Name: _____

Class: _____

BOOTSTRAP
www.bootstrapworld.org

Workbook v0.9

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Unit 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: _____ _____

| *Images* | ```
(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 | n |

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.

\# _____ : _____ → _____
       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
	``	

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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
```

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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...

    _____
```
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
```

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

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: 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

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
```

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	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…)

(worksheet continues on the next page)

```
# a _____State is _____

data _____State:

| _____(_____

               _____

               _____

               _____)
end
```

_____**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…

_____

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

Identifying Animation Data Worksheet

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…)

(worksheet continues on the next page)

```
# a _____State is _____

data _____State:

| _____(_____

                  _____

                  _____

                  _____)
end
```

_____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	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…)

(worksheet continues on the next page)

a _____**State** is _____

data _____**State:**

| _____(_____

_____

_____

_____)

end

_____**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	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…)

(worksheet continues on the next page)

```
# a _____State is _____

data _____State:

| _____(_____

              _____

              _____

              _____)
 end
```

_____A = _____

_____B = _____

_____C = _____

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".

\# _____ : _____ → _____

\# _____

```
examples:
```

_____(_____) is _____

_____(_____) is _____

_____(_____) is _____

_____(_____) is _____

```
end
```

(worksheet continues next page)

```
fun  _____(_____) :

      if _____:

         _____

      else if _____:

         _____

      else if _____:

         _____

      else: _____


      end
end
```

Piecewise Bug-Hunting

	Buggy Code	Correct Code / Explanation

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
	``	

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, focusing on the new behavior

| Sketch A | Sketch B | Sketch C |

What NEW things are changing? Are they independent of existing fields?

Thing	How does it change?	Does it change consistently? Independently?

What fields do you need to represent the NEW and independent 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	☐	☐
draw-state	If something is displayed in a new way or position	☐	☐
next-state-tick	If the Data Structure changed, or the animation happens automatically	☐	☐
next-state-key	If the Data Structure changed, or a keypress triggers the animation	☐	☐
reactor	If either next-state function is new	☐	☐

_____**A** = _____

_____**B** = _____

_____**C** = _____

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)

fun _____(_____) :

    if _____:

       _____

    else if _____:

       _____

    else if _____:

       _____

    else: _____

    end

end

Unit 5

Animation Extension Worksheet

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

Make the bars get smaller on each tick. Decrease hunger by 2 and sleep by 1.

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

| Sketch A | Sketch B | Sketch C |

What NEW things are changing? Are they independent of existing fields?

Thing	How does it change?	Does it change consistently? Independently?
Hunger	Gets smaller by 2 each tick	Consistently, uses existing field
Sleep	Gets smaller by 1 each tick	Consistently, uses existing field

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

Field name (dangerX, score, playerIMG…)	Datatype (Number, String, Image, Boolean…)
N/A	
N/A	

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*	☐	☐
draw-state	*If something is displayed in a new way or position*	☑	☐
next-state-tick	*If the Data Structure changed, or the animation happens automatically*	☑	☐
next-state-key	*If the Data Structure changed, or a keypress triggers the animation*	☑	☐
reactor	*If either next-state function is new*	☐	☐

petA = __pet(100, 100)_____

petB = __ pet(90, 95)_____

petC = ___ pet(30, 65) _____

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

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

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

_____

_____

_____

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, focusing on the new behavior

Sketch A   Sketch B   Sketch C

What NEW things are changing? Are they independent of existing fields?

Thing	How does it change?	Does it change consistently? Independently?

What fields do you need to represent the NEW and independent 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	☐	☐
draw-state	If something is displayed in a new way or position	☐	☐
next-state-tick	If the Data Structure changed, or the animation happens automatically	☐	☐
next-state-key	If the Data Structure changed, or a keypress triggers the animation	☐	☐
reactor	If either next-state function is new	☐	☐

_____**A** = _____

_____**B** = _____

_____**C** = _____

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, focusing on the new behavior

| Sketch A | Sketch B | Sketch C |

What NEW things are changing? Are they independent of existing fields?

Thing	How does it change?	Does it change consistently? Independently?

What fields do you need to represent the NEW and independent 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	☐	☐
draw-state	If something is displayed in a new way or position	☐	☐
next-state-tick	If the Data Structure changed, or the animation happens automatically	☐	☐
next-state-key	If the Data Structure changed, or a keypress triggers the animation	☐	☐
reactor	If either next-state function is new	☐	☐

_____**A** = _____

_____**B** = _____

_____**C** = _____

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 Design Worksheet

| 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

```
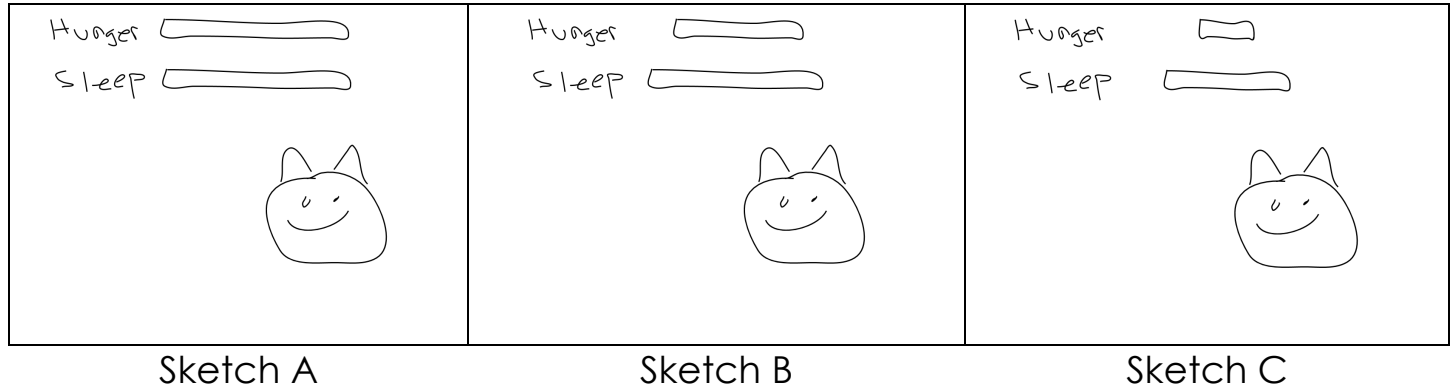# a _____State is _____

data _____State:

| _____(_____

            _____

            _____

            _____)

end
```

_____**A** = _____

_____**B** = _____

_____**C** = _____

_____

_____

_____

_____

_____

Collision

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

```
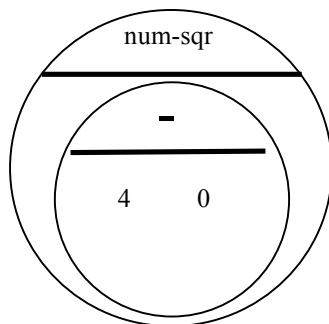examples:
        _____(_____)        is


        _____


        _____(_____)        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

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

```
# a _____State is _____

data _____State:

 | _____(_____

                 _____

                 _____

                 _____)
 end
```

_____A = _____

_____B = _____

_____C = _____

_____

_____

_____

_____

_____

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

```
# a _____State is _____

data _____State:

| _____(_____

                 _____

                 _____

                 _____)
end
```

_____A = _____

_____B = _____

_____C = _____

_____

_____

_____

_____

_____

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

```
# a _____State is _____

data _____State:

| _____(_____

              _____

              _____

              _____)

end
```

_____A = _____

_____B = _____

_____C = _____

_____

_____

_____

_____

_____

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, focusing on the new behavior

| Sketch A | Sketch B | Sketch C |

What NEW things are changing? Are they independent of existing fields?

Thing	How does it change?	Does it change consistently? Independently?

What fields do you need to represent the NEW and independent 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	☐	☐
draw-state	If something is displayed in a new way or position	☐	☐
next-state-tick	If the Data Structure changed, or the animation happens automatically	☐	☐
next-state-key	If the Data Structure changed, or a keypress triggers the animation	☐	☐
reactor	If either next-state function is new	☐	☐

_____**A** = _____

_____**B** = _____

_____**C** = _____

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, focusing on the new behavior

<center>Sketch A   Sketch B   Sketch C</center>

What NEW things are changing? Are they independent of existing fields?

Thing	How does it change?	Does it change consistently? Independently?

What fields do you need to represent the NEW and independent 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*	☐	☐
draw-state	*If something is displayed in a new way or position*	☐	☐
next-state-tick	*If the Data Structure changed, or the animation happens automatically*	☐	☐
next-state-key	*If the Data Structure changed, or a keypress triggers the animation*	☐	☐
reactor	*If either next-state function is new*	☐	☐

_____**A** = _____

_____**B** = _____

_____**C** = _____

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
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
#	..	↑	
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#	..	↑	

Contracts

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