Name:



# BOOTSTRAP: REACTIVE

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Class:



Workbook v0.9

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|         | Unit <sup>1</sup>                |                           |
|---------|----------------------------------|---------------------------|
|         | Racket Code                      | Pyret Code                |
|         | (define AGE 14)                  | AGE = 14                  |
|         | (define A-NUMBER 0.6)            | A-NUMBER = 0.6            |
| S       | (define SPEED -90)               | SPEED = -90               |
| Numbers |                                  | Two of your own:          |
| Ž       |                                  |                           |
|         |                                  |                           |
|         |                                  |                           |
|         | (define CLASS "Bootstrap")       | CLASS = "Bootstrap"       |
|         | (define PHRASE "Coding is fun!") | PHRASE = "Coding is fun!" |
|         | (define A-STRING "2500")         | A-STRING = "2500"         |
| ngs     |                                  | Two of your own:          |
| Strings |                                  |                           |
|         |                                  |                           |
|         |                                  |                           |
|         |                                  |                           |

```
(define SHAPE
                                          SHAPE =
     (triangle 40 "outline" "red"))
                                            triangle(40, "outline", "red")
   (define OUTLINE
                                          OUTLINE =
                                           star(80, "solid", "green")
     (star 80 "solid" "green"))
   (define SQUARE
                                          SQUARE =
     (rectangle 50 50 "solid" "blue"))
                                           rectangle(50, 50, "solid", "blue")
                                                    One of your own:
   (define BOOL true)
                                          BOOL = true
Booleans
   (define BOOL2 false)
                                                    One of your own:
                                          # double : Number -> Number
   ; double : Number -> Number
                                          # Given a number, multiply by
   ; Given a number, multiply by
   ; 2 to double it
                                          # 2 to double it
   (EXAMPLE (double 5) (*
                                  5)
                                          examples:
Functions
   (EXAMPLE (double 7) (*
                                              double(5) is 2 * 5
                                  7))
                                              double(7) is 2 * 7
   (define (double n) (*
                                          end
                                  n))
                                          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 |
|--|----------------------------|--------|
| examples:  double (5)  double (7)  end | ) is 2 * 5 n<br>) is 2 * 7 |        |
| fundouble(                             | n                          | ):     |
| end                                    |                            |        |
| #:                                     | domain ->                  | range  |
| examples:                              |                            |        |
| (                                      | ) is                       |        |
| end                                    | ) is                       |        |
| 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 |  |
|---------------|------------|--------------|----------|-------|--|
|               |            | domain       |          | runge |  |
| examples:     |            |              |          |       |  |
|               |            |              |          |       |  |
|               | (          | ) is         |          |       |  |
|               | ,          |              |          |       |  |
|               | (          | ) is         |          |       |  |
| end           |            |              |          |       |  |
| £             | ,          |              | <b>\</b> |       |  |
| fun           | (          |              | ):       |       |  |
|               |            |              |          |       |  |
|               |            |              |          |       |  |
| and           |            |              |          |       |  |
| end           |            |              |          |       |  |
|               |            |              |          |       |  |
| #             | <u>:</u> : |              | >        |       |  |
| #             | :          | domain       | >        | range |  |
| name          | :          | domain       | ->       | range |  |
|               | :          | domain       | >        | range |  |
| name          | ::         | domain       | >        | range |  |
| name          | ::::::     |              | >        | range |  |
| name          |            | ) is         | >        | range |  |
| examples:     | (          |              | ->       | range |  |
| name          | ·((        | ) is         | ->       | range |  |
| examples: end | ::::       | ) is<br>) is |          | range |  |
| examples:     |            | ) is<br>) is |          | range |  |
| examples: end |            | ) is<br>) is |          | range |  |
| examples: end |            | ) is<br>) is |          | range |  |

# Fast Functions!

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

| #       | name | • do    | omain | →  | range |
|---------|------|---------|-------|----|-------|
| example | es:  |         |       |    |       |
|         | (    | )       | is    |    |       |
|         | (    | )       | is    |    |       |
| end     |      |         |       |    |       |
| fun     |      | _(      |       | ): |       |
|         |      |         |       |    |       |
| end     |      |         |       |    |       |
| #       |      | ·<br>-• |       | -> |       |
|         | name | do      | omain |    | range |
| example | es:  |         |       |    |       |
|         | (    | )       | is    |    |       |
| end     | (    | )       | is    |    |       |
| CIIG    |      |         |       |    |       |
| fun     |      | _(      |       | ): |       |
|         |      |         |       |    |       |
|         |      |         |       |    |       |

### Bug Hunting: Pyret Edition SECONDS = (7)#1 STRING = my string SHAPE1 = circle(50 "solid" "blue") #2 SHAPE2 = triangle(75, outline, yellow) # triple : Number -> Number # Multiply a given number by # 3 to triple it #3 examples: triple(5) = 3 \* 5triple(7) = 3 \* 7end fun triple(n): 3 \* n #4 # 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") #5 ys(size): star(size "solid" "yellow") end

| Unit 2 |
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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.

|            | •  |  | `                                       |
|------------|--|--|---|
| name       | •  | Domain   | <b>&gt;</b>                             |
|            |  |  |   |
|            |  |  |   |
| xamples    |  | the function do?                               |   |
|            | unction in action                            |  |   |
| mples:     |  |  |   |
|            |  |  |   |
|            | (  | )  | is                                      |
| the user   | types  |  |   |
|            |  |  |   |
|            | which should beco                            | ome  |   |
|            | 1  | ,  | is                                      |
| the user t |  | )  | 15                                      |
|            |  |  |   |
|            |  | which should become                            |   |
|            |  | which should become                            |   |
| on         |  |  |   |
|            | examples, and name<br>verything that isn't c | e the variables.<br>ircled, and using names wh | ere you find variables!                 |
|            | , 5  | 0  | , |
|            |  | (  | ) :                                     |
|            |  |  |   |
|            |  |  |   |
|            |  |  |   |

### 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.

| • <u> </u>              |  | <del>-</del>            |           |
|-------------------------|--|-------------------------|-----------|
| name                    | Domain   |                         | Range     |
|                         |  |                         |           |
|                         | What does the function   | ı do?                   |           |
| xamples                 |  |                         |           |
| examples of your func   | tion in action   |                         |           |
| mples:                  |  |                         |           |
|                         | _(   | ) is                    |           |
| the user types.         |  |                         |           |
| the aser types.         | ••   |                         |           |
|                         |  |                         |           |
|                         | .which should become   |                         |           |
|                         | 1  | ) is                    |           |
| the user types          | _ (  |                         |           |
| the user types          |  |                         |           |
|                         |  |                         |           |
|                         | which should bec   | ome                     |           |
|                         |  |                         |           |
| on                      |  |                         |           |
|                         | nples, and name the variables.<br>thing that isn't circled, and usir |                         | d variabl |
| ie code, codvilia evelv |  | ig names where you line | a variabi |
|                         | (  |                         |           |

Word Problem: next-position
Write a function next-position, which takes in two numbers (an x and ycoordinate) and returns a JumperState, increasing the x-coordinate by 5 and decreasing the y-coordinate by 5.

| Every contract has                   |   |                      |                            |       |
|--------------------------------------|---|----------------------|----------------------------|-------|
| #                                    | :   |                      | $\rightarrow$              |       |
| name                                 |   | Domain               | Ranç                       | je    |
| #                                    |   |                      |                            |       |
|                                      |   | oes the function do? |                            |       |
| Give Examples<br>Write examples of v | our function in actio                               | n                    |                            |       |
| examples:                            |   |                      |                            |       |
| F =                                  | (   |                      | ) is                       |       |
|                                      | ·   |                      | <i>,</i>                   |       |
| tne                                  | e user types  |                      |                            |       |
|                                      |   |                      |                            |       |
|                                      | which should b                                      | pecome               |                            |       |
|                                      | (   |                      | ) is                       |       |
| tl                                   | he user types                                       |                      |                            |       |
|                                      |   |                      |                            |       |
| end                                  |   | which should become  |                            |       |
| end                                  |   |                      |                            |       |
| unction                              |   |                      |                            |       |
|                                      | n the examples, and no<br>vina everythina that isn' |                      | ames where you find variat | oles! |
| fun                                  | 3 - 7 - 3   | _                    | )                          | :     |
|                                      |   | `                    | ,                          |       |
|                                      |   |                      |                            |       |
|                                      |   |                      |                            |       |
|                                      |   |                      |                            |       |
| end                                  |   |                      |                            |       |

# Data Structure

| # A CakeType is a <b>flavor</b> , <b>layers</b> , & <b>is-iceCrea</b> | ım    |
|---|-------|
| data CakeType:  |       |
| cake(   |       |
|   |       |
|   |       |
|   | )     |
| end   |       |
|   |       |
| To make instances of this structure, I would w                        | rite: |
| 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.

| Contrac             | ct+Purpose Statement                              |            |
|---------------------|---|------------|
| #                   | :   |            |
| #                   |   |            |
| Give Exc            | amples  |            |
|                     | kamples of your function in action                |            |
| exam                | mples:  |            |
|                     | (   | ) is       |
|                     | the user types                                    |            |
| _                   |   |            |
|                     | which should become                               |            |
| _                   | (   | ) is       |
|                     | the user types                                    |            |
| end                 | which sho   | uld become |
| - ''                |   |            |
| Function Circle the | n<br>e changes in the examples, and name the var  | iables.    |
|                     | e code, copying everything that isn't circled, ar |            |
| fun                 | (   | ) <b>:</b> |
|                     |   |            |
|                     |   |            |
|                     |   |            |
| _                   |   |            |
| 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.

| Contrac             | ct+Purpose Statement                                   |             |
|---------------------|--|-------------|
| #                   | ·  | →           |
| #                   |  |             |
| Give Exc            | amples   |             |
|                     | kamples of your function in action                     |             |
| exam                | mples:   |             |
|                     | (  | ) is        |
|                     | the user types   |             |
|                     | which should become                                    |             |
|                     | wnich should become                                    |             |
|                     | (  | ) is        |
|                     | the user types   |             |
| end                 | which sho  | ould become |
|                     |  |             |
| Function Circle the | <b>n</b><br>e changes in the examples, and name the va | riables.    |
|                     | e code, copying everything that isn't circled, a       |             |
| fun                 | (  | ) :         |
|                     |  |             |
|                     |  |             |
|                     |  |             |
| _                   |  |             |
| end                 |  |             |

| 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 ch | anging?                 |
|--------------------|-------------------------|
| 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

end

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

data \_\_\_\_\_State:

\_\_\_\_\_)

#### 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.

| ontract+Purpose S  |                   |                       | ` -            |
|--------------------|-------------------|-----------------------|----------------|
| # draw-sta         | te :              |                       | → Image        |
|                    |                   |                       |                |
|                    |                   |                       |                |
| ite an expression  | for each piece    | of your final image   |                |
|                    |                   |                       |                |
| un                 |                   |                       |                |
| round              |                   |                       |                |
| ky                 |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |
| ite the draw-state | e function, using | g put-image to combir | ne your pieces |
| _                  |                   |                       |                |
| un                 |                   | (                     | ) :            |
|                    |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |
|                    |                   |                       |                |

### 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.

| ontract+Purpos | e Statement             |                  |                                    |
|----------------|-------------------------|------------------|------------------------------------|
| <u></u>        | ·                       | ·                | →                                  |
| <u>-</u>       |                         |                  |                                    |
| Give Examples  |                         |                  |                                    |
| •              | of your function in act | tion             |                                    |
| examples:      |                         |                  |                                    |
|                | (                       |                  | ) is                               |
|                | the user types          |                  |                                    |
|                | which should            | d become         |                                    |
|                | (                       |                  | ) is                               |
|                | the user types          |                  | ,                                  |
| <br>end        |                         | which should bec | come                               |
| CIIG           |                         |                  |                                    |
| unction        |                         |                  |                                    |
|                | s in the examples, and  |                  | ng names where you find variables! |
|                |                         |                  | ) :                                |
|                |                         | \                | , ·                                |
|                |                         |                  |                                    |
|                |                         |                  |                                    |
|                |                         |                  |                                    |
|                |                         |                  |                                    |
| end            |                         |                  |                                    |

# Identifying Animation Data Worksheet

| Sketch A                     | Sketch B                     | Sketch C                          |
|------------------------------|------------------------------|-----------------------------------|
| t things are changing? Thing | Describe ho                  | ow it changes                     |
|                              |                              |                                   |
|                              |                              |                                   |
| at fields do vou need to r   | epresent the things that cho | ange?                             |
| eld name (dangerX, score,    |                              | e (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

| raw a sketch for three distinct moments |                 | he animation         |                               |
|---|-----------------|----------------------|-------------------------------|
|   |                 |                      |                               |
| Sketch A                                | Ske             | etch B               | Sketch C                      |
| hat things are changing  Thing          | ś               | Describe how it o    | hanaes                        |
| 9                                       |                 |                      | <del></del>                   |
|   |                 |                      |                               |
|   |                 |                      |                               |
|   |                 |                      |                               |
|   |                 |                      |                               |
| nat fields do you need t                |                 |                      |                               |
| Field name (dangerX, sco                | ore, playerIMG) | <b>Datatype</b> (Nui | mber, 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

| w a sketch for three   | e distinct moments of                     | the animation      |                               |
|------------------------|---|--------------------|-------------------------------|
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   |                    |                               |
| Cl. I.I. A             | CI  | - I - I - D        | Cl L. L. C                    |
| Sketch A               | 3K  | etch B             | Sketch C                      |
| ıt things are chang    | ing?                                      |                    |                               |
| Thing                  |   | Describe how it ch | hanges                        |
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   |                    |                               |
|                        |   | :                  |                               |
| eld name (dangerX,     | ed to represent the the score, playerIMG) |                    | nber, String, Image, Boolean) |
| tera manne (eren genn) | σσιο, βια, σι                             |                    | nser, ennig, miage, zeeream,  |
|                        |   |                    |                               |
| _                      |   |                    |                               |
|                        |   |                    |                               |
|                        |   | ĺ                  |                               |

(worksheet continues on the next page)

#### Define the Data Structure

end

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

data \_\_\_\_\_State:

\_\_\_\_\_)

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

\_\_\_\_\_A = \_\_\_\_

\_\_\_\_\_B = \_\_\_\_

\_\_\_\_\_c = \_\_\_\_

# Identifying Animation Data Worksheet

| w a sketch for thre | e distinct moments  | of the animation                        |                               |
|---------------------|---------------------|---|-------------------------------|
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
| Cl alala A          |                     | St. J. J. D                             | 01 -1 -1 - 0                  |
| Sketch A            | ,                   | Sketch B                                | Sketch C                      |
| ıt things are chanç | ging?               |   |                               |
| Thing               |                     | Describe how it c                       | hanges                        |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
| at fields de veu pe | ad to represent the | things that change?                     |                               |
|                     | , score, playerIMG) |   | mber, String, Image, Boolean) |
| , 0                 | , , =,              | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     |   |                               |
|                     |                     | [                                       |                               |

(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 |
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### 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 Sto | atement  |      |   |
|----------------------|----------|------|---|
| #                    | <b>:</b> | <br> | → |
| #                    |          | <br> |   |
| Give Examples        |          |      |   |
| examples:            |          |      |   |
|                      | (        | ) is |   |
|                      |          |      |   |
|                      | (        | ) is | _ |
|                      |          |      |   |
|                      | (        | ) is |   |
|                      | (        | ) is |   |
|                      | `        |      | _ |
| ,                    |          |      |   |

end

(worksheet continues next page)

| Functi | ion     |      |      |      |    |
|--------|---------|------|------|------|----|
| fun    |         | (    |      | _) : |    |
|        | if      | <br> | <br> |      | :  |
|        | else if |      |      |      | _; |
|        | else if |      |      |      | :  |
|        | else: _ |      |      |      | -  |
| end    | end     |      |      |      |    |

### Piecewise Bug-Hunting **Buggy Code** Correct Code / Explanation fun piecewisefun(n): if (n > 0): n else: 0 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 fun absolute-value(a b): **if** a > b: a - b b - a end end 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 distinc  | ct moments of the animation                                       |         |      |  |
|------------------------|--------------------|---|---------|------|--|
|                        |                    |   |         |      |  |
|                        |                    |   |         |      |  |
|                        |                    |   |         |      |  |
|                        |                    |   |         |      |  |
| Sket                   | ch A               | Sketch B Sketch   | С       |      |  |
| What things are        | e chanaina?        |   |         |      |  |
| Thing                  |                    | Describe how it changes   |         |      |  |
|                        |                    |   |         |      |  |
|                        |                    |   |         |      |  |
|                        |                    |   |         |      |  |
| What fields do         | you need to re     | present the things that change?                                   |         |      |  |
| Field name (c          | langerX, score, p  | Datatype (Number, String, Image, Bo                               | oolean. | )    |  |
|                        |                    |   |         |      |  |
|                        |                    |   |         |      |  |
|                        |                    |   |         |      |  |
| Make a 10-Do Component |                    | off each as "Done" when you finish each one.  work to be done?    | To-Do   | Done |  |
| Data Structure         | If any new field   | ny new field(s) were added, changed or removed                    |         |      |  |
| draw-state             | If something is a  | something is displayed in a new way or position                   |         |      |  |
| next-state-tick        | If the Data Struc  | ne Data Structure changed, or the animation happens automatically |         |      |  |
| next-state-key         | If the Data Struc  | ne Data Structure changed, or a keypress triggers the animation   |         |      |  |
| reactor                | If either next-sto | either next-state function is new                                 |         |      |  |

| Make a sample     | instance for ec  | ach sketch from   | n the previous p  | oage:           |    |
|-------------------|------------------|-------------------|-------------------|-----------------|----|
|                   |                  |                   |                   |                 |    |
|                   | =                |                   |                   |                 |    |
|                   |                  |                   |                   |                 | •  |
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|                   |                  |                   |                   |                 | _  |
|                   | =                |                   |                   |                 |    |
|                   |                  |                   |                   |                 | _  |
|                   |                  |                   |                   |                 |    |
| Write at least on | ne NEW exampl    | e for one of the  | e functions on    | vour To-Do list |    |
|                   |                  |                   |                   | ,               |    |
|                   |                  |                   |                   |                 |    |
|                   |                  |                   |                   |                 |    |
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|                   |                  |                   |                   |                 |    |
|                   |                  |                   |                   |                 |    |
| If you have ano   | ther function or | n your To-Do list | t , write at leas | t one NEW examp | le |
|                   |                  |                   |                   |                 |    |
|                   |                  |                   |                   |                 |    |
|                   |                  |                   |                   |                 |    |
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### 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.

| Cont | tract+Purpose Stateme | ent |   |    |          |   |
|------|-----------------------|-----|---|----|----------|---|
| # _  |                       | :   |   |    | <b>→</b> | _ |
| # _  |                       |     |   |    |          |   |
| Give | Examples              |     |   |    |          |   |
| ex   | amples:               |     |   |    |          |   |
|      | (                     |     | ) | is |          |   |
|      |                       |     |   |    |          |   |
|      | (                     |     | ) | is |          |   |
|      |                       |     |   |    |          |   |
|      | (                     |     | ) | is |          | _ |
|      |                       |     |   |    |          |   |
|      | (                     |     | ) | is |          |   |
|      |                       |     |   |    |          |   |
|      | -                     |     |   |    |          |   |

end

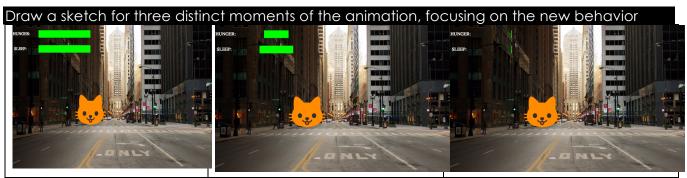
(worksheet continues next page)

| Function function |         | ( | ) | :      |
|-------------------|---------|---|---|--------|
|                   | if      |   |   | _ :    |
|                   | else if |   |   | <br>_• |
|                   | else if |   |   | -<br>- |
|                   | else:   |   |   | _      |
| end               | end     |   |   |        |

| Unit 5 |
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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.



Sketch A Sketch B Sketch C

| What things are cho | anging?                 |
|---------------------|-------------------------|
| Thing               | Describe how it changes |
|                     |                         |
|                     |                         |
|                     |                         |
|                     |                         |
|                     |                         |

| What fields do you need to represent the thi | ngs that change?                          |
|--|---|
| Field name (dangerX, score, playerIMG)       | Datatype (Number, String, Image, Boolean) |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |

| 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                    | V     |      |
| next-state-tick | If the Data Structure changed, or the animation happens automatically | Y     |      |
| next-state-key  | If the Data Structure changed, or a keypress triggers the animation   | V     |      |
| reactor         | If either next-state function is new                                  |       |      |

| Make a sam     | ple instance for each sketch from the previous page:                 |
|----------------|--|
| FULLPET =      | pet(100, 100)  |
| MIDPET =       | pet(50, 75)  |
| LOSEPET        | =pet(0, 0)   |
| Write at least | t 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     | e-tick(MIDPET) is pet(MIDPET.hunger - 2, MIDPET.sleep - 1)           |
| next-state     | e-tick(LOSEPET) is LOSEPET   |
|                |  |
|                |  |
|                |  |
| If you have    |  |
| ir you have d  | another function on your To-Do list , write at least one NEW example |
|                |  |
|                |  |
|                |  |
|                |  |
|                |  |

| Draw a sketch          | for three distinc  | ct moments of the animation                                    |         |      |
|------------------------|--------------------|--|---------|------|
|                        |                    |  |         |      |
|                        |                    |  |         |      |
|                        |                    |  |         |      |
|                        |                    |  |         |      |
| Sket                   | ≏h A               | Sketch B Sketch  | C       |      |
| What things are        |                    | OKOTCH D OKOTCH  |         |      |
| Thing                  | e changing ¢       | Describe how it changes  |         |      |
|                        |                    |  |         |      |
|                        |                    |  |         |      |
|                        |                    |  |         |      |
| What fields do         | you need to re     | present the things that change?                                |         |      |
|                        | langerX, score, p  |  | oolean. | )    |
|                        |                    |  |         |      |
|                        |                    |  |         |      |
|                        |                    |  |         |      |
| Make a 10-Do Component |                    | off each as "Done" when you finish each one.  work to be done? | To-Do   | Done |
| Data Structure         | If any new field   | (s) were added, changed or removed                             |         |      |
| draw-state             | If something is a  | displayed in a new way or position                             |         |      |
| next-state-tick        | If the Data Struc  | cture changed, or the animation happens automatically          |         |      |
| next-state-key         | If the Data Struc  | cture changed, or a keypress triggers the animation            |         |      |
| reactor                | If either next-sto | ate function is new  |         |      |

| Make a sample insta   | ance for each sketc | h from the previou     | us page:           |     |
|-----------------------|---------------------|------------------------|--------------------|-----|
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| =                     |                     |                        |                    | _   |
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| =                     |                     |                        |                    | _   |
| _                     |                     |                        |                    |     |
| <b>-</b>              |                     |                        |                    | _   |
|                       |                     |                        |                    |     |
| Write at least one NE | EW example for one  | of the functions of    | on your To-Do list |     |
|                       |                     |                        |                    |     |
|                       |                     |                        |                    |     |
|                       |                     |                        |                    |     |
|                       |                     |                        |                    |     |
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|                       |                     |                        |                    |     |
|                       |                     |                        |                    |     |
| If you have another   | function on your To | -Do list , write at le | east one NEW examp | ole |
|                       |                     |                        |                    |     |
|                       |                     |                        |                    |     |
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|                       |                     |                        |                    |     |

| Draw a sketch            | for three distinc                                | moments of the animation                                       |                     |         |      |
|--------------------------|--|--|---------------------|---------|------|
|                          |  |  |                     |         |      |
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|                          |  |  |                     |         |      |
| Sketo                    | ch A   | Sketch B   | Sketch              | С       |      |
| VA/la out theirs one our | a de cue cire co                                 |  |                     |         |      |
| What things are Thing    | e changings                                      | Describe how it change   | <u> </u>            |         |      |
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| \\ (!   . C              |  |  |                     |         |      |
|                          | you need to re <sub>l</sub><br>langerX, score, p | oresent the things that change?  ayerIMG)  Datatype (Number, S | trina Image Bo      | oolean  | )    |
| Tield Halle (e           | iangon, 30010, p                                 | Daidippe (Normality)   | 11119, 1111090, 110 | olodii. | •••  |
|                          |  |  |                     |         |      |
|                          |  |  |                     |         |      |
|                          |  |  |                     |         |      |
| Make a To-Do I           | ist, and check                                   | off each as "Done" when you finish e                           | ach one.            |         |      |
| Component                | When is there                                    | vork to be done?   |                     | To-Do   | Done |
| Data Structure           | If any new field                                 | s) were added, changed or removed                              |                     |         |      |
| draw-state               | If something is o                                | isplayed in a new way or position                              |                     |         |      |
| next-state-tick          | If the Data Struc                                | ture changed, or the animation happen.                         | s automatically     |         |      |
| next-state-key           | If the Data Struc                                | ture changed, or a keypress triggers the                       | animation           |         |      |
| reactor                  | If either next-sto                               | te function is new   |                     |         |      |

| Make a sample     | instance for each sketch from the previous page:                   |  |
|-------------------|--|--|
| ·                 |  |  |
|                   | _ =  |  |
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|                   | _ =  |  |
|                   | <del></del>  |  |
|                   | =  |  |
|                   | -  |  |
|                   |  |  |
| Write at least on | ne NEW example for one of the functions on your To-Do list         |  |
|                   |  |  |
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| 15                |  |  |
| If you have ano   | other function on your To-Do list , write at least one NEW example |  |
|                   |  |  |
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| Build Your Own Animation |
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| Draw a sketch         | for three distinc  | moments of the animation                |                     |         |      |
|-----------------------|--------------------|---|---------------------|---------|------|
|                       |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
| Cleat                 | olo A              | Chatab D                                | Cleatab             |         |      |
|                       | ch A               | Sketch B                                | Sketch              | <u></u> |      |
| What things are Thing | e changing?        | Describe how it changes                 |                     |         |      |
| 9                     |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
| What fields do        | vou need to re     | resent the things that change?          |                     |         |      |
|                       | dangerX, score, p  |   | , String, Image, Bo | oolean. | )    |
|                       |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
|                       |                    |   |                     |         |      |
|                       |                    |   | _                   |         |      |
| Make a To-Do          | List, and check    | off each as "Done" when you finish      | each one.           |         |      |
| Component             | When is there      | vork to be done?                        |                     | To-Do   | Done |
| Data Structure        | If any new field   | s) were added, changed or removed       |                     |         |      |
| draw-state            | If something is a  | isplayed in a new way or position       |                     |         |      |
| next-state-tick       | If the Data Struc  | ture changed, or the animation happe    | ens automatically   |         |      |
| next-state-key        | If the Data Struc  | ture changed, or a keypress triggers th | e animation         |         |      |
| reactor               | If either next-sto | te function is new                      |                     |         |      |

| a   | State is   |    |
|-----|--|----|
| ata | State:   |    |
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|     | e instance for each sketch from the previous pag |    |
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|     | ple for one of the functions on the previous pag | e: |
|     | ple for one of the functions on the previous pag | e: |
|     | ple for one of the functions on the previous pag | e: |

| Collision |
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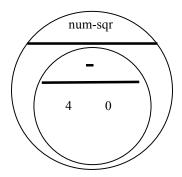
#### Distance:

The Player is at (4, 2) and the Target is at (0, 5). Distance takes in the player's x, player's y, character's x and character's y.

Use the formula below to fill in the EXAMPLE:

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

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:

| Contro            | ıct+Purpose State           | Distance <sup>2</sup> | = (px - cx | k) <sup>2</sup> + (py - cy | y) <sup>2</sup> |  |
|-------------------|-----------------------------|-----------------------|------------|----------------------------|-----------------|--|
|                   | :                           |                       |            |                            | >               |  |
|                   |                             |                       |            |                            |                 |  |
| Give E<br>Write e | xamples<br>examples of your | function in action    | on         |                            |                 |  |
|                   | mples:                      | _(                    | )          | is                         |                 |  |
|                   |                             | _(                    | )          | is                         |                 |  |
| end<br>Function   | on                          |                       |            |                            |                 |  |
| fun               |                             | (                     |            | ):                         |                 |  |
|                   |                             |                       |            |                            |                 |  |

end

# Word Problem: is-collision Write a function is-collision, which takes FOUR inputs:

| <u> </u>       | 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 c coordinates of the other character. Otherwise, false |     | of the |
|----------------|---|-----|--------|
| Contro         | act+Purpose Statement   |     |        |
| #              | • <u>-</u>  | >   |        |
|                |   |     |        |
| Give E         | xamples examples of your function in action   |     |        |
|                | mples:  |     |        |
|                |   | )   | is     |
|                |   |     |        |
|                |   |     |        |
|                |   | )   | is     |
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|                |   |     |        |
| end<br>Functio |   |     |        |
|                | (   | _): |        |
|                |   |     |        |
| end            |   |     |        |

#### Design Recipe

| Contra    | ct+Purpose Statement           |                       |         |       |  |
|-----------|--------------------------------|-----------------------|---------|-------|--|
| Every c   | contract has three parts:      |                       |         |       |  |
| 11        |                                |                       |         |       |  |
|           | ·                              |                       |         | >     |  |
| r         | name                           | Dom                   | iain    | Range |  |
| #         |                                |                       |         |       |  |
|           | WI                             | nat does the function | on do?  |       |  |
|           | camples                        |                       |         |       |  |
| write e   | xamples of your function in c  | noitac                |         |       |  |
| exan      | mples:                         |                       |         |       |  |
| C21GI1    | (                              | ,                     | is      |       |  |
| -         | the user types                 | /                     | TP      |       |  |
|           | ,,                             |                       |         |       |  |
| _         |                                | ·                     |         |       |  |
|           | which sh                       | ould become           |         |       |  |
|           | ,                              |                       |         |       |  |
| -         | •                              | )                     | is      |       |  |
|           | the user types                 |                       |         |       |  |
|           |                                |                       |         |       |  |
| _         | w                              | hich should become    | e       |       |  |
| end       |                                |                       |         |       |  |
| Functio   |                                |                       |         |       |  |
| Circle th | ne changes in the examples, ar | nd name the var       | iables. |       |  |
| fun       |                                |                       | ):      |       |  |
| ı alı     |                                |                       | /·      |       |  |
|           |                                |                       |         |       |  |
|           |                                |                       |         |       |  |
| and       |                                |                       |         |       |  |

#### DESIGN RECIPE

| Cont      | ract+Purpose Statemer      | nt                  |            |       |  |
|-----------|----------------------------|---------------------|------------|-------|--|
| Every     | contract has three par     | ts:                 |            |       |  |
| ,,        |                            |                     |            |       |  |
| #         | ·                          |                     |            | >     |  |
|           | name                       | Γ                   | Domain     | Range |  |
| #         |                            |                     |            |       |  |
| <i>''</i> |                            | What does the fun   | ction do?  |       |  |
|           | Examples                   |                     |            |       |  |
| Write     | examples of your functions | rion in action      |            |       |  |
| 037       | mmlog•                     |                     |            |       |  |
| exc       | amples:                    | ,                   |            |       |  |
|           | (                          | )                   | is         |       |  |
|           | the user types             | •                   |            |       |  |
|           |                            |                     |            |       |  |
|           | •••                        | which should become |            |       |  |
|           |                            |                     |            |       |  |
|           | (                          | )                   | is         |       |  |
|           | the user types             | ,                   |            |       |  |
|           |                            |                     |            |       |  |
|           |                            | which should bec    |            |       |  |
| enc       | 1                          | wnich should bec    | ome        |       |  |
| Func      |                            |                     |            |       |  |
|           | the changes in the exam    | ples, and name the  | variables. |       |  |
|           |                            |                     |            |       |  |
| fur       | າ                          | (                   | ):         |       |  |
|           |                            |                     |            |       |  |
|           |                            |                     |            |       |  |
|           |                            |                     |            |       |  |
| end       | l                          |                     |            |       |  |

| Draw a sketch   | for three distinc  | t moments of the animation                         |          |        |      |
|-----------------|--------------------|--|----------|--------|------|
|                 |                    |  |          |        |      |
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| Sket            | ch A               | Sketch B Sk  | etch (   | С      |      |
| What things are | a chanaina?        |  |          |        |      |
| Thing           | eriariging ?       | Describe how it changes                            |          |        |      |
|                 |                    |  |          |        |      |
|                 |                    |  |          |        |      |
|                 |                    |  |          |        |      |
|                 |                    |  |          |        |      |
| _               |                    |  |          |        |      |
| What fields do  | you need to re     | present the things that change?                    |          |        |      |
| Field name (c   | dangerX, score, p  | layerIMG) Datatype (Number, String, Ima            | age, Boo | olean. | )    |
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| Make a To-Do    | List, and check    | off each as "Done" when you finish each one        |          |        |      |
| Component       | When is there      | work to be done?                                   | T        | o-Do   | Done |
| Data Structure  | If any new field   | s) were added, changed or removed                  |          |        |      |
| draw-state      | If something is a  | lisplayed in a new way or position                 |          |        |      |
| next-state-tick | If the Data Stru   | cture changed, or the animation happens automo     | atically |        |      |
| next-state-key  | If the Data Stru   | cture changed, or a keypress triggers the animatic | on       |        |      |
| reactor         | If either next-sto | te function is new                                 |          |        |      |

| a         | State is   |   |
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|           | e instance for each sketch from the previous page: |   |
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| e an exam | ple for one of the functions on the previous page: |   |
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| Draw a sketch   | for three distinc   | t moments of th     | e animation          |                        |         |      |
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| BIGW G SKCICIT  | TOT TITLE CLISTIFIC |                     | e ariii ilanori      |                        |         |      |
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| Sket            | ch A                | Sket                | ch B                 | Sketch                 | С       |      |
| What things are | e changing?         |                     |                      |                        |         |      |
| Thing           |                     | De                  | escribe how it chan  | nges                   |         |      |
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| What fields do  | value pand to ra    | aracant tha thing   | gs that change?      |                        |         |      |
|                 | dangerX, score, p   |                     |                      | ber, String, Image, Bo | oolean. | )    |
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|                 |                     |                     | ne" when you fir     |                        |         |      |
| Component       |                     | work to be done     |                      |                        | To-Do   | Done |
| Data Structure  | If any new field    | (s) were added, c   | changed or remove    | ed                     |         |      |
| draw-state      | If something is a   | displayed in a nev  | v way or position    |                        |         |      |
| next-state-tick | If the Data Struc   | cture changed, o    | r the animation ha   | ppens automatically    |         |      |
| next-state-key  | If the Data Struc   | cture changed, o    | r a keypress trigger | rs the animation       |         |      |
| reactor         | If either next-sto  | ate function is nev | V                    |                        | П       |      |

| a   | State is   |    |
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| Draw a sketch   | for three distinc  | t moments of the animation                         |          |        |      |
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| Sket            | ch A               | Sketch B Sk  | etch     | С      |      |
| What things are | e changing?        |  |          |        |      |
| Thing           |                    | Describe how it changes                            |          |        |      |
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| What fields do  | vou need to re     | oresent the things that change?                    |          |        |      |
|                 | dangerX, score, p  |  | age, Bo  | olean. | )    |
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|                 |                    | off each as "Done" when you finish each one        |          |        |      |
| Component       |                    | work to be done?                                   |          | lo-Do  | Done |
| Data Structure  | If any new field   | (s) were added, changed or removed                 |          |        |      |
| draw-state      | If something is a  | lisplayed in a new way or position                 |          |        |      |
| next-state-tick | If the Data Stru   | cture changed, or the animation happens automo     | atically |        |      |
| next-state-key  | If the Data Stru   | cture changed, or a keypress triggers the animatic | on       |        |      |
| reactor         | If either next-sto | Ite function is new                                |          |        |      |

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| Sket                       | ch A  | Sketch B Sketch  | С       |             |
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| What things are            | e chanaina?   |  |         |             |
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| Make a To-Do               |   |  |         |             |
| Component                  | List, and check   | off each as "Done" when you finish each one.   |         |             |
| Data Structure             |   | off each as "Done" when you finish each one.  work to be done?                           | To-Do   | Done        |
|                            | When is there   | · · · · · · · · · · · · · · · · · · ·  | To-Do   | <b>Done</b> |
| draw-state                 | When is there  If any new field   | work to be done?   | To-Do   | Done        |
| draw-state next-state-tick | When is there  If any new field  If something is a                        | work to be done?  (s) were added, changed or removed                                     |         | Done        |
|                            | When is there  If any new field  If something is a  If the Data Structure | work to be done?  (s) were added, changed or removed  displayed in a new way or position |         | Done        |

| Make a sample insta   | ance for each sketc  | h from the previou     | us page:           |     |
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| Write at least one NE | EW example for one   | of the functions of    | on your To-Do list |     |
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| If you have another   | function on your To- | -Do list , write at le | east one NEW examp | ole |
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| Sket                     | ch A               | Sketch B Sketch  | С       |      |
|--------------------------|--------------------|--|---------|------|
| What things are Thing    | e changing?        | Describe how it changes  |         |      |
|                          |                    |  |         |      |
|                          |                    |  |         |      |
|                          |                    | oresent the things that change?                                |         |      |
| Field name (c            | langerX, score, p  | Datatype (Number, String, Image, Bo                            | oolean. | )    |
|                          |                    |  |         |      |
|                          |                    |  |         |      |
| Make a To-Do l Component |                    | off each as "Done" when you finish each one.  work to be done? | To-Do   | Done |
| Data Structure           | If any new field   | (s) were added, changed or removed                             |         |      |
| draw-state               | If something is a  | displayed in a new way or position                             |         |      |
| next-state-tick          | If the Data Struc  | cture changed, or the animation happens automatically          |         |      |
| next-state-key           | If the Data Struc  | cture changed, or a keypress triggers the animation            |         |      |
| reactor                  | If either next-sto | ate function is new  |         |      |

| Make a sample insta   | ance for each sketc  | h from the previou     | us page:           |     |
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| Write at least one NE | EW example for one   | of the functions of    | on your To-Do list |     |
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| If you have another   | function on your To- | -Do list , write at le | east one NEW examp | ole |
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# Contracts

| Name | Domain | Range    | example |
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# Contracts