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.

# double :	Number → _	Number
examples: double (5) double (7) end) is 2 * 5 n) 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					
£	,		\		
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) is		range	
examples:) is) is		range	
examples: end) is) is		range	
examples: end) is) 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					
#		· -•		->	
	name	do	omain		range
example	es:				
	()	is		
end	()	is		
CIIG					
fun		_():	

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				
examples of your	function in action	on		
mples:				
	()	
the user	types			
the user	cypes			
is				
	which should	become		
	()	
the user t			/	
	, p			
is				
		which should become		
on he changes in the	examples and n	ame the variables.		
		n't circled, and using name:	s where you fir	nd 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.

	·	D		
name		Domain		Range
	What do	pes the function do?		
Examples				
	of your function in actior	1		
amples	•			
	()	
	the user types			
	,			
is				
	which should become			
	()	
1	:he user types			
is				
nd		which should become		
ction	es in the examples, and nai	me the variables		
·le the change	, and the examples, and ha		mos whore you	, find variabl
	opying everything that isn't	i circiea, ana using na	illes wilele you	ilila vallabi

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.

What does the function do? Examples e examples of your function in action camples:		·		
what does the function do? Examples e examples of your function in action tamples: (name		Domain	Range
what does the function do? Examples The examples of your function in action Examples: (
ite examples of your function in action xamples:			does the function do?	
the user types is	ve Examples	f vour function in soti	0.0	
the user types is		I your function in action	on	
the user types which should become	examples:	1		\
is		(_,
the user types is	t	the user types		
the user types is	: ~			
the user types is	18			
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.		the 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 variable.	is			
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 variable.				
ircle the changes in the examples, and name the variables. Tite the code, copying everything that isn't circled, and using names where you find variable.				
rite the code, copying everything that isn't circled, and using names where you find variable				
fun():				s where you find variable
	fun		() :
				,

Data Structure

# A CakeType is a flavor, layers, & is-iceCrea	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.

ontract+Purp	pose Statement	
<u> </u>	:	→
:		
ive Example:		
	es of your function in action	
example		
	()
	the user types	
is	which should become	
	which should become	
	()
	the user types	
is		
end —	which should be	come
unction		
	ges in the examples, and name the v copying everything that isn't circled,	and using names where you find variables!
fun	() :
	· · ·	
end		

Word Problem: will-melt

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

	ose Statement	
	:	
e Examples		
	of your function in action	
xamples	:	
	()
	the user types	
is	which should become	
	which should become	
	()
	the user types	
is		
nd	which s	should become
IIU		
nction		
	es in the examples, and name the v copying everything that isn't circled,	variables. . and using names where you find variables!
Eun		

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 changi	ng?
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 in:	stance 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	5111	-\ Tmaga
# draw-state :		→ Image
Vrite an expression for each	ch piece of your final image	
SUN =		
GROUND =		
SKY =		
Vrite the draw-state tunct	on, using put-image to combine y	our 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.

ive Examples	·		
Give Examples			
Five Examples Vrite examples of			
rite examples of			
	your function in action		
examples:			
	()	
the	e user types		
is			
	which should become		
	()	
t	he user types		
is			
end	which	should become	
Cira			
unction			
	n the examples, and name the viring everything that isn't circled,		find variables!
		•	
fun	(

Identifying Animation Data Worksheet

Sketch A	Sketch B	Sketch C
t things are changing? Thing		ow it changes
A Sintale along the second and the		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:	
I	(
)
end	-	·

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

 = _			
=			
=			

Identifying Animation Data Worksheet

w a sketch for three o	distinct moments of the anim	mation
Sketch A	Sketch B	Sketch C
at things are changin Thing		ibe how it changes
	to represent the things tha	
ield name (dangerX, sc	ore, playerIMG) Dat	tatype (Number, String, Image, Boolean)

(worksheet continues on the next page)

Define the Data Structure

Identifying Animation Data Worksheet

Draw a sketch for th	nree distinc	t moments of t	the animation		
Cleadala	A	Class	- Lala D	Clas	1 - la C
Sketch .	A	2K6	etch B	2K6	tch C
What things are ch	anaina?				
Thing	arigirig:		Describe how it	changes	
9			2000112011011111		
\\/\langle				- 0	
What fields do you					ara Daniana N
Field name (dang	erx, score, p	ayenMG)	Datatype (INI	umber, String, Ima	ge, Boolean)

(worksheet continues on the next page)

Define the Data Structure

# a	State is	
data	_State:	
(
)	
end	,	
Make a sample instance	e for each sketch from the previous page:	
=		
=		

Identifying Animation Data Worksheet

w a sketch for three	distinct moments of	the animation	
Sketch A	Slee	etch B	Sketch C
SKEICH A	SK	FICH D	SKEICHC
ıt things are changi	ng 		
Thing		Describe how it ch	nanges
at fields do vou need	d to represent the thi	nas that change?	
eld name (dangerX, s			nber, String, Image, Boolean)

(worksheet continues on the next page)

Define the Data Structure

# a	_ State is	
data	State:	
	(
_))
end		
Make a sample instanc	e for each sketch from the previous page:	
	p. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.	
=_		
= _		

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	

end

(worksheet continues next page)

Function function		(\ .
Lun			
	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		
Sket	∽h A	Sketch B Sketch	\overline{C}	
		SKCICIT D SKCICIT	<u> </u>	
What things are Thing	e changing e	Describe how it changes		
What fields do	vou need to re	present the things that change?		
	langerX, score, p		oolean.)
		off each as "Done" when you finish each one.	T. D.	D
Component			To-Do	Done
Data Structure	it any new tiela	(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-sto	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			

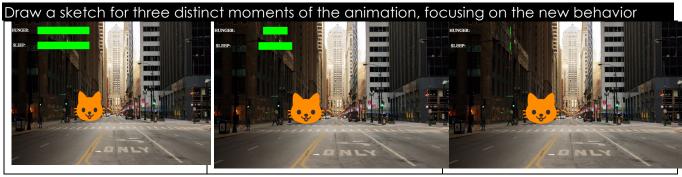
(worksheet continues next page)

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 sample instance for each sketch from the previous page:
FULLPET = $pet(100, 100)$
$MIDPET = \underline{pet(50, 75)}$
LOSEPET = pet(0, 0)
Write at least one NEW example for one of the functions on your To-Do list
next-state-tick(FULLPET) is pet(FULLPET.hunger - 2, FULLPET.sleep -
next-state-tick(MIDPET) is pet(MIDPET.hunger - 2, MIDPET.sleep - 1)
next-state-tick(LOSEPET) is LOSEPET
If you have another function on your To-Do list , write at least one NEW example
If you have another fortelion of your 10-boilst, write at least one NEW example

Draw a sketch	for three distinc	ct moments of the animation		
Cleat	ob A	Skatab D Skatab	<u> </u>	
Sket		Sketch B Sketch	C	
What things are Thing	e changing?	Describe how it changes		
What fields do	you need to re	present the things that change?		
	yoo need to te langerX, score, p		oolean.)
		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	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 offer NE	.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 animation			
Sketo	ch A	Ske	etch B	Sketch	С	
What things are	obanaina?					
What things are Thing	e changing ?		Describe how it ch	anges		
				`		
	you need to replangerX, score, p		ngs that change?	ber, String, Image, Bo	nolean	1
Tield fidine (e	idi 19017, 30010, p	nayonivio,	Daidiype (Nom	, boi, siiiig, iiiidgo, be	ologii.	•••
Make a To-Do I	List, and check	off each as "D	one" when you fir	nish each one.		
Component	When is there	work to be do	ne?		To-Do	Done
Data Structure	If any new field	(s) were added	, changed or remov	ed		
draw-state	If something is c	displayed in a ne	ew 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	rs the animation		
reactor	If either next-stc	ate function is ne	ew			

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 Sket	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	-	e, Boolean.)
		off each as "Done" when you finish each one. work to be done?	To-Do	Dono
Component			10-00	Done
Data Structure	ii any new iieia	(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 automati	cally \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

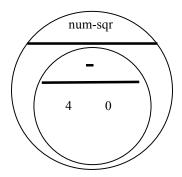
Distance:

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

 □ py: The y-coordinate of the player □ cx: The x-coordinate of another game character □ cy: The y-coordinate of another game character
It should return the distance between the two, using the Distance formula:
Distance ² = $(px - cx)^2 + (py - cy)^2$
Contract+Purpose Statement
#>
#
Give Examples
Write examples of your function in action
examples:
()
is
)
is
end
Function
fun):
end

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

□ p □ c □ t	ox: The x-coordinate of the player by: The y-coordinate of the player by: The x-coordinate of another game character by: The y-coordinate of another game character by: The y-coordinate of another game character by: Should return true if the coordinates of the player are within 50 pixels of the by: Coordinates of the other character. Otherwise, false. by: Coordinates of the other character. Otherwise, false.
	·>
#	
Give Exc	amples amples of your function in action
exam -	ples:
is	
_	
_	()
is	5
_	
end	
Function	
fun	():
_	
end -	

DESIGN RECIPE

	act+Purpose Stateme		
Every	contract has three po	arts:	
#	:		>
	name	Domain	Range
#			
		What does the function do?	
	Examples examples of your fund	ction in action	
exa	imples:		
	-)	
	the user type	S	
	is		
		which should become	
	()	
	the user types	/	
	ia		
	TS		
end	I	which should become	
Funct			
Circle	the changes in the exa	mples, and name the variables.	
fun	l	()	•
end			

DESIGN RECIPE

Contract+Purpose Statem very contract has three p		
very contract has three p	idis.	
t:_		->
name	Domain	Range
<u>. </u>		
	What does the function do?	
ive Examples Trite examples of your fur	action in action	
examples:		
the user type) es	
is		
	which should become	
(_ the user types)	
is		
	which should become	
end		
unction ircle the changes in the exc	amples, and name the variable	PS.
un	():
 nd		

Draw a sketch	for three distinc	t moments of the animation			
Sket	ch A	Sketch B	Sketch	С	
What things are	a chanaina?				
Thing	eriariging ?	Describe how it changes			
		-			
L					
What fields do	you need to re	present the things that change?			
Field name (c	dangerX, score, p	dayerIMG) Datatype (Number, Strin	ıg, Image, Bo	oolean.)
Make a To-Do	List, and check	off each as "Done" when you finish eac	h 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 a	isplayed in a new way or position			
next-state-tick	If the Data Struc	ture changed, or the animation happens a	utomatically		
next-state-key	If the Data Stru	ture changed, or a keypress triggers the ani	imation		
reactor	If either next-sto	te function is new			

a	State is	
ata	State:	
	(
)
ıd		
	e instance for each sketch from the previous page:	
	_ =	
	_ =	
	_ =	
e an exam	ole for one of the functions on the previous page:	
e an exam	ple for one of the functions on the previous page:	
e an exam	ple for one of the functions on the previous page:	

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, Boolean	1)
		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		
draw-state	If something is a	displayed 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		

	Structure	
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ke a sample i	nstance for each sketch from the previous page	e:
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e an exampl	e for one of the functions on the previous page:	

Draw a sketch	for three distinc	t moments of the animation			
Sket	ch A	Sketch B S	sketch	С	
What things are	e changing?				
Thing		Describe how it changes			
What fields do	vou need to re	present the things that change?			
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Component		work to be done?		To-Do	Done
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Sket	ch A	Sketch B Sketch	С	
What things are Thing	e changing?	Describe how it changes		
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Field name (c	olean.)		
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		
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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	instance for ec	ach sketch fron	n the previous	page:	
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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 lis	t , write at lea	st one NEW exam	ple

Sket	ch A	Sketch B Sketch	С				
What things are Thing	e changing?	Describe how it changes					
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Make a To-Do I	List, and check	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 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 insta	nce for each sketch fro	m the previous pag	e:
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Write at least one NE	EW example for one of the	ne functions on your	r Io-Do list
wille at least offe M	w example for one of the	TE TOTICTIONS OF YOUR	
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Contracts

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Contracts

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