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				

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.

		
name	Domain	Range
	What does the function do?	
kamples examples of your fur		
mples:	ichorri denorr	
mprob.		
	() is
the user ty	nes.	
the user typ	Jes	
	which should become	
	(_) is
the user type	·s	
	which should become	
on ne changes in the exc	amples, and name the variables.	
	rything that isn't circled, and using names w	vhere 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	es the function do	?	
Examples				
	our function in action	1		
amples:				
	() is	
the u	ser types			
tile u	ser types			
	which should be	ecome		
	1) is	
	() IS	
the use	er types			
 il		which should become		
•				
on				
	he examples, and nar			
	ng everything that isn't	_	ames where you fir	nd variabl
				١ .

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.

	•	·····	-
name		Domain	Range
		es the function do?	
ive Examples rite examples of your	function in action		
examples:	Torremon in denon		
examples.	1	1	is
	\)	15
the user	types		
	which should bec		
	() is
the use	er types		
end		which should become	
ena			
unction Circle the changes in the			ore you find variables!
ircle the changes in the		ne the variables. circled, and using names wh (•

Data Structure

A CakeT is a flavor, layers, & is-iceCream
data CakeT:
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 CakeTs, and produces true if the number of layers in the first CakeT is greater than the number of layers in the second.

	se Statement	
‡	:	
‡		
Give Examples		
Vrite examples	of your function in action	
examples	:	
	() is
	the user types	
	which should become	
	() is
	the user types	
end	which sh	nould become
iunction		
Function Direlethechange	es in the examples, and name the vo	ariables.
on cio into citarige	onving everything that isn't circled o	and using names where you find variables!
	opying everyining man biri circlea, c	

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.

Contract+Pu	urpose Statement	
#	:	→
#		
Give Examp		
	oles of your function in action	
exampl	es:	_
	() is
	the user types	
	which should become	
	() is
	the user types	
end	wh	ich should become
Eunation		
	anges in the examples, and name th	
		ed, and using names where you find variables!
fun _		.():
end		

Unit 3

Identifying Animation Data Worksheet: Sunset

Draw a sketch for three distinct moments of the animation					
plaw a sketch for three district morners of the armination					
	T				
Sketch A	Sketch B	Sketch C			

What things are ch	nanging?
Thing	Describe how it changes

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

(worksheet continues on the next page)

Define the Data Structure

a _____**State** is _____

data _____State:

____(_____

_____)

end

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

_____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.

Contract+Purpose Stateme	ent			
draw-state:			<i>></i>	Image
rite an expression for eac	h piece of your fir	nal image		
,	,	C		
Sun				
Ground				
Sky				
КУ				
rite the draw-state functi	on, usina put-imac	ge to combine vour	pieces	
	<u> </u>	, , ,		
fun		() :
				_, •
end				

17

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	oose Statement	
#	:	→
#		
Give Example	S	
	es of your function in action	
example	S:	
	() is
	the user types	
	which should bec	come
	() is
	the user types	
end	•••	which should become
Function		
	iges in the examples, and nam	ne the variables.
	, copying everything that isn't o	circled, and using names where you find variables!
fun		():
-		
end		

Identifying Animation Data Worksheet

Draw a sketch for th	nree distinc	moments of the anim	nation	
Sketch .	A	Sketch B		Sketch C
What things are ch	anging?			
Thing		Describ	e how it ch	nanges
What fields do you	need to rer	present the things that	change?	
Field name (dange				nber, 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

aw a sketch for three c	distinct moments of	the animation	
Sketch A	Sko	etch B	Sketch C
hat things are changin Thing	g\$	Describe how it c	hanges
hat fields do you need Field name (dangerX, so			? mber, String, Image, Boolean)
, ,	, , ,	<i>,</i> , , , , , , , , , , , , , , , , , ,	, ,

(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

aw a sketch for three di	stinct moments of th	e animation	
Sketch A	Sket	ch B	Sketch C
nat things are changing Thing		Describe how it ch	nanges
nat fields do you need t Field name (dangerX, sco			nber, String, Image, Boolean)
· · · · · · · · · · · · · · · · · · ·			<u> </u>

(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

Draw a sketch for th	nree distinc	moments of the anim	nation	
Sketch .	A	Sketch B		Sketch C
What things are ch	anging?			
Thing		Describ	e how it ch	nanges
What fields do you	need to rer	present the things that	change?	
Field name (dange				nber, 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 = ____

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+Purpo	se Statement		
#	·	>	
П			
Give Examples			
examples	•		
	() is	
J			

end

(worksheet continues next page)

Functi	on		
fun		() :
	if	 	 :
	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	t moments of	the animation			
Sketo	ch A	Ske	etch B	Sketch	С	
What things are	chanaina?					
Thing	e changing?		Describe how it ch	anges		
			ngs that change?	her String Image Ro	olean	1
Field name (dangerX, score, playerIMG) Datatype (Number, String, Image, Boolean)				••)		
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 removed					
draw-state	If something is displayed in a new way or position					
next-state-tick	If the Data Structure changed, or the animation happens automatically					
next-state-key	If the Data Structure changed, or a keypress triggers the animation					
reactor	If either next-sto	ate function is ne	5M			

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

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+F	Purpose Statement		
#	:	-	_
#			
Give Exam	ples		
examp]			
	() is	
	() is	
	() is	
	() is	

end

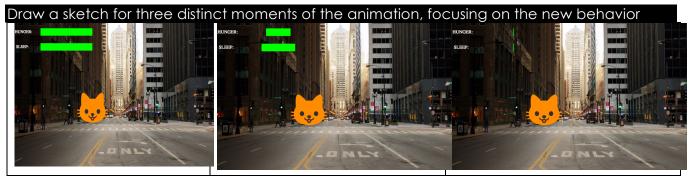
(worksheet continues next page)

Functi	on			
fun			() :
	if			:
	else 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. Make the green bars get smaller based on hunger and sleep levels.



Sketch A Sketch B Sketch C

What NEW things are changing? Are they independent of existing fields?			
Thing	Describe how it changes		
Hunger level	Decreases by 2 each tick		
Sleep level	Decreases by 1 each tick		

What fields do you need to represent the NEW and independent 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	M	
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 sar	mple instance for each sketch from the previous page:
FULLPET	=pet(100, 100)
MIDPET	= <u>pet(50, 75)</u>
LOSEPET	=pet(0, 0)
Write at lec	ast one NEW example for one of the functions on your To-Do list
next-stat	e-tick(FULLPET) is pet(FULLPET.hunger - 2, FULLPET.sleep - 1
next-sta	te-tick(MIDPET) is pet(MIDPET.hunger - 2, MIDPET.sleep - 1)
next-sta	ite-tick(LOSEPET) is LOSEPET
If you have	another function on your To-Do list , write at least one NEW example

Draw a sketch	for three distinc	t moments of	the animation			
Sketo	ch A	Ske	etch B	Sketch	С	
What things are	e changing?					
Thing	e changing?		Describe how it ch	anges		
	you need to re langerX, score, p		ngs that change?	ber, String, Image, Bc	oolean	1
rieid fiditie (C	idilgeix, scole, p	idyenivio)	Dalatype (140111	ber, siling, image, bo	olean.	••)
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 remove	ed		
draw-state	If something is a	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-sto	ate function is ne	ew			

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

Draw a sketch	for three distinc	t moments of	the animation			
Sketo	ch A	Ske	etch B	Sketch	С	
What things are	e changing?					
Thing			Describe how it che	anges		
What fields do	you need to rep	oresent the thi	ngs that change?			
Field name (c	langerX, score, p	layerIMG)	Datatype (Num	ber, String, Image, Bo	olean.)
Make a To-Do I	ist, and check	off each as "C	Done" when you fir	nish each one.		
Component	When is there				To-Do	Done
Data Structure	If any new field	(s) were added,	, changed or remove	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-sto	ate function is ne	ew			

Make a sample insta	ance for each sketch fro	om the previous pa	ige:	
=				
=	:			
=	:			
Write at least one NI	EW example for one of t	the functions on vo	ur To-Do list	
wille at least offer in	LW example for one or i	THE TOTICTIONS OF YO		
If you have another	function on your To-Do	list write at least o	na NEW avamala	
ii you nave anoinei	TUNCTION ON YOUR TO-DO	iisi, wille al leasi o	пе нем ехатрів	,

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?	Describe how it changes		
9				
What fields do	you need to re	present the things that change?		
Field name (c	dangerX, score, p	olayerIMG) Datatype (Number, String, Imag	ge, Boolean.)
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		
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	ate function is new		

fine the Dato		
a	State is	
ata	State:	
	(
nd)
ke a sample	instance for each sketch from the previous page:	:
	=	
	=	
	=	
e an examp	le for one of the functions on the previous page:	

Collision

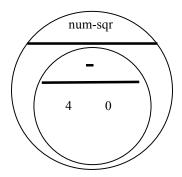
Distance:

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

Use the formula below to fill in the EXAMPLE:

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

Convert it into a Circle of Evaluation. (We've already gotten you started!)



Convert it into Pyret code:

Word Problem: distance Write a function distance, which takes FOUR inputs: px: The x-coordinate of the player py: The y-coordinate of the player cx: The x-coordinate of another game character cy: The y-coordinate of another game character

It should return the distance between the two, using the Distance formula:

Distance² = $(px - cx)^2 + (py - cy)^2$ 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:

0	px: The x-coordinate of the place py: The y-coordinate of the place cx: The x-coordinate of another cy: The y-coordinate of another the should return true if the coordinates of the other characteristics.	ayer er game charact er game charact dinates of the pla acter. Otherwise	ter ayer are within 50 pi x e, false.	cels of the	
Contr	act+Purpose Statement				
#	:		->_		
#					
Civo	- Examples				
	examples of your function in ac				
	7 .				
exa	mples:	,	,	,	
		()	is	
		,			
		()	is	
end					
Funct	ion				
fun	():		
end					

DESIGN RECIPE

Domain
name Domain Range
name Domain Range
#
What does the function do?
Give Examples
Write examples of your function in action
examples:
() is
the user types
which should become
() is
the user types
which should become
end
Function
Circle the changes in the examples, and name the variables.
fun ():
end

DESIGN RECIPE

Cont	ract+Purpose Statemen	it				
Every	contract has three par	ts:				
,,						
#	·			>		
	name		Domain		Range	
#						
<i>''</i>		What does the fu	nction do?			
	Examples					
Write	examples of your funct	ion in action				
037	mmlog•					
exc	amples:	,				
	()	is			
	the user types	•				
	•••	which should become				
	()	is			
	the user types	,				
		which should be				
enc	1	wnich should be	come			
Funct						
	the changes in the exam	ples, and name the	variables.			
fur	າ	()	:		
enc	d					

Draw a sketch	for three distinc	t moments of the animation			
Sket	ch A	Sketch B S	ketch	С	
What things are	e changing?				
Thing		Describe how it changes			
	I				
	you need to re dangerX, score, p	present the things that change? Datatype (Number, String, Ir	mage Bo	olean)
Tield fidille (c	adilgerx, score, p	Daidy pe (Normoci, shiring, ii	nage, be	oledii.	•••)
Make a To-Do	List, and check	off each as "Done" when you finish each o	ne.		
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	lisplayed in a new way or position			
next-state-tick	If the Data Struc	ture changed, or the animation happens autor	natically		
next-state-key	If the Data Stru	ture changed, or a keypress triggers the anima	tion		
reactor	If either next-sto	te function is new			

	Structure	
a	State is	
ata	State:	
	(
nd)
ce a sample	instance for each sketch from the previous page	a·
	=	
	=	
	=	
e an evamn	le for one of the functions on the previous page:	
	e for one of the folicitors of the previous page.	

Draw a sketch	for three distinc	t moments of the animation			
Sket	ch A	Sketch B S	ketch	С	
What things are	e changing?				
Thing		Describe how it changes			
	I				
	you need to re dangerX, score, p	present the things that change? Datatype (Number, String, Ir	mage Bo	olean)
Tield fidille (c	adilgerx, score, p	Daidy pe (Normoci, shiring, ii	nage, be	oledii.	•••)
Make a To-Do	List, and check	off each as "Done" when you finish each o	ne.		
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	lisplayed in a new way or position			
next-state-tick	If the Data Struc	ture changed, or the animation happens autor	natically		
next-state-key	If the Data Stru	ture changed, or a keypress triggers the anima	tion		
reactor	If either next-sto	te 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:

Draw a sketch	for three distinc	t moments of the animation		
Sket	ch A	Sketch B Ske	tch C	
What things are	e changing?	Describe how it changes		
9				
What fields do	you need to re	present the things that change?		
Field name (c	dangerX, score, p	olayerIMG) Datatype (Number, String, Imag	ge, Boolean.)
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		
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	ate function is new		

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Sket	ch A	Sketch B Sketch	C	
What things are	e changing?			
Thing	y changing y	Describe how it changes		
What fields do	vou need to re	oresent the things that change?		
	langerX, score, p		olean.)
Make a To-Do	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		

Make a sample insta	ance for each sketcl	n from the previou	ıs page:	
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Write at least one NE	EW example for one	of the functions o	n your To-Do list	
If you have another	function on your To-	Do list , write at le	ast one NEW examp	le

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 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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Contracts

Name	Domain	Range	example
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Contracts