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:

1

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

2

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
```


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Fast Functions!

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

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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
```

Syntax and Style Bug Hunting: Pyret Edition

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#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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Unit 2

8

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:

    ________________(________________________)
            the user types...

    is ____________________________________________________
                    ...which should become

    ________________(________________________)
            the user types...

    is ____________________________________________________
                    ...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: 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:
  ______________(_________________________)
        the user types...

  is ____________________________________________________
        ...which should become

  ______________(_________________________)
        the user types...

  is ____________________________________________________
        ...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 DeliveryState, 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:
  ______________(___________________________)
        the user types...

   is ____________________________________________________
                ...which should become

  ______________(___________________________)
        the user types...

   is ____________________________________________________
                ...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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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:

_____

_____

_____

12

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:
   _____(_____)
```

the user types…

```
   is _____
```

…which should become

```
   _____(_____)
```

the user types…

```
   is _____
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
```


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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:
   _____(_____)
```

the user types…

```
   is _____
```

…which should become

```
   _____(_____)
```

the user types…

```
   is _____
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
```


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Vocabulary Practice

Below is a new structure definition:

```
data MediaType:
    | book(
        title :: String,
        author :: String,
        pubyear :: Number)
end

# an example book:
book1 = book("1984", "Orwell", 1949)
```

Fill in the blanks below with the vocabulary term that applies to each name. Here are the terms to choose from:

- contract
- header
- datatype
- constructor
- name
- example
- field
- instance
- data block
- purpose

author is a _____

book is a _____

MediaType is a _____

book1 is a _____

title is a _____

data ... end is a _____

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Unit 3

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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)

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Define the Data Structure

```
# a _________State is ________________________

data _________State:

| ___________(________________________________

              ________________________________

              ________________________________

              ________________________________)
end
```

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

_____ = _____

_____ = _____

_____ = _____

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Word Problem: 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
```


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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:
   _____(_____)
```

the user types…

```
    is _____
```

…which should become

```
    _____(_____)
```

the user types…

```
   is _____
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
```


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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:

_____ = _____

_____ = _____

_____ = _____

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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:

_____ = _____

_____ = _____

_____ = _____

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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:

_____ = _____

_____ = _____

_____ = _____

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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:

_____ = _____

_____ = _____

_____ = _____

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Unit 4

29

Function

```
fun  _____(_____) :

    if _____:

       _____

     else if _____:

       _____

     else if _____:

       _____

     else: _____


   end
end
```

Syntax and Style Bug Hunting: Piecewise Edition

	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`	

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	*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*	☐	☐

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

_____

_____

_____

_____

_____

Function

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

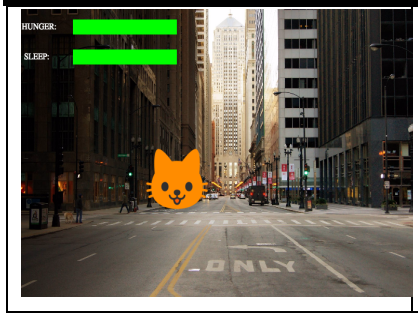
Unit 5

Animation Extension Worksheet

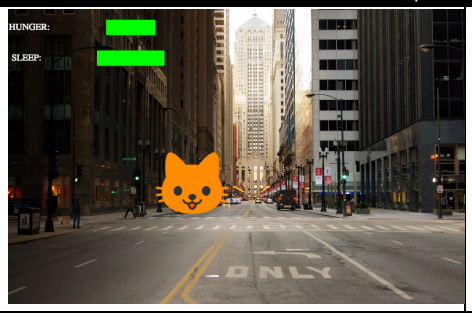
Describe the goal of your change: what new feature or behavior will it add to your animation?

Decrease the cat's hunger level by 2 and sleep level by 1 on each tick.

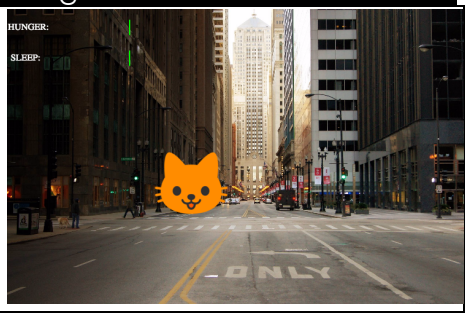
Draw a sketch for three distinct moments of the animation, focusing on the new behavior



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*	☐	☐
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*	☐	☐

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	*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*	☐	☐

reactor	*If either next-state function is new*	☐	☐

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	*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*	☐	☐

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

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	*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*	☐	☐

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:

_____

_____

_____

_____

_____

Collision

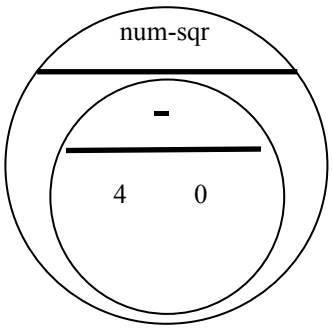
Distance:

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:

$$Distance^2 = (px - cx)^2 + (py - cy)^2$$

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
```

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
```

Build Your Own Animation

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	*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*	☐	☐

Build Your Own Animation

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…)

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Animation Extension Worksheet

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

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