```
four06% cat -n arith0.c
     1	/* arith0.c: simple parser -- no output
     2	 * grammar:
     3	 *   P ---> E '#'
     4	 *   E ---> T {('+'|'-') T}
     5	 *   T ---> S {('*'|'/') S}
     6	 *   S ---> F '^' S | F
     7	 *   F ---> char | '(' E ')'
     8	 */
     9	#include <stdio.h>
    10	#include <stdlib.h>
    11	#include <ctype.h>
    12	char next;
    13	void E(void);
    14	void T(void);
    15	void S(void);
    16	void F(void);
    17	void error(int);
    18	void scan(void);
    19	void enter(char);
    20	void leave(char);
    21	void spaces(int);
    22	int level = 0;
    23
    24	void main(void)
    25	{
    26	   scan();
    27	   E();
    28	   if (next != '#') error(1);
    29	   else printf("Successful parse\n");
    30	}
    31
    32	void E(void)
    33	{
    34	   enter('E');
    35	   T();
    36	   while (next == '+' || next == '-') {
    37	      scan();
    38	      T();
    39	   }
    40	   leave('E');
    41	}
    42
    43	void T(void)
    44	{
    45	   enter('T');
    46	   S();
    47	   while (next == '*' || next == '/') {
    48	      scan();
    49	      S();
    50	   }
    51	   leave('T');
    52	}
    53	void S(void)
    54	{
    55	   enter('S');
    56	   F();
    57	   if (next == '^') {
    58	      scan();
    59	      S();
    60	   }
    61	   leave('S');
    62	}
    63	void F(void)
    64	{
    65	   enter('F');
    66	   if (isalpha(next)) {
    67	      scan();
    68	   }
    69	   else if (next == '(') {
    70	      scan();
    71	      E();
    72	      if (next == ')') scan();
    73	      else error(2);
    74	   }
    75	   else {
    76	      error(3);
    77	   }
    78	   leave('F');
    79	}
    80	void scan(void)
    81	{
    82	   while (isspace(next = getchar()))
    83	      ;
    84	}
    85	void error(int n)
    86	{
    87	   printf("\n*** ERROR: %i\n", n);
    88	   exit(1);
    89	}
    90	void enter(char name)
    91	{
    92	   spaces(level++);
    93	   printf("+-%c: Enter, \t", name);
    94	   printf("Next == %c\n", next);
    95	}
    96	void leave(char name)
    97	{
    98	   spaces(--level);
    99	   printf("+-%c: Leave, \t", name);
   100	   printf("Next == %c\n", next);
   101	}
   102
   103	void spaces(int local_level)
   104	{
   105	   while (local_level-- > 0)
   106	      printf("|  ");
   107	}
```

```
four06% arith0
a + b + c #
+-E: Enter,       Next == a
| +-T: Enter,     Next == a
| | +-S: Enter,   Next == a
| | | +-F: Enter,       Next == a
| | | +-F: Leave,       Next == +
| | +-S: Leave,   Next == +
| +-T: Leave,     Next == +
| +-T: Enter,     Next == b
| | +-S: Enter,   Next == b
| | | +-F: Enter,       Next == b
| | | +-F: Leave,       Next == +
| | +-S: Leave,   Next == +
| +-T: Leave,     Next == +
| +-T: Enter,     Next == c
| | +-S: Enter,   Next == c
| | | +-F: Enter,       Next == c
| | | +-F: Leave,       Next == #
| | +-S: Leave,   Next == #
| +-T: Leave,     Next == #
+-E: Leave,       Next == #
Successful parse
four06% arith0
a ^ b ^ c #
+-E: Enter,       Next == a
| +-T: Enter,     Next == a
| | +-S: Enter,   Next == a
| | | +-F: Enter,       Next == a
| | | +-F: Leave,       Next == ^
| | | +-S: Enter,       Next == b
| | | | +-F: Enter,     Next == b
| | | | +-F: Leave,     Next == ^
| | | | +-S: Enter,     Next == c
| | | | | +-F: Enter,   Next == c
| | | | | +-F: Leave,   Next == #
| | | | +-S: Leave,     Next == #
| | | +-S: Leave,       Next == #
| | +-S: Leave,   Next == #
| +-T: Leave,     Next == #
+-E: Leave,       Next == #
Successful parse
```

```
four06% arith0
( a * b #
+-E: Enter,       Next == (
| +-T: Enter,     Next == (
| | +-S: Enter,   Next == (
| | | +-F: Enter,       Next == (
| | | | +-E: Enter,     Next == a
| | | | | +-T: Enter,   Next == a
| | | | | | +-S: Enter,       Next == a
| | | | | | | +-F: Enter,     Next == a
| | | | | | | +-F: Leave,     Next == *
| | | | | | +-S: Leave,       Next == *
| | | | | | +-S: Enter,       Next == b
| | | | | | | +-F: Enter,     Next == b
| | | | | | | +-F: Leave,     Next == #
| | | | | | +-S: Leave,       Next == #
| | | | | +-T: Leave,   Next == #
| | | | +-E: Leave,     Next == #
*** ERROR: 2
four06% arith0
(a + b) * c #
+-E: Enter,       Next == (
| +-T: Enter,     Next == (
| | +-S: Enter,   Next == (
| | | +-F: Enter,       Next == (
| | | | +-E: Enter,     Next == a
| | | | | +-T: Enter,   Next == a
| | | | | | +-S: Enter,       Next == a
| | | | | | | +-F: Enter,     Next == a
| | | | | | | +-F: Leave,     Next == +
| | | | | | +-S: Leave,       Next == +
| | | | | +-T: Leave,   Next == +
| | | | | +-T: Enter,   Next == b
| | | | | | +-S: Enter,       Next == b
| | | | | | | +-F: Enter,     Next == b
| | | | | | | +-F: Leave,     Next == )
| | | | | | +-S: Leave,       Next == )
| | | | | +-T: Leave,   Next == )
| | | | +-E: Leave,     Next == )
| | | +-F: Leave,       Next == *
| | +-S: Leave,   Next == *
| | +-S: Enter,   Next == c
| | | +-F: Enter,       Next == c
| | | +-F: Leave,       Next == #
| | +-S: Leave,   Next == #
| +-T: Leave,     Next == #
+-E: Leave,       Next == #
Successful parse
```