Name: _____



BOOTSTRAP: 2

www.bootstrapworld.org

Class:



Workbook v0.9

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Lesson 1

| | Racket Code | Pyret Code |
|---------|----------------------------------|---------------------------|
| | (define AGE 14) | AGE = 14 |
| | (define A-NUMBER 0.6) | A-NUMBER = 0.6 |
| 100 | (define SPEED -90) | SPEED = -90 |
| Numbers | | Two of your own: |
| | | |
| | | |
| | | |
| | (define CLASS "Bootstrap") | CLASS = "Bootstrap" |
| | (define PHRASE "Coding is fun!") | PHRASE = "Coding is fun!" |
| | (define A-STRING "2500") | A-STRING = "2500" |
| SS | | 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:
                                         BOOL = true
    (define 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) (* 2 5)
                                         examples:
Functions
    (EXAMPLE (double 7) (* 2 7))
                                              double(5) is 2 * 5
                                              double(7) is 2 * 7
    (define (double n) (* 2 n))
                                         end
                                         fun double(n):
                                              2 * n
                                         end
```

Fast Functions!

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

double : Number -> Number range

examples:
 double (5) is 2 * 5
 double (7) is 2 * 7
end n

fun double (n):

2 * n

end

______ -> _____ range

examples:

end

fun _____(____):

end

| _ | | | | ı |
|------|-----|------|-----|---|
| Fast | ınc | `TIC | าทร | ı |

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

| # | | | > | | |
|-----------|----------|--------|----|-------|--|
| name | | domain | | range | |
| examples: | | | | | |
| | (|) is | | | |
| | (|) is | | | |
| end | | | | | |
| fun | (| |): | | |
| | | | | | |
| | | | | | |
| end | | | | | |
| # | : | | > | | |
| name | | domain | | range | |
| examples: | | | | | |
| | (|) is | | | |
| | (|) is | | | |
| end | | | | | |
| fun | (| |): | | |
| | | | | | |
| | | | | | |
| end | | | | | |

| Fast | ΗU | nc | TO | nst |
|------|----|----|----|-----|

| Fill out the contract for each function, then try to write two examples and the definition |
|--|
|--|

| # | . | domain | > | range | |
|------------|--------------|----------------|-----|-------|--|
| examples: | | | | | |
| | (| _) is | | | |
| | (| _) is | | | |
| end | | | | | |
| fun | (| | _): | | |
| | | | | | |
| end | | | | | |
| ena | | | | | |
| # | :_ | domain | > | range | |
| # | :_ | domain | > | range | |
| #name | : | | | | |
| #name | : | | | range | |
| #name | :::: | _) is | | | |
| #examples: | | _) is | | | |
| #examples: | ::::: | _) is _) is | | | |

| | Bug Hunting: Py | ret Edition |
|----|--|-------------|
| | SECONDS = (7) | |
| #1 | STRING = my string | |
| #2 | SHAPE1 = circle(50 "solid" "blue") | |
| π2 | SHAPE2 = triangle(75, outline, yellow) | |
| #3 | <pre># triple : Number -> Number # Multiply a given number by # 3 to triple it examples: triple(5) = 3 * 5 triple(7) = 3 * 7 end</pre> | |
| #4 | <pre>fun triple(n): 3 * n</pre> | |
| #5 | <pre># ys : Number -> Number # Given a number, create a solid # yellow star of the given size examples: ys(99) is star(99, "solid", "yellow") ys(33) is star(99, "solid", "yellow") ys(size): star(size "solid" "yellow") end</pre> | |

Lesson 2

Word Problem: double-radius

Write a function double-radius, which takes in a radius and a color. It produces an outlined circle of whatever color was passed in, whose radius is twice as big as the input.

| Contrac | ct+Purpose Statement | | | |
|-----------|------------------------------|--------------------------------|------------------|----------------|
| | ontract has three parts: | | | |
| # | <u>:</u> | | -) | > |
| | | Domain | | Range |
| # | | | | |
| " | | What does the function do | ? | |
| Give Exc | amples | | | |
| | xamples of your function in | n action | | |
| exam | mples: | | | |
| | (|) | is | |
| | the user types | , | | |
| | | | | |
| _ | which | should become | | |
| | , | , | | |
| | the user types |) | is | |
| | | | | |
| _ | | which should become | | |
| end | | | | |
| Function | | | | |
| Circle th | e changes in the examples, | | | |
| Write the | e code, copying everything t | hat isn't circled, and using n | ames where you f | ind variables! |
| fun | | _(| _): | |
| | | | | |
| | | | | |
| end | | | | |

Word Problem: double-width

Write a function double-width, which takes in a number (the length of a rectangle) and produces a rectangle whose width is twice the given length.

| | Purpose Statement | | | |
|------------------------|---------------------------|--|-------------------|-----------------|
| ery contr | ract has three parts: | | | |
| | : | | _ | > |
| name | | Domain | | Range |
| | | | | |
| | W | | ? | |
| Francisco | l | | | |
| ive Examp rite exam | ples of your function in | action | | |
| | | | | |
| exampl | Les: | | | |
| | (|) | is | |
| | the user types | | | |
| | | | | |
| | which s | hould become | | |
| | , | , | | |
| | (|) | is | |
| | the user types | | | |
| | | | | |
| - n d | ' | which should become | | |
| end | | | | |
| unction | | | | |
| | nanges in the examples, a | and name the variables. Nat isn't circled, and using no | ames where you | find variables |
| THE HE CO | de, copying everynning in | iai isiri ciicica, ana osing n | arries wriere you | iii a vanabies: |
| fun | | (| _): | |
| | | | | |
| | | | | |
| | | | | |
| end | | | | |

Word Problem: next-position

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

| | ose Statement nas three parts: | | | |
|-------------------------------------|--|--|----------------|-------------------|
| | : | | - | -> |
| name | | Domain | | Range |
| | | | | |
| | Wha | at does the function do | ? | |
| e Examples | | | | |
| re examples | of your function in a | ction | | |
| xamples | } . | | | |
| | (|) | is | |
| | the user types | , | | |
| | | | | |
| | which sho | ould become | | |
| | | | | |
| | (|) | is | |
| u | e user types | | | |
| | | | | |
| nd | wh | nich should become | | |
| .10 | | | | |
| nction | | al resource Alexa considerate to a | | |
| rite the change rite the code, c | es in the examples, an copying everything tha | d name the variables. It isn't circled, and using n | ames where you | u find variables! |
| | , | | ١., | |
| un | (| | _): | |
| | | | | |
| | | | | |
| end | | | | |

Data Structure

| # a CakeT i | s a flavor, layers, & is-iceCream |
|---------------|---|
| data CakeT: | |
| cake(| |
| | |
| | |
| |) |
| end | |
| | |
| To make insta | inces of this structure, I would write: |
| cake1 = | |
| | |
| cake2 = | |
| | |
| To access the | e fields of cake2, I would write: |
| | |
| | |
| | |
| | |
| | |

Word Problem: taller-than

Write a function called *taller-than*, which consumes two CakeTs, and produces true if the number of layers in the first CakeT is greater than the number of layers in the second

| Contro | act+Purpose Statement | | | | |
|----------|-----------------------|---|-----|---|--|
| | : | | | > | |
| | | | | | |
| | | | | | |
| exam | xamples uples: | | | | |
| | (|) | is | | |
| | | | | | |
| | | | | | |
| | (|) | is | | |
| | | | | | |
| end | | | | | |
| Function | on | | | | |
| fun | (| | _): | | |
| | | | | | |
| end | | | | | |

Word Problem: will-melt

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

| Contro | act+Purpose Statement | | | | |
|-----------------|-----------------------|-------|----|----|--|
| # | : | | | -> | |
| # | | | | | |
| Give Ex | camples ples: | | | | |
| CAdin | |) | is | | |
| | (|) | is | | |
| end | | | | | |
| Function fun | on |) | : | | |
| end | | | | | |

Lesson 3

Animation Design Worksheet

| Pι | ır | n | റ | ς | e | • |
|----|----|---|---|---|---|---|
| | 41 | μ | v | J | · | • |

| Draw | | and of the origin | a arti a ra | | | |
|-------|---|-------------------|-------------|----------------|---------------------|------------|
| DIGW | a sketch for three distinct mom | | ПОПОП | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | Image A | lmo | age B | | Image C | |
| What | things are changing? | | | | | |
| Thing | | ge? | | Does it cl | nange consistently? | |
| | | | | | | = |
| | | | | | | |
| | fields do you need? name (dangerX, score, timer | .) | Datatype | (Number, Strin | g, Image, Boolean) | |
| | | , | ,, | , | , | |
| | | | | | | |
| Cir | alo tho itoms ho | Now tha | ıt volu | will no | ad ta writa ar adi | i + |
| | eck them off wh | | • | | ed to write or edi | Ι. |
| | cek mem on wi | ien yee | 11111511 | cacii. | | |
| | Sample instances | 5 | | | | |
| | draw-state: | | > | mage | | |
| | next-state-tick: | | | > | | |
| | next-state-key: | | | | | |
| | reactor | | · | - | | |

Data Structures

| # a | St | ate is | a | | | |
|---------------|-------------|--------------|--------------|-------------|--------------|----------------|
| data | | State: | | | | |
| l | | _ (| | | | |
| | | | | | | |
| | | | | | |) |
| end | | | | | | |
| | | | | | | |
| To make san | nple instar | ices that re | present m | y sketches | from the pre | evious page, I |
| would write. | •• | | | | | |
| | A = _ | | | | | |
| | в = | | | | | |
| | | | | | | |
| | c = | | | | | |
| | | | | | | |
| Write an exar | mple for on | e of the fun | nctions on t | he previous | page: | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Animation Design Worksheet

| Pι | ırı | oc | se | ٠ |
|----|-----|---------------|--------|---|
| | 41 | \mathcal{I} | \sim | |

| Draw | a sketch for three distinct mom | onts of the animation | | |
|-------|--|-----------------------|---------------------------------------|-------|
| DIGW | d sketch for three distinct mone | ens of the animation | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | Image A | Image B | Image C | |
| | | | | |
| Thing | things are changing? How does it chan | ge? | Does it change consistently? | |
| | | | | |
| | | | | |
| | fields do you need? |) Datata | (N) walk on China has a see Deals and | |
| rieia | name (dangerX, score, timer | .) Datatype | (Number, String, Image, Boolean) | |
| | | | | |
| • | | | •11 | |
| | | • | will need to write or e | edit. |
| Cn | eck them off wh | ien you iinish | l each. | |
| | Sample instances | | | |
| | draw-state: | -> | mage | |
| | next-state-tick: | | > | |
| | next-state-key: | , S | tring -> | |
| | reactor | , | | |

Data Structures

| # a | Sta | ite is a | |
|---------------|--------------|----------------------------------|-------------------------------|
| data | | | |
| I | | _ (| |
| | | | |
| | | |) |
| end | | | |
| | | | |
| | | ces that represent my sketch | nes from the previous page, I |
| would write | | | |
| | <u> </u> | | |
| | _B = | | |
| | | | |
| | _c = | | |
| | | | |
| Write an exan | nple for one | e of the functions on the previo | ous page: |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Lesson 4

Word Problem: location

Write a function called *location*, which consumes a JumperState, and produces a String representing the jumper's location: either "cliff", "beach", "water", or "air".

| Conf | tract+Purpose State | ement | | | |
|------|---------------------|-------|---|----|----|
| # _ | | : | | | -> |
| # _ | | | | | |
| | Examples mples: | | | | |
| | | (|) | is | |
| | | (|) | is | |
| | | (|) | is | |
| | | (|) | is | |
| end | | | | | |

else: _____

end

end

Piecewise Bug-Hunting

| | Buggy Code | Correct Code / Explaination |
|---------|--|-----------------------------|
| Round 1 | <pre>fun piecewisefun(n): if (n > 0): n else: 0</pre> | |
| Round 2 | <pre>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</pre> | |
| Round 3 | <pre>fun absolute-value(a b): if a > b: a - b b - a end end</pre> | |
| Round 4 | <pre>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</pre> | |
| Round 5 | <pre>fun my-function(x): if (4 < 8): x else: x * 2 end end</pre> | |

Word Problem: sun-color

Write a function called *sun-color*, which consumes a SunsetState, and produces an image of a sun (a solid, 25 pixel circle), whose color is "yellow", when the sun's y-coordinate is greater than 225, "orange", when its y-coordinate is between 150 and 225, and "red" otherwise.

| Cont | ract+Purpose State | ement | | | | |
|------|--------------------|----------|--------|----|---|--|
| # | | : | | | > | |
| # | | | | | | |
| | Examples mples: | | | | | |
| | | (| _) | is | | |
| | | (| _) | is | | |
| | | | | | | |
| | | (| _) | is | | |
| | | (| _) | is | | |
| end | | | | | | |

else if _____:

else: _____

end

end

Lesson 5

Word Problem: red-shape

| | | | ime of a shape (such as "circle", |
|---------------|---|----------|--|
| _ | | | solid, red shape. Use 50 as the etriangle. Make the rectangle 99 |
| pixels long b | | , | |
| # | | • | -> |
| # | | | |
| # | | | |
| Give Examples | | | |
| examples: | | | |
| | (|) is | |
| | 1 | \ | |
| | (|) 1S | |
| | (|) is | |
| | , | . | |
| end | (|) is | |
| | | | |
| Function | | | |
| fun | | _(|): |
| ask: | 1 | | then: |
| | l | | |
| | | | |
| | 1 | | + h o n • |
| | | | then: |
| | | | |
| | | | |
| | | | then: |
| | | | |
| | | | |
| | | | then: |
| | | | |
| end | | | |

end

Word Problem: strong-password

Websites have strict password requirements. Write a function strong-password, which takes in a username and password, and checks to make sure they aren't the same, and then checks the string-length of the password to make sure it is greater than 8 characters. The function should return a message to the user letting them know if their password is strong enough.

| # | | | : -> | |
|--------|------------------|---|------------|-------|
| # | | | | |
| | Example nples | | | |
| Crai | | | () is | 3 |
| | | | | 3 |
| | | | () is | 3 |
| end | | | | |
| Functi | ion | | | |
| fun | | | | |
| | ask: | I | | then: |
| | | I | | then: |
| end | end | I | otherwise: | |

Building Your Helper Functions

| # is-off-right | :> |
|----------------|----------|
| examples: | |
| |) is |
| | |
| |) is |
| o n d | |
| end |): |
| | |
| end | |
| | |
| # is-off-left | _:> |
| examples: | <u> </u> |
| |) is |
| | |
| |) is |
| | |
| end | |
| fun |): |
| | |
| end | |

| # | :> |
|-----------|-------|
| examples: | |
| | () is |
| | |
| | () is |
| and | |
| end | (): |
| | /• |
| end | |
| | |
| # | > |
| examples: | |
| | () is |
| | |
| | () is |
| | |
| end | |
| | |
| fun | (): |

Word Problem: line-length

Write a function called *line-length*, which takes in two numbers and returns the difference between them. It should always subtract the smaller number from the bigger one.

| Contra | ct+Purpose Statemer | nt . | | | |
|----------|---------------------|----------|-------|---|--|
| # | : | | | > | |
| | | | | | |
| | | | | | |
| Give Exc | | | | | |
| exan | mples: | | | | |
| - | (|) | is | | |
| _ | | | | | |
| | (|) | is | | |
| - | | | 10 | | |
| end | | | | | |
| Function | n Header | | | | |
| fun | | (|): | | |
| | function name | variable | names | | |
| - | : | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| • | end | | | | |
| end | | | | | |

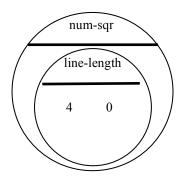
Distance:

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

Use the formula below to fill in the EXAMPLE:

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

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 ch cy: The y-coordinate of another game ch | | |
|----------|--|--------------------------------------|--|
| It shoul | ld return the distance between the two, | using the Distance formula: | |
| | Distance ² = (line-length p | $px cx)^2 + (line-length py cy)^2$) | |
| Contra | act+Purpose Statement | | |
| # | · | > | |
| # | | | |
| Give Exc | | | |
| | examples of your function in action | | |
| exar | mples: () |) is | |
| - | () |) is | |
| end | | | |
| Function | n | | |
| fun | (|): | |
| | | | |
| end | | | |

32

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

| | cy: The y-coordinate of the should return true if the coordinates of the other. | of the player of another game charce of another game charce he coordinates of the her character. Otherw | acter player are within 50 pixe | ls of the |
|--------------------|---|---|---|------------------|
| Contro | ıct+Purpose Statemen | t | | |
| # | · | | -> | |
| | | | | |
| | | | | |
| Give Ex Write e | amples examples of your funct | ion in action | | |
| exar | mples: | (|) | is |
| | | | , | |
| | | | | |
| | | (|) | is |
| | | | | |
| - | | | | |
| end | | | | |
| Functio | n | | | |
| fun | | (|): | |
| | | | | |
| end | | | | |

Using Helpers inside next-world:

How does the World structure change when...?

| TEST | | RESULT | |
|------|---------|--------|---|
| | world(_ | | |
| | | | |
| | | | |
| | | | |
| | | |) |
| | world(_ | | |
| | | | |
| | | | |
| | | | |
| | | |) |
| | world(_ | | |
| | | | |
| | | | |
| | | | |
| | | |) |
| | world(_ | | |
| | | | |
| | | | |
| | | | |
| | | |) |
| | | | , |

Supplemental

DESIGN RECIPE

| Contract+Purpo | | | | | |
|------------------|-------------------------|---------------------|----------|------------|--|
| very contract h | as three parts: | | | | |
| <i>t</i> | • | | | -> | |
| name | · | Dom | nain | / Range | |
| | | | | 3 | |
| ! | | | | | |
| | What | t does the function | on do? | | |
| ive Examples | | | | | |
| Vrite examples o | of your function in ac | :tion | | | |
| examples | • | | | | |
| zzampies | (|) | is | | |
| | the user types | / | 13 | | |
| | | | | | |
| | velstala alsove | | | | |
| | which shou | ld become | | | |
| | (| , | is | | |
| the | e user types | / | 15 | | |
| | | | | | |
| | | | | | |
| end | Whi | ch should becom | e | | |
| erra. | | | | | |
| unction | | | | | |
| ircle the change | es in the examples, and | name the vai | riables. | | |
| fun | (| |): | | |
| | \ | | , | | |
| | | | | | |
| | | | | | |
| end | | | | | |

DESIGN RECIPE

| Contract+Purpos | | | | | |
|------------------|------------------------|-------------------|----------|-------|--|
| ery contract ho | as three parts: | | | | |
| L | • | | | -> | |
| name | · | Don | nain | Range | |
| , | | | | J | |
| | NA/I 4 | | | | |
| | wnat | does the function | on do? | | |
| ive Examples | | 1. | | | |
| rite examples o | f your function in ac | ition | | | |
| examples: | | | | | |
| | (|) | is | | |
| t | the user types | / | | | |
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| | which shou | Id become | | | |
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Contracts

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Contracts

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