Name:



BOOTSTRAP: REACTIVE

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Class:



Workbook v0.9

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	Unit ¹	
	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.

# <u>double</u> :	Number →	Number
double (5	n is 2 * 5 n 2 * 7	1
fun <u>double</u> (_	n):
2 * 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	
examples:				
	() is		
	() is		
end				
fun	():	
end				
#	:	domain	->range	
examples:				
	() is		
end	() is		
end fun	(():	
	((((() is):	

Fast Functions!

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

#	:			
name		domain	ran	ge
examples:				
	() is		
	() is		
end				
fun	():	
end				
#	:	domain	->ran	
examples:				
	() is		
	() is		
end				
fun	():	
end				

Syntax and Style 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

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.

	:		\rightarrow
name		Domain	Range
		does the function do?	
kamples			
xamples of you	r function in ac	tion	
mples:			
	(_)
the us	er types		
	o. c, pos		
is			
	which shou	ld become	
	()
the user			_,
is			
		which should become	
on			
	e examples, and	name the variables.	
		isn't circled, and using names	where you find variables!
		,	\
		() :

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.

	·		
name		Domain	Range
	What do	oes the function do?	
ve Examples			
	of your function in actio	n	
examples	. •		
	()	
	the user types		
is	which should become		
	which should become		
	()	
	the user types	/	
	and abor types		
is			
end		which should become	
ınction			
	es in the examples, and na	ame the variables. It circled, and using names wh	nere you find variable
mo mo oodo, t		_	•
Eun			

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.

the user types is		·		-	
Examples e examples of your function in action amples: (name		Domain	F	Range
the user types is					
the examples of your function in action xamples:			does the function do?		
the user types is	ve Examples	your function in activ	an an		
the user types is		your function in action	JH		
the user types is	examples:	1		,	
is		(,	
the user types is and which should become which should become which should become unction ircle the changes in the examples, and name the variables. rite the code, copying everything that isn't circled, and using names where you find variables	the	e user types			
the user types is and which should become which should become which should become Junction ircle the changes in the examples, and name the variables. In the code, copying everything that isn't circled, and using names where you find variables	ia				
the user types is which should become unction ircle the changes in the examples, and name the variables. rite the code, copying everything that isn't circled, and using names where you find variables	TP				
the user types is		,			
which should become)	
which should become unction rcle the changes in the examples, and name the variables. rite the code, copying everything that isn't circled, and using names where you find variables	t	he user types			
which should become unction ircle the changes in the examples, and name the variables. rite the code, copying everything that isn't circled, and using names where you find variables	is				
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ircle the changes in the examples, and name the variables. Irite the code, copying everything that isn't circled, and using names where you find variables					
rite the code, copying everything that isn't circled, and using names where you find variables		the examples and n	amo the variables		
fun():				es where you find va	riables!
·	un		()	:
				,	

Data Structure

A CakeType is a flavor, layers, & is-iceCream data CakeType: cake(____ end To make instances of this structure, I would write: cake1 = ____ cake2 = _____ To access the fields of cake2, I would write:

Word Problem: taller-than

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

the user types is(
ve Examples rite examples of your function in action examples: the user types is which should become the user types	
the user types is()
the user types is)
the user types is()
the user types is)
is()
which should become ()
which should become ()
the user types)
the user types)
is	
endwhich should become	
onu -	
unction	
ircle the changes in the examples, and name the variables. Irite the code, copying everything that isn't circled, and using nam	mes where you find variables!
fun((
T GII	·

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.

is		act+Purpose statement
is	:	: →
rite examples of your function in action examples:	:	
the user types is		
the user types is		
the user types is	эха	mples:
is	_	()
the user types is		the user types
the user types is		is
the user types is endwhich should become Unction ircle the changes in the examples, and name the variables. Irite the code, copying everything that isn't circled, and using names where you find variables!		
the user types is endwhich should become Unction ircle the changes in the examples, and name the variables. Irite the code, copying everything that isn't circled, and using names where you find variables!		
unction ircle the changes in the examples, and name the variables. irite the code, copying everything that isn't circled, and using names where you find variables!	•	
unction ircle the changes in the examples, and name the variables. In the code, copying everything that isn't circled, and using names where you find variables!		
Unction ircle the changes in the examples, and name the variables. Irite the code, copying everything that isn't circled, and using names where you find variables!		is
ircle the changes in the examples, and name the variables. (rite the code, copying everything that isn't circled, and using names where you find variables!	end	which should become
ircle the changes in the examples, and name the variables. rite the code, copying everything that isn't circled, and using names where you find variables!	ınctio	on l
	ircle t	he changes in the examples, and name the variables.
run():		
	run	(
	end	

Vocabulary Practice

Below is a new structure definition:

```
data MediaType:
   book (
      title :: String,
      author :: String,
      pubyear :: Number)
end
# an example book:
book1 = book("1984", "Orwell", 1949)
Fill in the blanks below with the vocabulary term that applies to each
name. Here are the terms to choose from:
          - contract - example
          - header
                   - field
          - datatype - instance
          - constructor - data block
          - name
                    - purpose
  author is a _____
  book is a ____
  MediaType is a _____
  book1 is a _____
  title is a
  data ... end is a
```

Unit 3

Identifying Animation Data Worksheet: Sunset

Draw a sketch for three distinct moments of the animation					
Sketch A	Sketch B	Sketch C			

What things are cha	inging?
Thing	Describe how it changes

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

(worksheet continues on the next page)

Define the Data Structure

# a	State is	_
data	State:	
[(
		_)
end		
Make a sample insta	nce for each sketch from the previous page:	
Make a sample instal	ice for each sketch from the previous page.	
=		
=	:	

Word Problem: draw-state

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

Contract+Purpose Statem		-\ Tmaga
# draw-state :		> Image
Vrite an expression for ea	ch piece of your final image	
SUN =		
GROUND =		
SKY =		
Vrite the draw-state tunct	ion, using put-image to combine your	pieces
C	,	,
fun	() :

Word Problem: next-state-tick

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

Contract+Purp	ose Statement			
<u> </u>	:		→	
: 				
ive Examples				
•	s of your function in action			
examples	3:			
	()	
	the user types			
is				
	which should becon	ne		
	()	
	the user types			
is				
end	٧	hich should become		
unction				
ircle the chang	ges in the examples, and name			
	copying everything that isn't cir	_	•	riables!
fun		_()	:
end				

Identifying Animation Data Worksheet

Sketch A	Sketch B	Sketch C
t things are changing? Thing		ow it changes
A Sintale along the same and ha		2
eld name (dangerX, score	represent the things that choese, playerIMG) Datatype	e (Number, String, Image, Boolean
	1	

(worksheet continues on the next page)

Define the Data Structure

# a	State is	
data	State:	
l	(
)
end		,

Make a sample instance for each sketch from the previous page					
	Make a cample	inctance	tor aach skats	h trom the	pravious page.
	Make a sallible		IOI CACII INCIC		DIEVIOUS DAGE.

= _		
=		
_		
_		

Identifying Animation Data Worksheet

w a sketch for three	distinct moments of	the animation	
Cl l . l . A	CI	- I - I- D	CL - L-L- C
Sketch A	2K6	etch B	Sketch C
ıt things are chang	ing?		
Thing		Describe how it ch	nanges
at fields de vou	ol to represent the date:	n an the art also are a 2	
at tielas do you nee leld name (dangerX,	d to represent the thi		nber, String, Image, Boolean)
(0.0.1.9017)		20.0.760 (1001	

(worksheet continues on the next page)

Define the Data Structure

Identifying Animation Data Worksheet

v a sketch for thre	ee distinct moment	s of the animation	
Sketch A		Sketch B	Sketch C
at things are char	iging?	Describe how it c	hanges
at fields de vou se	and to represent th	o things that obango	
	x, score, playerIMG	e things that change? .) Datatype (Nur	mber, String, Image, Boolean)

(worksheet continues on the next page)

Define the Data Structure

# a	State is	_
data	State:	
	(_
		_)
end		
Make a sample ins	stance for each sketch from the previous page:	
	=	
	=	

Identifying Animation Data Worksheet

w a sketch for three	e distinct moments of	the animation	
-			
Sketch A	 Sk	etch B	Sketch C
		CICIID	3KGTCTT C
at things are chang	ging?	Danasila a la consila al	
Thing		Describe how it ch	anges
at fields do you <u>ne</u> c	ed to represent the th	ings that change?	
	score, playerIMG)		nber, String, Image, Boolean)

(worksheet continues on the next page)

Define the Data Structure

# a	State is	
data	State:	
l	(
)	
end	·	
Make a sample ins	ance for each sketch from the previous page:	
:	=	
	=	

Unit 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".

Contract+Purpose St	atement		
#	:	 	-
#		 	
Give Examples			
examples:			
	() is	
	() is	
	_() is	_
	() is	
	. `	<u> </u>	
•			

end

(worksheet continues next page)

Functi	on				
fun		(_) :	;
	if				:
	else if				_
	else if				:
	else: _				_
end	end				

Syntax and Style Bug Hunting: Piecewise Edition 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		
Draw a skeren	for infee distinc	r moments of the animation		
Sket	ch A	Sketch B Sketch	С	
What things are	o ob an ain a?			
What things are Thing	e changing e	Describe how it changes		
What fields do	you need to re	present the things that change?		
	dangerX, score, p		olean.)
Mako a Io Do	list and shock	off each as "Done" when you finish each one.		
Component		·	To-Do	Done
Data Structure	If any 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	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-stc	ate function is new		

Make a sample ins	stance for each sk	etch from the p	evious page:		
		·			
=	=				
:	=				
:	=				
Write at least one I	NEW example for	one of the funct	ions on your To-D	o list	
			,		
		· · ·			
If you have anothe	er function on you	ir Io-Do list , write	at least one NEV	W example	

Word Problem: draw-sun

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

Contract+Purpos	e Statement		
#	:	 	
#			
Give Examples			
examples:			
	() is	
	() is	
	() is	
end			

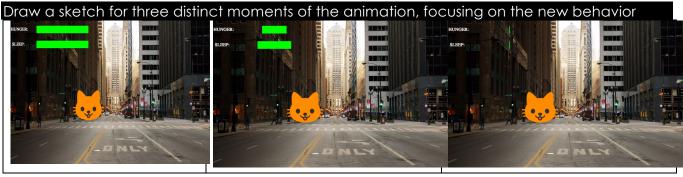
(worksheet continues next page)

Funct	tion		
fui	n	() :
	if		:
	else if		_:
	else:		
	end		
end]		

Unit 5

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.



Sketch A Sketch B Sketch C

What things are changing?						
Thing	Describe how it changes					

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

Make a To-Do List, and check off each as "Done" when you finish each one.							
Component	When is there work to be done?	To-Do	Done				
Data Structure	If any new field(s) were added, changed or removed						
draw-state	If something is displayed in a new way or position	V					
next-state-tick	If the Data Structure changed, or the animation happens automatically						
next-state-key	If the Data Structure changed, or a keypress triggers the animation						
reactor	If either next-state function is new						

Make a samp	ole instance for each sketch from the previous page:
FULLPET =	pet(100, 100)
MIDPET =	pet(50, 75)
LOSEPET =	=pet(0, 0)
Write at least	one NEW example for one of the functions on your To-Do list
n <u>ext-state-</u>	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 a	nother function on your To-Do list , write at least one NEW example

Draw a sketch	for three distinc	ct moments of the animation		
Sket	ch A	Sketch B Sketch	C.	
		OKOTOTI DI OKOTOTI		
What things are Thing	e changing ?	Describe how it changes		
		present the things that change?		
rieia name (C	langerX, score, p	Datatype (Number, String, Image, Bo	oolean.	••)
Make a To-Do Component		off each as "Done" when you finish each one. work to be done?	To-Do	Done
Data Structure		(s) were added, changed or removed		
		<u> </u>		
draw-state	ii someining is c	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 previo	us page:	
•		•	, 0	
= _				
=				
=				
Write at least one NE	-W example for one	of the functions	on vour Io-Do list	
Wille at least offe NL	.w example for one	Of the folichors		
If you have another t	tunction on your to-	-Do list , write at le	east one NEW exa	mple

Draw a sketch	for three distinc	t moments of the	e animation			
Clast	- I- A	Cl - I	- I- D	Cl - l - l		
Sket		Sket	CU R	Sketch	C	
What things are	e changing?					
Thing			Describe how it ch	anges		
		oresent the thing				
Field name (c	langerX, score, p	layerIMG)	Datatype (Num	ber, String, Image, Bo	oolean.)
Make a To-Do I	ist, and check	off each as "Do	ne" when you fin	nish each one.		
Component	When is there	work to be done	?		To-Do	Done
Data Structure	If any new field	(s) were added, c	hanged or remove	ed		
draw-state	If something is a	lisplayed in a new	way or position			
next-state-tick	If the Data Struc	cture changed, or	the animation ha	ppens automatically		
next-state-key	If the Data Struc	cture changed, or	a keypress trigger	s the animation		
reactor	If either next-sto	ite function is new	,			

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

Build Your Own Animation

Draw a sketch	for three distinc	t moments of the animation		
Sket	ch A	Sketch B Ske	tch C	
What things are	e changing?			
Thing		Describe how it changes		
What fields do	vou need to re	oresent the things that change?		
	dangerX, score, p		ge, Boolear)
		off each as "Done" when you finish each one. work to be done?		Done
Component			10-00	Done
Data Structure	ii any new neid	(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 automat	ically \Box	
next-state-key	If the Data Stru	cture changed, or a keypress triggers the animation		
reactor	If either next-sto	ite function is new		

a	State is	
ata	State:	
	(
_)
ıd		
	e instance for each sketch from the previous pag	
	_ =	
	_ =	
	_ =	
	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

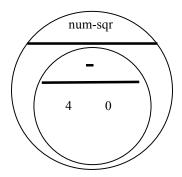
Distance:

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

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

 px: The x-coordinate of the player py: The y-coordinate of the player cx: The x-coordinate of another game character cy: The y-coordinate of another game character It should return true if the coordinates of the player are within 50 pixels of the coordinates of the other character. Otherwise, false. Contract+Purpose Statement	
<u></u> :>	
<i>‡</i>	
Give Examples Vrite examples of your function in action	
examples:()	
is	
()	
is	
end	
unction Eun():	
end	

DESIGN RECIPE

	ract+Purpose Statem				
Every	contract has three	oarts:			
#	:			->	
	name	Domai	n	Range	
#					
		What does the function	do?		
	Examples examples of your fu	nction in action			
exa	amples:				
	()			
	the user typ	oes			
	is				
		which should become			
	()			
	the user types.	/			
	is				
		which should become			
end	d				
Funct		amples, and name the varia	hles		
	-	·			
fur	1	():		
end	 d				

DESIGN RECIPE

Contract+Purpose Statemer	nt	
Every contract has three par	rts:	
# :		->
name •	Domain	Range
#		
#	What does the function do?	
Give Examples		
Write examples of your func	tion in action	
examples:		
-)	
the user types	<i>)</i>	
is		
	and the late and discourse	
•••	which should become.	
1	,	
(the user types)	
the aser types		
is		
	which should become	
end	willen silvata become	
Function		
Circle the changes in the exam	pples, and name the variables.	
£		.
fun	(_):
end		

Draw a sketch	for three distinc	t moments of the animation			
Sket	ch A	Sketch B Sk	cetch (С	
What things are	e changing?				
Thing		Describe how it changes			
What fields do	vou pood to ro	oresent the things that change?			
	dangerX, score, p		age, Bo	olean.)
		off each as "Done" when you finish each on			
Component	When is there	work to be done?	1	To-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 autom	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			

a	State is	
ata	State:	
	(
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Make a To-Do	List, and check	off each as "Done" when you finish each one.		
Component		work to be done?	To-Do	Done
Data Structure	If any new field	(s) were added, changed or removed		
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next-state-tick	If the Data Stru	cture changed, or the animation happens automaticall	У	
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Contracts

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Contracts

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