

INFDEV02-2

DEV Team

Abstraction, loop, and data structures.

Lecture Homework 2

Exercise 1 - Player Fill in the missing state values

```
1 class Vector2 :
2 def __init__ (self,x,y):
3 self.X=x
4
5 self.Y=y
6
7
8
9 class Player :
10 def __init__ (self,name,x,y):
11 self.Name=name
12
13 self.Position=Vector2 (x,y)
14
15
16
17
18 p1=Player ("Pippo",0,0)
19
20
21 p2=Player ("Pluto",10,5)
```

globals

stack

heap

definitions

globals

stack

heap

definitions Vector2 __init__ (self,x,y) => ...

globals		self ref(1)	
		x	0
		y	0
		ret	null
stack			self <input type="text"/>
			name "Pippo"
			x <input type="text"/>
			y <input type="text"/>
			ret null
heap			0 class Player
			Name "Pippo"
			1 class Vector2
			X 0
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...
globals		self ref(1)	
		x	0
		y	0
		ret	null
stack			self <input type="text"/>
			name "Pippo"
			x <input type="text"/>
			y <input type="text"/>
			ret null
heap			0 class Player
			Name "Pippo"
			class Vector2
			1 X 0
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...

globals				self	ref(1)
				x	0
				y	0
				ret	ref(1)
stack			self	<input type="text"/>	
			name	"Pippo"	
			x	<input type="text"/>	
			y	<input type="text"/>	
			ret	null	
heap			0	class	Player
				Name	"Pippo"
				class	Vector2
			1	X	0
				Y	0
definitions	Vector2	__init__ (self,x,y) => ...			
	Player	__init__ (self,name,x,y) => ...			
globals					
stack			self	<input type="text"/>	
			name	<input type="text"/>	
			x	<input type="text"/>	
			y	<input type="text"/>	
			ret	null	
heap			0	class	Player
				Name	"Pippo"
				class	Vector2
			1	X	0
				Y	0
definitions	Vector2	__init__ (self,x,y) => ...			
	Player	__init__ (self,name,x,y) => ...			

globals			
stack		self	ref(0)
		name	<input type="text"/>
		x	<input type="text"/>
		y	<input type="text"/>
heap		ret	null
		class	Player
	0	Name	"Pippo"
		Position	ref(1)
definitions		class	Vector2
	1	X	0
		Y	0
	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...
globals			
stack		self	ref(0)
		name	<input type="text"/>
		x	<input type="text"/>
		y	<input type="text"/>
heap		ret	ref(0)
		class	Player
	0	Name	"Pippo"
		Position	ref(1)
definitions		class	Vector2
	1	X	0
		Y	0
	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...
globals			
stack			
heap		class	Player
	0	Name	"Pippo"
		Position	ref(1)
		class	Vector2
definitions	1	X	0
		Y	0
	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...

globals		p1	ref(0)
stack			
		class	Player
	0	Name	"Pippo"
heap		Position	ref(1)
		class	Vector2
	1	X	0
		Y	0
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...
globals		p1	ref(0)
		self	ref(2)
		name	"Pluto"
stack		x	10
		y	5
		ret	null
		class	Player
	0	Name	"Pippo"
heap		Position	ref(1)
		class	Vector2
	1	X	0
		Y	0
	2	class	Player
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...

globals	p1 ref(0)	
	self ref(2)	
	name "Pluto"	
stack	x 10	
	y 5	
	ret null	
heap	class Player	
	0	Name "Pippo"
	Position ref(1)	
	class Vector2	
	1	X 0
	Y 0	
	class Player	
	2	Name <input type="text"/>
	Vector2	__init__ (self,x,y) => ...
	Player	__init__ (self,name,x,y) => ...
globals	p1 ref(0)	
	self ref(3)	
	x 10	
	y 5	
stack	ret null	
	self ref(2)	
	name "Pluto"	
heap	x 10	
	y 5	
	ret null	
	class Player	
	0	Name "Pippo"
	Position ref(1)	
	class Vector2	
	1	X 0
	Y 0	
definitions	class Player	
	2	Name <input type="text"/>
	class Vector2	
	3	
	Vector2	__init__ (self,x,y) => ...
	Player	__init__ (self,name,x,y) => ...

globals		p1	ref(0)	
		self	ref(3)	
		x	10	
		y	5	
		ret	null	
stack		self	ref(2)	
		name	"Pluto"	
		x	10	
		y	5	
		ret	null	
		class	Player	
	0	Name	"Pippo"	
		Position	ref(1)	
		class	Vector2	
heap	1	X	0	
		Y	0	
		class	Player	
	2	Name	<input type="text"/>	
		class	Vector2	
	3	X	<input type="text"/>	
definitions	Vector2	__init__	(self,x,y) => ...	
	Player	__init__	(self,name,x,y) => ...	

globals		p1	ref(0)
		self	ref(3)
		x	10
		y	5
		ret	null
<hr/>			
stack		self	ref(2)
		name	"Pluto"
		x	10
		y	5
		ret	null
<hr/>			
		class	Player
	0	Name	"Pippo"
		Position	ref(1)
		class	Vector2
	1	X	0
heap		Y	0
		class	Player
	2	Name	<input type="text"/>
		class	Vector2
	3	X	<input type="text"/>
		Y	<input type="text"/>
<hr/>			
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...

globals		p1	ref(0)	
		self	ref(3)	
		x	10	
		y	5	
		ret	ref(3)	
stack		self	ref(2)	
		name	"Pluto"	
		x	10	
		y	5	
		ret	null	
		class	Player	
	0	Name	"Pippo"	
		Position	ref(1)	
		class	Vector2	
	1	X	0	
heap		Y	0	
	2	class	Player	
		Name	"Pluto"	
		class	Vector2	
	3	X	10	
		Y	5	
definitions	Vector2	__init__	(self,x,y) => ...	
	Player	__init__	(self,name,x,y) => ...	

globals		p1	ref(0)
		self	ref(2)
		name	"Pluto"
stack		x	10
		y	5
		ret	null
		class	Player
	0	Name	"Pippo"
		Position	ref(1)
		class	Vector2
	1	X	0
heap		Y	0
	2	class	Player
		Name	"Pluto"
		class	Vector2
	3	X	10
		Y	5
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...
globals		p1	ref(0)
		self	ref(2)
		name	"Pluto"
stack		x	10
		y	5
		ret	null
		class	Player
	0	Name	"Pippo"
		Position	ref(1)
		class	Vector2
	1	X	0
		Y	0
heap		class	Player
	2	Name	"Pluto"
		Position	<div style="border: 1px solid black; width: 40px; height: 15px; display: inline-block;"></div>
		class	Vector2
	3	X	10
		Y	5
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...

globals		p1	ref(0)
		self	ref(2)
		name	"Pluto"
stack		x	10
		y	5
		ret	ref(2)
		class	Player
		0	Name "Pippo"
			Position ref(1)
			class Vector2
		1	X 0
			Y 0
heap			class Player
		2	Name "Pluto"
			Position ref(3)
			class Vector2
		3	X 10
			Y 5
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...
globals		p1	ref(0)
stack			
		class	Player
		0	Name "Pippo"
			Position ref(1)
			class Vector2
		1	X 0
			Y 0
heap			class Player
		2	Name "Pluto"
			Position ref(3)
			class Vector2
		3	X 10
			Y 5
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...
p2=ref(2)			

globals		p1	ref(0)
		p2	ref(2)
stack			
		class	Player
	0	Name	"Pippo"
		Position	ref(1)
		class	Vector2
	1	X	0
		Y	0
heap		class	Player
	2	Name	"Pluto"
		Position	ref(3)
		class	Vector2
	3	X	10
		Y	5
definitions	Vector2	__init__	(self,x,y) => ...
	Player	__init__	(self,name,x,y) => ...

Exercise 2 - List Fill in the missing state values

```

1 class Empty :
2 def __init__ (self):
3 self.IsEmpty=True
4
5
6
7 class Node :
8 def __init__ (self,value,tail):
9 self.IsEmpty=False
10
11 self.Value=value
12
13 self.Tail=tail
14
15
16
17 l=Node (1,Node (2,Node (3,Empty ()
18 )
19 )
20 )

```

globals	
stack	
heap	
definitions	
<hr/>	
globals	
stack	
heap	
definitions	Empty __init__ (self) => ...
<hr/>	
globals	
stack	
heap	
definitions	Empty __init__ (self) => ...
	Node __init__ (self,value,tail) => ...
<hr/>	
globals	
	self ref(0)
stack	ret null
	<hr/>
heap	0 class Empty
	Empty __init__ (self) => ...
definitions	Node __init__ (self,value,tail) => ...
<hr/>	

globals			
stack			
self ref(0)			
ret null			
heap			
0 class Empty			
IsEmpty True			
definitions Empty			
__init__ (self) => ...			
Node __init__ (self,value,tail) => ...			
globals			
stack			
self ref(0)			
ret ref(0)			
heap			
0 class Empty			
IsEmpty True			
definitions Empty			
__init__ (self) => ...			
Node __init__ (self,value,tail) => ...			
globals			
stack			
heap			
0 class Empty			
IsEmpty True			
definitions Empty			
__init__ (self) => ...			
Node __init__ (self,value,tail) => ...			
globals			
stack			
self <input type="text"/>			
value <input type="text"/>			
tail <input type="text"/>			
ret null			
heap			
0 class Empty			
IsEmpty True			
1 class Node			
definitions Empty			
__init__ (self) => ...			
Node __init__ (self,value,tail) => ...			

<hr/>				
globals			self	<input type="text"/>
			value	<input type="text"/>
stack			tail	<input type="text"/>
			ret	null
<hr/>				
		0	class	Empty
			IsEmpty	True
heap			class	Node
		1	IsEmpty	False
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...
<hr/>				
globals			self	<input type="text"/>
			value	<input type="text"/>
stack			tail	<input type="text"/>
			ret	null
<hr/>				
		0	class	Empty
			IsEmpty	True
heap			class	Node
		1	IsEmpty	False
			Value	3
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...
<hr/>				
globals			self	<input type="text"/>
			value	<input type="text"/>
stack			tail	<input type="text"/>
			ret	null
<hr/>				
		0	class	Empty
			IsEmpty	True
heap			class	Node
		1	IsEmpty	False
			Value	3
			Tail	ref(0)
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...
<hr/>				

globals					
			self	<input type="text"/>	
			value	<input type="text"/>	
stack			tail	<input type="text"/>	
			<input type="text"/>	ref(1)	
		0	class	Empty	
			IsEmpty	True	
			class	Node	
heap		1	IsEmpty	False	
			Value	3	
			Tail	ref(0)	
definitions	Empty		__init__	(self) => ...	
	Node		__init__	(self,value,tail) => ...	
globals					
stack					
		0	class	Empty	
			IsEmpty	True	
			class	Node	
heap		1	IsEmpty	False	
			Value	3	
			Tail	ref(0)	
definitions	Empty		__init__	(self) => ...	
	Node		__init__	(self,value,tail) => ...	
globals					
			<input type="text"/>	ref(2)	
			<input type="text"/>	2	
stack			<input type="text"/>	ref(1)	
			<input type="text"/>	null	
		0	class	Empty	
			IsEmpty	True	
			class	Node	
heap		1	IsEmpty	False	
			Value	3	
			Tail	ref(0)	
		2	class	Node	
definitions	Empty		__init__	(self) => ...	
	Node		__init__	(self,value,tail) => ...	

<hr/>		
globals		<div></div> ref(2)
		<div></div> 2
stack		<div></div> ref(1)
		<div></div> null
<hr/>		
	0	class Empty
		IsEmpty True
		class Node
		IsEmpty False
heap	1	Value 3
		Tail ref(0)
	2	class Node
		IsEmpty <div></div>
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
<hr/>		
globals		<div></div> ref(2)
		<div></div> 2
stack		<div></div> ref(1)
		<div></div> null
<hr/>		
	0	class Empty
		IsEmpty True
		class Node
		IsEmpty False
heap	1	Value 3
		Tail ref(0)
	2	class Node
		IsEmpty <div></div>
		Value <div></div>
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
<hr/>		

globals		<div></div> ref(2)	
stack		<div></div> 2	
		<div></div> ref(1)	
		<div></div> null	
heap		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
			Value 3
definitions			Tail ref(0)
			class Node
		2	IsEmpty <div></div>
			Value <div></div>
			Tail <div></div>
		Empty	__init__ (self) => ...
		Node	__init__ (self,value,tail) => ...
globals		<div></div> ref(2)	
stack		<div></div> 2	
		<div></div> ref(1)	
		<div></div> ref(2)	
heap		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
			Value 3
definitions			Tail ref(0)
			class <div></div>
		2	IsEmpty <div></div>
			Value <div></div>
			Tail <div></div>
		Empty	__init__ (self) => ...
		Node	__init__ (self,value,tail) => ...

globals			
stack			
heap		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
			Value 3
			Tail ref(0)
			class
		2	 False
			Value
			 ref(1)
definitions	Empty		__init__ (self) => ...
	Node		__init__ (self,value,tail) => ...
globals			
stack			self ref(3)
			value 1
			tail ref(2)
			ret null
heap		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
			Value 3
			Tail ref(0)
			class Node
		2	IsEmpty False
			Value 2
			Tail ref(1)
definitions	Empty	3	class Node
	Node		__init__ (self,value,tail) => ...

globals			self	ref(3)
stack			value	1
			tail	ref(2)
			ret	null
heap		0	class	Empty
			IsEmpty	True
			class	Node
		1	IsEmpty	False
			Value	3
			Tail	ref(0)
			class	Node
		2	IsEmpty	False
			Value	2
			Tail	ref(1)
		3	class	Node
			IsEmpty	<input type="text"/>
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			self	ref(3)
stack			value	1
			tail	ref(2)
			ret	null
heap		0	class	Empty
			IsEmpty	True
			class	Node
		1	IsEmpty	False
			Value	3
			Tail	ref(0)
			class	Node
		2	IsEmpty	False
			Value	2
			Tail	ref(1)
			class	<input type="text"/>
		3	IsEmpty	<input type="text"/>
			Value	<input type="text"/>
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			self	ref(3)
			value	1
stack			tail	ref(2)
			ret	null
			<hr/>	
	0	class	Empty	
		IsEmpty	True	
		class	Node	
	1	IsEmpty	False	
		Value	3	
		Tail	ref(0)	
heap		class	Node	
	2	IsEmpty	False	
		Value	2	
		Tail	ref(1)	
		class	<input type="text"/>	
	3	IsEmpty	<input type="text"/>	
		Value	<input type="text"/>	
		Tail	<input type="text"/>	
definitions	Empty	__init__	(self)	=> ...
	Node	__init__	(self,value,tail)	=> ...

globals					
				self	ref(3)
				value	1
stack				tail	ref(2)
				ret	ref(3)
		<hr/>			
		0	class	Empty	
			IsEmpty	True	
			class	Node	
		1	IsEmpty	False	
			Value	3	
			Tail	ref(0)	
heap			class	Node	
		2	IsEmpty	False	
			Value	2	
			Tail	ref(1)	
			class	<input type="text"/>	
		3	IsEmpty	<input type="text"/>	
			Value	<input type="text"/>	
			Tail	<input type="text"/>	
definitions		Empty	__init__	(self)	=> ...
		Node	__init__	(self,value,tail)	=> ...
globals		<hr/>			
stack					
		0	class	Empty	
			IsEmpty	True	
			class	Node	
		1	IsEmpty	False	
			Value	3	
			Tail	ref(0)	
heap			class	Node	
		2	IsEmpty	False	
			Value	2	
			Tail	ref(1)	
			class	<input type="text"/>	
		3	IsEmpty	<input type="text"/>	
			Value	<input type="text"/>	
			Tail	<input type="text"/>	
definitions		Empty	__init__	(self)	=> ...
		Node	__init__	(self,value,tail)	=> ...

l=ref(3)		
globals	1	<input type="text"/>
stack		
	0	class Empty IsEmpty True
		class Node
	1	IsEmpty False Value 3 Tail ref(0)
heap		class Node
	2	IsEmpty False Value 2 Tail ref(1)
		class <input type="text"/>
	3	IsEmpty <input type="text"/> Value <input type="text"/> Tail <input type="text"/>
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...

Exercise 3 - List print

Fill in the missing code blocks

```
1 class  :
2     def __init__ (self):
3         self.  = 
4
5
6
7     class  :
8         def __init__ (self,value,tail):
9             self.  = 
10
11             self.  = 
12
13             self.  = 
14
15
16
17 l=Node (  ,Node (  ,Empty ()
18 )
19 )
20
21
22 res= 
23
24 while((not l.  )):
25     res=(  +str(  .  ))
26
27 l=l. 
28
29
30 print (  )
```

globals

stack

heap

definitions

globals

stack

heap

definitions Empty __init__ (self) => ...

globals		
stack		
heap		
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
globals		
stack		self ref(0)
		ret null
heap		0 class Empty
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
globals		
stack		self ref(0)
		ret null
heap		0 class Empty
		IsEmpty True
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
globals		
stack		self ref(0)
		ret ref(0)
heap		0 class Empty
		IsEmpty True
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
globals		
stack		
heap		0 class Empty
		IsEmpty True
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...

globals			self	ref(1)
			value	2
stack			tail	ref(0)
			ret	null
		0	class	Empty
heap			IsEmpty	True
		1	class	Node
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			self	ref(1)
			value	2
stack			tail	ref(0)
			ret	null
		0	class	Empty
			IsEmpty	True
heap			class	Node
		1	IsEmpty	False
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			self	ref(1)
			value	2
stack			tail	ref(0)
			ret	null
		0	class	Empty
			IsEmpty	True
heap			class	Node
		1	IsEmpty	False
			Value	2
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			
stack		self	ref(1)
		value	2
		tail	ref(0)
		ret	null
heap			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
		Value	2
definitions		Tail	ref(0)
	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
globals			
stack		self	ref(1)
		value	2
		tail	ref(0)
		ret	ref(1)
heap			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
		Value	2
definitions		Tail	ref(0)
	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
globals			
stack			
heap	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
		Value	2
		Tail	ref(0)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

<hr/>		
globals		self ref(2)
		value 1
stack		tail ref(1)
		ret null
		<hr/>
	0	class Empty
		IsEmpty True
		class Node
heap	1	IsEmpty False
		Value 2
		Tail ref(0)
	2	class Node
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
<hr/>		
globals		self ref(2)
		value 1
stack		tail ref(1)
		ret null
		<hr/>
	0	class Empty
		IsEmpty True
		class Node
heap	1	IsEmpty False
		Value 2
		Tail ref(0)
	2	class Node
		IsEmpty False
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
<hr/>		

globals			self	ref(2)
			value	1
stack			tail	ref(1)
			ret	null
		0	class	Empty
			IsEmpty	True
			class	Node
		1	IsEmpty	False
heap			Value	2
			Tail	ref(0)
			class	Node
		2	IsEmpty	False
			Value	1
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			self	ref(2)
			value	1
stack			tail	ref(1)
			ret	null
		0	class	Empty
			IsEmpty	True
			class	Node
		1	IsEmpty	False
heap			Value	2
			Tail	ref(0)
			class	Node
		2	IsEmpty	False
			Value	1
			Tail	ref(1)
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals					
				self	ref(2)
				value	1
stack				tail	ref(1)
				ret	ref(2)
				<hr/>	
		0		class	Empty
				IsEmpty	True
				class	Node
		1		IsEmpty	False
				Value	2
heap				Tail	ref(0)
				class	Node
		2		IsEmpty	False
				Value	1
				Tail	ref(1)
definitions	Empty			__init__	(self) => ...
	Node			__init__	(self,value,tail) => ...
globals		<hr/>			
stack					
		0		class	Empty
				IsEmpty	True
				class	Node
		1		IsEmpty	False
				Value	2
heap				Tail	ref(0)
				class	Node
		2		IsEmpty	False
				Value	1
				Tail	ref(1)
definitions	Empty			__init__	(self) => ...
	Node			__init__	(self,value,tail) => ...

globals		1	ref(2)
stack			
		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
heap			Value 2
			Tail ref(0)
			class Node
		2	IsEmpty False
			Value 1
			Tail ref(1)
definitions	Empty		__init__ (self) => ...
	Node		__init__ (self,value,tail) => ...
globals		1	ref(2)
stack			res ""
		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
heap			Value 2
			Tail ref(0)
			class Node
		2	IsEmpty False
			Value 1
			Tail ref(1)
definitions	Empty		__init__ (self) => ...
	Node		__init__ (self,value,tail) => ...

globals		1	ref(2)
stack		res	""
heap	0	class	Empty
		IsEmpty	True
	1	class	Node
		IsEmpty	False
	2	Value	2
		Tail	ref(0)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
globals		1	ref(2)
stack		res	"1"
heap	0	class	Empty
		IsEmpty	True
	1	class	Node
		IsEmpty	False
	2	Value	2
		Tail	ref(0)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(1)
		res	"1"
stack			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
heap		Value	2
		Tail	ref(0)
		class	Node
	2	IsEmpty	False
		Value	1
		Tail	ref(1)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(1)
		res	"1"
stack			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
heap		Value	2
		Tail	ref(0)
		class	Node
	2	IsEmpty	False
		Value	1
		Tail	ref(1)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(1)
		res	"12"
stack			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
heap		Value	2
		Tail	ref(0)
		class	Node
	2	IsEmpty	False
		Value	1
		Tail	ref(1)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(0)
		res	"12"
stack			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
heap		Value	2
		Tail	ref(0)
		class	Node
	2	IsEmpty	False
		Value	1
		Tail	ref(1)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

		1	ref(0)
globals		res	"12"
stack			
		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
heap			Value 2
			Tail ref(0)
			class Node
		2	IsEmpty False
			Value 1
			Tail ref(1)
definitions	Empty	__init__ (self) => ...	
	Node	__init__ (self,value,tail) => ...	
		1	ref(0)
globals		res	"12"
stack			
		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
heap			Value 2
			Tail ref(0)
			class Node
		2	IsEmpty False
			Value 1
			Tail ref(1)
definitions	Empty	__init__ (self) => ...	
	Node	__init__ (self,value,tail) => ...	
output		"12"	

Exercise 4 - List transform Fill in the missing code blocks

```

1 class Empty :
2 def __init__ (self):
3      .  = 
4
5
6
7 class Node :
8 def __init__ (self,value,tail):

```

```

9  [ ] .IsEmpty=False
10
11 self. [ ] =value
12
13 self.Tail= [ ]
14
15
16
17 l=Node (1,Node ( [ ] ,Node (3,Empty (
18 )
19 )
20 )
21
22
23 x= [ ]
24
25 while((not [ ] .IsEmpty)):
26 x.Value=(x. [ ] * [ ] )
27
28 [ ] =x. [ ]

```

globals			
stack			
heap			
definitions			
<hr/>			
globals			
stack			
heap			
definitions	Empty	__init__	(self) => ...
<hr/>			
globals			
stack			
heap			
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			
globals			
		self	ref(0)
stack		ret	null
heap		0	class Empty
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			

<hr/>			
globals			
stack		self	ref(0)
		ret	null
<hr/>			
heap		0	class Empty
			IsEmpty True
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			
globals			
stack		self	ref(0)
		ret	ref(0)
<hr/>			
heap		0	class Empty
			IsEmpty True
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			
globals			
stack			
heap		0	class Empty
			IsEmpty True
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			
globals			
		self	ref(1)
		value	3
stack		tail	ref(0)
		ret	null
<hr/>			
heap		0	class Empty
			IsEmpty True
		1	class Node
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			

<hr/>			
globals		self	ref(1)
		value	3
stack		tail	ref(0)
		ret	null
<hr/>			
	0	class	Empty
		IsEmpty	True
heap		class	Node
	1	IsEmpty	False
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			
globals		self	ref(1)
		value	3
stack		tail	ref(0)
		ret	null
<hr/>			
	0	class	Empty
		IsEmpty	True
heap		class	Node
	1	IsEmpty	False
		Value	3
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			
globals		self	ref(1)
		value	3
stack		tail	ref(0)
		ret	null
<hr/>			
	0	class	Empty
		IsEmpty	True
heap		class	Node
	1	IsEmpty	False
		Value	3
		Tail	ref(0)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
<hr/>			

<hr/>				
globals			self	ref(1)
			value	3
stack			tail	ref(0)
			ret	ref(1)
<hr/>				
		0	class	Empty
			IsEmpty	True
			class	Node
heap		1	IsEmpty	False
			Value	3
			Tail	ref(0)
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...
<hr/>				
globals				
stack				
		0	class	Empty
			IsEmpty	True
			class	Node
heap		1	IsEmpty	False
			Value	3
			Tail	ref(0)
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...
<hr/>				
globals				
			self	ref(2)
			value	2
stack			tail	ref(1)
			ret	null
<hr/>				
		0	class	Empty
			IsEmpty	True
			class	Node
heap		1	IsEmpty	False
			Value	3
			Tail	ref(0)
		2	class	Node
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...
<hr/>				

globals			self	ref(2)
stack			value	2
			tail	ref(1)
			ret	null
heap	0		class	Empty
			IsEmpty	True
			class	Node
			IsEmpty	False
	1		Value	3
			Tail	ref(0)
			class	Node
			IsEmpty	False
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			self	ref(2)
stack			value	2
			tail	ref(1)
			ret	null
heap	0		class	Empty
			IsEmpty	True
			class	Node
			IsEmpty	False
	1		Value	3
			Tail	ref(0)
			class	Node
			IsEmpty	False
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

<hr/>		
globals		self ref(2)
		value 2
stack		tail ref(1)
		ret null
		<hr/>
	0	class Empty
		IsEmpty True
		class Node
	1	IsEmpty False
		Value 3
heap		Tail ref(0)
		class Node
	2	IsEmpty False
		Value 2
		Tail ref(1)
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
<hr/>		
globals		self ref(2)
		value 2
stack		tail ref(1)
		ret ref(2)
		<hr/>
	0	class Empty
		IsEmpty True
		class Node
	1	IsEmpty False
		Value 3
heap		Tail ref(0)
		class Node
	2	IsEmpty False
		Value 2
		Tail ref(1)
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
<hr/>		

<hr/>		
globals		
stack		
	0	class Empty
		IsEmpty True
		class Node
	1	IsEmpty False
heap		Value 3
		Tail ref(0)
		class Node
	2	IsEmpty False
		Value 2
		Tail ref(1)
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
<hr/>		
globals		
		self ref(3)
		value 1
stack		tail ref(2)
		ret null
		<hr/>
	0	class Empty
		IsEmpty True
		class Node
	1	IsEmpty False
heap		Value 3
		Tail ref(0)
		class Node
	2	IsEmpty False
		Value 2
		Tail ref(1)
	3	class Node
definitions	Empty	__init__ (self) => ...
	Node	__init__ (self,value,tail) => ...
<hr/>		

globals			self	ref(3)
stack			value	1
			tail	ref(2)
			ret	null
heap		0	class	Empty
			IsEmpty	True
			class	Node
		1	IsEmpty	False
			Value	3
			Tail	ref(0)
			class	Node
		2	IsEmpty	False
			Value	2
			Tail	ref(1)
		3	class	Node
			IsEmpty	False
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			self	ref(3)
stack			value	1
			tail	ref(2)
			ret	null
heap		0	class	Empty
			IsEmpty	True
			class	Node
		1	IsEmpty	False
			Value	3
			Tail	ref(0)
			class	Node
		2	IsEmpty	False
			Value	2
			Tail	ref(1)
			class	Node
		3	IsEmpty	False
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			self	ref(3)
			value	1
stack			tail	ref(2)
			ret	null
			<hr/>	
	0		class	Empty
			IsEmpty	True
			class	Node
	1		IsEmpty	False
			Value	3
			Tail	ref(0)
heap			class	Node
	2		IsEmpty	False
			Value	2
			Tail	ref(1)
			class	Node
	3		IsEmpty	False
			Value	1
			Tail	ref(2)
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</
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globals		1	ref(3)
stack			
heap		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
			Value 3
			Tail ref(0)
			class Node
		2	IsEmpty False
			Value 2
			Tail ref(1)
definitions		3	class Node
			IsEmpty False
			Value 1
			Tail ref(2)
	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
globals		1	ref(3)
stack		x	ref(3)
heap		0	class Empty
			IsEmpty True
			class Node
		1	IsEmpty False
			Value 3
			Tail ref(0)
			class Node
		2	IsEmpty False
			Value 2
			Tail ref(1)
definitions		3	class Node
			IsEmpty False
			Value 1
			Tail ref(2)
	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(3)
		x	ref(3)
stack			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
		Value	3
		Tail	ref(0)
heap		class	Node
	2	IsEmpty	False
		Value	2
		Tail	ref(1)
		class	Node
	3	IsEmpty	False
		Value	1
		Tail	ref(2)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(3)
		x	ref(3)
stack			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
		Value	3
		Tail	ref(0)
heap		class	Node
	2	IsEmpty	False
		Value	2
		Tail	ref(1)
		class	Node
	3	IsEmpty	False
		Value	5
		Tail	ref(2)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals			1	ref(3)
			x	ref(2)
stack				
		0	class	Empty
			IsEmpty	True
			class	Node
		1	IsEmpty	False
			Value	3
			Tail	ref(0)
heap			class	Node
		2	IsEmpty	False
			Value	2
			Tail	ref(1)
			class	Node
		3	IsEmpty	False
			Value	5
			Tail	ref(2)
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals			1	ref(3)
			x	ref(2)
stack				
		0	class	Empty
			IsEmpty	True
			class	Node
		1	IsEmpty	False
			Value	3
			Tail	ref(0)
heap			class	Node
		2	IsEmpty	False
			Value	2
			Tail	ref(1)
			class	Node
		3	IsEmpty	False
			Value	5
			Tail	ref(2)
definitions	Empty		__init__	(self) => ...
	Node		__init__	(self,value,tail) => ...

globals		1	ref(3)
		x	ref(2)
stack			
heap	0	class	Empty
		IsEmpty	True
	1	class	Node
		IsEmpty	False
		Value	3
		Tail	ref(0)
	2	class	Node
		IsEmpty	False
		Value	10
		Tail	ref(1)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(3)
		x	ref(1)
stack			
heap	0	class	Empty
		IsEmpty	True
	1	class	Node
		IsEmpty	False
		Value	3
		Tail	ref(0)
	2	class	Node
		IsEmpty	False
		Value	10
		Tail	ref(1)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(3)
		x	ref(1)
stack			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
		Value	3
		Tail	ref(0)
heap		class	Node
	2	IsEmpty	False
		Value	10
		Tail	ref(1)
		class	Node
	3	IsEmpty	False
		Value	5
		Tail	ref(2)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(3)
		x	ref(1)
stack			
	0	class	Empty
		IsEmpty	True
		class	Node
	1	IsEmpty	False
		Value	15
		Tail	ref(0)
heap		class	Node
	2	IsEmpty	False
		Value	10
		Tail	ref(1)
		class	Node
	3	IsEmpty	False
		Value	5
		Tail	ref(2)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...

globals		1	ref(3)
		x	ref(0)
stack			
heap	0	class	Empty
		IsEmpty	True
	1	class	Node
		IsEmpty	False
	2	Value	15
		Tail	ref(0)
	3	class	Node
		IsEmpty	False
	4	Value	10
		Tail	ref(1)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...
globals		1	ref(3)
		x	ref(0)
stack			
heap	0	class	Empty
		IsEmpty	True
	1	class	Node
		IsEmpty	False
	2	Value	15
		Tail	ref(0)
	3	class	Node
		IsEmpty	False
	4	Value	10
		Tail	ref(1)
definitions	Empty	__init__	(self) => ...
	Node	__init__	(self,value,tail) => ...