

## Lab 1 Compiler

1. **Lex Version** = flex 2.6.4
2. **Working Platform** = Ubuntu 22.04.4 LTS
3. **Execution Method**

First, you need to Install flex if you don't have it, by using "sudo apt-get install flex", then make a "StudentID.l" file as the Lex Pascal Scanner and a "makefile" file to run the file, then enter "make all" in the terminal, then input "./a.out < inputfile.pas". The result will be printed next.

### 4. How I Deal With an Issue

I deal an issue in the code by searching google for a hint, I also watch youtube video to learn more about regex. I also use the website "regexr.com" to make the syntax and debugging the regex I've created.

### 5. The Problem I Encountered While Writing The Assignment

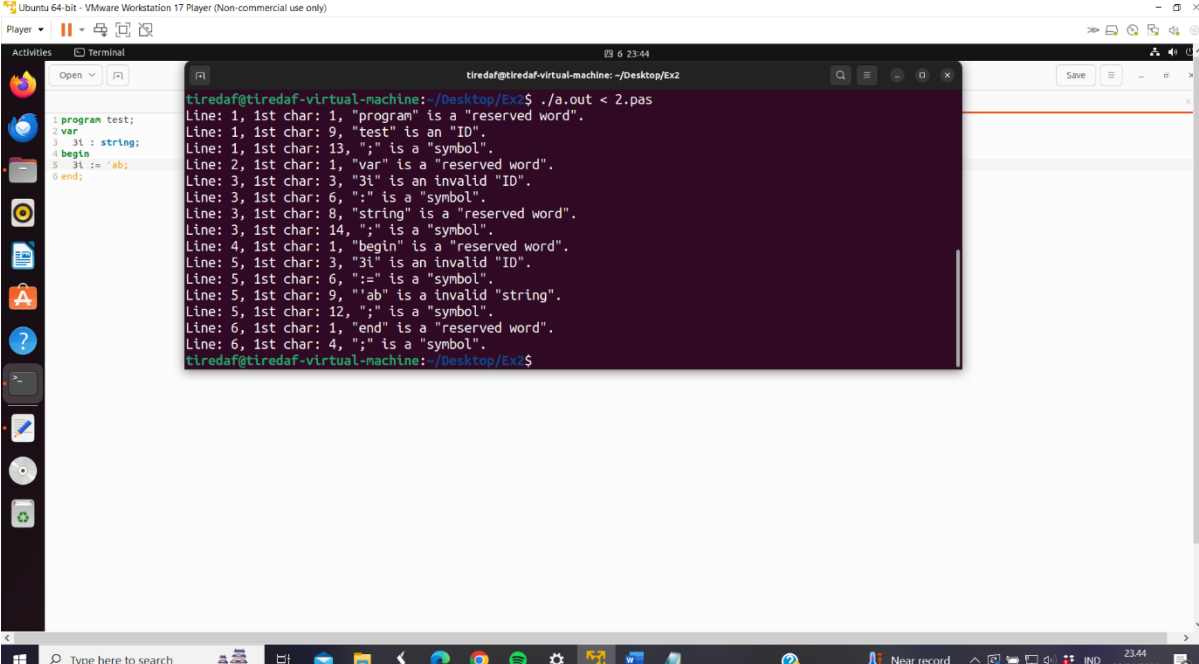
The first problem is when the identifier have a number in it, then the interger can match it, it make the identifier divided into two different entities. I'm pretty confused with the symbol like, ?, +, (), {}, I don't know when the right time to use it but at the end I can figure it out. The last problem is the comment line, it's hard to make the syntax, I spend a lot time here.

### 6. The Results of All Test Case

1.pas

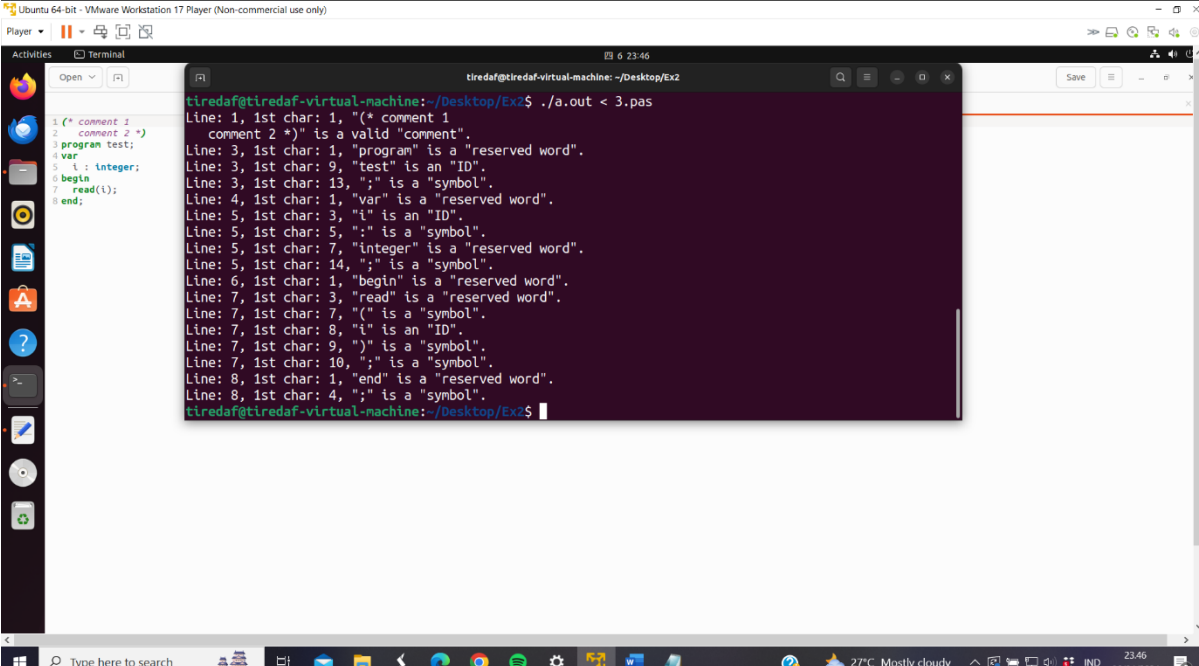
```
tiredaf@tiredaf-virtual-machine: ~/Desktop/Ex2
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$ make clean
rm a.out lex.yy.c
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$ make all
flex -i B103040059.l
gcc lex.yy.c -lfl
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$ ./a.out < 1.pas
Line: 1, 1st char: 1, "program" is a "reserved word".
Line: 1, 1st char: 9, "test" is an "ID".
Line: 1, 1st char: 13, ";" is a "symbol".
Line: 2, 1st char: 1, "var" is a "reserved word".
Line: 3, 1st char: 3, "i" is an "ID".
Line: 3, 1st char: 5, ":" is a "symbol".
Line: 3, 1st char: 7, "integer" is a "reserved word".
Line: 3, 1st char: 14, ";" is a "symbol".
Line: 4, 1st char: 1, "begin" is a "reserved word".
Line: 5, 1st char: 3, "read" is a "reserved word".
Line: 5, 1st char: 7, "(" is a "symbol".
Line: 5, 1st char: 8, "i" is an "ID".
Line: 5, 1st char: 9, ")" is a "symbol".
Line: 5, 1st char: 10, ";" is a "symbol".
Line: 6, 1st char: 1, "end" is a "reserved word".
Line: 6, 1st char: 4, ";" is a "symbol".
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$
```

## 2.pas



```
Ubuntu 64-bit - VMware Workstation 17 Player (Non-commercial use only)
Player
Activities
Terminal
tiredaf@tiredaf-virtual-machine: ~/Desktop/Ex2
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$ ./a.out < 2.pas
Line: 1, 1st char: 1, "program" is a "reserved word".
Line: 1, 1st char: 9, "test" is an "ID".
Line: 1, 1st char: 13, ";" is a "symbol".
Line: 2, 1st char: 1, "var" is a "reserved word".
Line: 2, 1st char: 3, "3i" is an invalid "ID".
Line: 3, 1st char: 3, ":" is a "symbol".
Line: 3, 1st char: 6, "string" is a "reserved word".
Line: 3, 1st char: 14, ";" is a "symbol".
Line: 4, 1st char: 1, "begin" is a "reserved word".
Line: 5, 1st char: 3, "3i" is an invalid "ID".
Line: 5, 1st char: 6, "ab" is a "symbol".
Line: 5, 1st char: 9, "string" is a "reserved word".
Line: 5, 1st char: 12, ";" is a "symbol".
Line: 6, 1st char: 1, "end" is a "reserved word".
Line: 6, 1st char: 4, ";" is a "symbol".
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$
```

## 3.pas



```
Ubuntu 64-bit - VMware Workstation 17 Player (Non-commercial use only)
Player
Activities
Terminal
tiredaf@tiredaf-virtual-machine: ~/Desktop/Ex2
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$ ./a.out < 3.pas
Line: 1, 1st char: 1, "(* comment 1" is a "symbol".
Line: 1, 1st char: 2, "comment 2 *)" is a "symbol".
Line: 3, 1st char: 1, "program" is a "reserved word".
Line: 3, 1st char: 9, "test" is an "ID".
Line: 3, 1st char: 13, ";" is a "symbol".
Line: 4, 1st char: 1, "var" is a "reserved word".
Line: 5, 1st char: 3, "i" is an "ID".
Line: 5, 1st char: 5, ":" is a "symbol".
Line: 5, 1st char: 7, "integer" is a "reserved word".
Line: 5, 1st char: 14, ";" is a "symbol".
Line: 6, 1st char: 1, "begin" is a "reserved word".
Line: 7, 1st char: 3, "read" is a "reserved word".
Line: 7, 1st char: 7, "(" is a "symbol".
Line: 7, 1st char: 8, "i" is an "ID".
Line: 7, 1st char: 9, ")" is a "symbol".
Line: 7, 1st char: 10, ";" is a "symbol".
Line: 8, 1st char: 1, "end" is a "reserved word".
Line: 8, 1st char: 4, ";" is a "symbol".
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$
```

## 4.pas

The screenshot shows a VMware Workstation 17 Player running a Ubuntu 64-bit virtual machine. The interface includes a top menu bar, a left sidebar with application icons, and a bottom status bar. A terminal window is open, displaying the execution of a Pascal program named 'test.pas'. The program's purpose is to identify tokens in the source code and categorize them as reserved words, symbols, or real numbers.

**Source Code (test.pas):**

```
1 program test;  
2 var  
3   f : float;  
4 begin  
5   f := 12.25e+6;  
6 end;
```

**Terminal Output:**

```
tiredaf@tiredaf-virtual-machine: ~/Desktop/Ex2$ ./a.out < 4.pas  
Line: 1, 1st char: 1, "program" is a "reserved word".  
Line: 1, 1st char: 9, "test" is an "ID".  
Line: 1, 1st char: 13, ";" is a "symbol".  
Line: 2, 1st char: 1, "var" is a "reserved word".  
Line: 3, 1st char: 3, "f" is an "ID".  
Line: 3, 1st char: 5, ":" is a "symbol".  
Line: 3, 1st char: 7, "float" is a "reserved word".  
Line: 3, 1st char: 12, ";" is a "symbol".  
Line: 4, 1st char: 1, "begin" is a "reserved word".  
Line: 5, 1st char: 3, "f" is an "ID".  
Line: 5, 1st char: 5, ":=" is a "symbol".  
Line: 5, 1st char: 8, "12.25e+6" is a "real number".  
Line: 5, 1st char: 16, ";" is a "symbol".  
Line: 6, 1st char: 1, "end" is a "reserved word".  
Line: 6, 1st char: 4, ";" is a "symbol".  
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$
```

## 5.pas

The screenshot shows a VMware Workstation 17 Player window. The main window displays a terminal window titled "tiredof-virtual-machine - /Desktop/Ex1\$". The terminal output shows the execution of a C program that tokenizes the input string "program test; var i; integer; s1 s2 s3 s4 s5 : string; begin i := 100; s1 := 'db lab'; s2 := 'you'll see'; s3 := ' '; s4 := '\*\*\*'; s5 := ' '; end;". The output lists each token and its category (e.g., "program" is a reserved word, "test;" is a symbol, "var" is a reserved word, etc.).

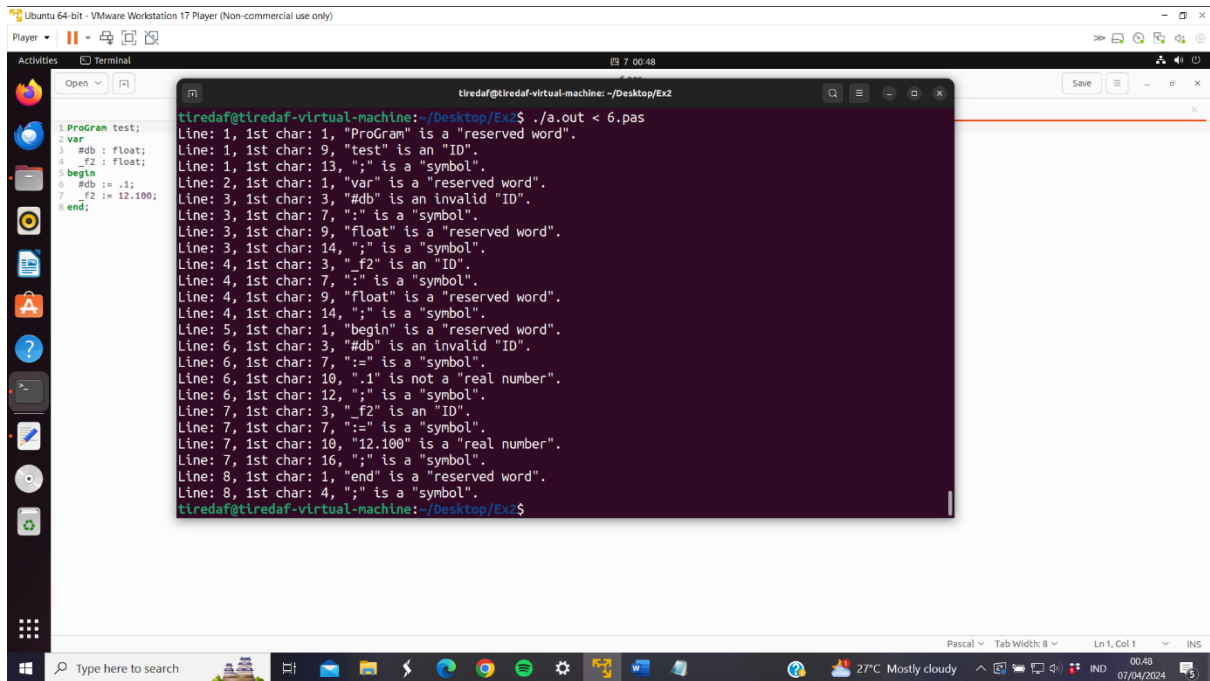
The code editor on the left shows the C source code with syntax highlighting. The code is as follows:

```
1 (* a+b *)
2 program test;
3 var
4   i : integer;
5   s1, s2, s3, s4, s5 : string;
6 begin
7   i := 100;
8   s1 := 'db lab';
9   s2 := 'you'll see';
10  s3 := ' ';
11  s4 := '***';
12  s5 := ' ';
13 end;
```

The terminal output is as follows:

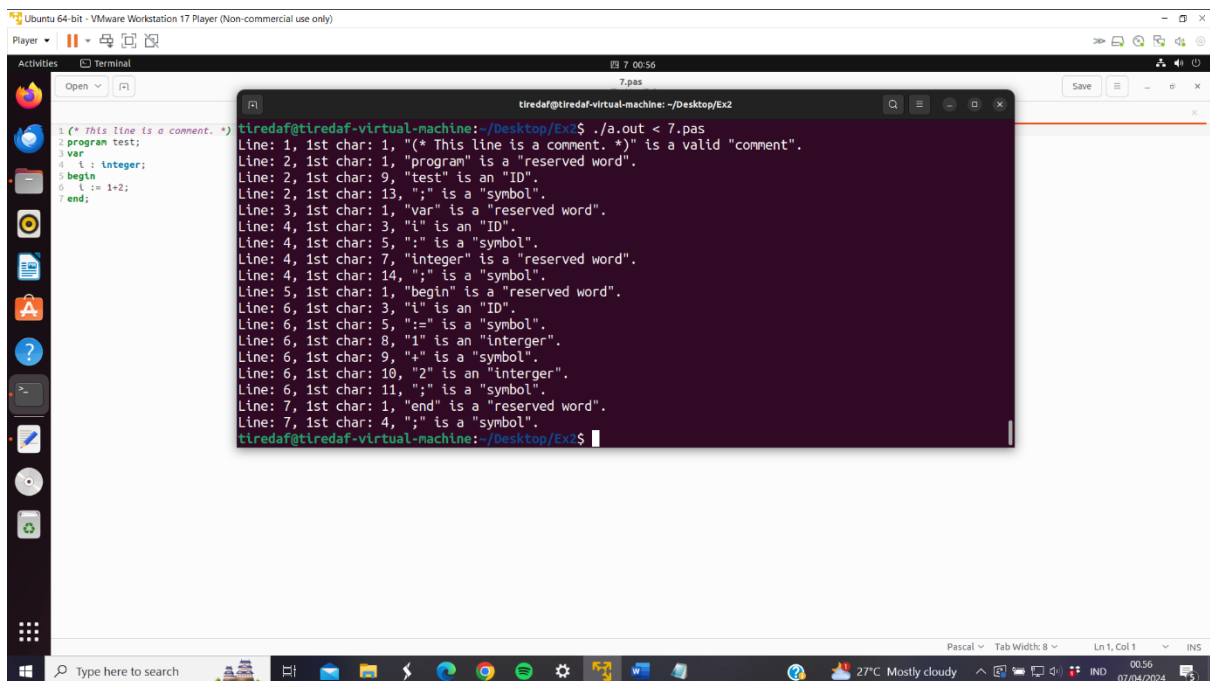
```
Line: 1, 1st char: 1, "(* a+b *)" is a valid "comment".
Line: 2, 1st char: 1, "program" is a "reserved word".
Line: 2, 1st char: 9, "test;" is an "ID".
Line: 2, 1st char: 13, ";" is a "symbol".
Line: 3, 1st char: 1, "var" is a "reserved word".
Line: 3, 1st char: 3, "i" is an "ID".
Line: 4, 1st char: 5, ":" is a "symbol".
Line: 4, 1st char: 7, "integer" is a "reserved word".
Line: 4, 1st char: 14, ";" is a "symbol".
Line: 5, 1st char: 3, "s1" is an "ID".
Line: 5, 1st char: 5, ":" is a "symbol".
Line: 5, 1st char: 7, "integer" is a "reserved word".
Line: 5, 1st char: 14, ";" is a "symbol".
Line: 5, 1st char: 3, "s2" is an "ID".
Line: 5, 1st char: 5, ":" is a "symbol".
Line: 5, 1st char: 7, "s3" is an "ID".
Line: 5, 1st char: 9, ":" is a "symbol".
Line: 5, 1st char: 11, "s4" is an "ID".
Line: 5, 1st char: 13, ":" is a "symbol".
Line: 5, 1st char: 15, "s5" is an "ID".
Line: 5, 1st char: 17, ":" is a "symbol".
Line: 5, 1st char: 19, "string" is a "reserved word".
Line: 5, 1st char: 26, ";" is a "symbol".
Line: 6, 1st char: 1, "begin" is a "reserved word".
Line: 6, 1st char: 3, "i" is an "ID".
Line: 6, 1st char: 5, ":" is a "symbol".
Line: 6, 1st char: 7, "100" is an "integer".
Line: 6, 1st char: 12, ";" is a "symbol".
Line: 6, 1st char: 3, "s1" is an "ID".
Line: 6, 1st char: 5, ":" is a "symbol".
Line: 6, 1st char: 7, "db lab" is a "string".
Line: 6, 1st char: 17, ";" is a "symbol".
Line: 6, 1st char: 3, "s2" is an "ID".
Line: 6, 1st char: 5, ":" is a "symbol".
Line: 6, 1st char: 7, "you'll see" is a "string".
Line: 6, 1st char: 23, ";" is a "symbol".
Line: 6, 1st char: 3, "s3" is an "ID".
Line: 6, 1st char: 5, ":" is a "symbol".
Line: 6, 1st char: 7, " " is a "whitespace".
Line: 6, 1st char: 12, ";" is a "symbol".
Line: 6, 1st char: 3, "s4" is an "ID".
Line: 6, 1st char: 5, ":" is a "symbol".
Line: 6, 1st char: 7, "***" is a "string".
Line: 6, 1st char: 14, ";" is a "symbol".
Line: 6, 1st char: 3, "s5" is an "ID".
Line: 6, 1st char: 5, ":" is a "symbol".
Line: 6, 1st char: 7, " " is a "whitespace".
Line: 6, 1st char: 12, ";" is a "symbol".
Line: 6, 1st char: 3, "end" is a "reserved word".
Line: 6, 1st char: 4, ";" is a "symbol".
```

## 6.pas



```
tiredaf@tiredaf-virtual-machine: ~/Desktop/Ex2
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$ ./a.out < 6.pas
Line: 1, 1st char: 1, "ProGram" is a "reserved word".
Line: 1, 1st char: 9, "test" is an "ID".
Line: 1, 1st char: 13, ";" is a "symbol".
Line: 2, 1st char: 1, "var" is a "reserved word".
Line: 3, 1st char: 3, "#db" is an invalid "ID".
Line: 3, 1st char: 7, ":" is a "symbol".
Line: 3, 1st char: 9, "float" is a "reserved word".
Line: 3, 1st char: 14, ";" is a "symbol".
Line: 4, 1st char: 3, "f2" is an "ID".
Line: 4, 1st char: 7, ":" is a "symbol".
Line: 4, 1st char: 9, "float" is a "reserved word".
Line: 4, 1st char: 14, ";" is a "symbol".
Line: 5, 1st char: 1, "begin" is a "reserved word".
Line: 6, 1st char: 3, "#db" is an invalid "ID".
Line: 6, 1st char: 7, "!=" is a "symbol".
Line: 6, 1st char: 10, ".1" is not a "real number".
Line: 6, 1st char: 12, ";" is a "symbol".
Line: 7, 1st char: 3, "f2" is an "ID".
Line: 7, 1st char: 7, "!=" is a "symbol".
Line: 7, 1st char: 10, "12.100" is a "real number".
Line: 7, 1st char: 16, ";" is a "symbol".
Line: 8, 1st char: 1, "end" is a "reserved word".
Line: 8, 1st char: 4, ";" is a "symbol".
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$
```

## 7. Pas



```
tiredaf@tiredaf-virtual-machine: ~/Desktop/Ex2
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$ ./a.out < 7.pas
Line: 1, 1st char: 1, "(* This line is a comment. *)" is a valid "comment".
Line: 2, 1st char: 1, "program" is a "reserved word".
Line: 2, 1st char: 9, "test" is an "ID".
Line: 2, 1st char: 13, ";" is a "symbol".
Line: 3, 1st char: 1, "var" is a "reserved word".
Line: 4, 1st char: 3, "i" is an "ID".
Line: 4, 1st char: 5, ":" is a "symbol".
Line: 4, 1st char: 7, "integer" is a "reserved word".
Line: 4, 1st char: 14, ";" is a "symbol".
Line: 5, 1st char: 1, "begin" is a "reserved word".
Line: 6, 1st char: 3, "i" is an "ID".
Line: 6, 1st char: 5, "!=" is a "symbol".
Line: 6, 1st char: 8, "1" is an "integer".
Line: 6, 1st char: 9, "+" is a "symbol".
Line: 6, 1st char: 10, "2" is an "integer".
Line: 6, 1st char: 11, ";" is a "symbol".
Line: 7, 1st char: 1, "end" is a "reserved word".
Line: 7, 1st char: 4, ";" is a "symbol".
tiredaf@tiredaf-virtual-machine:~/Desktop/Ex2$
```