Name: _____

BOOTSTRAP:2

www.bootstrapworld.org

Class: _____

Lesson 1

	Racket Code	Pyret Code

Numbers	```(define AGE 14)```
	
	```(define A-NUMBER 0.6)```
	
	```(define SPEED -90)```
		```AGE = 14```
		
		```A-NUMBER = 0.6```
		
		```SPEED = -90```
		
		Two of your own:
		
		_____
		
		_____

Strings	```(define CLASS "Bootstrap")```
	
	```(define PHRASE "Coding is fun!")```
	
	```(define A-STRING "2500")```
		```CLASS = "Bootstrap"```
		
		```PHRASE = "Coding is fun!"```
		
		```A-STRING = "2500"```
		
		Two of your own:
		
		_____
		
		_____

| | ```
(define SHAPE
  (triangle 40 "outline" "red"))

(define OUTLINE
  (star 80 "solid" "green"))

(define SQUARE
  (rectangle 50 50 "solid" "blue"))
``` | ```
SHAPE =
  triangle(40, "outline", "red")

OUTLINE =
  star(80, "solid", "green")

SQUARE =
  rectangle(50, 50, "solid", "blue")
```<br><br>One of your own:<br><br>_____ |
| *Booleans* | ```
(define BOOL true)

(define BOOL2 false)
``` | ```
BOOL = true
```<br><br>One of your own:<br><br>_____ |
| *Functions* | ```
; double : Number -> Number
; Given a number, multiply by
; 2 to double it

(EXAMPLE (double 5) (*  2  5)
(EXAMPLE (double 7) (*  2  7))

(define (double n)  (*  2  n))
``` | ```
# double : Number -> Number
# Given a number, multiply by
# 2 to double it

examples:
    double(5) is 2 * 5
    double(7) is 2 * 7
end

fun double(n):
    2 * n
end
``` |
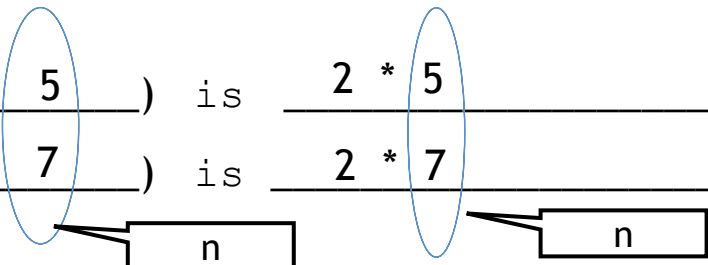
Fill out the contract for each function, then try to write two examples and the definition by yourself.

___double___ : ___Number___ -> ___Number___
     name   domain   range

examples:
    ___double___ (5) is ___2 * 5___
    ___double___ (7) is ___2 * 7___

  end

[n]

[n]

fun ___double___ (___n___):

    ___2 * n___

  end

_____ : _____ -> _____
     name   domain   range

examples:
    _____(_____) is _____
    _____(_____) is _____

  end

fun _____(_____):

    _____

  end

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

_____:_____ -> _____
        name   domain   range

examples:

    _____(_____) is _____

    _____(_____) is _____

  end

fun _____(_____):

    _____

  end

_____:_____ -> _____
        name   domain   range

examples:

    _____(_____) is _____

    _____(_____) is _____

end

fun _____(_____):

    _____

  end

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

\# _____:_____ -> _____
         name   domain   range

examples:

    _____(_____) is _____

    _____(_____) is _____

  end

fun _____(_____):

    _____

  end

\# _____:_____ -> _____
         name   domain   range

examples:

    _____(_____) is _____

    _____(_____) is _____

end

fun _____(_____):

    _____

  end

Bug Hunting: Pyret Edition

#1	`SECONDS = (7)`
	
	`STRING = my string`	

#2	`SHAPE1 = circle(50 "solid" "blue")`
	
	`SHAPE2 = triangle(75, outline, yellow)`	

#3	`# triple : Number -> Number`
	`# Multiply a given number by`
	`# 3 to triple it`
	
	`examples:`
	`    triple(5) = 3 * 5`
	`    triple(7) = 3 * 7`
	`end`	

#4	`fun triple(n):` `    3 * n`	

#5	`# ys : Number -> Number`
	`# Given a number, create a solid`
	`# yellow star of the given size`
	
	`examples:`
	`   ys(99) is star(99, "solid", "yellow")`
	`   ys(33) is star(99, "solid", "yellow")`
	
	`ys(size):`
	`    star(size "solid" "yellow")`
	`end`	

Lesson 2

Word Problem: double-radius

Write a function *double-radius*, which takes in a radius and a color. It produces an outlined circle of whatever color was passed in, whose radius is twice as big as the input.

Contract+Purpose Statement

Every contract has three parts:

\# _____ : _____ -> _____
      name   Domain   Range

\# _____
                    What does the function do?

Give Examples

Write examples of your function in action

```
examples:
        _____(_____)        is
              the user types…


        _____
                     …which should become


        _____(_____)        is
              the user types…


        _____
                     …which should become
end
```

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!

```
fun _____(_____):


        _____

end
```

Word Problem: double-width

Write a function *double-width*, which takes in a number (the length of a rectangle) and produces a rectangle whose width is twice the given length.

Contract+Purpose Statement
Every contract has three parts:

\# _____ : _____ -> _____
      name   Domain   Range

\# _____
                              What does the function do?

Give Examples
Write examples of your function in action

examples:

    _____(_____)   is
          the user types...

    _____
               ...which should become

    _____(_____)   is
          the user types...

    _____
               ...which should become

end

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!

fun _____(_____):

    _____

end

Word Problem: next-position

Write a function *next-position*, which takes in two numbers (an x and y-coordinate) and returns a Coord, increasing the x-coordinate by 5 and decreasing the y-coordinate by 5.

Contract+Purpose Statement

Every contract has three parts:

_____ : _____ -> _____
<div align="center">name</div> <div align="center">Domain</div> <div align="center">Range</div>

_____
<div align="center">What does the function do?</div>

Give Examples

Write examples of your function in action

```
examples:
        _____(_____)        is
            the user types...


        _____
                        ...which should become


        _____(_____)        is
            the user types...


        _____
                        ...which should become
end
```

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!

```
fun _____(_____):


        _____

end
```

```
# a Cake is a flavor, color, message, layers, & is-iceCream
data Cake:
    |   cake(_____
              _____
              _____
              _____
              _____)
end
```

To make examples of this structure, I would write:

cake1 = _____

cake2 = _____

To access the fields of **cake2**, I would write:

_____

_____

_____

_____

_____

Lesson 3

```
# a Party is a location, theme, and number of guests
data Party:
    |    party(_____

              _____

              _____)
end
```

To make examples of this structure, I would write:

party1 = _____

party2 = _____

To access the fields of **party2**, I would write:

           _____

           _____

           _____

Word Problem: change-flavor

Write a function called *change-flavor,* which takes in a Cake and a flavor, and returns a new Cake that is almost the same as the original, but is now the given flavor.

\# _____ : _____ -> _____

\# _____

```
examples:

        _____(_____)      is

              _____
              _____
              _____
              _____
              _____

        _____(_____)      is

              _____
              _____
              _____
              _____
              _____

end
```

```
fun _____(_____):

              _____
              _____
              _____
              _____
              _____

end
```

14

Word Problem: will-melt

Write a function called *will-melt,* which takes in a Cake and a temperature, and returns true if the temperature is greater than 32 degrees, AND the Cake is an ice cream cake.

Contract+Purpose Statement

\# _____ : _____ -> _____

\# _____

Give Examples

```
examples:

        _____(_____)         is



        _____


        _____(_____)         is



        _____

end
```

Function

```
fun _____(_____):



        _____

end
```

Lesson 4+5

Word Problem: keypress (Ninja World)

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

Contract+Purpose Statement

keypress   :   World   String   ->   World

Given a world and a key, produce a new world with NinjaCat's position
moved by 10 pixels, depending on which arrow key was pressed

Give Examples

```
examples:
```
    keypress(worldA, "up")   `is`

        world(worldA.dogX, worldA.coinX, worldA.catX, worldA.catY + 10)

    keypress(worldB, "down") `is`

        world(worldB.dogX, worldB.coinX, worldB.catX, worldB.catY - 10)

    keypress(worldA, "left")   `is`

        world(worldA.dogX, worldA.coinX, worldA.catX - 10, worldA.catY)

    keypress(worldB, "right") `is`

        world(worldB.dogX, worldB.coinX, worldB.catX + 10, worldB.catY)

```
end
```

```
fun  keypress(current-world, key) :
```

ask:
| string-equal(key, "up") then:

world(current-world.dogX, current-world.coinX,
current-world.catX, current-world.catY + 10)

| string-equal(key, "down") then:

world(current-world.dogX, current-world.coinX,
current-world.catX, current-world.catY + 10)

| string-equal(key, "left") then:

world(current-world.dogX, current-world.coinX,
current-world.catX - 10, current-world.catY)

| string-equal(key, "right") then:

world(current-world.dogX, current-world.coinX,
current-world.catX + 10, current-world.catY)

| otherwise: current-world

```
     end
end
```

Given a world, return the next world by adding 10 to dogX, subtracting 5 from coinX, and subtracting 5 from catY *only* when the cat's y-coordinate is greater than 75.

Contract+Purpose Statement

\# _____ : _____ -> _____

\# _____

Give Examples

```
examples:
```

_____(_____)   is

_____

_____

_____

_____

_____

_____(_____)   is

_____

_____

_____

_____

_____

```
end
```

```
fun _____(_____):

        ask:

          | _____ then:

                    _____

                    _____

                    _____

                    _____

                    _____

          | otherwise:


                    _____

                    _____

                    _____

                    _____

                    _____

        end
end
```

Lesson 6

Word Problem: red-shape

Write a function *red-shape*, which takes in the name of a shape (such as "circle", "triangle", "star", or "rectangle"), and draws that solid, red shape. Use 50 as the radius of the circle and star, and side-length of the triangle. Make the rectangle 99 pixels long by 9 wide.

\# _____ : _____ -> _____

\# _____

examples:

_____(_____) is _____

_____(_____) is _____

_____(_____) is _____

_____(_____) is _____

end

fun _____(_____):

    ask:

       | _____ then:

        _____

       | _____ then:

        _____

       | _____ then:

        _____

       | _____ then:

        _____

    end

end

Word Problem: strong-password

Websites have strict password requirements. Write a function *strong-password*, which takes in a username and password, and checks to make sure they aren't the same, and then checks the string-length of the password to make sure it is greater than 8 characters. The function should return a message to the user letting them know if their password is strong enough.

\# _____ : _____ -> _____

\# _____

examples:

    _____(_____) is

    _____

    _____(_____) is

    _____

    _____(_____) is

    _____

end

Function

fun _____(_____):

    ask:

        | _____ then:

        _____

        | _____ then:

        _____

        | otherwise: _____

    end
end

Building Your Helper Functions

\# is-off-right   :_____ -> _____

examples:

    _____(_____) is

        _____

    _____(_____) is

        _____

end

fun _____(_____):

    _____

 end

\# is-off-left   :_____ -> _____

examples:

    _____(_____) is

        _____

    _____(_____) is

        _____

end

fun _____(_____):

    _____

 end

_____:_____ -> _____

examples:

_____(_____) is

_____

_____(_____) is

_____

end

fun _____(_____):

_____

end

_____:_____ -> _____

examples:

_____(_____) is

_____

_____(_____) is

_____

end

fun _____(_____):

_____

end

Lesson 7

Write a function called *line-length*, 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

_____ : _____ -> _____

_____

Give Examples

examples:

    _____(_____)   is

    _____

    _____(_____)   is

    _____

end

Function Header

fun _____(_____) :

         function name   variable names

    _____:

      end

end

Distance:

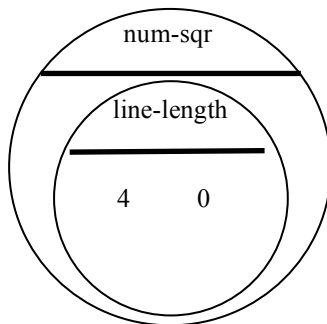The Player is at **(4, 2)** and the Target is at **(0, 5)**.
Distance takes in the player's x, player's y, character's x and character's y.

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!)

num-sqr
line-length
4   0

Convert it into Pyret code:

Word Problem: distance

Write a function `distance`, *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:

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

Contract+Purpose Statement

\# _____ : _____ -> _____

\# _____

Give Examples
Write examples of your function in action

examples:

    _____(_____)   is

    _____

    _____(_____)   is

    _____

end

Function

fun _____(_____):

    _____

    _____

end

Word Problem: is-collision

Write a function *is-collision*, 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 **50 pixels** of the coordinates of the other character. Otherwise, false.

Contract+Purpose Statement

\# _____ : _____ -> _____

\# _____

Give Examples

Write examples of your function in action

```
examples:
        _____(_____)     is


        _____

        _____


        _____(_____)     is


        _____

        _____

end
```

Function
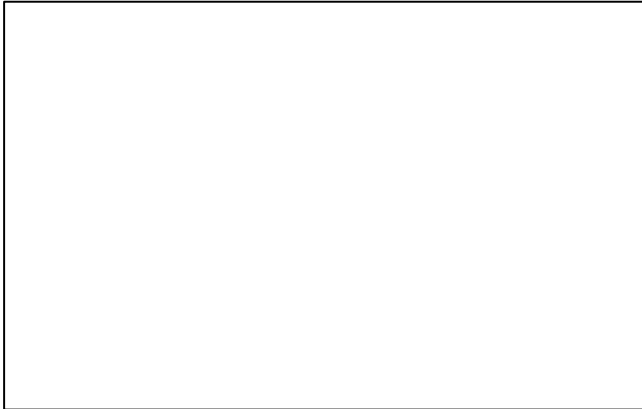
```
fun _____(_____):

        _____

        _____
end
```

30

GAME DESIGN
"Start Simple, Get Complex"

Draw a rough sketch of your game when it begins, and another sketch just a moment later

A sketch at the START of the game…   *A sketch for the very NEXT moment…*

What images will you need for your game? Name them in the 1st column, and describe them in the 2nd

BACKGROUND	

List everything that has changed from one sketch to the other. What datatype will represent it?

Changed (position, score, color, costume…)	**Datatype** (Number, String, Image, Boolean…)

```
# a world is a _____

data World:

    | world(_____

           _____

           _____

           _____

           _____)

end
```

To make example worlds that represent my sketches from page 31, I would write…

worldA   = _____

worldB   = _____

To access the fields of worldA, I would write:

_____

_____

_____

_____

_____

Lesson 8

Word Problem: draw-world (My game)

_____ : _____ -> _____

fun _____(_____) :

    put-image(_____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

end

Word Problem: next-world (My game)

Contract+Purpose Statement

_____ : _____ -> _____

_____

Give Examples

examples:

_____(_____)   is

_____

_____

_____

_____

_____

_____(_____)   is

_____

_____

_____

_____

_____

end

Function

fun _____(_____):

_____

_____

_____

_____

_____

end

Lesson 9

When *this* key is pressed…	..*this* field of the new world…	…changes by…

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Word Problem: keypress (My game)

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

\#_____ : _____ ->_____

\#_____

`examples:`

keypress(worldA, _____)   `is`

_____

_____

_____

_____

_____

keypress(worldA, _____)   `is`

_____

_____

_____

_____

_____

keypress(worldA, _____)   `is`

_____

_____

_____

_____

_____

`end`

```
fun_____(_____)
    ask:
        | _____ then:

            _____

        | _____ then:

            _____

        | _____ then:

            _____

        | _____ then:

            _____

        | _____ then:

            _____

        | _____ then:

            _____

        |_____

    end
end
```

is-off-right   :_____ -> _____

examples:

_____(_____) is

_____

_____(_____) is

_____

end

fun _____(_____):

_____

 end

is-off-left   :_____ -> _____

examples:

_____(_____) is

_____

_____(_____) is

_____

end

fun _____(_____):

_____

 end

_____:_____ -> _____

examples:

    _____(_____) is

        _____

    _____(_____) is

        _____

end

fun _____(_____):

    _____

end

_____:_____ -> _____

examples:

    _____(_____) is

        _____

    _____(_____) is

        _____

end

fun _____(_____):

    _____

end

Using Helpers inside `next-world`:

How does the World structure change when....?

TEST	RESULT
	world(_____ _____ _____ _____ _____)
	world(_____ _____ _____ _____ _____)
	world(_____ _____ _____ _____ _____)
	world(_____ _____ _____ _____ _____)

TEST	RESULT
	world(_____ _____ _____ _____ _____)
	world(_____ _____ _____ _____ _____)
	world(_____ _____ _____ _____ _____)
	world(_____ _____ _____ _____ _____)

Using Helpers inside `draw-world`:

What changes the *appearance* of your game?

TEST	RESULT
	put-image(_____ put-image(_____ put-image(_____ put-image(_____ put-image(_____
	put-image(_____ put-image(_____ put-image(_____ put-image(_____ put-image(_____
	put-image(_____ put-image(_____ put-image(_____ put-image(_____ put-image(_____
	put-image(_____ put-image(_____ put-image(_____ put-image(_____ put-image(_____

TEST	RESULT

	put-image(_____
	    put-image(_____
	    put-image(_____
	    put-image(_____
	    put-image(_____

	put-image(_____
	    put-image(_____
	    put-image(_____
	    put-image(_____
	    put-image(_____

	put-image(_____
	    put-image(_____
	    put-image(_____
	    put-image(_____
	    put-image(_____

	put-image(_____
	    put-image(_____
	    put-image(_____
	    put-image(_____
	    put-image(_____

Lesson 10

Supplemental

DESIGN RECIPE

Every contract has three parts:

\# _____ : _____ -> _____

      name   Domain   Range

\# _____

                                  What does the function do?

Write examples of your function in action

examples:

    _____(_____)   is

             the user types...

    _____

               ...which should become

    _____(_____)   is

             the user types...

    _____

               ...which should become

end

Circle the changes in the examples, and name the variables.

fun _____(_____):

    _____

end

DESIGN RECIPE

Every contract has three parts:

\# _____ : _____ -> _____

      name   Domain   Range

\# _____

                                 What does the function do?

Write examples of your function in action

examples:

    _____(_____)   is

             the user types...

    _____

             ...which should become

    _____(_____)   is

          the user types...

    _____

            ...which should become

end

Circle the changes in the examples, and name the variables.

fun _____(_____):

    _____

end

Contracts

Name	Domain	Range	example
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	

Contracts

Name	Domain	Range	example
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	