Name: _____



Class:			
(1000			
1 1/1/			





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
Ş	(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"
sgı		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>do</u>	name	::::	Numb	er ,	·	Number	
	les: double (double (5 n 7 n	is	2 * (5	n		
fun _	double	(<u> </u>			_):		
	2 * n					·	
end							
#	name	::	domain		>	range	
examp	les:						
		(_) is				-
en d		(_) 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			
end					
fun	():		
					_
end					
end					
#	:	domain	->	range	
#	::::	domain	>	range	
#	:	domain		range	
#				range	
#examples:	() is		range	

Fast Functions!

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

#		••		. →	
	name		domain		range
examp]	les:				
		_(_) is		
		(_) is		
end					
fun		():	
end					
#	name	::	domain	->	range
examp]	les:				
		(_) is		
end		.(_) is		
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 * 5
         triple(7) = 3 * 7
     end
     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.

ntract+Purpose Stater ery contract has three			
	•		
name	Domain		_ → Range
ve Examples	What does the function	do?	
rite examples of your fu	nction in action		
examples:			
	()	
the user t	/pes		
is			
	which should become		
	()	
the user typ	es		
ic			
	which should beco	me	
end			
unction			
	camples, and name the variables. erything that isn't circled, and using	a names where vo	ou find variables!
2 2 2 2 2 2 7 2 2 7 1 1 9 0 1	- , - O	<i>y</i>	
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.

name	:	Domain		→
		Domain		D
				Range
e Examples		t does the function do?		
	s of your function in ac	ction		
xamples	3:			
_	()	
	the user types			
	the user types			
is				
	which should becom	ne		
	1		1	
	the user types			
	and user typesin			
is				
nd		which should become		
nction	ges in the examples, and	I name the variables		
		isn't circled, and using no	ames where you	find variable:
ite the code,	copying everynning man			

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

ntract+Purpos				
ery contract h	as three parts:			
‡	• •			→
name		Domain		Range
_				
		does the function do		
ive Examples	Wilde	does the function do	•	
/rite examples c	of your function in acti	on		
examples:	}			
	()	
	the user types			
	the user types			
is				
	which should	become		
	1		1	
	the user types		/	
	the user types			
is				
end		which should become		
unction				
	s in the examples, and ropying everything that is		ames where v	ou find variables!
_	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		,	
		\		
end				

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.

ive Examples rite examples of your function in ace examples:(
ive Examples /rite examples of your function in ace examples:(tion
ive Examples rite examples of your function in ace examples:(tion
Sive Examples Vrite examples of your function in actes and the user types	tion
Vrite examples of your function in ace examples:(
examples:((
the user types)
the user types	/
ic	
is which should becom	ne
,	
)
the user types	
is	
endw	hich should become
Cild	
unction	
Circle the changes in the examples, and	name the variables. isn't circled, and using names where you find variables!
	() :
1 1171	7

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.

Contr	act+Purpose Statement		
#	::		→
#			
Give I	Examples		
	examples of your function	in action	
exa	amples:		
_	(_)
	the user types		
	is		
		ch should become	
	()
	the user types		
	is		
end		which should become	9
	the changes in the example:		names where you find variables!
fur		((·
		\	,
			

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 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)				

(worksheet continues on the next page)

# a	State is	
data	State:	
	(
,)
end		
Make a sample in	nstance for each sketch from the previous page:	
	. =	
	_	
	_ =	

Define the Data Structure

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 Staten	nent			
# draw-state	• •			→ Image
#				
Write an expression for ec				
THE GIT EXPLOSION TO THE	son place of year			
SUN =				
GROUND =				
SKY =				
Write the draw-state func	tion, usina put-i	maae to combi	ne vour pieces	
			, сс. р.с.с.	
fun		() :

end

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	
#	÷	
 		
Give Examples		
	s of your function in action	
example	· 5:	
_	()	
	the user types	
is		
	which should become	
	()	
	the user types	
is		
end	which should become	
unction		
Circle the chan	ges in the examples, and name the variables.	
	copying everything that isn't circled, and using names where you find variable	les!
fun	() :	
-		
end		

Identifying Animation Data Worksheet

Sketch /		Sketch	В	Sketch C
hat things are cho	anging?	Dee	owile a least it als	
Thing		Des	cribe how it ch	langes
nat fields do vou r	need to ren	resent the things th	nat change?	
Field name (dange				nber, String, Image, Boolean)
		1		

(worksheet continues on the next page)

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

Define the Data Structure

Identifying Animation Data Worksheet

Diaw a sketch for it	nree distinc	t moments of the animation	
Sketch /	A	Sketch B	Sketch C
What things are cho	anging?		
Thing		Describe how it	changes
What fields do you	need to rep	present the things that change	ş
What fields do you			? Imber, String, Image, Boolean)

(worksheet continues on the next page)

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

Define the Data Structure

Identifying Animation Data Worksheet

Diaw a sketch for it	nree distinc	t moments of the animation	
Sketch /	A	Sketch B	Sketch C
What things are cho	anging?		
Thing		Describe how it	changes
What fields do you	need to rep	present the things that change	ş
What fields do you			? Imber, String, Image, Boolean)

(worksheet continues on the next page)

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

Define the Data Structure

Identifying Animation Data Worksheet

		t moments of the animation	
Sketch	A	Sketch B	Sketch C
at things are ch	nanging?		
Thing		Describe how i	it changes
	_		
	_1		
	need to ren	present the things that chang	ge\$
at fields do y <u>ou</u>			
at fields do you Field name (dang		ayerIMG) Datatype (1	Number, String, Image, Boolean)
		ayerIMG) Datatype (1	Number, String, Image, Boolean)
		ayerIMG) Datatype (1	Number, String, Image, Boolean)

(worksheet continues on the next page)

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

Define the Data Structure

Unit 4

Word Problem: location

Write a function called *location*, which consumes a DeliveryState, and produces a String representing the location of a box: either "road", "delivery zone", "house", or "air".

Cont	tract+Purpose Statement		
# _	::		_
# _			
Give	Examples		
	amples:		
	() is	

end

(worksheet continues next page)

Function		() :
			 :
	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	t moments of	the animation			
Sket	ch A	Ske	etch B	Sketch	С	
What things are	a chanaina?					
Thing	e changing v		Describe how it ch	anges		
What fields do	vou need to re	nresent the thi	ngs that change?			
	dangerX, score, p			ber, String, Image, Bo	oolean.)
			one'' when you fir			
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 Stru	If the Data Structure changed, or a keypress triggers the animation				
reactor	If either next-sto	ate function is ne				
			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		

Make a sam	ole instance for each sketch from the previous page:	
	=	
	=	
	=	
Write at leas	one NEW example for one of the functions on your To-D	o list
_		
If you have c	nother function on your To-Do list , write at least one NEV	V 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		
fu	n	() :
	if		:
	else if		:
	else:		
	end		
end	l		

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.

Draw a sketch for three distin	ct moments of the animation, fo	cusing on the new behavior
HUNGER:	HUNGER:	HUNGER:
SLEEP:	SLEEP:	SLEEP:
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.hur	nger - 2, FULLPET.sleep - 1)
next-state-tick(MIDPET) is pet(MIDPET.hung	er - 2, MIDPET.sleep - 1)
next-state-tick(LOSEPET) is LOSEPET	
If you have another function on your To-Do list , write at lea	st one NEW example

Draw a sketch	for three distinc	t moments of th	ne animation			
Sket	ch A	Ske	tch B	Sketch	С	
\\/\langle	la					
What things are Thing	e changing ?		Describe how it ch	anges		
M/le and find all and a						
	you need to re dangerX, score, p		gs that change? Datatype (Num	ber, String, Image, Bo	oolean.)
	9 - 7	-,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	3, 3,,,		··• ,
Make a To-Do	List, and check	off each as "Do	one" when you fir	nish each one.		
Component	When is there	work to be don	e?		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 nev	w way or position			
next-state-tick	If the Data Stru	cture changed, c	or the animation ha	ppens automatically		
next-state-key	If the Data Stru	cture changed, c	or a keypress trigger	rs the animation		
reactor	If either next-sto	ate function is nev	W			

Make a sample	e instance for each sketch from the previous page:	
	_ =	
	_ =	
	_ =	
	-	
Write at least on	ne NEW example for one of the functions on your To-Do list	
If you have anot	other function on your To-Do list , write at least one NEW example	

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) Make a To-Do List, and check off each as "Done" when you finish each one. Component When is there work to be done? Data Structure If any new field(s) were added, changed or removed	Draw a sketch	for three distinc	t moments of th	ne animation			
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? 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							
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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? 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							
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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	2Ket	cn A	2Ke	ICU R	Sketch	C	
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? 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	What things are	e changing?					
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	Thing			Describe how it ch	anges		
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							
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							
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							
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Make a To-Do List, and check off each as "Done" when you finish each one. Component When is there work to be done? 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	What fields do	you need to re	oresent the thin	gs that change?			
Component When is there work to be done? To-Do Done Data Structure If any new field(s) were added, changed or removed	Field name (c	langerX, score, p	layerIMG)	Datatype (Num	ber, String, Image, Bo	oolean.)
Component When is there work to be done? To-Do Done Data Structure If any new field(s) were added, changed or removed							
Component When is there work to be done? To-Do Done Data Structure If any new field(s) were added, changed or removed							
Component When is there work to be done? To-Do Done Data Structure If any new field(s) were added, changed or removed							
Component When is there work to be done? To-Do Done Data Structure If any new field(s) were added, changed or removed	Make a Te De l	ist and shook	off acab as "Do	ano" when you fin	sish agah ana		
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Make a sample	e instance for each sketch from the previous page:	
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Write at least on	ne NEW example for one of the functions on your To-Do list	
If you have anot	other function on your To-Do list , write at least one NEW example	

Build Your Own Animation

Draw a sketch	for three distinc	t moments of the animation		
61 1	1 4			
3Ket	ch A	Sketch B Sketch	C	
What things are	e changing?			
Thing		Describe how it changes		
What fields do	you need to re	oresent the things that change?		
Field name (c	dangerX, score, p	Datatype (Number, String, Image, Bo	oolean.)
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 o	displayed in a new way or position		
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example fo	or one of the functions on the previous page	e:

Collision

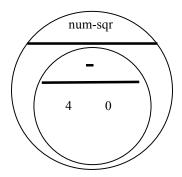
Distance:

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: \Box 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 end Function fun _____(___):

end

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 #_____-->____ Give Examples Write examples of your function in action examples: end Function fun _____(____):

end

DESIGN RECIPE

Contract Every co	t+Purpose Statement ntract has three parts:		
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	me	Domain	Range
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Function Circle the	changes in the examples, and	d name the variables.	
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DESIGN RECIPE

Contract+Purpo	se Statement			
Every contract h	nas three parts:			
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Write at least one NEW example for one of the functions on your To-Do list
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Contracts

Range example	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Domain																		
Name	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	

Contracts

example																		
Range	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
Domain																		
Name	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#