编译原理第一次实验测试用例：目录

1 A 组测试用例

本组测试用例共 10 个，每个仅包含单个的词法或者语法错误。除特殊说明外，不可多报。多报、漏报错误，或者打印语法树都会导致扣分。错误编号和行号之后的说明文字不要求与给出的输出完全一致，仅供助教理解使用，不作为评分依据。

1.1 A-1

1.1.1 输入

```
1 int main() {
2   int err[];
3   return 0;
4 }
```

1.1.2 输出

```
1 Error type B at Line 2: syntax error, unexpected RB, expecting INT.
     invalid Array declaration.
```

1.1.3 说明

错误的数组声明。

1.2 A-2

1.2.1 输入

```
1 int sum(int a, int b) {
2   int sum = a + b;
3   return 2sum;
4 }
5
6 int main() { return 0; }
```

1.2.2 输出

```
1 Error type A at Line 3: Illegal ID '2sum'.
```

1.2.3 说明

标识符不能以数字开头。（注：也可以识别为 B 类错误。）

1.3 A-3

1.3.1 输入

```
int main() {
  int n = 5;
  int factorial = 1;
  while (n > 0) {
    factorial *= n;
    n = n - 1;
  }
  return 0;
}
```

1.3.2 输出

```
Error type B at Line 5: syntax error, unexpected ASSIGNOP.
```

1.3.3 说明

*=是不支持的运算符。

1.4 A-4

1.4.1 输入

```
struct Student {
  int id;
  float gpa;
};

int main() {
  Student student;
  student.id = 1;
  student.gpa = 32;
  return 0;
```

```
11 }
```

1.4.2 输出

```
1 Error type B at Line 7: Syntax error near 'student'
```

1.4.3 说明

Student前缺少struct关键字。

1.5 A-5

1.5.1 输入

```
1 int main() {
2   int arr[5], ;
3   int sum = 0, i = 0;
4   while (i < 5) {
5     sum = sum + arr[i];
6     i = i + 1;
7   }
8   return 0;
9 }
```

1.5.2 输出

```
1 Error type B at Line 2: expect Dec on the right of ','; check if a
     Dec is missed.
```

1.5.3 说明

arr[5]后多了一个逗号。

1.6 A-6

1.6.1 输入

```
int gcd = 0;

int main() {
  int a = 24;
  int b = 36;
  while (a != b) {
    if (a > b) {
      a = a - b;
    } else {
      b = b - a;
    }
  }
  gcd = a;
  return 0;
}
```

1.6.2 输出

```
Error type B at Line 1: ERROR:variable assignment should not be done
   ahead of a Program.
```

1.6.3 说明

全局变量定义时不能初始化。

1.7 A-7

1.7.1 输入

```
int main() {
  int a = 10;
  int b = 20;
  return max~(a, b);
}
```

1.7.2 输出

```
Error type A at Line 4: Illegal character '~'.
```

1.7.3 说明

标识符不能含有~符号。(注：也可以识别为 B 类错误。)

1.8 A-8

1.8.1 输入

```
int main() {
  int max_value = 9;
  while (max_value)
    ;
  return 0;
}
```

1.8.2 输出

```
Error type B at Line 4: Syntax error near ';'
```

1.8.3 说明

while语句循环体不能为空。

1.9 A-9

1.9.1 输入

```
int factorial(int) {
  if (n == 0) {
    return 1;
  } else {
    return n * factorial(n - 1);
  }
}

int main() { return factorial(5); }
```

1.9.2 输出

```
Error type B at Line 1: syntax error, unexpected RP, expecting ID.
```

1.9.3 说明

int后缺少变量名。

1.10 A-10

1.10.1 输入

```
1 int hello_world() { return; }
2
3 int main() {
4   hello_world();
5   return 0;
6 }
```

1.10.2 输出

```
1 Error type B at Line 1: syntax error, unexpected SEMI. invalid
    expression in RETURN Code block.
```

1.10.3 说明

return语句缺少返回值。

2 B 组测试用例

本组测试用例共 2 个，每个用例包含多处不同的错误。除特殊说明外，漏报、多报错误或者打印语法树都会导致扣分。

2.1 B-1

2.1.1 输入

```
1 int main() {
2   int n = 1b1010;
3   int fib1 = 0; int fib2 = 1, fib;
4   int i = 2;
5   if (n !n) {
6     n = n * 1;
7   } else {
```

```
8       n, n / 1;
9     }
10    while (i <= n) {
11      fib = fib1 + fib2 + ;
12      fib1 = fib2;
13      fib2 = fib;
14      i = i + 1;
15    };
16    return 0;
17  }
```

2.1.2 输出

```
1  Error type B at Line 2: Syntax error near 'b1010'
2  Error type B at Line 5: Syntax error near '!'
3  Error type B at Line 8: Syntax error near ','
4  Error type B at Line 11: Syntax error near ';'
5  Error type B at Line 15: Syntax error near ';'
```

2.1.3 说明

1. 1b1010是非法的常量。(注：识别为 A、B 类错误均可。)
2. !不是二元运算符。
3. n, n / 1;不是合法的语句。
4. fib2 +后面缺少表达式。
5. 本语言未定义空语句。

2.2 B-2

2.2.1 输入

```
1  struct Point {
2    float x;
3    float y;
4  };
5
```

```
6  float distance(struct Point a, struct b) {
7    float d;
8    d = sqrt(square(a.x - b.x) + square(a.y - b.y));
9    float result = d;
10   return result;
11 }
12
13 int main(void) {
14   struct Point p;
15   p.x = 0.12.3;
16   p.y = .20;
17   return 0
18 }
```

2.2.2 输出

```
1 Error type B at Line 6: Syntax error near ')'
2 Error type B at Line 9: Syntax error near 'float'
3 Error type B at Line 13: Syntax error near 'void'
4 Error type B at Line 15: Syntax error near '3'
5 Error type B at Line 16: Syntax error near '.'
6 Error type B at Line 18: Syntax error near '}'
```

2.2.3 说明

1. `struct b`缺少结构名`Point`。
2. 变量只能在每一个语句块的开头定义。
3. `main(void)`不是合法的函数定义。
4. `0.12.3`和`.20`都不是合法浮点数。(注：识别为 A、B 类错误均可。)
5. `return 0`后缺少分号。

3 C 组测试用例

本组测试用例共 2 个，不包含任何错误，需要输出正确的语法树。除特殊说明外，应与给出的语法树完全相同。语法树打印错误酌情扣分。

3.1 C-1

3.1.1 输入

```
float matrixMultiply(int matrix1[3][2], int matrix2[2][3], int result
    [3][3]) {
  int i = 0;
  while (i < 3) {
    int j = 0;
    while (j < 3) {
      int k = 0;
      result[i][j] = 0;
      while (k < 2) {
        result[i][j] = result[i][j] + matrix1[i][k] * matrix2[k][j];
        k = k + 1;
      }
      j = j + 1;
    }
    i = i + 1;
  }
  return -0.0;
}

int main() {
  int matrix1[3][2];
  int matrix2[2][3];
  int result[3][3];
  matrixMultiply(matrix1, matrix2, result);
  return 0;
}
```

3.1.2 输出

```
Program (1)
  ExtDefList (1)
    ExtDef (1)
      Specifier (1)
        TYPE: float
```

```
6         FunDec (1)
7           ID: matrixMultiply
8           LP
9           VarList (1)
10            ParamDec (1)
11              Specifier (1)
12                TYPE: int
13              VarDec (1)
14                VarDec (1)
15                  VarDec (1)
16                    ID: matrix1
17                  LB
18                  INT: 3
19                  RB
20                LB
21                INT: 2
22                RB
23            COMMA
24            VarList (1)
25              ParamDec (1)
26                Specifier (1)
27                  TYPE: int
28                VarDec (1)
29                  VarDec (1)
30                    VarDec (1)
31                      ID: matrix2
32                    LB
33                    INT: 2
34                    RB
35                  LB
36                  INT: 3
37                  RB
38              COMMA
39              VarList (1)
40                ParamDec (1)
41                  Specifier (1)
42                    TYPE: int
```

```
43                VarDec (1)
44                  VarDec (1)
45                    VarDec (1)
46                      ID: result
47                    LB
48                    INT: 3
49                    RB
50                  LB
51                  INT: 3
52                  RB
53          RP
54        CompSt (1)
55          LC
56          DefList (2)
57            Def (2)
58              Specifier (2)
59                TYPE: int
60              DecList (2)
61                Dec (2)
62                  VarDec (2)
63                    ID: i
64                  ASSIGNOP
65                  Exp (2)
66                    INT: 0
67              SEMI
68          StmtList (3)
69            Stmt (3)
70              WHILE
71              LP
72              Exp (3)
73                Exp (3)
74                  ID: i
75                RELOP
76                Exp (3)
77                  INT: 3
78              RP
79              Stmt (3)
```

```
80                CompSt (3)
81                  LC
82                  DefList (4)
83                    Def (4)
84                      Specifier (4)
85                        TYPE: int
86                      DecList (4)
87                        Dec (4)
88                          VarDec (4)
89                            ID: j
90                          ASSIGNOP
91                          Exp (4)
92                            INT: 0
93                      SEMI
94                  StmtList (5)
95                    Stmt (5)
96                      WHILE
97                      LP
98                      Exp (5)
99                        Exp (5)
100                         ID: j
101                       RELOP
102                       Exp (5)
103                         INT: 3
104                     RP
105                     Stmt (5)
106                       CompSt (5)
107                         LC
108                         DefList (6)
109                           Def (6)
110                             Specifier (6)
111                               TYPE: int
112                             DecList (6)
113                               Dec (6)
114                                 VarDec (6)
115                                   ID: k
116                                 ASSIGNOP
```

```
                Exp (6)
                  INT: 0
              SEMI
            StmtList (7)
              Stmt (7)
                Exp (7)
                  Exp (7)
                    Exp (7)
                      Exp (7)
                        ID: result
                      LB
                      Exp (7)
                        ID: i
                      RB
                    LB
                    Exp (7)
                      ID: j
                    RB
                  ASSIGNOP
                  Exp (7)
                    INT: 0
                SEMI
              StmtList (8)
                Stmt (8)
                  WHILE
                  LP
                  Exp (8)
                    Exp (8)
                      ID: k
                    RELOP
                    Exp (8)
                      INT: 2
                  RP
                  Stmt (8)
                    CompSt (8)
                      LC
                      StmtList (9)
```

```
Stmt (9)
  Exp (9)
    Exp (9)
      Exp (9)
        Exp (9)
          Exp (9)
            ID: result
          LB
          Exp (9)
            ID: i
          RB
        LB
        Exp (9)
          ID: j
        RB
      ASSIGNOP
      Exp (9)
        Exp (9)
          Exp (9)
            Exp (9)
              ID: result
            LB
            Exp (9)
              ID: i
            RB
          LB
          Exp (9)
            ID: j
          RB
        PLUS
        Exp (9)
          Exp (9)
            Exp (9)
              Exp (9)
                ID: matrix1
              LB
              Exp (9)
                ID: i
```

```
                                    RB
                                  LB
                                  Exp (9)
                                    ID: k
                                  RB
                                STAR
                                Exp (9)
                                  Exp (9)
                                    Exp (9)
                                      ID: matrix2
                                    LB
                                    Exp (9)
                                      ID: k
                                    RB
                                  LB
                                  Exp (9)
                                    ID: j
                                  RB
                            SEMI
                          StmtList (10)
                            Stmt (10)
                              Exp (10)
                                Exp (10)
                                  ID: k
                                ASSIGNOP
                                Exp (10)
                                  Exp (10)
                                    ID: k
                                  PLUS
                                  Exp (10)
                                    INT: 1
                              SEMI
                        RC
                    StmtList (12)
                      Stmt (12)
                        Exp (12)
                          Exp (12)
```

```
                                    ID: j
                                  ASSIGNOP
                                  Exp (12)
                                    Exp (12)
                                      ID: j
                                    PLUS
                                    Exp (12)
                                      INT: 1
                                SEMI
                        RC
                  StmtList (14)
                    Stmt (14)
                      Exp (14)
                        Exp (14)
                          ID: i
                        ASSIGNOP
                        Exp (14)
                          Exp (14)
                            ID: i
                          PLUS
                          Exp (14)
                            INT: 1
                      SEMI
                RC
          StmtList (16)
            Stmt (16)
              RETURN
              Exp (16)
                MINUS
                Exp (16)
                  FLOAT: 0.000000
              SEMI
        RC
    ExtDefList (19)
      ExtDef (19)
        Specifier (19)
          TYPE: int
```

```
265         FunDec (19)
266           ID: main
267           LP
268           RP
269         CompSt (19)
270           LC
271           DefList (20)
272             Def (20)
273               Specifier (20)
274                 TYPE: int
275               DecList (20)
276                 Dec (20)
277                   VarDec (20)
278                     VarDec (20)
279                       VarDec (20)
280                         ID: matrix1
281                       LB
282                       INT: 3
283                       RB
284                     LB
285                     INT: 2
286                     RB
287               SEMI
288             DefList (21)
289               Def (21)
290                 Specifier (21)
291                   TYPE: int
292                 DecList (21)
293                   Dec (21)
294                     VarDec (21)
295                       VarDec (21)
296                         VarDec (21)
297                           ID: matrix2
298                         LB
299                         INT: 2
300                         RB
301                       LB
```

```
                    INT: 3
                    RB
                SEMI
              DefList (22)
                Def (22)
                  Specifier (22)
                    TYPE: int
                  DecList (22)
                    Dec (22)
                      VarDec (22)
                        VarDec (22)
                          VarDec (22)
                            ID: result
                          LB
                          INT: 3
                          RB
                        LB
                        INT: 3
                        RB
                  SEMI
            StmtList (23)
              Stmt (23)
                Exp (23)
                  ID: matrixMultiply
                  LP
                  Args (23)
                    Exp (23)
                      ID: matrix1
                    COMMA
                    Args (23)
                      Exp (23)
                        ID: matrix2
                      COMMA
                      Args (23)
                        Exp (23)
                          ID: result
                  RP
```

```
            SEMI
          StmtList (24)
            Stmt (24)
              RETURN
              Exp (24)
                INT: 0
              SEMI
        RC
```

3.2 C-2

3.2.1 输入

```c
int minDistance(int dist[6], int visited[6]) {
  int min = 2147483647, min_index, v = 0;
  while (v < 6) {
    if (!visited[v] && dist[v] <= min) {
      min = dist[v];
      min_index = v;
    }
    v = v + 1;
  }
  return min_index;
}

int dijkstra(int graph[6][6], int src) {
  int dist[6];
  int visited[6];
  int i = 0;
  int count = 0;

  while (i < 6) {
    dist[i] = 2147483647;
    visited[i] = 0;
    i = i + 1;
  }

  dist[src] = 0;
```

```
26
27    while (count < 6 - 1) {
28      int v = 0, u = minDistance(dist, visited);
29      visited[u] = 1;
30
31      while (v < 6) {
32        if (!visited[v] && graph[u][v] && dist[u] != 2147483647 &&
33            dist[u] + graph[u][v] < dist[v]) {
34          dist[v] = dist[u] + graph[u][v];
35        }
36        v = v + 1;
37      }
38      count = count + 1;
39    }
40    return 0;
41  }
42
43  int main() {
44    int graph[6][6];
45    dijkstra(graph, 0);
46    return 0;
47  }
```

3.2.2 输出

```
1   Program (1)
2     ExtDefList (1)
3       ExtDef (1)
4         Specifier (1)
5           TYPE: int
6         FunDec (1)
7           ID: minDistance
8           LP
9           VarList (1)
10            ParamDec (1)
11              Specifier (1)
12                TYPE: int
```

```
13            VarDec (1)
14              VarDec (1)
15                ID: dist
16              LB
17              INT: 6
18              RB
19          COMMA
20          VarList (1)
21            ParamDec (1)
22              Specifier (1)
23                TYPE: int
24              VarDec (1)
25                VarDec (1)
26                  ID: visited
27                LB
28                INT: 6
29                RB
30        RP
31      CompSt (1)
32        LC
33        DefList (2)
34          Def (2)
35            Specifier (2)
36              TYPE: int
37            DecList (2)
38              Dec (2)
39                VarDec (2)
40                  ID: min
41                ASSIGNOP
42                Exp (2)
43                  INT: 2147483647
44              COMMA
45              DecList (2)
46                Dec (2)
47                  VarDec (2)
48                    ID: min_index
49                COMMA
```

```
            DecList (2)
              Dec (2)
                VarDec (2)
                  ID: v
                ASSIGNOP
                Exp (2)
                  INT: 0
          SEMI
        StmtList (3)
          Stmt (3)
            WHILE
            LP
            Exp (3)
              Exp (3)
                ID: v
              RELOP
              Exp (3)
                INT: 6
            RP
            Stmt (3)
              CompSt (3)
                LC
                StmtList (4)
                  Stmt (4)
                    IF
                    LP
                    Exp (4)
                      Exp (4)
                        NOT
                        Exp (4)
                          Exp (4)
                            ID: visited
                          LB
                          Exp (4)
                            ID: v
                          RB
                      AND
```

```
    Exp (4)
      Exp (4)
        Exp (4)
          ID: dist
        LB
        Exp (4)
          ID: v
        RB
      RELOP
      Exp (4)
        ID: min
  RP
  Stmt (4)
    CompSt (4)
      LC
      StmtList (5)
        Stmt (5)
          Exp (5)
            Exp (5)
              ID: min
            ASSIGNOP
            Exp (5)
              Exp (5)
                ID: dist
              LB
              Exp (5)
                ID: v
              RB
          SEMI
        StmtList (6)
          Stmt (6)
            Exp (6)
              Exp (6)
                ID: min_index
              ASSIGNOP
              Exp (6)
                ID: v
```

```
                                SEMI
                            RC
                        StmtList (8)
                          Stmt (8)
                            Exp (8)
                              Exp (8)
                                ID: v
                              ASSIGNOP
                              Exp (8)
                                Exp (8)
                                  ID: v
                                PLUS
                                Exp (8)
                                  INT: 1
                            SEMI
                    RC
                StmtList (10)
                  Stmt (10)
                    RETURN
                    Exp (10)
                      ID: min_index
                    SEMI
            RC
        ExtDefList (13)
          ExtDef (13)
            Specifier (13)
              TYPE: int
            FunDec (13)
              ID: dijkstra
              LP
              VarList (13)
                ParamDec (13)
                  Specifier (13)
                    TYPE: int
                  VarDec (13)
                    VarDec (13)
                      VarDec (13)
```

```
                    ID: graph
                  LB
                  INT: 6
                  RB
                LB
                INT: 6
                RB
            COMMA
            VarList (13)
              ParamDec (13)
                Specifier (13)
                  TYPE: int
                VarDec (13)
                  ID: src
          RP
        CompSt (13)
          LC
          DefList (14)
            Def (14)
              Specifier (14)
                TYPE: int
              DecList (14)
                Dec (14)
                  VarDec (14)
                    VarDec (14)
                      ID: dist
                    LB
                    INT: 6
                    RB
              SEMI
            DefList (15)
              Def (15)
                Specifier (15)
                  TYPE: int
                DecList (15)
                  Dec (15)
                    VarDec (15)
```

```
                    VarDec (15)
                      ID: visited
                    LB
                    INT: 6
                    RB
                SEMI
              DefList (16)
                Def (16)
                  Specifier (16)
                    TYPE: int
                  DecList (16)
                    Dec (16)
                      VarDec (16)
                        ID: i
                      ASSIGNOP
                      Exp (16)
                        INT: 0
                  SEMI
                DefList (17)
                  Def (17)
                    Specifier (17)
                      TYPE: int
                    DecList (17)
                      Dec (17)
                        VarDec (17)
                          ID: count
                        ASSIGNOP
                        Exp (17)
                          INT: 0
                  SEMI
            StmtList (19)
              Stmt (19)
                WHILE
                LP
                Exp (19)
                  Exp (19)
                    ID: i
```

```
    RELOP
    Exp (19)
      INT: 6
  RP
  Stmt (19)
    CompSt (19)
      LC
      StmtList (20)
        Stmt (20)
          Exp (20)
            Exp (20)
              Exp (20)
                ID: dist
              LB
              Exp (20)
                ID: i
              RB
            ASSIGNOP
            Exp (20)
              INT: 2147483647
          SEMI
        StmtList (21)
          Stmt (21)
            Exp (21)
              Exp (21)
                Exp (21)
                  ID: visited
                LB
                Exp (21)
                  ID: i
                RB
              ASSIGNOP
              Exp (21)
                INT: 0
            SEMI
          StmtList (22)
            Stmt (22)
```

```
                        Exp (22)
                          Exp (22)
                            ID: i
                          ASSIGNOP
                          Exp (22)
                            Exp (22)
                              ID: i
                            PLUS
                            Exp (22)
                              INT: 1
                        SEMI
              RC
          StmtList (25)
            Stmt (25)
              Exp (25)
                Exp (25)
                  Exp (25)
                    ID: dist
                  LB
                  Exp (25)
                    ID: src
                  RB
                ASSIGNOP
                Exp (25)
                  INT: 0
              SEMI
            StmtList (27)
              Stmt (27)
                WHILE
                LP
                Exp (27)
                  Exp (27)
                    ID: count
                  RELOP
                  Exp (27)
                    Exp (27)
                      INT: 6
```

```
        MINUS
        Exp (27)
          INT: 1
      RP
      Stmt (27)
        CompSt (27)
          LC
          DefList (28)
            Def (28)
              Specifier (28)
                TYPE: int
              DecList (28)
                Dec (28)
                  VarDec (28)
                    ID: v
                  ASSIGNOP
                  Exp (28)
                    INT: 0
                COMMA
                DecList (28)
                  Dec (28)
                    VarDec (28)
                      ID: u
                    ASSIGNOP
                    Exp (28)
                      ID: minDistance
                      LP
                      Args (28)
                        Exp (28)
                          ID: dist
                        COMMA
                        Args (28)
                          Exp (28)
                            ID: visited
                      RP
              SEMI
          StmtList (29)
```

```
Stmt (29)
  Exp (29)
    Exp (29)
      Exp (29)
        ID: visited
      LB
      Exp (29)
        ID: u
      RB
    ASSIGNOP
    Exp (29)
      INT: 1
  SEMI
StmtList (31)
  Stmt (31)
    WHILE
    LP
    Exp (31)
      Exp (31)
        ID: v
      RELOP
      Exp (31)
        INT: 6
    RP
    Stmt (31)
      CompSt (31)
        LC
        StmtList (32)
          Stmt (32)
            IF
            LP
            Exp (32)
              Exp (32)
                Exp (32)
                  Exp (32)
                    NOT
                    Exp (32)
```

```
                Exp (32)
                  ID: visited
                LB
                Exp (32)
                  ID: v
                RB
              AND
              Exp (32)
                Exp (32)
                  Exp (32)
                    ID: graph
                  LB
                  Exp (32)
                    ID: u
                  RB
                LB
                Exp (32)
                  ID: v
                RB
            AND
            Exp (32)
              Exp (32)
                Exp (32)
                  ID: dist
                LB
                Exp (32)
                  ID: u
                RB
              RELOP
              Exp (32)
                INT: 2147483647
        AND
        Exp (33)
          Exp (33)
            Exp (33)
              Exp (33)
                ID: dist
```

```
          LB
          Exp (33)
            ID: u
          RB
        PLUS
        Exp (33)
          Exp (33)
            Exp (33)
              ID: graph
            LB
            Exp (33)
              ID: u
            RB
          LB
          Exp (33)
            ID: v
          RB
      RELOP
      Exp (33)
        Exp (33)
          ID: dist
        LB
        Exp (33)
          ID: v
        RB
    RP
    Stmt (33)
      CompSt (33)
        LC
        StmtList (34)
          Stmt (34)
            Exp (34)
              Exp (34)
                Exp (34)
                  ID: dist
                LB
                Exp (34)
```

```
                    ID: v
                  RB
                ASSIGNOP
                Exp (34)
                  Exp (34)
                    Exp (34)
                      ID: dist
                    LB
                    Exp (34)
                      ID: u
                    RB
                  PLUS
                  Exp (34)
                    Exp (34)
                      Exp (34)
                        ID: graph
                      LB
                      Exp (34)
                        ID: u
                      RB
                    LB
                    Exp (34)
                      ID: v
                    RB
              SEMI
          RC
    StmtList (36)
      Stmt (36)
        Exp (36)
          Exp (36)
            ID: v
          ASSIGNOP
          Exp (36)
            Exp (36)
              ID: v
            PLUS
            Exp (36)
```

```
                                                INT: 1
                                            SEMI
                                        RC
                                    StmtList (38)
                                      Stmt (38)
                                        Exp (38)
                                          Exp (38)
                                            ID: count
                                          ASSIGNOP
                                          Exp (38)
                                            Exp (38)
                                              ID: count
                                            PLUS
                                            Exp (38)
                                              INT: 1
                                        SEMI
                            RC
                        StmtList (40)
                          Stmt (40)
                            RETURN
                            Exp (40)
                              INT: 0
                            SEMI
                    RC
                ExtDefList (43)
                  ExtDef (43)
                    Specifier (43)
                      TYPE: int
                    FunDec (43)
                      ID: main
                      LP
                      RP
                    CompSt (43)
                      LC
                      DefList (44)
                        Def (44)
                          Specifier (44)
```

```
                TYPE: int
              DecList (44)
                Dec (44)
                  VarDec (44)
                    VarDec (44)
                      VarDec (44)
                        ID: graph
                      LB
                      INT: 6
                      RB
                    LB
                    INT: 6
                    RB
              SEMI
          StmtList (45)
            Stmt (45)
              Exp (45)
                ID: dijkstra
                LP
                Args (45)
                  Exp (45)
                    ID: graph
                  COMMA
                  Args (45)
                    Exp (45)
                      INT: 0
                RP
              SEMI
            StmtList (46)
              Stmt (46)
                RETURN
                Exp (46)
                  INT: 0
                SEMI
          RC
```

4 D 组测试用例

本组测试用例共 3 个，针对不同分组进行测试。对应分组的同学需要输出语法树，提示错误则不得分；其他分组的同学只需要在对应位置提示错误即可，如果打印了语法树，则将视为违规，将会倒扣分。

4.1 D-1

4.1.1 输入

```
int main() {
  int oct1 = 0123;
  int hex1 = 0xAdA0f12;
  int hex2 = 0Xf1b3;
  int oct2 = 0007;

  int hex4 = hex1 + hex2;
  oct2 = !(-oct1);

  return 0;
}
```

4.1.2 输出

```
Program (1)
  ExtDefList (1)
    ExtDef (1)
      Specifier (1)
        TYPE: int
      FunDec (1)
        ID: main
        LP
        RP
      CompSt (1)
        LC
        DefList (2)
          Def (2)
            Specifier (2)
              TYPE: int
```

```
16              DecList (2)
17                Dec (2)
18                  VarDec (2)
19                    ID: oct1
20                  ASSIGNOP
21                  Exp (2)
22                    INT: 83
23                SEMI
24              DefList (3)
25                Def (3)
26                  Specifier (3)
27                    TYPE: int
28                  DecList (3)
29                    Dec (3)
30                      VarDec (3)
31                        ID: hex1
32                      ASSIGNOP
33                      Exp (3)
34                        INT: 182062866
35                  SEMI
36                DefList (4)
37                  Def (4)
38                    Specifier (4)
39                      TYPE: int
40                    DecList (4)
41                      Dec (4)
42                        VarDec (4)
43                          ID: hex2
44                        ASSIGNOP
45                        Exp (4)
46                          INT: 61875
47                    SEMI
48                  DefList (5)
49                    Def (5)
50                      Specifier (5)
51                        TYPE: int
52                      DecList (5)
```

```
                    Dec (5)
                      VarDec (5)
                        ID: oct2
                      ASSIGNOP
                      Exp (5)
                        INT: 7
                  SEMI
                DefList (7)
                  Def (7)
                    Specifier (7)
                      TYPE: int
                    DecList (7)
                      Dec (7)
                        VarDec (7)
                          ID: hex4
                        ASSIGNOP
                        Exp (7)
                          Exp (7)
                            ID: hex1
                          PLUS
                          Exp (7)
                            ID: hex2
                    SEMI
          StmtList (8)
            Stmt (8)
              Exp (8)
                Exp (8)
                  ID: oct2
                ASSIGNOP
                Exp (8)
                  NOT
                  Exp (8)
                    LP
                    Exp (8)
                      MINUS
                      Exp (8)
                        ID: oct1
```

```
                    RP
              SEMI
            StmtList (10)
              Stmt (10)
                RETURN
                Exp (10)
                  INT: 0
                SEMI
          RC
```

4.1.3 说明

1.1 分组的同学需要输出正确的语法树，八进制和十六进制数必须正确转换。

其它分组的同学要提示相应的错误，示例如下。（注：识别为 A、B 类错误均可。）

```
Error type A at Line 2: Illegal INT number '0123'.
Error type A at Line 3: Illegal ID '0xAdA0f12'.
Error type A at Line 4: Illegal ID '0Xf1b3'.
Error type A at Line 5: Illegal INT number '0007'.
```

4.2 D-2

4.2.1 输入

```
int main() {
  float num1 = 0.23e-4;
  float num2 = -9.99E6;
}
```

4.2.2 输出

```
Program (1)
  ExtDefList (1)
    ExtDef (1)
      Specifier (1)
        TYPE: int
      FunDec (1)
        ID: main
        LP
```

```
    RP
  CompSt (1)
    LC
    DefList (2)
      Def (2)
        Specifier (2)
          TYPE: float
        DecList (2)
          Dec (2)
            VarDec (2)
              ID: num1
            ASSIGNOP
            Exp (2)
              FLOAT: 0.000023
        SEMI
      DefList (3)
        Def (3)
          Specifier (3)
            TYPE: float
          DecList (3)
            Dec (3)
              VarDec (3)
                ID: num2
              ASSIGNOP
              Exp (3)
                MINUS
                Exp (3)
                  FLOAT: 9990000.000000
          SEMI
    RC
```

4.2.3 说明

1.2 分组的同学需要输出正确的语法树，注意科学计数法浮点数的正确转换。其它分组的同学要提示相应的错误，识别为 A、B 类错误均可。

4.3 D-3

4.3.1 输入

```
/* This is a test program. */

int main() {
  // This is a comment line.
  int x = 5; // let x be 5

  return /* return value */ 0;
}
```

4.3.2 输出

```
Program (3)
  ExtDefList (3)
    ExtDef (3)
      Specifier (3)
        TYPE: int
      FunDec (3)
        ID: main
        LP
        RP
      CompSt (3)
        LC
        DefList (5)
          Def (5)
            Specifier (5)
              TYPE: int
            DecList (5)
              Dec (5)
                VarDec (5)
                  ID: x
                ASSIGNOP
                Exp (5)
                  INT: 5
            SEMI
```

```
        StmtList (7)
          Stmt (7)
            RETURN
            Exp (7)
              INT: 0
            SEMI
        RC
```

4.3.3 说明

1.3 分组的同学需要输出正确的语法树，不能提示有语法错误；其它分组的同学只要提示相应的错误（不输出语法树）即可。（注：识别为 A、B 类错误均可。）

5 E 组测试用例

本组测试用例共 6 个，针对不同分组进行测试。其中：

- E1-x 针对 1.1 分组的同学。
- E2-x 针对 1.2 分组的同学。
- E3-x 针对 1.3 分组的同学。

5.1 E1-1

5.1.1 输入

```c
int foo(int a, int b) {
  int bar = 01234 * a || b;
  return bar + 0xdead;
}

int main() {
  int octal_num = 012;
  int hex_num = 0x1A;
  int sum = octal_num + hex_num;
  hex_num = foo(octal_num, sum);

  return 0;
}
```

5.1.2 输出

```
Program (1)
  ExtDefList (1)
    ExtDef (1)
      Specifier (1)
        TYPE: int
      FunDec (1)
        ID: foo
        LP
        VarList (1)
          ParamDec (1)
            Specifier (1)
              TYPE: int
            VarDec (1)
              ID: a
          COMMA
          VarList (1)
            ParamDec (1)
              Specifier (1)
                TYPE: int
              VarDec (1)
                ID: b
        RP
      CompSt (1)
        LC
        DefList (2)
          Def (2)
            Specifier (2)
              TYPE: int
            DecList (2)
              Dec (2)
                VarDec (2)
                  ID: bar
                ASSIGNOP
                Exp (2)
                  Exp (2)
                    Exp (2)
```

```
                    INT: 668
                  STAR
                  Exp (2)
                    ID: a
                OR
                Exp (2)
                  ID: b
            SEMI
        StmtList (3)
          Stmt (3)
            RETURN
            Exp (3)
              Exp (3)
                ID: bar
              PLUS
              Exp (3)
                INT: 57005
            SEMI
        RC
    ExtDefList (6)
      ExtDef (6)
        Specifier (6)
          TYPE: int
        FunDec (6)
          ID: main
          LP
          RP
        CompSt (6)
          LC
          DefList (7)
            Def (7)
              Specifier (7)
                TYPE: int
              DecList (7)
                Dec (7)
                  VarDec (7)
                    ID: octal_num
```

```
                ASSIGNOP
                Exp (7)
                  INT: 10
              SEMI
            DefList (8)
              Def (8)
                Specifier (8)
                  TYPE: int
                DecList (8)
                  Dec (8)
                    VarDec (8)
                      ID: hex_num
                    ASSIGNOP
                    Exp (8)
                      INT: 26
              SEMI
              DefList (9)
                Def (9)
                  Specifier (9)
                    TYPE: int
                  DecList (9)
                    Dec (9)
                      VarDec (9)
                        ID: sum
                      ASSIGNOP
                      Exp (9)
                        Exp (9)
                          ID: octal_num
                        PLUS
                        Exp (9)
                          ID: hex_num
                SEMI
          StmtList (10)
            Stmt (10)
              Exp (10)
                Exp (10)
                  ID: hex_num
```

```
111                 ASSIGNOP
112                 Exp (10)
113                   ID: foo
114                   LP
115                   Args (10)
116                     Exp (10)
117                       ID: octal_num
118                     COMMA
119                     Args (10)
120                       Exp (10)
121                         ID: sum
122                   RP
123               SEMI
124             StmtList (12)
125               Stmt (12)
126                 RETURN
127                 Exp (12)
128                   INT: 0
129                 SEMI
130           RC
```

5.2 E1-2

5.2.1 输入

```
1  int main() {
2    int x = 0123456789;
3    int y = 0XABCdefGHI;
4    float result = sqrt(pow(x, 2) + pow(y, 2)) / (x + y) - pow(x * y,
       2);
5
6    return 0;
7  }
```

5.2.2 输出

```
1  Error type B at Line 2: Syntax error near '89'
2  Error type B at Line 3: Syntax error near 'GHI'
```

5.2.3 说明

识别为 A、B 类错误均可。

5.3 E2-1

5.3.1 输入

```
int main() {
  float PI = 0314159.e-5;
  float radius = 6.250e1;
  float volume = (4.0 / 3.0) * PI * radius * radius * radius;

  float length = 2.5e-03 / 3.54 + -(-123.0E-3);
  float width = 1.88E2 + 100 * .57e-1;
  float perimeter = 2 * (length + width);
  float area = length * width;

  return 0;
}
```

5.3.2 输出

```
Program (1)
  ExtDefList (1)
    ExtDef (1)
      Specifier (1)
        TYPE: int
      FunDec (1)
        ID: main
        LP
        RP
      CompSt (1)
        LC
        DefList (2)
          Def (2)
            Specifier (2)
              TYPE: float
            DecList (2)
```

```
17              Dec (2)
18                VarDec (2)
19                  ID: PI
20                ASSIGNOP
21                Exp (2)
22                  FLOAT: 3.141590
23            SEMI
24          DefList (3)
25            Def (3)
26              Specifier (3)
27                TYPE: float
28              DecList (3)
29                Dec (3)
30                  VarDec (3)
31                    ID: radius
32                  ASSIGNOP
33                  Exp (3)
34                    FLOAT: 62.500000
35              SEMI
36            DefList (4)
37              Def (4)
38                Specifier (4)
39                  TYPE: float
40                DecList (4)
41                  Dec (4)
42                    VarDec (4)
43                      ID: volume
44                    ASSIGNOP
45                    Exp (4)
46                      Exp (4)
47                        Exp (4)
48                          Exp (4)
49                            Exp (4)
50                              LP
51                              Exp (4)
52                                Exp (4)
53                                  FLOAT: 4.000000
```

```
                            DIV
                            Exp (4)
                              FLOAT: 3.000000
                          RP
                        STAR
                        Exp (4)
                          ID: PI
                      STAR
                      Exp (4)
                        ID: radius
                    STAR
                    Exp (4)
                      ID: radius
                  STAR
                  Exp (4)
                    ID: radius
    SEMI
  DefList (6)
    Def (6)
      Specifier (6)
        TYPE: float
      DecList (6)
        Dec (6)
          VarDec (6)
            ID: length
          ASSIGNOP
          Exp (6)
            Exp (6)
              Exp (6)
                FLOAT: 0.002500
              DIV
              Exp (6)
                FLOAT: 3.540000
            PLUS
            Exp (6)
              MINUS
              Exp (6)
```

```
                    LP
                    Exp (6)
                      MINUS
                      Exp (6)
                        FLOAT: 0.123000
                    RP
                SEMI
              DefList (7)
                Def (7)
                  Specifier (7)
                    TYPE: float
                  DecList (7)
                    Dec (7)
                      VarDec (7)
                        ID: width
                      ASSIGNOP
                      Exp (7)
                        Exp (7)
                          FLOAT: 188.000000
                        PLUS
                        Exp (7)
                          Exp (7)
                            INT: 100
                          STAR
                          Exp (7)
                            FLOAT: 0.057000
                SEMI
                DefList (8)
                  Def (8)
                    Specifier (8)
                      TYPE: float
                    DecList (8)
                      Dec (8)
                        VarDec (8)
                          ID: perimeter
                        ASSIGNOP
                        Exp (8)
```

```
                            Exp (8)
                              INT: 2
                            STAR
                            Exp (8)
                              LP
                              Exp (8)
                                Exp (8)
                                  ID: length
                                PLUS
                                Exp (8)
                                  ID: width
                              RP
                        SEMI
                      DefList (9)
                        Def (9)
                          Specifier (9)
                            TYPE: float
                          DecList (9)
                            Dec (9)
                              VarDec (9)
                                ID: area
                              ASSIGNOP
                              Exp (9)
                                Exp (9)
                                  ID: length
                                STAR
                                Exp (9)
                                  ID: width
                        SEMI
          StmtList (11)
            Stmt (11)
              RETURN
              Exp (11)
                INT: 0
              SEMI
          RC
```

5.4 E2-2

5.4.1 输入

```
int main() {
  float length = 9.8e1.;
  float width = 6e5;

  return 0;
}
```

5.4.2 输出

```
Error type B at Line 2: Syntax error near ';'
Error type B at Line 3: Syntax error near 'e5'
```

5.4.3 说明

识别为 A、B 类错误均可。

5.5 E3-1

5.5.1 输入

```
/* 这是一个复杂的注释示例。
   它包含一些特殊符号，例如 / 和 **。这些符号容易造成
   词法分析器 (lexer) 错误。 */
/*./\/\/\
\\\(((**\/./\\(*))))*/
/**********这是一个合法的注释*(**\/*\**\)*/
///****\\\\\/./\\\\../\**

int main() {
  int x = 10; // 这是一个简单的注释。
  int y = 20; /* 这是另一个注释，它包含
                 多行内容。 */

  // /* 以下是一个嵌套注释的示例:
  //    /* 这是嵌套注释的内部注释。
```

```
16    //          注意这里的特殊符号。*/
17    // */
18    /*注释也可以放在行首*/ return /*注释也可以放在语句
19    中*/ 0;
20  }
```

5.5.2 输出

```
1   Program (9)
2     ExtDefList (9)
3       ExtDef (9)
4         Specifier (9)
5           TYPE: int
6         FunDec (9)
7           ID: main
8           LP
9           RP
10        CompSt (9)
11          LC
12          DefList (10)
13            Def (10)
14              Specifier (10)
15                TYPE: int
16              DecList (10)
17                Dec (10)
18                  VarDec (10)
19                    ID: x
20                  ASSIGNOP
21                  Exp (10)
22                    INT: 10
23              SEMI
24            DefList (11)
25              Def (11)
26                Specifier (11)
27                  TYPE: int
28                DecList (11)
29                  Dec (11)
```

```
                    VarDec (11)
                      ID: y
                    ASSIGNOP
                    Exp (11)
                      INT: 20
                SEMI
          StmtList (18)
            Stmt (18)
              RETURN
              Exp (19)
                INT: 0
              SEMI
          RC
```

5.6 E3-2

5.6.1 输入

```
int main() {

  /* 以下是一个非法嵌套注释的示例:
     /* 这是嵌套注释的内部注释。
     注意这里的特殊符号。 */
  */ return 0;
}
```

5.6.2 输出

```
Error type B at Line 6: unexpected right comment '*/'.
```

6 结束语

若对本文档有任何疑议，可写邮件与周意可助教联系，注意同时抄送给许畅老师。