Name: _____

Bootstrap:2

www.bootstrapworld.org

Class: _____

Workbook v0.9

Brought to you by the Bootstrap team:

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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

Fast Functions!

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

fun double(n):
    2 * n
end
```

n n

```
# _____ : _____ -> _____
  name   domain    range

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

fun _____(_____):

    _____

end
```

Fast Functions!

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
```

Fast Functions!

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 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
```

Data Structure

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

Contract+Purpose Statement

```
# _______________ : _____________________________ -> __________

# ____________________________________________________________________
```

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

Draw a sketch for three distinct moments of the animation

Sketch A Sketch B Sketch C

What things are changing?

Thing	How does it change?	Does it change consistently?

What fields do you need to represent the things that change?

Field name (dangerX, score, playerIMG…)	**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

Data Structures

a _____**State** is a _____

data _____**State**:

| _____(_____

_____

_____

_____)

end

Make three sample instances that represent the sketches from the previous page:

_____**A** = _____

_____**B** = _____

_____**C** = _____

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

_____

_____

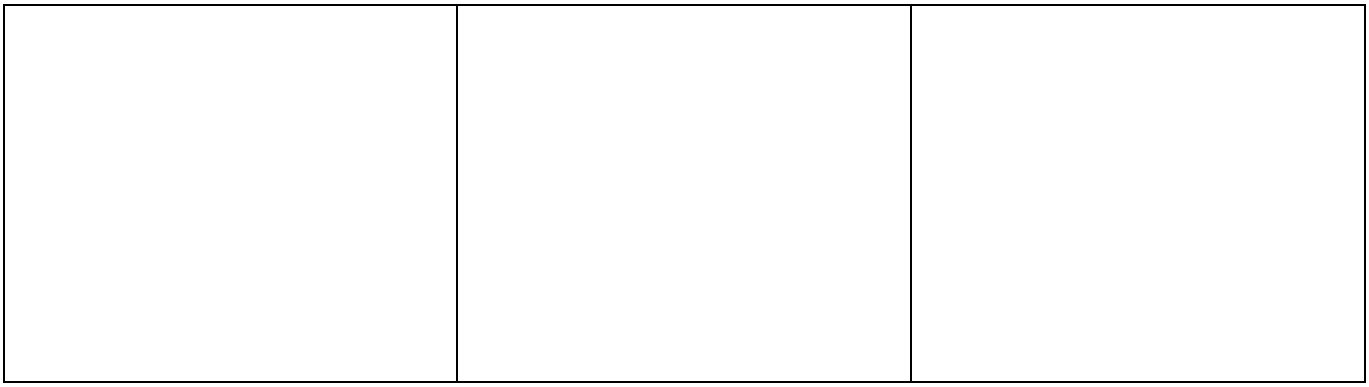
_____

_____

_____

ANIMATION DESIGN WORKSHEET

Draw a sketch for three distinct moments of the animation



Sketch A | Sketch B | Sketch C

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data _____**State**:

| _____(_____

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_____

_____)

end

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_____**B** = _____

_____**C** = _____

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

_____

_____

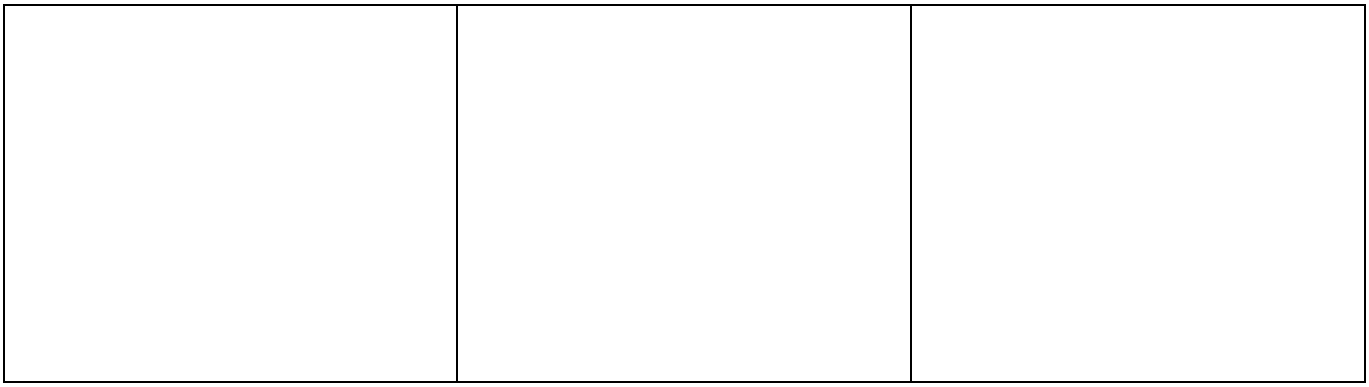
_____

_____

_____

ANIMATION DESIGN WORKSHEET

Draw a sketch for three distinct moments of the animation



Sketch A | Sketch B | Sketch C

What things are changing?

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- ☐ Sample instances
- ☐ `draw-state : _____ -> Image`
- ☐ `next-state-tick : _____ -> _____`
- ☐ `next-state-key : _____, String -> _____`
- ☐ reactor

Data Structures

a _____**State** is a _____

data _____**State**:

| _____(_____

_____

_____

_____)

end

Make three sample instances that represent the sketches from the previous page:

_____**A** = _____

_____**B** = _____

_____**C** = _____

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

_____

_____

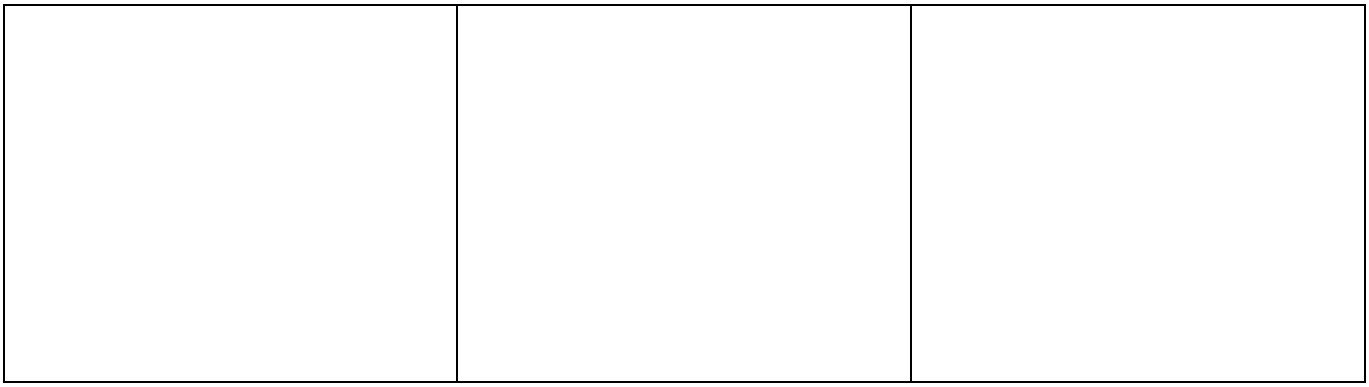
_____

_____

_____

ANIMATION DESIGN WORKSHEET

Draw a sketch for three distinct moments of the animation



Sketch A | Sketch B | Sketch C

What things are changing?

Thing	How does it change?	Does it change consistently?

What fields do you need to represent the things that change?

Field name (dangerX, score, playerIMG…)	**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

Data Structures

a _____**State** is a _____

data _____**State**:

| _____(_____

_____

_____

_____)

end

Make three sample instances that represent the sketches from the previous page:

_____**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.

: ->

#

Give Examples

```
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
```

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.

Contract+Purpose Statement

```
# _____ : _____ -> _____

# _____
```

Give Examples

```
examples:
    _____(_____)        is

    _____

    _____(_____)        is

    _____
end
```

Function Header

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

function name — variable names

```
    _____:
```


```
    end
end
```

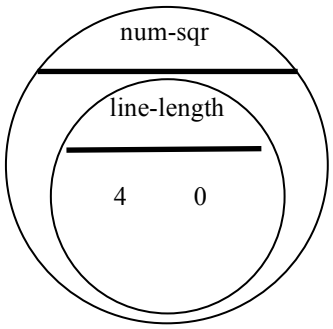
Distance:

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:

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

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



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

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
```

Contracts

Name	Domain	Range	example
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	

Contracts

Name	Domain	Range	example
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
#	:	→	
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#	:	→	