXAMPLE (	Use the function h		)	
	ose the function in	iere		
	find anoth	ner way to get the same resu	ılt here	)
	rina anour	ier way to get the same resu	ice nere	
Write the defini	tion, giving variable	names to all your inp	ut values.	
		,		
(define (	 on name	variable names	)	

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	
	What	does the function do?		
on the computer was	ita an ayamala a	f your function in action, usi	na EVALADI E	
·	·	•	_	
EXAMPLE (	Use the funct	ion here	)	
			`	
	find a	another way to get the same result h	nere	
EXAMPLE (			)	
	Use the funct	ion here		
	final -		)	
	find a	another way to get the same result h	iere	
Write the defir	nition aiving vario	able names to all your input	values	
wille frie delli	illon, giving valid		values.	
			`	
define (			)	

### Word Problem: safe-right?

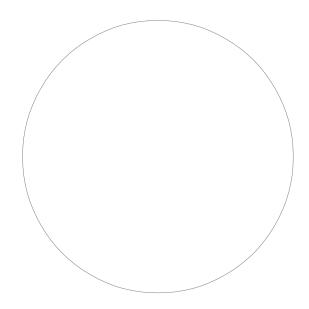
Use the Design Recipe to write a function <u>safe-right?</u>, which takes in an x-coordinate and checks to see if it is less than 690.

name Domain Range  What does the function do?  On the computer, write an example of your function in action, using EXAMPLE.				
What does the function do?  What does the function do?  On the computer, write an example of your function in action, using EXAMPLE.  (EXAMPLE (	Every contract h	nas three parts:		
What does the function do?  What does the function do?  On the computer, write an example of your function in action, using EXAMPLE.  (EXAMPLE (	-			
What does the function do?  What does the function do?  On the computer, write an example of your function in action, using EXAMPLE.  (EXAMPLE (				
What does the function do?  On the computer, write an example of your function in action, using EXAMPLE.  (EXAMPLE (	•	·		
What does the function do?  On the computer, write an example of your function in action, using EXAMPLE.  (EXAMPLE (	name		Domain	Range
What does the function do?  On the computer, write an example of your function in action, using EXAMPLE.  (EXAMPLE (	•			
(EXAMPLE (	,			
(EXAMPLE (				
(EXAMPLE (	On the compute	er write an example (	of your function in action, using EXA	MPI F
(EXAMPLE ()	on the compate	ii, write air example t	or your runction in action, using Exam	VII LL.
find another way to get the same result here  (EXAMPLE (	(EXAMPLE (			)
(EXAMPLE ()  Use the function here  find another way to get the same result here  Write the definition, giving variable names to all your input values.  (define ()		Use the	function here	
(EXAMPLE ()  Use the function here  find another way to get the same result here  Write the definition, giving variable names to all your input values.  (define ()				
(EXAMPLE ()  Use the function here  find another way to get the same result here  Write the definition, giving variable names to all your input values.  (define ()				1
find another way to get the same result here  Write the definition, giving variable names to all your input values.  (define ()	_		find another way to get the same result here	/ :
find another way to get the same result here  Write the definition, giving variable names to all your input values.  (define ()				
find another way to get the same result here  Write the definition, giving variable names to all your input values.  (define ()				
find another way to get the same result here  Write the definition, giving variable names to all your input values.  (define ()	(EVAMDLE (			1
find another way to get the same result here  Write the definition, giving variable names to all your input values.  (define ()	(EXAMPLE (	Use the	function here	)
Write the definition, giving variable names to all your input values.  (define ()				
Write the definition, giving variable names to all your input values.  (define ()				
Write the definition, giving variable names to all your input values.  (define ()	_			)
(define ()		1	find another way to get the same result here	2
(define ()				
(define () variable names	Write the	e definition, giving v	rariable names to all your input va	lues.
function name variable names				,
function name variable names	(define (_		· ·	)
)		function name	variable names	
/				

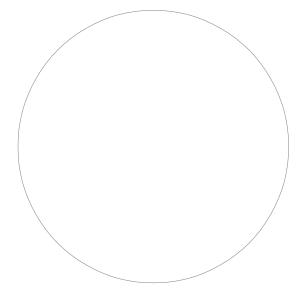
### and / or

### 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.

name			>	
		Domain	Range	
	What doe	es the function do?		
the computer, write	an example of your	function in action, using	EXAMPLE.	
XAMPLE (			)	
(	Use the function	here		
			)	
	Tind anot	ther way to get the same result	: nere	
XAMPLE (			)	
	Use the function	here		
	find anot	ther way to get the same result	) t here	
		way to got the same result		
Write the defini	tion, giving variable	e names to all your inpu	it values.	
	tion, giving variable	,	it values.	

### 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	of your function for e	ach topping, using EXAMPLE.
·	,	
(EXAMPLE ( <u>cost</u> "pe	epperoni'' )	)
Use the function he		What should the function produce?
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	mar shedia ma fericiion prodoce.
/EYANADIE /	1	1
(EXAMPLE (	//	What should the function produce?
use the function ne	ere	what should the function produce?
/EV/ A A ADI E /	,	,
(EXAMPLE (	)	)
Use the function he	ere	What should the function produce?
(EXAMPLE (	)	)
Use the function he	ere .	What should the function produce?
(define (		
function name	variable r	names
Tonellon name	valiable i	idities
	I	_

### 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 exc	amples we've started fo	or you, and make t	wo more
(EXAMPLE ( <u>ur</u>	Use the function here	<u>28 "up")</u> _	What should the function produce?
(EXAMPLE (up	odate-player 4 Use the function here	.51 "down")	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 (	unction name	variable ne	ames )
)			


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.

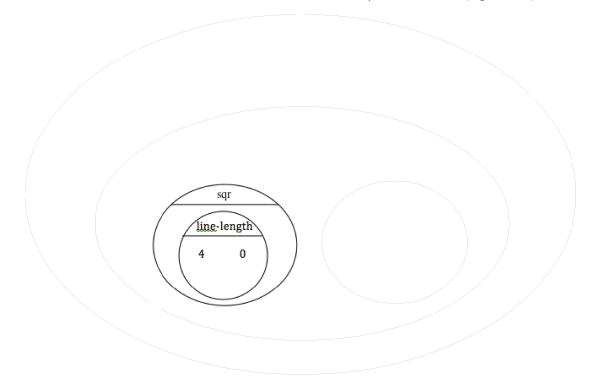
name	:			Domain	->	Range	
(EXAMPLE	(line-length Use the funct	10 ion here	5	)	(- 10 What should the fun	5) action produce?	
(EXAMPLE	(line-length Use the funct	2 ion here	8	)	<u>(</u> - 8 What should the fun	2) action produce?	
Write (define	the definition, givin	_	ole nam	variable na	)		
	(	_	ole nam		)		

### 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!)

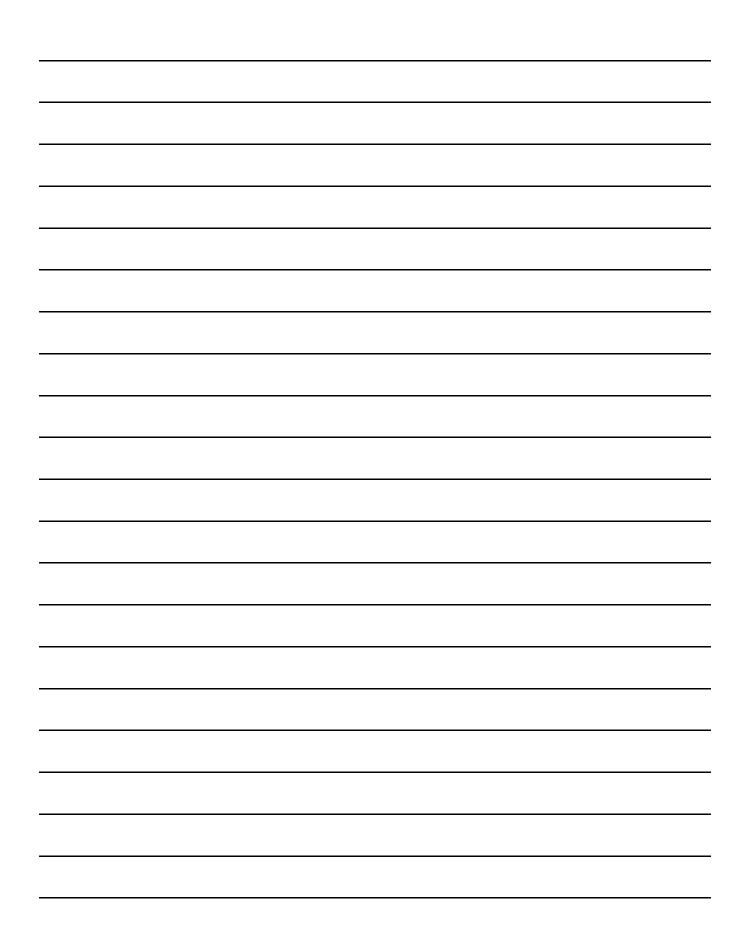


Convert the Circle of Evaluation into Racket code:

Write a function distance, which  px: The x-coordinate of the  py: The y-coordinate of the  cx: The x-coordinate of and  cy: The y-coordinate of and	e player e player other game character	
It should return the distance between you did on page 27!)	een the two, using the Distance fo	ormula. (HINT: look at what
;:		>
name	Domain	Range
;	What does the function do?	
(EXAMPLE (	function here	)
	find another way to get the same result her	e
, , , , , , , , , , , , , , , , , , , ,	function here	)
	find another way to get the same result her	e
(define (	variable names	)

□ px: Th □ py: Th □ cx: Th □ cy: Th lt show	a function collide?, which takes FOUR inputs: the x-coordinate of the player the y-coordinate of the player the x-coordinate of the player the x-coordinate of another game character the y-coordinate of another game character the uld return true if the coordinates of the player are with the other character. Otherwise, false.	vithin 50 <b>pixels</b> of the
:	::	->
name	Domain	Range
;	What does the function do?	
(EXAMPLE	(Use the function here	)
	find another way to get the same res	sult here
(EXAMPLE	(Use the function here	)
	find another way to get the same res	sult here
(define	function name variable names	)
		)

Catchy Intro:
lame, Age, Grade:
Same Title:
ack Story:
Characters:
xplain 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? Definitely! No way! 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!

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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	Domain	Range
) Who	at does the function do	
Write some examples of red-shape below.	The first one has alr	ready been done for you.
(EXAMPLE <u>(red-shape</u> "circ	cle" <u>)</u>	(circle 50 "solid" "red") What should the function produce?
(EXAMPLE (	)	What should the function produce?
(EXAMPLE (	)	What should the function produce?
(EXAMPLE (	)	What should the function produce?
III. Definition		
(define (	variable na	ames )
	(circ	cle 50 "solid" "red")

### Translating into Algebra

### **Value Definitions**

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))	

### **Function Definitions**

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 <u>distance</u> D that the rocket has traveled, as a function of <u>time</u> t.

<u>D</u> :_		>
name	Domain	Range
	What does the function do?	
/rite an example of your	function for <u>some sample inputs</u>	
D(1) =		
se the function here	What should the function produce?	
D(2)=		
se the function here	What should the function produce?	
D( ) =		
se the function here	What should the function produce?	
=		
se the function here	What should the function produce?	
Irita tha farmula aivina	variable 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*.

every contract has three p	parts:	
_		
•	>_	
name	Domain	Range
, ,	What does the function do?	
	what does the function do?	
Write an example of your t	function for <u>some sample inputs</u>	
=		
Jse the function here	What should the function produce?	
=		
Jse the function here	What should the function produce?	
=		
Jse the function here	What should the function produce?	
=		
Jse the function here	What should the function produce?	
Write the Formula, giving v	variable names to all your input values.	
3 3	•	
=		

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?

Every contract has three parts:		
•		>
name	Domain	Range
	Wile ark also as the first Keep als 2	
	What does the function do?	
Vrite an example of your	function for <u>some sample inputs</u>	
ville all example of your		
=		
Ise the function here	What should the function produce?	
se the function here	What should the function produce?	
30 mo fonction note	What should the folletion produce:	
=		
Ise the function here	What should the function produce?	
= Ise the function here	What should the function produce?	
se the function here	What should the function produce?	
	variable names to all your input values.	<u> </u>
Vrite the Formula, giving	variable flatties to all your import values.	
Vrite the Formula, giving	variable flatties to all your impor values.	

		·>
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?	
=		
= e the function here	What should the function produce?	
	What should the function produce?	
e the function here	What should the function produce?  What should the function produce?	