Contracts

Name	Domain		Range	example	
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		
:_	..		↑		

Contracts

Name	Domain	Range	example
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	
:	..	↑	

Lesson 1

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

Fill out the contract for each function, then try to write two examples and the definition by yourself.

; _double_____:__Number_____ -> _Number_____

   name   domain   range

(EXAMPLE (_double_ __5__) _(* 2 5)_____)

(EXAMPLE (_double_ __7__) _(* 2 7)_____)

(define (__double_ _n____) _(* 2 n)_____)

; _____:_____ -> _____

   name   domain   range

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

; _____:_____ -> _____

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

; _____:_____ -> _____

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

Lesson 2

DESIGN RECIPE: SAMPLE

Make a circle (spot) of size 100, with the provided color

Contract+Purpose Statement

Every contract has three parts:

; __spot100__ : _____String_____ -> __Image__

name   Domain   Range

; _____Makes a size 100 circle in a color_____

What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (spot100 "green")(circle 100 "solid" "green"))

the user types...   ...which should become

color

(EXAMPLE (spot100 "blue")(circle 100 "solid" "blue"))

the user types...   ...which should become

Function

Circle the changes in the EXAMPLEs, and name the variables.
Write the code, copying everything that isn't circled, and using names where you find variables!

(define (spot100   color   )   (circle 100 "solid" color))

function name   variable names   ...and the computer does this

DESIGN RECIPE: DOUBLE-RADIUS

State the problem:

Contract+Purpose Statement

Every contract has three parts:

; _____ : _____ -> _____
           name   Domain   Range

; _____
                                  What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____ _____) _____)
                      the user types…   …which should become

(EXAMPLE (_____ _____) _____)
                      the user types…   …which should become

Function

Circle the changes in the EXAMPLEs, and name the variables.
Write the code, copying everything that isn't circled, and using names where you find variables!

(define (_____ _____) _____)

DESIGN RECIPE: DOUBLE-WIDTH

State the problem:

Contract+Purpose Statement

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

; _____
                               What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____ _____) _____)
                     the user types…   …which should become

(EXAMPLE (_____ _____) _____)
                     the user types…   …which should become

Function

Circle the changes in the EXAMPLEs, and name the variables.
Write the code, copying everything that isn't circled, and using names where you find variables!

(define (_____ _____) _____)

DESIGN RECIPE: PAINT-JOB

State the problem:

Contract+Purpose Statement

; _____ : _____ -> _____
      name   Domain   Range
; _____
                          What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____   _____)

                    _____

                    _____

                    _____

                    _____

                    _____)

(EXAMPLE (_____   _____)

                    _____

                    _____

                    _____

                    _____

                    _____)

Function

(define   (_____   _____)

                    _____

                    _____

                    _____

                    _____

                    _____)

DESIGN RECIPE: TURBO-CHARGE

State the problem:

Contract+Purpose Statement

; _____ : _____ -> _____
　　　　　　name　　　　　　　　　　　　　　　　　　Domain　　　　　　　　　　　　　Range

; _____
　　　　　　　　　　　　　　　　　　What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____　　_____)

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____)

(EXAMPLE (_____　　_____)

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____)

Function

(define　　(_____　　_____)

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____

　　　　　　　　　　　　_____)

Lesson 3

DESIGN RECIPE: PIMP

State the problem:

Contract+Purpose Statement

; _____ : _____ -> _____
       name   Domain   Range

; _____

What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____   _____)

                           _____

                           _____

                           _____

                           _____

                           _____)

(EXAMPLE (_____   _____)

                           _____

                           _____

                           _____

                           _____

                           _____)

Function

(define   (_____   _____)

                           _____

                           _____

                           _____

                           _____

                           _____)

DEFINE-STRUCT

Autos:

; an auto is a _____

(define-struct auto   (_____

                  _____

                  _____

                  _____

                  _____))

; a party is a _____

(define-struct party   (_____

                  _____

                  _____))

DESIGN RECIPE: RSVP

State the problem:

Contract+Purpose Statement

; _____ : _____ -> _____
         name   Domain   Range

; _____
What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____ _____)

                        _____

                        _____

                        _____)

(EXAMPLE (_____ _____)

                        _____

                        _____

                        _____)

Function

(define (_____ _____)

                        _____

                        _____

                        _____)

DESIGN RECIPE: RELOCATE

State the problem:

Contract+Purpose Statement

; _____ : _____ -> _____
       name   Domain   Range

; _____
                       What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____ _____)

             _____

             _____

             _____)

(EXAMPLE (_____ _____)

             _____

             _____

             _____)

Function

(define (_____ _____)

             _____

             _____

             _____)

Dissecting a Demo: Ninja World

What changes?

_____

_____

_____

_____

Ninja World:

; a world is a _____

(define-struct world (_____))

My constructor function is:

1) (How do you make a world?)_____

What is its contract? _____

My accessor function is:

2) (How do you get the dogX out of the world?)

_____

What is its contract? _____

DESIGN RECIPE: UPDATE-WORLD (NINJA WORLD)

State the problem:

Contract+Purpose Statement

; _____ : _____ -> _____
        name   Domain   Range

;_____
                              What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE   (_____ _____)

         _____)

(EXAMPLE   (_____ _____)

         _____)

Function

(define (_____ _____)

         _____)

Lesson 4

Review: define-struct

Last week we talked about a function that created new structs. For the structs below, what function would you use for each of the following?

; an auto is a String _____ Number _____ Number

(define-struct auto (model hp rims color value))

Make an auto? _____

Get the model out of an auto? _____

Get the hp out of an auto? _____

; a party is a _____ String Number

(define-struct team (location theme guests))

Make a party? _____

Get the location out of the party? _____

Get the theme out of the party? _____

Get the guests out of the party? _____

; a world is a Number

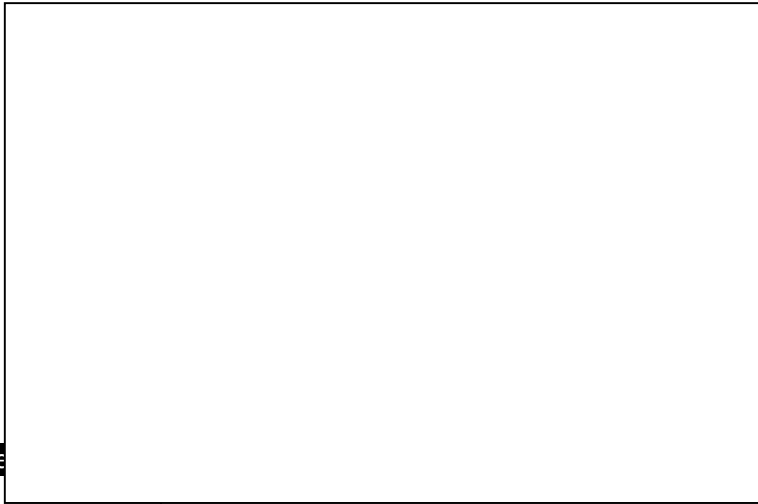(define-struct world (dogX))

What function would you use to:

Make a world? _____

Get the dogX out of the world? _____

GAME DESIGN
"Start Simple, Get Complex"

Draw a rough sketch of your game in action

What images will you ne

Background	

List everything that has changed, and the datatype you will use to represent it

Changed (position? score? color? costume?)	**Datatype** (number? string? image? boolean?)

; a world is a _____

(define-struct world (_____

                        _____

                        _____

                        _____

                        _____))

; make-world : _____ → World

;_____

;_____

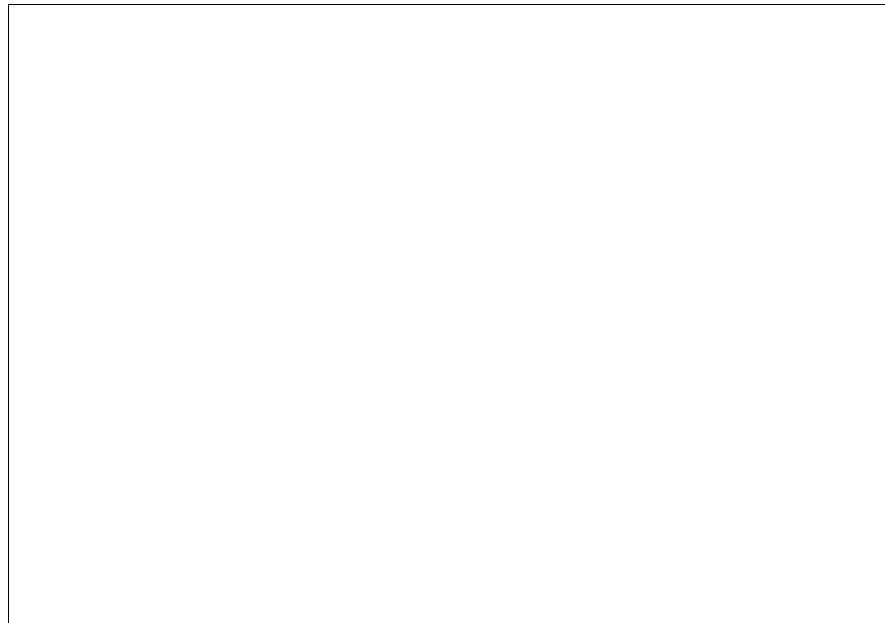;_____

;_____

;_____

Lesson 5

(0, 480)   **START**   (640,480)

(0, 0)   (640, 0)

At the start of my game, this is where everything is:
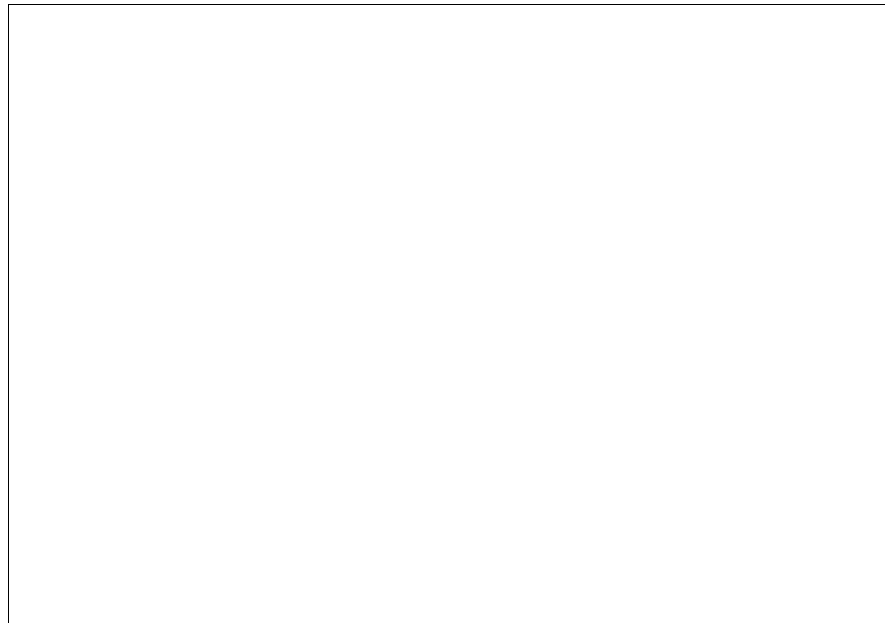
Object (top to bottom of stack)	Position (x, y)
Background	██████████████████████

(define START(make-world _____

_____

_____

_____

_____))

NEXT

(0, 0) (640, 0)

A split second later, this is where everything is:

Object (top to bottom of stack)	Position (x, y)
Background	███████████████████

(define NEXT (make-world _____

_____

_____

_____

_____))

DRAW-WORLD

Contract

; _____ : _____ -> _____

Using put-image

(define (_____ _____)

(put-image _____

_____

(put-image _____

_____

(put-image

_____

_____

(put-image _____

_____

BACKGROUND _____

DESIGN RECIPE: UPDATE-WORLD

State the problem (What changes?):

Contract+Purpose Statement

; _____ : _____ -> _____
       name   Domain   Range

; _____
                                  What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____   _____)

                          _____
                          _____
                          _____
                          _____
                          _____)

(EXAMPLE (_____   _____)

                          _____
                          _____
                          _____
                          _____
                          _____)

Function

(define   (_____   _____)

                          _____
                          _____
                          _____
                          _____
                          _____)

Lesson 6

When the user presses…	*this* part...	Changes by…

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

DESIGN RECIPE

For each keypress in the Ninja World game, show how (keypress START <key>) should change your world.

Contract+Purpose Statement

; _____ : _____ -> _____
       name   Domain   Ranges

Give Examples

(EXAMPLE (keypress START _____)

         (make-world   _____

                              _____

                              _____

                              _____

                              _____))

(EXAMPLE (keypress START _____)

         (make-world   _____

                              _____

                              _____

                              _____

                              _____))

```
(define    (_____  _____)
    (cond
    [(_____)

        _____

                        _____

                        _____

                        _____

                        _____]

    [(_____)

        _____

                        _____

                        _____

                        _____

                        _____]))
```

DESIGN RECIPE

For each keypress in your game, show how (keypress START <key>) should change your world.

Contract+Purpose Statement
; _____ : _____ -> _____
      name   Domain   Ranges

Give Examples

(EXAMPLE (keypress START _____)

             (make-world   _____

                               _____

                               _____

                               _____

                               _____))

(EXAMPLE (keypress START _____)

             (make-world   _____

                               _____

                               _____

                               _____

                               _____))

```
(EXAMPLE   (keypress START  _____)
           (make-world      _____

                            _____

                            _____

                            _____

                _____))
```
_____
```
(define    (_____  _____)
     (cond
       [(_____)

                    _____

                         _____

                         _____

                         _____

                         _____]

       [(_____)

                    _____

                         _____

                         _____

                         _____

                         _____]

       [(_____)

                    _____

                         _____

                         _____

                         _____

                         _____]))
```

Lesson 7

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Extended update-world:

; __off-right?___:_____ -> _____

      name   domain   range

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

 (define (_____ _____) _____)

; _off-left?___:_____ -> _____

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

 (define (_____ _____) _____)

; _____:_____ -> _____

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

; _____:_____ -> _____

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

TEST	RESULT
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)

Lesson 8

Design Recipe: line-length

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.

Contract+Purpose Statement

Every contract has three parts:

; _____ : _____ -> _____
      name   Domain   Range

Give Examples

(EXAMPLE   (_____)   _____)

(EXAMPLE   (_____)   _____)

Function Header

Write the Function Header, giving variable names to all your input values that change.

(define (_____   _____)
        function name   variable names

    _____

)

Distance:

The Player is at (4, 2) and the Target is at (0, 5).
Distance takes in the player-x, player-y, character-x and character-y.

Use the formula below to fill in the EXAMPLE:

$$\sqrt{(line-length \quad 4 \quad 0)^2 + (line-length \quad 2 \quad 5)^2}$$

Convert it into a Circle of Evaluation. (We've already gotten you started!)
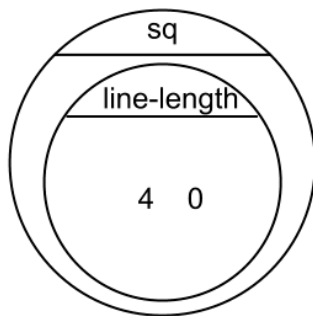
Convert it into Racket code:

(EXAMPLE (_____   _____)

(_____

_____)

Design Recipe: distance

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

- ❏ *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:

$$\text{Distance} = ((\text{line-length px cx})^2 + (\text{line-length py cy})^2)$$

Contract+Purpose Statement

; _____ : _____ -> _____

       name   Domain   Range

; _____

                                What does the function do?

Give Examples

(EXAMPLE

    (_____)

_____)

(EXAMPLE

    (_____)

_____)

Function Header

(define (_____   _____)

             function name   variable names

_____)

DESIGN RECIPE: COLLIDE?

Write a function `collide?`*,which takes FOUR inputs:*
- ❑ *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 `true` if the coordinates of the player are within **75 pixels** of the coordinates of the other character. Otherwise, `false`.

Contract+Purpose Statement

; _____ : _____ -> _____
    name   Domain   Range

; _____
                              What does the function do?

Give Examples

(EXAMPLE

   (_____)

_____)

(EXAMPLE

   (_____)

_____)

Function Header

(define (_____   _____)

        _____)

TEST	RESULT
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)

Supplemental

DESIGN RECIPE

State the problem:

Contract+Purpose Statement

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

; _____
                                 What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____ _____) _____)
                  the user types...   ...which should become

(EXAMPLE (_____ _____) _____)
                  the user types...   ...which should become

Function

Circle the changes in the EXAMPLEs, and name the variables.
Write the code, copying everything that isn't circled, and using names where you find variables!

(define (_____ _____) _____)

DESIGN RECIPE

State the problem:

Contract+Purpose Statement

Every contract has three parts:

; _____ : _____ -> _____
         name   Domain   Range

; _____
                              What does the function do?

Give Examples

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____ _____) _____)
                    the user types...   ...which should become

(EXAMPLE (_____ _____) _____)
                    the user types...   ...which should become

Function

Circle the changes in the EXAMPLEs, and name the variables.
Write the code, copying everything that isn't circled, and using names where you find variables!

(define (_____ _____) _____)

TEST	RESULT
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)
	(make-world _____ _____ _____ _____ _____)