Memoria de la Práctica de Procesadores de Lenguajes: Analizador Sintáctico

Diego José Abengózar Vilar, Alejandro García Castellanos,
Ignacio Javier Encinas Ramos

Grupo 82

November 27, 2019

Índice

1 Diseño del Analizador Sintáctico **2**
1.1 Gramática 2
1.2 Autómata Reconocedor de Prefijos Viables 3
1.2.1 Estados del autómata 4
1.3 Conflictos y Tabla de Decisión 6
1.4 Errores 10

2 Anexo de Pruebas **10**

1 Diseño del Analizador Sintáctico

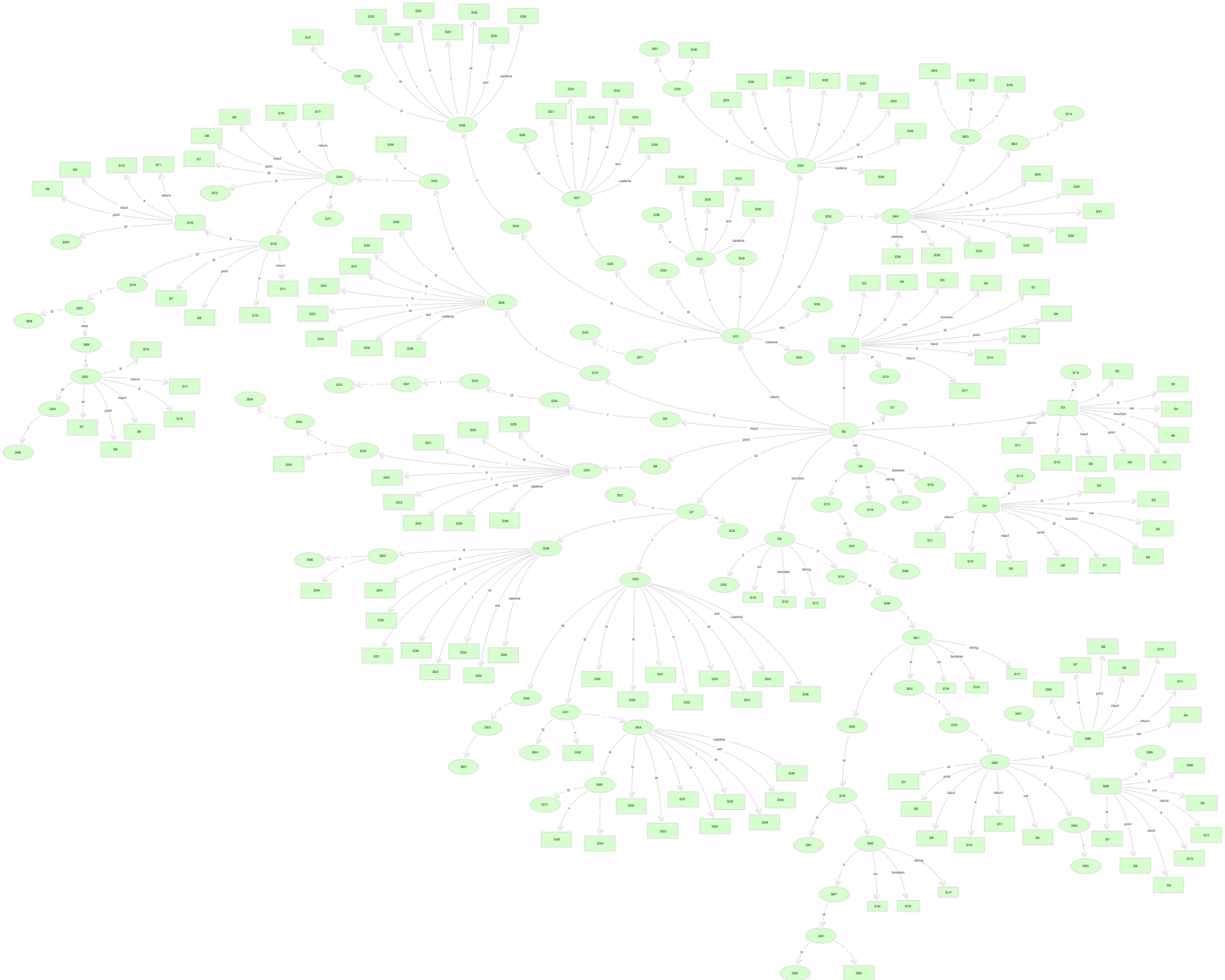
1.1 Gramática

$$
\begin{aligned}
&Terminales = \{\ ;\ \{\ \}\ id\ ent\ cadena\ (\ )\ +\ <\ !\ =\ |=\ var\ int\\
&boolean\ string\ print\ input\ ,\ return\ function\ if\ else\ \}\\
&NoTerminales = \{\ P\ D\ T\ F\ T1\ A\ K\ C\ S\ L\ M\ Q\ S1\ G\ X\ E\ U\ R\ V\ S2\ \}\\
&Axioma = P\\
&Producciones = \{\\
&\quad P \rightarrow D\ P\\
&\quad P \rightarrow F\ P\\
&\quad P \rightarrow S\ P\\
&\quad D \rightarrow var\ T\ id\ ;\\
&\quad T \rightarrow int\\
&\quad T \rightarrow string\\
&\quad T \rightarrow boolean\\
&\quad F \rightarrow function\ T1\ id\ (\ A\ )\ \{\ C\ \}\\
&\quad T1 \rightarrow \lambda\\
&\quad T1 \rightarrow T\\
&\quad A \rightarrow T\ id\ K\\
&\quad A \rightarrow \lambda\\
&\quad K \rightarrow \lambda\\
&\quad K \rightarrow ,\ T\ id\ K\\
&\quad C \rightarrow D\ C\\
&\quad C \rightarrow S\ C\\
&\quad C \rightarrow \lambda\\
&\quad S \rightarrow id\ L\ E\ ;\\
&\quad S \rightarrow id\ (\ M\ )\ ;\\
&\quad S \rightarrow print\ (\ E\ )\ ;\\
&\quad S \rightarrow input\ (\ id\ )\ ;\\
&\quad S \rightarrow if\ (\ E\ )\ S1\\
&\quad S \rightarrow return\ X\ ;\\
&\quad L \rightarrow |=\\
&\quad L \rightarrow =\\
&\quad M \rightarrow E\ Q\\
&\quad M \rightarrow \lambda\\
&\quad Q \rightarrow \lambda\\
&\quad Q \rightarrow ,\ E\ Q\\
&\quad S1 \rightarrow \{\ S2\ \}\ G\\
&\quad S1 \rightarrow S\\
&\quad G \rightarrow else\ \{\ S2\ \}\\
&\quad G \rightarrow \lambda\\
&\quad X \rightarrow E\\
&\quad X \rightarrow \lambda\\
&\quad E \rightarrow E < U\\
&\quad E \rightarrow U\\
&\quad U \rightarrow U + R\\
&\quad U \rightarrow R
\end{aligned}
$$

$R \rightarrow\ !\ V$
$R \rightarrow\ V$
$V \rightarrow\ (\ E\ )$
$V \rightarrow\ id$
$V \rightarrow\ id\ (\ M\ )$
$V \rightarrow\ ent$
$V \rightarrow\ cadena$
$S2 \rightarrow\ S\ \ S2$
$S2 \rightarrow\ S$
$P \rightarrow\ \lambda$

}

1.2 Autómata Reconocedor de Prefijos Viables



1.2.1 Estados del autómata

S_0={P1 →• P, P → • DP, P → • SP, P → • , D → • var T id;,
F → • function T1 id(A){C}, S → • id L E;, S → • id(M);
S → • print(E);, S → • input(id);, S → • if(E) S1,
S → • return X;}
S_1={P1 →P •}
S_2={P →D • P, P → • DP, P → • SP, P → • , D → • var T id;,
F → • function T1 id(A){C}, S → • id L E;, S → • id(M);
S → • print(E);, S → • input(id);, S → • if(E) S1,
S → • return X;}
S_3={P →F • P, P → • DP, P → • FP, P → • SP, P → •,
D → • var T id;,F → • function T1 id(A){C},
S → • id L E;, S → • id(M);, S → • print(E);,
S → • input(id);, S → • if(E) S1, S → • return X;}
S_4={P →S • P, P → • DP, P → • FP, P → • SP, P → •,
D → • var T id;, F → • function T1 id(A){C},
S → • id L E;, S → • id(M);, S → • print(E);,
S → • input(id);, S → • if(E) S1, S → • return X;}
S_5={D → var • T id;, T → • int , T → • string , T → • boolean}
S_6={F → function • T1 id(A){C}, T1 → •, T1 → • T,
T → • int , T → • string , T → • boolean}
S_7={S → id • L E;, S → id • (M);, L → |=, L → • =}
S_8={S → print • (E);}
S_9={S → input • (id);}
S_{10}={S → if • (E) S1}
S_{11}={S →return • X;, X → •, X → • E, E → • E < U, E → • U,
U → • U + R, U → • R, R → • ! V, R → • V, V → • (E),
V → • id , V → • id(M) , V → • ent , V → • cadena}
S_{12}={P →DP •}
S_{13}={P →FP •}
S_{14}={P →SP •}
S_{15}={D →var T • id;}
S_{16}={T →int •}
S_{17}={T →string •}
S_{18}={T →boolean •}
S_{19}={F →function T1 • id(A){C}}
S_{20}={T1 →T •}
S_{21}={L →= •}
S_{22}={S →id (•M);, M → • E Q, M → •, E → • E < U, E → • U,
U → • U + R, U → • R, R → • ! V, R → • V, V → • (E),
V → • id , V → • id(M) , V → • ent , V → • cadena}
S_{23}={L →|= •}
S_{24}={S →print (• E);, E → • E < U, E → • U, U → • U + R,
U → • R, R → • ! V, R → • V, V → • (E), V → • id ,
V → • id(M) , V → • ent , V → • cadena}
S_{25}={S →input (• id)}
S_{26}={S →if (• E) S1, E → • E < U, E → • U, U → • U + R,
U → • R, R → • ! V, R → • V, V → • (E), V → • id ,
V → • id(M) , V → • ent , V → • cadena}
S_{27}={S →return X • ;}
S_{28}={X →E •, E → E • < U}
S_{29}={E →U •, U → U • + R}
S_{30}={U →R •}
S_{31}={R →! • V, V → • (E), V → • id , V → • id(M) ,
V → • ent , V → • cadena}
S_{32}={R →V •}
S_{33}={V →(• E), E → • E < U, E → • U, U → • U + R,

U → • R, R → • ! V, R → • V, V → • (E), V → • id,
V → • id(M), V → • ent, V → • cadena}

S_{34}={V →id •, V → id • (M)}

S_{35}={V →ent •}

S_{36}={V →cadena •}

S_{37}={D →var T id •;}

S_{38}={F →function T1 id • (A){C}}

S_{39}={S →id L • E, E → • E < U, E → • U, U → • U + R,
U → • R, R → • ! V, R → • V, V → • (E), V → • id,
V → • id(M), V → • ent, V → • cadena}

S_{40}={S →id (M •);}

S_{41}={M →E • Q, E → E • < U, Q → •, Q → • ,EQ}

S_{42}={S →print(E •);, E → E • < U}

S_{43}={S →input(id •);}

S_{44}={S →if(E •) S1, E → E • < U}

S_{45}={S →return X; •}

S_{46}={E →E < • U, U → • R, U → • U + R, R→ • ! V, R → • V
V → • (E), V → • id, V → • id(M), V → • ent, V → • cadena}

S_{47}={U →U + • R, R → • ! V, V → • (E), V → • id(M),
V → • ent, V → • cadena}

S_{48}={R →! V •}

S_{49}={V →(E •), E → E • < U}

S_{50}={V →id(• M), M → • E Q, M → •, E → • E < U, E → • U,
U → • U + R, U → • R, R → • ! V, R → • V, V → • (E),
V → • id, V → • id(M), V → • ent, V → • cadena}

S_{51}={F →function T1 id(• A){C}, A → • T id K, A → •, T → • int,
T → • string, T → • boolean}

S_{52}={S →id L E • ;, E → E • < U}

S_{53}={S →id(M) • ;}

S_{54}={M →E Q •}

S_{55}={Q →, • E Q, E → • E < U, E → • U,
U → • U + R, U → • R, R → • ! V, R → • V, V → • (E),
V → • id, V → • id(M), V → • ent, V → • cadena}

S_{56}={S →print(E) • ;}

S_{57}={S →input(id) • ;}

S_{58}={S →if(E) • S1, S1 → • {S2}G, S1 → • S, S → • id L E;,
S → • id(M);, S → • print(E);, S → • input(id);,
S → • if(E)S1, S → • return X ;}

S_{59}={E →E < U •, U → U • + R}

S_{60}={U →U + R •}

S_{61}={V →(E) •}

S_{62}={V →id(M •)}

S_{63}={M →E • Q, E → E • < U, Q → •, Q → • ,EQ}

S_{64}={F →function T1 id(A •){C}}

S_{65}={A →T • id K}

S_{66}={S →id L E ; •}

S_{67}={S →id (M); •}

S_{68}={Q →,E • Q, E → E • < U, Q → •, Q → • ,EQ}

S_{69}={S →print(E); •}

S_{70}={S →input(id); •}

S_{71}={S →if(E) S1 •}

S_{72}={S1 →{• S2}G, S2 → • S S2, S2 → • S, S → • id L E;,
S → • id(M);, S → • print(E);, S → • input(id);,
S → • if(E)S1, S → • return X ;}

S_{73}={S1 →S •}

S_{74}={S2 →S • S2 , S2 → S • , S2 → • S S2, S2 → • S,
S → • id L E ;, S → • id (M) ;, S → • print (E) ;,
S → • input (id) ;, S → • if (E) S1, S → • return X ;}

S_{75}={F →function T1 id (K) • {C}}
S_{76}={A →T id •K , K → •, K → • , T id K}
S_{77}={Q → , E Q •}
S_{78}={S1 →{S2 • } G}
S_{79}={S2 →S • S2, S2 → S •, S2 → • S S2, S → • id L E;,
S → • id(M);, S → • print(E); S → • if(E)S1;,
S → • input(id);, S → return X;}
S_{80}={F →function T1 id (K) { •C}, C → • D C , C → • ,
D → • var T id ;, S → • id L E , S → • id (M);,
S → • print (E);, S → • input (id);, S → • if (E) S1,
S → • return X ;}
S_{81}={A →T id K •}
S_{82}={K → , •T id K, T → • int , T → • string , T → • boolean}
S_{83}={S1 →{S2} •G , G → • else {S2} , G → •}
S_{84}={F →function T1 id (K) {C • }}
S_{85}={C →D •C, C → • D C, C → • S C, C → •, D → • var T id ;,
S → • id L E ;, S → • id (M) ;, S → • print (E) ;,
S → • input (id) ;, S → • if (E) S1, S → • return X ;}
S_{86}={C →S •C, C → • D C, C → • S C, C → •, D → • var T id ;,
S → • id L E ;, S → • id (M) ;, S → • print (E) ;,
S → • input (id) ;, S → • if (E) S1, S → • return X ;}
S_{87}={K → , T • id K}
S_{88}={S1 →{S2} G •}
S_{89}={G →else • {S2}}
S_{90}={F →function T1 id (K) {C} •}
S_{91}={K → , T id •K, K → •, K → • , T id K}
S_{92}={G →else { • S2}, S2 → • S S2, S2 → • S, S → • id L E ;,
S → • id (M) ; , S → • print (E) ;, S → • input(id);,
S → • if (E) S1, S → • return X ;}
S_{93}={K → , T id K •}
S_{94}={G →else { S2 • }}
S_{95}={G →else { S2 } •}
S_{96}={C →D C •}
S_{97}={C →S C •}
S_{98}={D →var T id ; •}
S_{99}={S2 →S S2 •}

1.3 Conflictos y Tabla de Decisión

Como podemos observar en la tabla de decisión no hay ningún conflicto.

Los posibles conflictos son:

Reducción-Reducción

Podríamos ver como en los posibles estados con este conflicto, en nuestro caso ninguno, se verifica que

$\forall$ {A $\rightarrow \alpha$ •, B $\rightarrow \beta$ •} $\subset S_x \Rightarrow$ Follow(A) $\cap$ Follow(B) = $\emptyset$ (Esto lo podemos observar al no tener dos entradas de reducción en la misma celda de cada fila de S_x)

Reducción-Desplazamiento

Podemos ver como en los posibles estados con este conflicto, S_0, S_2, S_3, S_4, S_6, S_{11}, S_{22}, S_{28}, S_{29}, S_{34}, S_{41}, S_{50}, S_{51}, S_{59}, S_{63}, S_{68}, S_{76}, S_{79}, S_{80}, S_{83}, S_{85}, S_{86}, S_{91}, se verifica

$\forall$ {A $\rightarrow \alpha$ • b γ, C $\rightarrow \beta$ •} $\subset S_x \Rightarrow$ b $\notin$ Follow(C) (Esto lo podemos observar al no tener una entrada de desplazamiento y otra de reducción en la misma celda de cada fila de S_x)

Por ejemplo, para los estados S_0, S_2, S_3, S_4: {var, function, id, print, input, if, return} $\notin$ Follow(P) = { $ }
En el estado S_6: {int, string, boolean} $\notin$ Follow(T1) = { id }
Y así sucesivamente con el resto de estados.

	;	{	}	id	entero	cadena	(	)	+	<	!	=		=	var	int	boolean	string	print	input	,	return	function	if	else	$	P	D	T	F	T'	A	K	C	S	L	M	Q	S'	G	X	E	U	R	V	S"
S0				d7											d5					d8	d9		d11	d6	d10		r49	1	2		3					4												
S1																										a																						
S2				d7											d5					d8	d9		d11	d6	d10		r49	12	2		3					4												
S3				d7											d5					d8	d9		d11	d6	d10		r49	13	2		3					4												
S4				d7											d5					d8	d9		d11	d6	d10		r49	14	2		3					4												
S5																d16	d18	d17											15																		
S6				r9												d16	d18	d17											20		19																	
S7							d22					d21	d23																						39												
S8							d24																																									
S9							d25																																									
S10							d26																																									
S11	r35			d34	d35	d36	d33				d31																															27	28	29	30	32	
S12																										r1																						
S13																										r2																						
S14																										r3																						
S15				d37																																												
S16				r5																																												
S17				r6																																												
S18				r7																																												
S19				d38																																												
S20				r10																																												
S21				r25	r25	r25	r25				r25																																					
S22				d34	d35	d36	d33	r27			d31																																41	29	30	32	
S23				r24	r24	r24	r24				r24																																					
S24				d34	d35	d36	d33				d31																																42	29	30	32	
S25				d43																																												
S26				d34	d35	d36	d33				d31																																44	29	30	32	
S27	d45																																														
S28	r34										d46																																					
S29	r37							r37	d47	r37											r37																											
S30	r39							r39	r39	r39											r39																											
S31				d34	d35	d36	d33																																								48	
S32	r41							r41	r41	r41											r41																											
S33				d34	d35	d36	d33				d31																																49	29	30	32	
S34	r43						d50	r43	r43	r43											r43																											
S35	r45							r45	r45	r45											r45																											
S36	r46							r46	r46	r46											r46																											
S37	d98																																														
S38							d51																																									
S39				d34	d35	d36	d33				d31																																52	29	30	32	
S40								d53																																								
S41								r28		d46											d55																											
S42								d56		d46																																						
S43								d57																																								
S44								d58		d46																																						
S45			r23	r23											r23					r23	r23		r23	r23	r23		r23																				
S46				d34	d35	d36	d33				d31																																	59	30	32	
S47				d34	d35	d36	d33				d31																																		60	32	
S48	r40							r40	r40	r40											r40																											
S49								d61		d46																																						

	;	{	}	id	entero	cadena	(	)	+	<	!	=	|=	var	int	boolean	string	print	input	,	return	function	if	else	$	P	D	T	F	T'	A	K	C	S	L	M	Q	S'	G	X	E	U	R	V	S"
S50				d34	d35	d36	d33	r27			d31																								62					63	29	30	32	
S51								r12							d16	d18	d17											65		64																
S52	d66									d46																																			
S53	d67																																												
S54								r26																																					
S55				d34	d35	d36	d33				d31																														68	29	30	32	
S56	d69																																												
S57	d70																																												
S58		d72		d7														d8	d9		d11		d10											73			71							
S59	r36							r36	d47	r36										r36																									
S60	r38							r38	r38	r38										r38																									
S61	r42							r42	r42	r42										r42																									
S62								d74																																					
S63								r28		d46										d55																			54						
S64								d75																																					
S65				d76																																									
S66			r18	r18										r18				r18	r18		r18	r18	r18		r18																			
S67			r19	r19										r19				r19	r19		r19	r19	r19		r19																			
S68								r28		d46										d55																			77						
S69			r20	r20										r20				r20	r20		r20	r20	r20		r20																			
S70			r21	r21										r21				r21	r21		r21	r21	r21		r21																			
S71			r22	r22										r22				r22	r22		r22	r22	r22		r22																			
S72				d7														d8	d9		d11		d10											79										78
S73			r31	r31										r31				r31	r31		r31	r31	r31		r31																			
S74	r44							r44	r44	r44										r44																									
S75		d80																																											
S76								r13												d82													81											
S77								r29																																					
S78			d83																																									
S79			r48	d7														d8	d9		d11		d10											79										99
S80			r17	d7										d5				d8	d9		d11		d10				85						84	86									
S81								r11																																					
S82															d16	d18	d17											87																
S83			r33	r33										r33				r33	r33		r33	r33	r33	d89	r33												88						
S84			d90																																									
S85			r17	d7										d5				d8	d9		d11		d10										96	86									
S86			r17	d7										d5				d8	d9		d11		d10				85						97	86									
S87				d91																																								
S88			r30	r30										r30				r30	r30		r30	r30	r30		r30																			
S89		d92																																										
S90				r8										r8				r8	r8		r8	r8	r8		r8																			
S91								r13												d82													93											
S92				d7														d8	d9		d11		d10											79										94
S93								r14																																					
S94			d95																																									
S95			r32	r32										r32				r32	r32		r32	r32	r32		r32																			
S96			r15																																									
S97			r16																																									
S98			r4	r4										r4				r4	r4		r4	r4	r4		r4																			
S99			r47																																									

1.4 Errores

En las celdas vacías de cada fila se lanzan los siguientes errores:

S_0, S_4, S_7, S_{14}, S_{85}, S_{86}, S_{96}, S_{97}: Error 1: "Sentencia no válida"

S_1: Error -1 : "No se pudo derivar la raíz"

S_2, S_5, S_{12}, S_{15}, S_{37}, S_{98}: Error 2: "Declaración incorrecta de variable"

S_3, S_6, S_{13}, S_{19}, S_{38}, S_{51}, S_{64}, S_{65}, S_{75}, S_{76}, S_{80}, S_{81}, S_{82}, S_{84}, S_{87}, S_{90}, S_{91}, S_{93}: Error 3: "Declaración incorrecta de función"

S_8, S_{24}, S_{42}, S_{56}, S_{69}: Error 4: "Sentencia print incorrecta"

S_9, S_{25}, S_{43}, S_{57}, S_{70}: Error 5: "Sentencia input incorrecta"

S_{10}, S_{26}, S_{44}, S_{58}, S_{71}, S_{73}: Error 6: "Sentencia condicional simple incorrecta"

S_{11}, S_{27}, S_{28}, S_{45}: Error 7: "Sentencia return incorrecta"

S_{16}, S_{17}, S_{18}, S_{20}: Error 8: "Tipo incorrecto"

S_{21}, S_{23}, S_{39}, S_{52}, S_{66}: Error 9: "Asignación incorrecta"

S_{22}, S_{40}, S_{41}, S_{53}, S_{54}, S_{55}, S_{63}, S_{67}, S_{68}, S_{77}: Error 10: "Llamada a función incorrecta"

S_{29}, S_{30}, S_{31}, S_{32}, S_{33}, S_{34}, S_{35}, S_{36}, S_{46}, S_{47}, S_{48}, S_{49}, S_{50}, S_{59}, S_{60}, S_{61}, S_{62}, S_{74}: Error 11: "Expresión incorrecta"

S_{72}, S_{78}, S_{79}, S_{83}, S_{88}, S_{89}, S_{92}, S_{94}, S_{95}, S_{99} : Error 12 "Sentencia condicional compuesta incorrecta"

2 Anexo de Pruebas

Error 1:

```
1 var int a;
2 var b;
3 a = 3;
4 b = a;
5 if (a < b) b = 1;
6 if (b < a) b = 8;
7 a = a + b;
8 print (a);
9 print (b);
```

```
> Error Sintactico: Declaracion incorrecta de variable.  Linea: 2
```

Error 2:

```
1  var string texto;
2  function pideTexto ()
3  {
4    print ('Introduce un texto');
5    input (texto);
6  }
7  function imprime (string msg,)
8  {
9    print (msg);
10 }
11 pideTexto();
12 var string textoAux;
13 textoAux = texto;
14 imprime (textoAux);
```

```
> Error Sintactico: Declaracion incorrecta de funcion.  Linea: 7
```

Error 3:

```
1  var int a;
2  var int b;
3  a = 3;
4  b = a;
5  var boolean c;
6  c = a < b;
7  if (c) {
8   b = 1;
9  } else {
10 c = b < a;
11 if (c) b = 4;
12 a = a + b;
13 print (a);
14 print (b);
```

```
> Error Sintactico: Sentencia condicional compuesta incorrecta.  Linea: 14
```

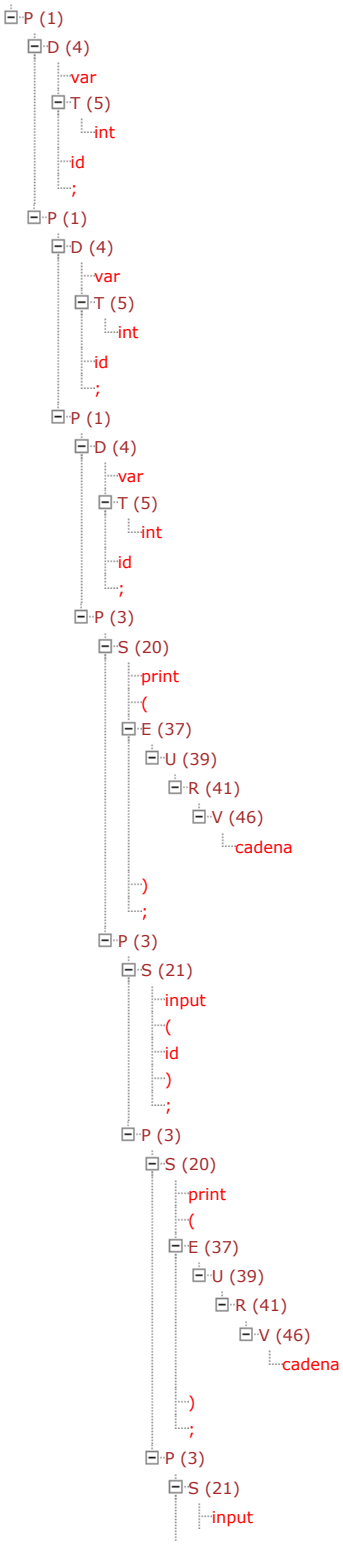
Prueba 1 Correcta:

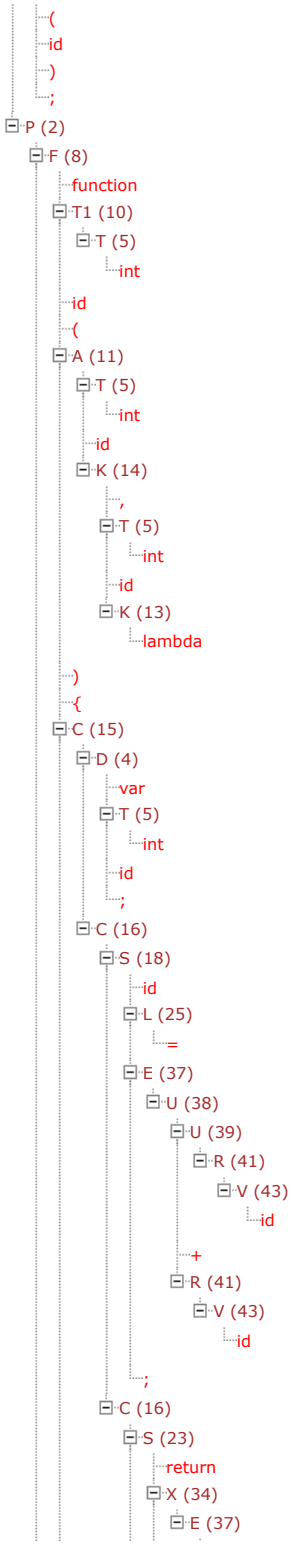
```
1  var int a;
2  var int b;
3  var int c;
4  print ('Introduce el primer operando');
5  input (a);
6  print ('Introduce el segundo operando');
7  input (b);
8  function int suma (int num1, int num2)
9  {
10   var int res;
11   res = num1+num2;
12   return res;
13 }
14 c = suma (a, b);
15 print (c);
```

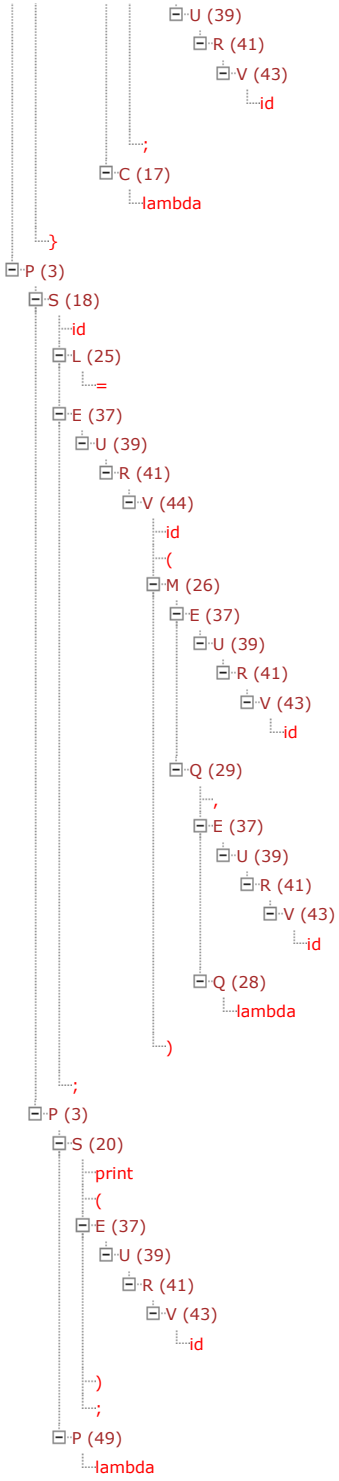
Parse a Derechas:

A 5 4 5 4 5 4 46 41 39 37 20 21 46 41 39 37 20 21 5 10 5 5 13 14 11 5 4 25 43 41 39 43 41 38 37 18 43 41 39 37 34 23 17 16 16 15 8 25 43 41 39 37 43 41 39 37 28 29 26 44 41 39 37 18 43 41 39 37 20 49 3 3 2 3 3 3 3 1 1 1

Árbol sintáctico:




(
id
)
;
P (2)
F (8)
function
T1 (10)
T (5)
int
id
(
A (11)
T (5)
int
id
K (14)
,
T (5)
int
id
K (13)
lambda
)
{
C (15)
D (4)
var
T (5)
int
id
;
C (16)
S (18)
id
L (25)
=
E (37)
U (38)
U (39)
R (41)
V (43)
id
+
R (41)
V (43)
id
;
C (16)
S (23)
return
X (34)
E (37)


U (39)
R (41)
V (43)
id
;
C (17)
lambda
}
P (3)
S (18)
id
L (25)
=
E (37)
U (39)
R (41)
V (44)
id
(
M (26)
E (37)
U (39)
R (41)
V (43)
id
Q (29)
,
E (37)
U (39)
R (41)
V (43)
id
Q (28)
lambda
)
;
P (3)
S (20)
print
(
E (37)
U (39)
R (41)
V (43)
id
)
;
P (49)
lambda

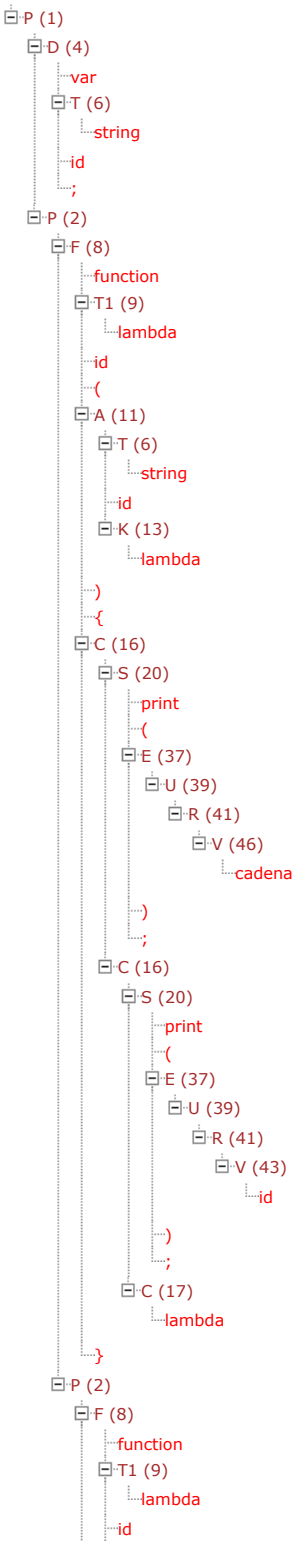
Prueba 2 Correcta:

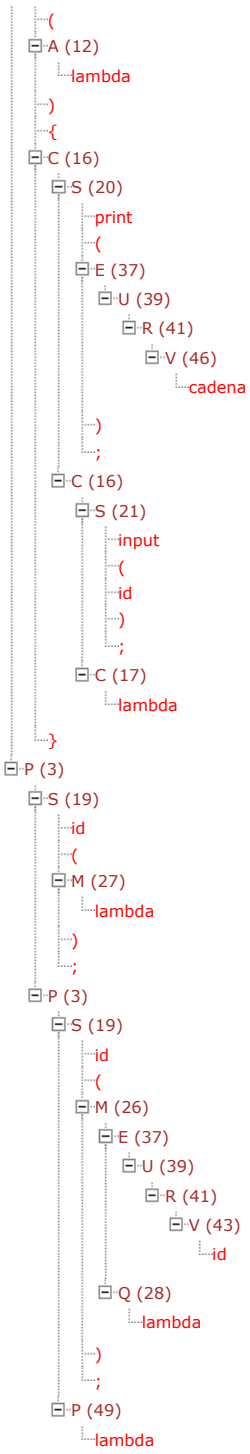
```
1  var string texto;
2  function imprime (string msg)
3  {
4    print ('Mensage introducido:');
5    print (msg);
6  }
7  function pideTexto ()
8  {
9    print ('Introduce un texto');
10   input (texto);
11 }
12 pideTexto();
13 imprime (texto);
```

Parse a Derechas:

A 6 4 9 6 13 11 46 41 39 37 20 43 41 39 37 20 17 16 16 8 9 12 46 41 39 37 20 21 17 16 16 8 27 19 43 41 39 37 28 26 19 49 3 3 2 2 1

Árbol sintáctico:




(
A (12)
lambda
)
{
C (16)
S (20)
print
(
E (37)
U (39)
R (41)
V (46)
cadena
)
;
C (16)
S (21)
input
(
id
)
;
C (17)
lambda
}
P (3)
S (19)
id
(
M (27)
lambda
)
;
P (3)
S (19)
id
(
M (26)
E (37)
U (39)
R (41)
V (43)
id
Q (28)
lambda
)
;
P (49)
lambda

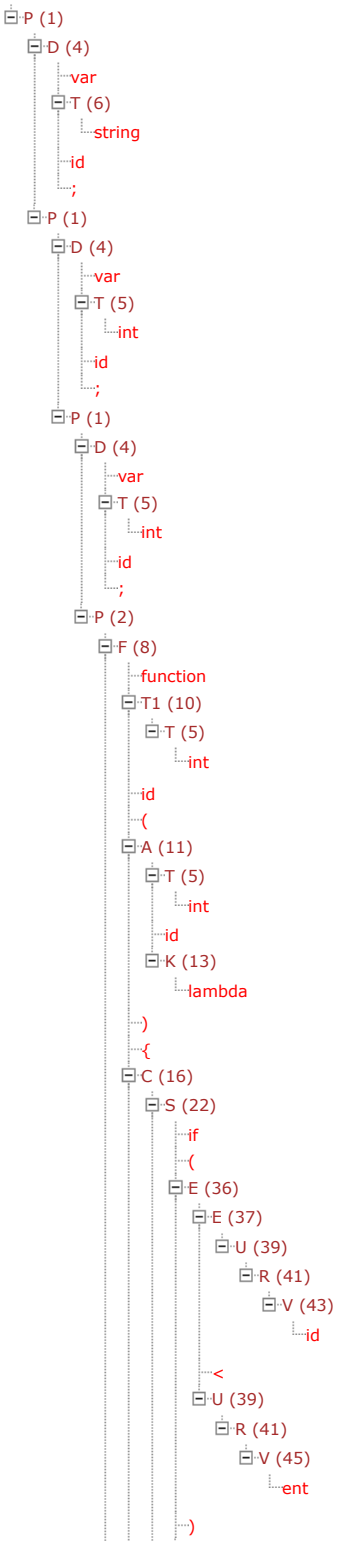
Prueba 3 Correcta:

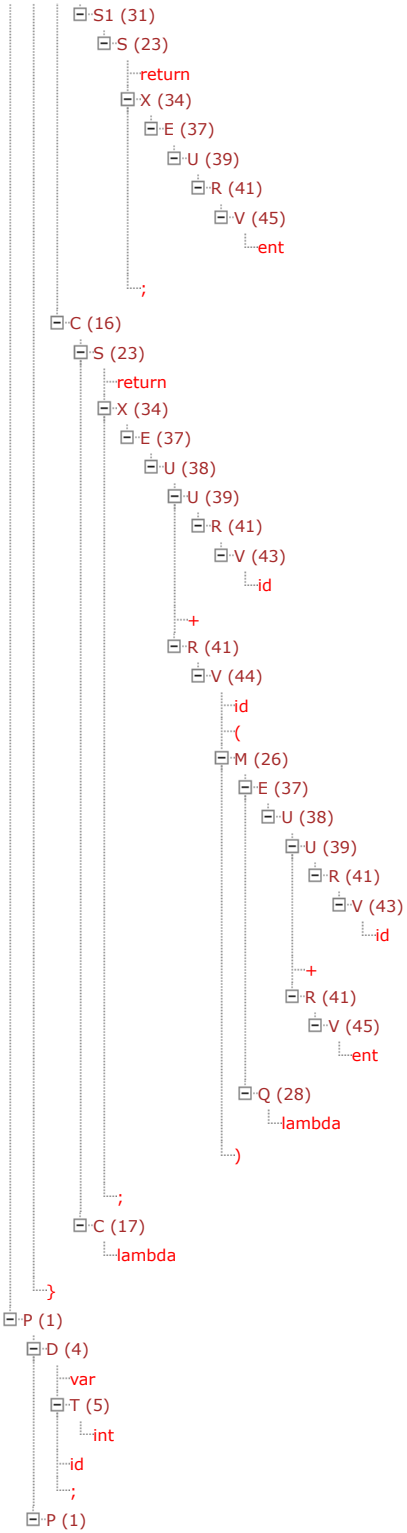
```
function string cadena (boolean log)
{
  if (!log)
  {
    imprime (s, 'hola', 33);
    if (uno < UNO)  return s;
  }
  else
  {
    return 'Fin';
  }
}
s = 'El factorial ';

if (num < 0)    print ('No existe el factorial de un negativo.');
imprime (cadena (booleano), 'recursivo es: ', Factorial (num));
```

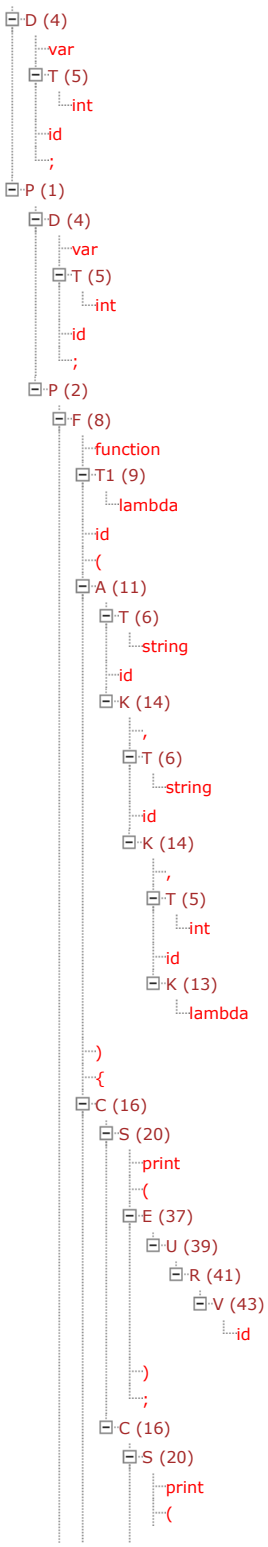
Parse a Derechas:

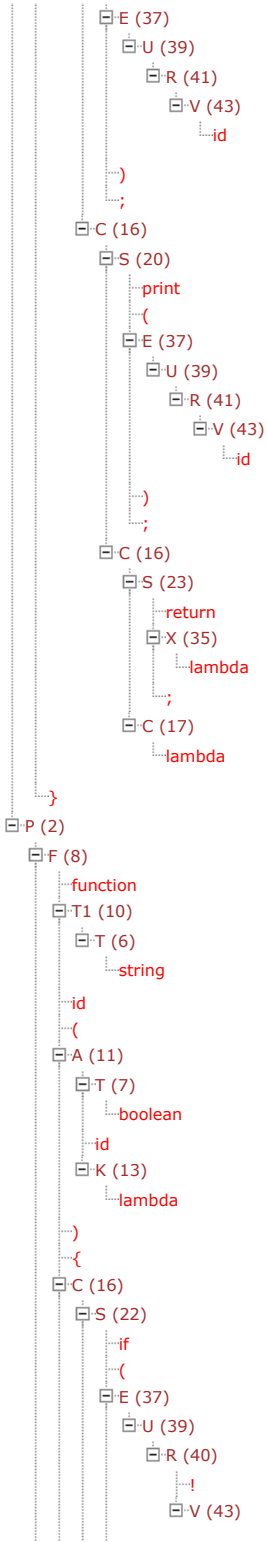
A 6 10 7 13 11 43 40 39 37 43 41 39 37 46 41 39 37 45 41 39 37 28 29 29 26 19 43 41 39 37 43 41 39 36 43 41 39 37 34 23 31 22 48 47 46 41 39 37 34 23 48 32 30 22 17 16 8 25 46 41 39 37 18 43 41 39 37 45 41 39 36 46 41 39 37 20 31 22 43 41 39 37 28 26 44 41 39 37 46 41 39 37 43 41 39 37 28 26 44 41 39 37 28 29 29 26 19 49 3 3 3 2

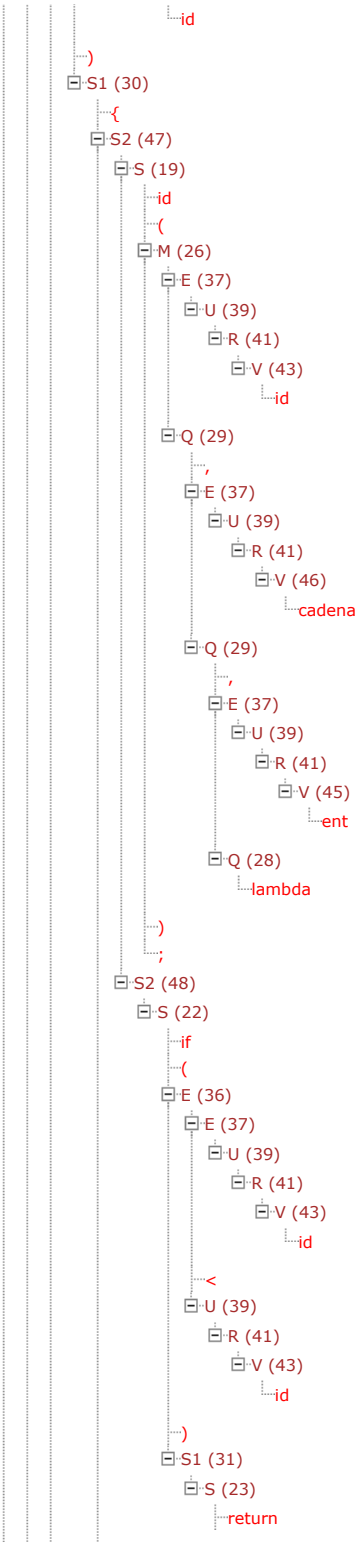
Árbol sintáctico:

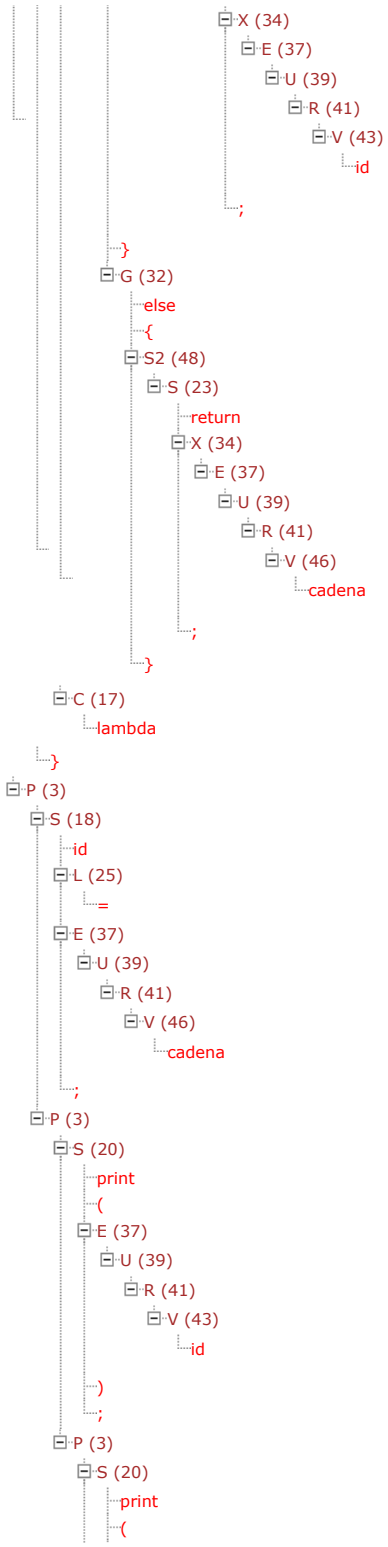


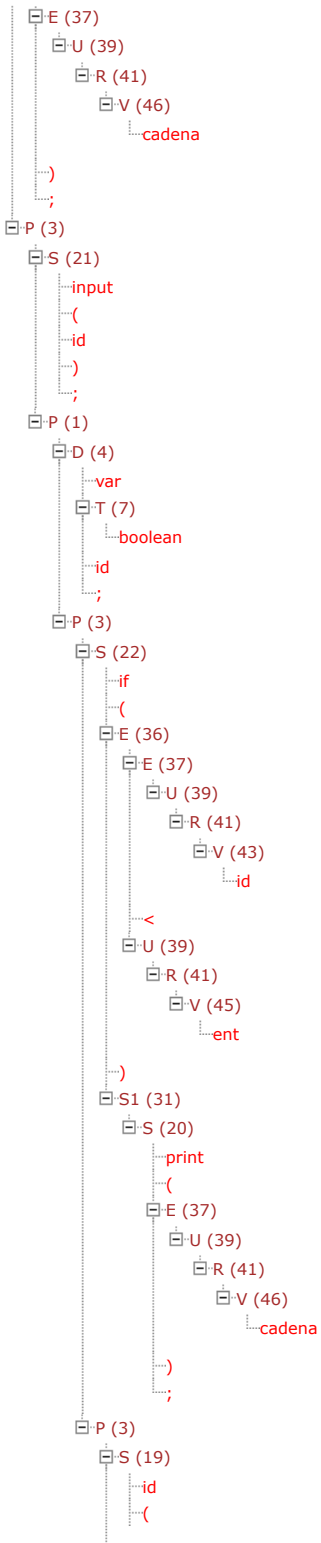

S1 (31)
S (23)
return
X (34)
E (37)
U (39)
R (41)
V (45)
ent
;
C (16)
S (23)
return
X (34)
E (37)
U (38)
U (39)
R (41)
V (43)
id
+
R (41)
V (44)
id
(
M (26)
E (37)
U (38)
U (39)
R (41)
V (43)
id
+
R (41)
V (45)
ent
Q (28)
lambda
)
;
C (17)
lambda
}
P (1)
D (4)
var
T (5)
int
id
;
P (1)

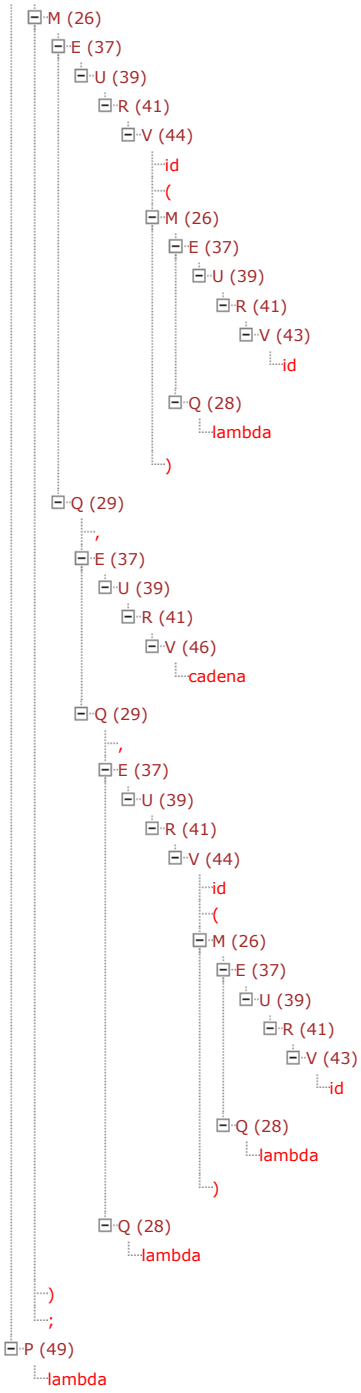

D (4)
var
T (5)
int
id
;
P (1)
D (4)
var
T (5)
int
id
;
P (2)
F (8)
function
T1 (9)
lambda
id
(
A (11)
T (6)
string
id
K (14)
,
T (6)
string
id
K (14)
,
T (5)
int
id
K (13)
lambda
)
{
C (16)
S (20)
print
(
E (37)
U (39)
R (41)
V (43)
id
)
;
C (16)
S (20)
print
(


E (37)
U (39)
R (41)
V (43)
id
)
;
C (16)
S (20)
print
(
E (37)
U (39)
R (41)
V (43)
id
)
;
C (16)
S (23)
return
X (35)
lambda
;
C (17)
lambda
}
P (2)
F (8)
function
T1 (10)
T (6)
string
id
(
A (11)
T (7)
boolean
id
K (13)
lambda
)
{
C (16)
S (22)
if
(
E (37)
U (39)
R (40)
!
V (43)


id
)
S1 (30)
{
S2 (47)
S (19)
id
(
M (26)
E (37)
U (39)
R (41)
V (43)
id
Q (29)
,
E (37)
U (39)
R (41)
V (46)
cadena
Q (29)
,
E (37)
U (39)
R (41)
V (45)
ent
Q (28)
lambda
)
;
S2 (48)
S (22)
if
(
E (36)
E (37)
U (39)
R (41)
V (43)
id
<
U (39)
R (41)
V (43)
id
)
S1 (31)
S (23)
return


X (34)
E (37)
U (39)
R (41)
V (43)
id
;
}
G (32)
else
{
S2 (48)
S (23)
return
X (34)
E (37)
U (39)
R (41)
V (46)
cadena
;
}
C (17)
lambda
}
P (3)
S (18)
id
L (25)
=
E (37)
U (39)
R (41)
V (46)
cadena
;
P (3)
S (20)
print
(
E (37)
U (39)
R (41)
V (43)
id
)
;
P (3)
S (20)
print
(


E (37)
U (39)
R (41)
V (46)
cadena
)
;
P (3)
S (21)
input
(
id
)
;
P (1)
D (4)
var
T (7)
boolean
id
;
P (3)
S (22)
if
(
E (36)
E (37)
U (39)
R (41)
V (43)
id
<
U (39)
R (41)
V (45)
ent
)
S1 (31)
S (20)
print
(
E (37)
U (39)
R (41)
V (46)
cadena
)
;
P (3)
S (19)
id
(


M (26)
E (37)
U (39)
R (41)
V (44)
id
(
M (26)
E (37)
U (39)
R (41)
V (43)
id
Q (28)
lambda
)
Q (29)
,
E (37)
U (39)
R (41)
V (46)
cadena
Q (29)
,
E (37)
U (39)
R (41)
V (44)
id
(
M (26)
E (37)
U (39)
R (41)
V (43)
id
Q (28)
lambda
)
Q (28)
lambda
)
;
P (49)
lambda