Name: _____

BOOTSTRAP:2

www.bootstrapworld.org

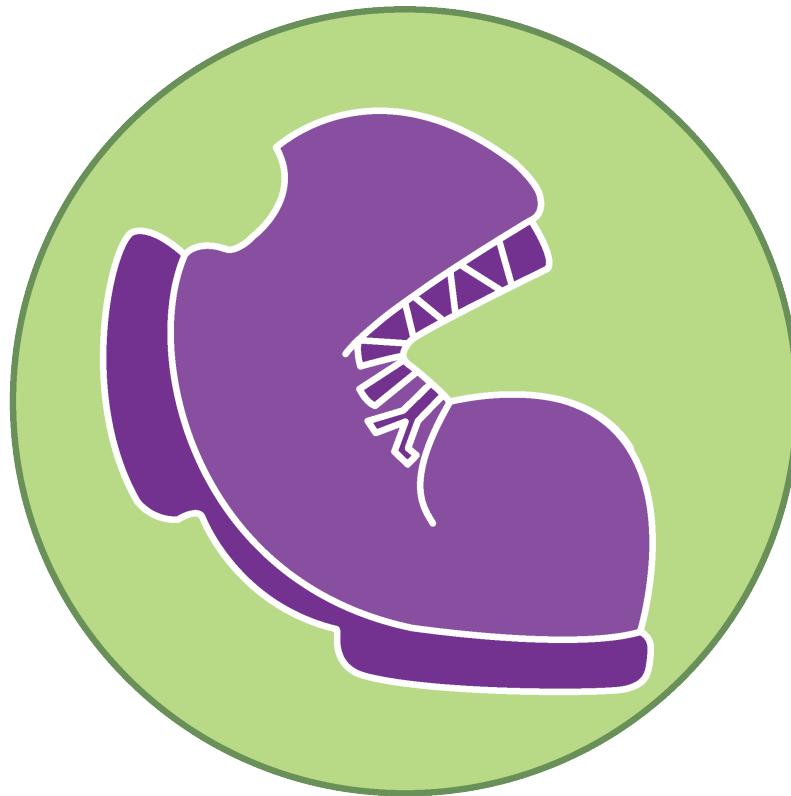Class: _____

![Bootstrap logo - www.bootstrapworld.org]

Workbook v0.9

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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")
```

One of your own:

_____ |
| *Booleans* | ```
(define BOOL true)

(define BOOL2 false)
``` | ```
BOOL = true
```

One of your own:

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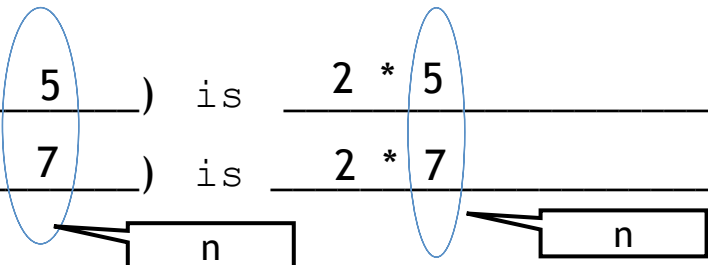
Fill out the contract for each function, then try to write two examples and the definition by yourself.

\# _____double_____ : _____Number_____ -> _____Number_____
       name   domain   range

examples:
    ___double___ (___5___) is ___2 * 5___
    ___double___ (___7___) is ___2 * 7___

  n

  end
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
``` | |

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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.

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.

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.
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 JumperState, increasing the x-coordinate by 5 and decreasing the y-coordinate by 5.

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
```

```
# a CakeT is a flavor, layers, & is-iceCream
data CakeT:
    | cake(_____

             _____

             _____)

end
```

To make instances of this structure, I would write:

cake1 = _____

cake2 = _____

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

_____

_____

_____

Word Problem: taller-than

Write a function called *taller-than,* which consumes two CakeTs, and produces true if the number of layers in the first CakeT is greater than the number of layers in the second

\# _____ : _____ -> _____

\# _____

Give Examples

```
examples:

        _____(_____)        is


        _____


        _____(_____)        is


        _____
end
```

Function

```
fun _____(_____):


        _____
end
```

Word Problem: will-melt

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

Contract+Purpose Statement

\# _____ : _____ -> _____

\# _____

Give Examples

examples:

　　　　_____(_____)　　　is

　　　　_____

　　　　_____(_____)　　　is

　　　　_____

end

Function

fun _____(_____):

　　　　_____

end

Lesson 3

ANIMATION DESIGN WORKSHEET

Purpose:

Draw a sketch for three distinct moments of the animation

Image A   Image B   Image C

What things are changing?

Thing	How does it change?	Does it change consistently?

What fields do you need?

Field name (dangerX, score, timer…)	Datatype (Number, String, Image, Boolean…)

Circle the items below that you will need to write or edit. **Check them off when you finish each.**

☐   Sample instances

☐   draw-state : _____ -> Image

☐   next-state-tick : _____ -> _____

☐   next-state-key : _____, String -> _____

☐   reactor

```
# a _____State is a  _____
data _____State:
    | _____ (_____
                 _____
                 _____)
end
```

To make sample instances that represent my sketches from the previous page, I would write...

_____A = _____

_____B = _____

_____C = _____

Write an example for one of the functions on the previous page:

_____

_____

_____

_____

_____

_____

ANIMATION DESIGN WORKSHEET

Purpose:

Draw a sketch for three distinct moments of the animation

Image A | Image B | Image C

What things are changing?

Thing	How does it change?	Does it change consistently?

What fields do you need?

Field name (dangerX, score, timer…)	Datatype (Number, String, Image, Boolean…)

Circle the items below that you will need to write or edit. **Check them off when you finish each.**

☐ Sample instances

☐ draw-state : _____ -> Image

☐ next-state-tick : _____ -> _____

☐ next-state-key : _____, String -> _____

☐ reactor

`# a _____State is a _____`

`data _____State:`

`| _____ (_____`

`_____`

`_____)`

`end`

To make sample instances that represent my sketches from the previous page, I would write…

`_____A = _____`

`_____B = _____`

`_____C = _____`

Write an example for one of the functions on the previous page:

_____

_____

_____

_____

_____

_____

Lesson 4

Word Problem: location

Write a function called *location*, which consumes a JumperState, and produces a String representing the jumper's location: either "cliff", "beach", "water", or "air".

Contract+Purpose Statement

\# _____ : _____ -> _____

\# _____

Give Examples

```
examples:
```

_____(_____) is _____

_____(_____) is _____

_____(_____) is _____

_____(_____) is _____

```
end
```

```
fun _____(_____):

      if _____:

            _____


            else if _____:

                  _____


            else if _____:

                  _____


            else: _____


      end
end
```

Piecewise Bug-Hunting

	Buggy Code	Correct Code / Explaination
Round 1	```fun piecewisefun(n):
if (n > 0): n
else: 0```	
Round 2	```fun cost(topping):
if string-equal(topping,
"pepperoni"): 10.50
else string-equal(topping,
"cheese"): 9.00
else string-equal(topping,
"chicken"): 11.25
else string-equal(topping,
"broccoli"): 10.25
else: "That's not on the menu!"
end
end```	
Round 3	```fun absolute-value(a b):
if a > b: a - b
b - a
end
end```	
Round 4	```fun best-function(f):
if string-equal(f, "blue"):
"you win!"
else if string-equal(f, "blue"):
"you lose!"
else if string-equal(f, "red"):
"Try again!"
else: "Invalid entry!"
end
end```	
Round 5	```fun my-function(x):
if (4 < 8): x
else: x * 2
end
end```	

Word Problem: sun-color

Write a function called *sun-color,* which consumes a SunsetState, and produces an image of a sun (a solid, 25 pixel circle), whose color is "yellow", when the sun's y-coordinate is greater than 225, "orange", when its y-coordinate is between 150 and 225, and "red" otherwise.

Contract+Purpose Statement

\# _____ : _____ -> _____

\# _____

Give Examples

```
examples:

        _____(_____) is _____

        _____(_____) is _____

        _____(_____) is _____

        _____(_____) is _____

end
```

```
fun _____(_____):

      if _____:

          _____

          else if _____:

              _____

          else if _____:

              _____

          else: _____

      end
end
```

Lesson 5

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.

\# _____ : _____ ->

\# _____

Give Examples

```
examples:
_____(_____) is _____

_____(_____) is _____

_____(_____) is _____

_____(_____) is _____
end
```

Function

```
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

fun _____(_____):
    ask:
        | _____ then:

          _____

        | _____ then:

          _____

        | otherwise: _____
    end
end

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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

Word Problem: line-length

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.

\# _____ : _____ -> _____

\# _____

examples:

    _____(_____)   is

    _____

    _____(_____)   is

    _____

end

fun _____(_____):
      function name   variable names

    _____:

       end

end

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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:

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

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

```
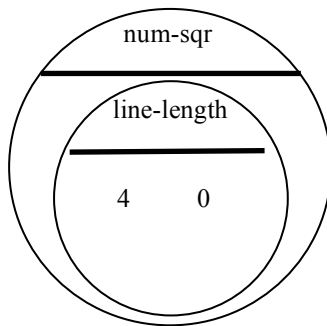examples:
       _____(_____)        is


       _____


       _____(_____)        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
```

Using Helpers inside `next-world`:

How does the World structure change when….?

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

Supplemental

DESIGN RECIPE

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.

fun _____(_____):

      _____

end

DESIGN RECIPE

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.

```
fun _____(_____):
```

    _____

```
end
```

Contracts

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

Contracts

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