

Name: \_\_\_\_\_



# **BOOTSTRAP:REACTIVE**

---

[www.bootstrapworld.org](http://www.bootstrapworld.org)

Class: \_\_\_\_\_



Workbook v0.9

Brought to you by the Bootstrap team:

- Emma Youndtsmith
- Emmanuel Schanzer
- Kathi Fisler
- Joe Politz
- Shriram Krishnamurthi

Visual Design: Colleen Murphy

---

Bootstrap is licensed under a Creative Commons 3.0 Unported License. Based on a work from [www.BootstrapWorld.org](http://www.BootstrapWorld.org). Permissions beyond the scope of this license may be available at [schanzer@BootstrapWorld](mailto:schanzer@BootstrapWorld)

# Unit 1

	Racket Code	Pyret Code
<i>Numbers</i>	<pre>(define AGE 14)  (define A-NUMBER 0.6)  (define SPEED -90)</pre>	<pre>AGE = 14  A-NUMBER = 0.6  SPEED = -90  Two of your own:</pre> <hr/> <hr/>
<i>Strings</i>	<pre>(define CLASS "Bootstrap")  (define PHRASE "Coding is fun!")  (define A-STRING "2500")</pre>	<pre>CLASS = "Bootstrap"  PHRASE = "Coding is fun!"  A-STRING = "2500"  Two of your own:</pre> <hr/> <hr/>

<i>Images</i>	<pre> (define SHAPE   (triangle 40 "outline" "red"))  (define OUTLINE   (star 80 "solid" "green"))  (define SQUARE   (rectangle 50 50 "solid" "blue")) </pre>	<pre> SHAPE =   triangle(40, "outline", "red")  OUTLINE =   star(80, "solid", "green")  SQUARE =   rectangle(50, 50, "solid", "blue") </pre> <p>One of your own:</p> <hr/>
<i>Booleans</i>	<pre> (define BOOL true)  (define BOOL2 false) </pre>	<pre> BOOL = true </pre> <p>One of your own:</p> <hr/>
<i>Functions</i>	<pre> ; double : Number -&gt; 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)) </pre>	<pre> # double : Number -&gt; 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 </pre>

# 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

# \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_  
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.

$$\# \quad \underline{\hspace{8em}} : \underline{\hspace{8em}} \rightarrow \underline{\hspace{8em}}$$

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.

$$\# \text{--- name ---} : \text{--- domain ---} \rightarrow \text{--- range ---}$$

examples:

\_\_\_\_\_ ( \_\_\_\_\_ ) is \_\_\_\_\_

\_\_\_\_\_ ( \_\_\_\_\_ ) is \_\_\_\_\_

end

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

---

end

# \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_  
name domain range

examples:

\_\_\_\_\_ ( \_\_\_\_\_ ) is \_\_\_\_\_

\_\_\_\_\_ ( \_\_\_\_\_ ) is \_\_\_\_\_

end

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

---

end

# Bug Hunting: Pyret Edition

#1	<pre>SECONDS = (7)  STRING = my string</pre>	<hr/> <hr/> <hr/>
#2	<pre>SHAPE1 = circle(50 "solid" "blue")  SHAPE2 = triangle(75, outline, yellow)</pre>	<hr/> <hr/> <hr/>
#3	<pre># triple : Number -&gt; Number # Multiply a given number by # 3 to triple it  examples:   triple(5) = 3 * 5   triple(7) = 3 * 7 end</pre>	
#4	<pre>fun triple(n):   3 * n</pre>	
#5	<pre># ys : Number -&gt; 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</pre>	



## Unit 2

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# 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...

end \_\_\_\_\_ ...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!

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 CakeType is a **flavor, layers, & is-iceCream**

data **CakeType**:

```
|  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 CakeTypes, and produces true if the number of layers in the first CakeType is greater than the number of layers in the second.

### Contract+Purpose Statement

# \_\_\_\_\_ : \_\_\_\_\_ → \_\_\_\_\_

# \_\_\_\_\_

### 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: will-melt

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

Contract+Purpose Statement

# \_\_\_\_\_ : \_\_\_\_\_ → \_\_\_\_\_

# \_\_\_\_\_

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**

## Unit 3

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



# Identifying Animation Data Worksheet: Sunset

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

(worksheet continues on the next page)

## Define the Data Structure

# a \_\_\_\_\_ **State** is \_\_\_\_\_

data \_\_\_\_\_ **State:**

\_\_\_\_\_ (\_\_\_\_\_)

---

---

\_\_\_\_\_)

end

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ **A** = \_\_\_\_\_

           B =                                 

**C =** \_\_\_\_\_

## draw-state

Write a function called *draw-state*, which takes in a *SunsetState* and returns an image in which the sun (a circle) appears at the position given in the *SunsetState*. The sun should be behind the horizon (the ground) once it is low in the sky.

Contract+Purpose Statement

# draw-state : \_\_\_\_\_ → Image

# \_\_\_\_\_

Write an expression for each piece of your final image

Sun	
Ground	
Sky	

Write the draw-state function, using put-image to combine your pieces

fun \_\_\_\_\_ ( \_\_\_\_\_ ) :

---

---

---

end

## Word Problem: next-state-tick

Write a function called *next-state-tick*, which takes in a `SunsetState` and returns a `SunsetState` in which the new x-coordinate is 8 pixels larger than in the given `SunsetState` and the y-coordinate is 4 pixels smaller than in the given `SunsetState`.

Contract+Purpose Statement

# \_\_\_\_\_ : \_\_\_\_\_ → \_\_\_\_\_

# \_\_\_\_\_

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

# Identifying Animation Data Worksheet

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

(worksheet continues on the next page)

## Define the Data Structure

# a \_\_\_\_\_ **State** is \_\_\_\_\_

data \_\_\_\_\_ **State:**

\_\_\_\_\_ (\_\_\_\_\_)

---

---

---

end

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ **A** = \_\_\_\_\_

           B =                                 

           C =

# Identifying Animation Data Worksheet

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

(worksheet continues on the next page)

## Define the Data Structure

# a \_\_\_\_\_ **State** is \_\_\_\_\_

data \_\_\_\_\_ **State:**

\_\_\_\_\_ (\_\_\_\_\_)

---

---

---

end

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ **A** = \_\_\_\_\_

           B =                                 

**C =** \_\_\_\_\_



# Identifying Animation Data Worksheet

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

(worksheet continues on the next page)

## Define the Data Structure

# a \_\_\_\_\_ **State** is \_\_\_\_\_

data \_\_\_\_\_ **State:**

\_\_\_\_\_ (\_\_\_\_\_)

---

---

\_\_\_\_\_)

end

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ **A** = \_\_\_\_\_

           B =                                 

**C =** \_\_\_\_\_

# Identifying Animation Data Worksheet

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

(worksheet continues on the next page)

## Define the Data Structure

# a \_\_\_\_\_ **State** is \_\_\_\_\_

data \_\_\_\_\_ **State:**

\_\_\_\_\_ (\_\_\_\_\_)

---

---

\_\_\_\_\_)

end

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ **A** = \_\_\_\_\_

           B =                                 

           C = \_\_\_\_\_

## Unit 4

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

## 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

(worksheet continues next page)

## Function

```
fun _____ ( _____ ) :  
  if _____ :  
    _____  
  else if _____ :  
    _____  
  else if _____ :  
    _____  
  else: _____  
  
end  
end
```

# Piecewise Bug-Hunting

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



# Animation Extension Worksheet

Describe the goal of your change: what new feature or behavior will it add to your animation?

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

Write at least one NEW example for one of the functions on your To-Do list

---

---

---

---

---

If you have another function on your To-Do list , write at least one NEW example

---

---

---

---

---

## Word Problem: draw-sun

Write a function called *draw-sun*, 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

(worksheet continues next page)

## Function

```
fun _____ ( _____ ) :  
  if _____ :  
    _____  
  else if _____ :  
    _____  
  else if _____ :  
    _____  
  else: _____  
  
end  
end
```

## Unit 5

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# Animation Extension Worksheet

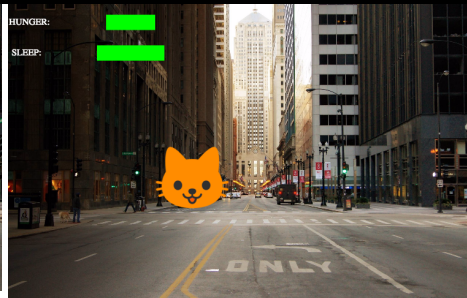
Describe the goal of your change: what new feature or behavior will it add to your animation?

Decrease the cat's hunger level by 2 and sleep level by 1 on each tick. Make the green bars get smaller based on hunger and sleep levels.

Draw a sketch for three distinct moments of the animation, focusing on the new behavior



Sketch A



Sketch B



Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	If any new field(s) were added, changed or removed	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	If something is displayed in a new way or position	<input checked="" type="checkbox"/>	<input type="checkbox"/>
next-state-tick	If the Data Structure changed, or the animation happens automatically	<input checked="" type="checkbox"/>	<input type="checkbox"/>
next-state-key	If the Data Structure changed, or a keypress triggers the animation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
reactor	If either next-state function is new	<input type="checkbox"/>	<input type="checkbox"/>

Make a sample instance for each sketch from the previous page:

FULLPET = pet(100, 100)

MIDPET = pet(50, 75)

LOSEPET = pet(0, 0)

Write at least one NEW example for one of the functions on your To-Do list

next-state-tick(FULLPET) is pet(FULLPET.hunger - 2, FULLPET.sleep - 1)

next-state-tick(MIDPET) is pet(MIDPET.hunger - 2, MIDPET.sleep - 1)

next-state-tick(LOSEPET) is LOSEPET

If you have another function on your To-Do list , write at least one NEW example

# Animation Extension Worksheet

Describe the goal of your change: what new feature or behavior will it add to your animation?

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>



Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

Write at least one NEW example for one of the functions on your To-Do list

---

---

---

---

---

If you have another function on your To-Do list , write at least one NEW example

---

---

---

---

---

# Animation Extension Worksheet

Describe the goal of your change: what new feature or behavior will it add to your animation?

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

Write at least one NEW example for one of the functions on your To-Do list

---

---

---

---

---

If you have another function on your To-Do list , write at least one NEW example

---

---

---

---

---

## Build Your Own Animation

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# Animation Design Worksheet

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>

## Define the Data Structure

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

Make a sample instance for each sketch from the previous page:

<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

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

---

---

---

---

## Collision

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

## Distance:

The Player is at (4, 2) and the Target is at (0, 5).

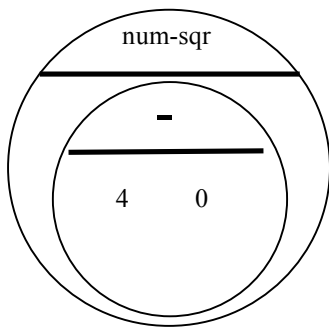
Distance takes in the player's x, player's y, character's x and character's y.

Use the formula below to fill in the EXAMPLE:

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

---

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:

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

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

# 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

# Animation Design Worksheet

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>

## Define the Data Structure

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

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

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	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>

## Define the Data Structure

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

Make a sample instance for each sketch from the previous page:

<hr/>	=	<hr/>
<hr/>	=	<hr/>
<hr/>	=	<hr/>

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	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>

## Define the Data Structure

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

Make a sample instance for each sketch from the previous page:

<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

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

---

---

---

---

# Animation Extension Worksheet

Describe the goal of your change: what new feature or behavior will it add to your animation?

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

Write at least one NEW example for one of the functions on your To-Do list

---

---

---

---

---

If you have another function on your To-Do list , write at least one NEW example

---

---

---

---

---

# Animation Extension Worksheet

Describe the goal of your change: what new feature or behavior will it add to your animation?

Draw a sketch for three distinct moments of the animation

--	--	--

Sketch A

Sketch B

Sketch C

What things are changing?

Thing	Describe how it changes

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

Field name (dangerX, score, playerIMG...)	Datatype (Number, String, Image, Boolean...)

Make a To-Do List, and check off each as "Done" when you finish each one.

Component	When is there work to be done?	To-Do	Done
Data Structure	<i>If any new field(s) were added, changed or removed</i>	<input type="checkbox"/>	<input type="checkbox"/>
draw-state	<i>If something is displayed in a new way or position</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-tick	<i>If the Data Structure changed, or the animation happens automatically</i>	<input type="checkbox"/>	<input type="checkbox"/>
next-state-key	<i>If the Data Structure changed, or a keypress triggers the animation</i>	<input type="checkbox"/>	<input type="checkbox"/>
reactor	<i>If either next-state function is new</i>	<input type="checkbox"/>	<input type="checkbox"/>

Make a sample instance for each sketch from the previous page:

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

\_\_\_\_\_ = \_\_\_\_\_

Write at least one NEW example for one of the functions on your To-Do list

---

---

---

---

---

If you have another function on your To-Do list , write at least one NEW example

---

---

---

---

---

# Contracts

Name	Domain	Range	example
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	
#	::	↑	

# Contracts

Name	Domain	Range	example
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	
#	:	↑	