Ricardo Deodutt

The code attached is my postfix expression scanner. I chose to write this project in python because its a simple programming language and I have had experience using python to incorporate file reading in my previous CS courses. Since I have some experience with incorporating files with python codes I chose to use this option. Also since you said that if you work with multiple people you would have to do something more special such as reading input from a file so I decided, if I read inputs from a file I would get a better grade because I worked on this project myself.

When running my code in a python IDE you can either run the code by inputting the argument, "python ScannerObject.py" or you can enter in line arguments such as "python ScannerObject.py Test.txt". When typing out the file name be sure to be case sensitive so the IDE can read the file. Once you enter a file name in the command argument and press enter, the code will run and it will output a table with all the Lexemes and Tokens.

Along with putting a file name in the argument, you can also just put the postfix expression in the argument. For example you can enter "python ScannerObject.py A_B_c_+" and it will output all the lexemes and tokens.

If a user inputs "python ScanerObject.py" into the IDE, you would be given the prompt saying "No string or file argument passed" then under that you would be given the option "Do you want to enter a filename? Y/N". The user would have to input Yes or No (or Y or N).

- If a user selects Yes, they would be asked to enter a filename that ends with .txt. If a user successfully enters that file, the code will then read the file and output the table. If a user **unsuccessfully** enters a file name (fails to enter one or incorrect file), the code will say "Failed to open file Exiting", and the code will end once user presses enter. The user will then have to run the program again to try again.
- If a user selects No(no they don't want to enter a filename), They will then be prompted "Do you want to enter a postfix expression".
  - If a user selects yes (they want to enter a postfix expression), they are then given the prompt to enter an expression. The code will then read the users input and output a table with all the lexemes and tokens.
  - If a user selects no (they do not want to enter a postfix expression), the program will just close because there is nothing else this code can do to please the user.

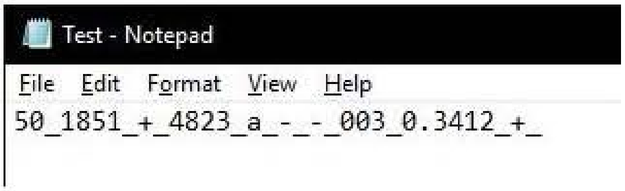
- Whenever responding to the program when they give the option Y/N (yes or no) the program will just close if a user inputs anything other than Yes, No, Y, N. The program will say "Invalid input program is exiting"

Once the program gets a users input/ postfix expression from a file, the program first reads the input character by character. The program identifies the first character and matches it to the grammar then it saves that lexeme and token. The program removes the first character, then the program recursively repeats itself until it reads all the input characters. Then the program prints out all the lexemes and tokens in a table.

This project is more of a scanner then a lexical analyzer. The program will not analyze the expression to see if its valid or not. The program will only read the user inputs and compare it to the grammar provided by the professor. The program will then list the lexemes and tokens. I based my program off of what the professor wanted. I believe my project represents what he wanted.

Test Cases

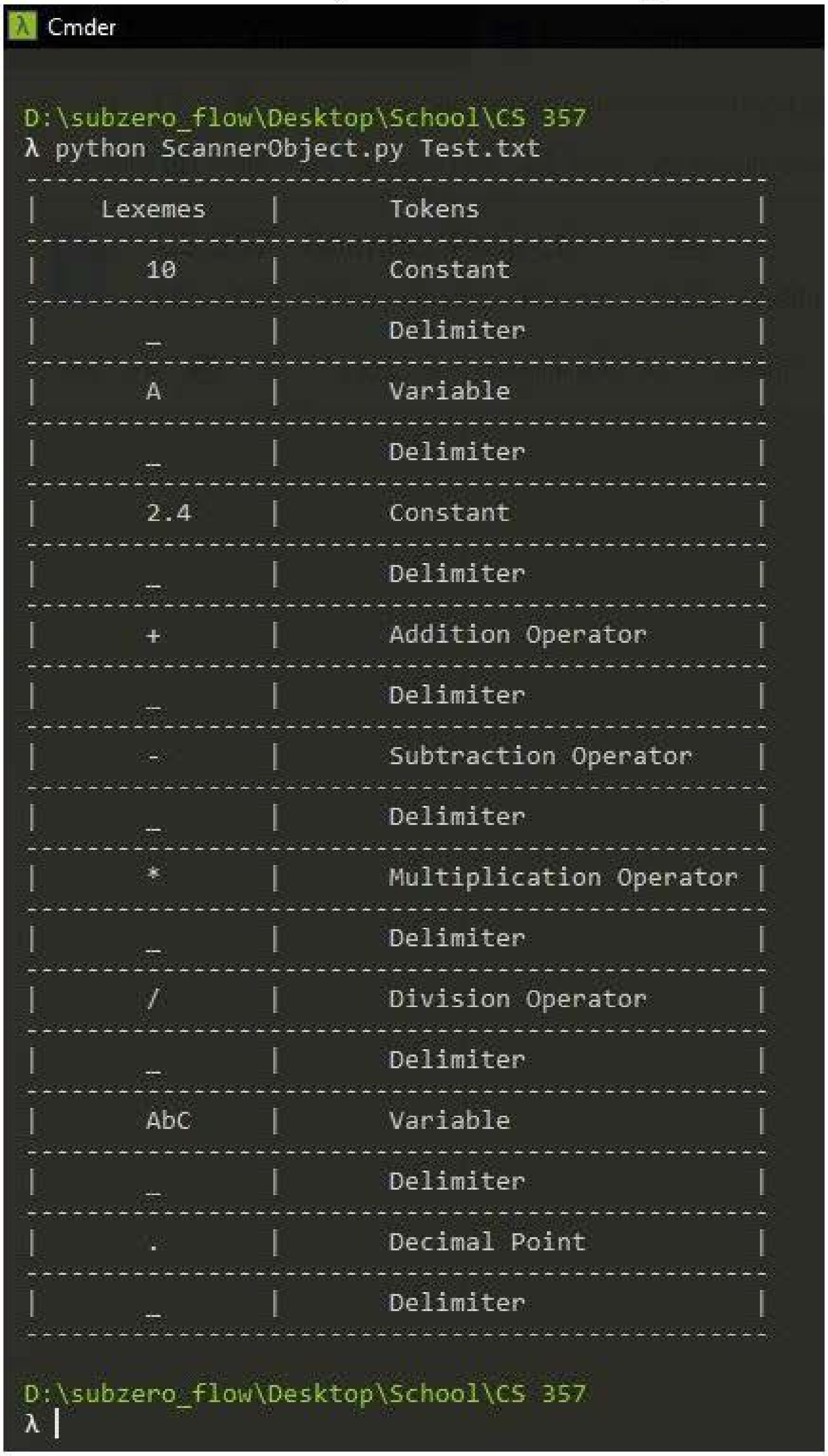
If using a file, the notepad should have a postfix expression like this one.



```
50_1851_+_4823_a_-_-_003_0.3412_+_
```

I also used a program called Cmder which is a portable console emulator for Windows. I used this program to run my python code.

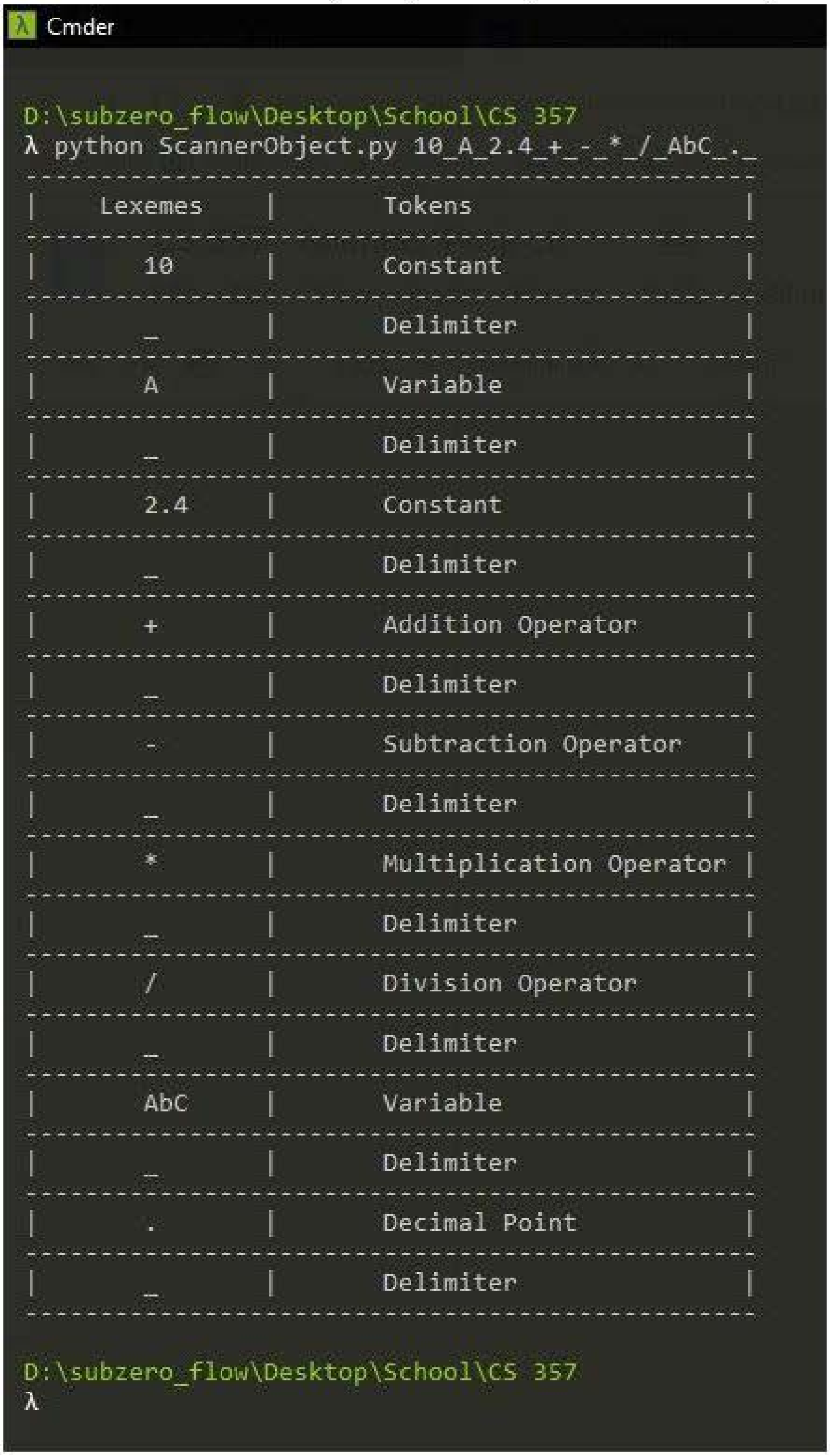
This test for when a user inputs a file name in the argument.



Cmder

```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
-------------------------------------------------
|    Lexemes    |       Tokens                  |
-------------------------------------------------
|       10      |       Constant                |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       A       |       Variable                |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       2.4     |       Constant                |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       +       |       Addition Operator       |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       -       |       Subtraction Operator    |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       *       |       Multiplication Operator |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       /       |       Division Operator       |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       AbC     |       Variable                |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       .       |       Decimal Point           |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ
```

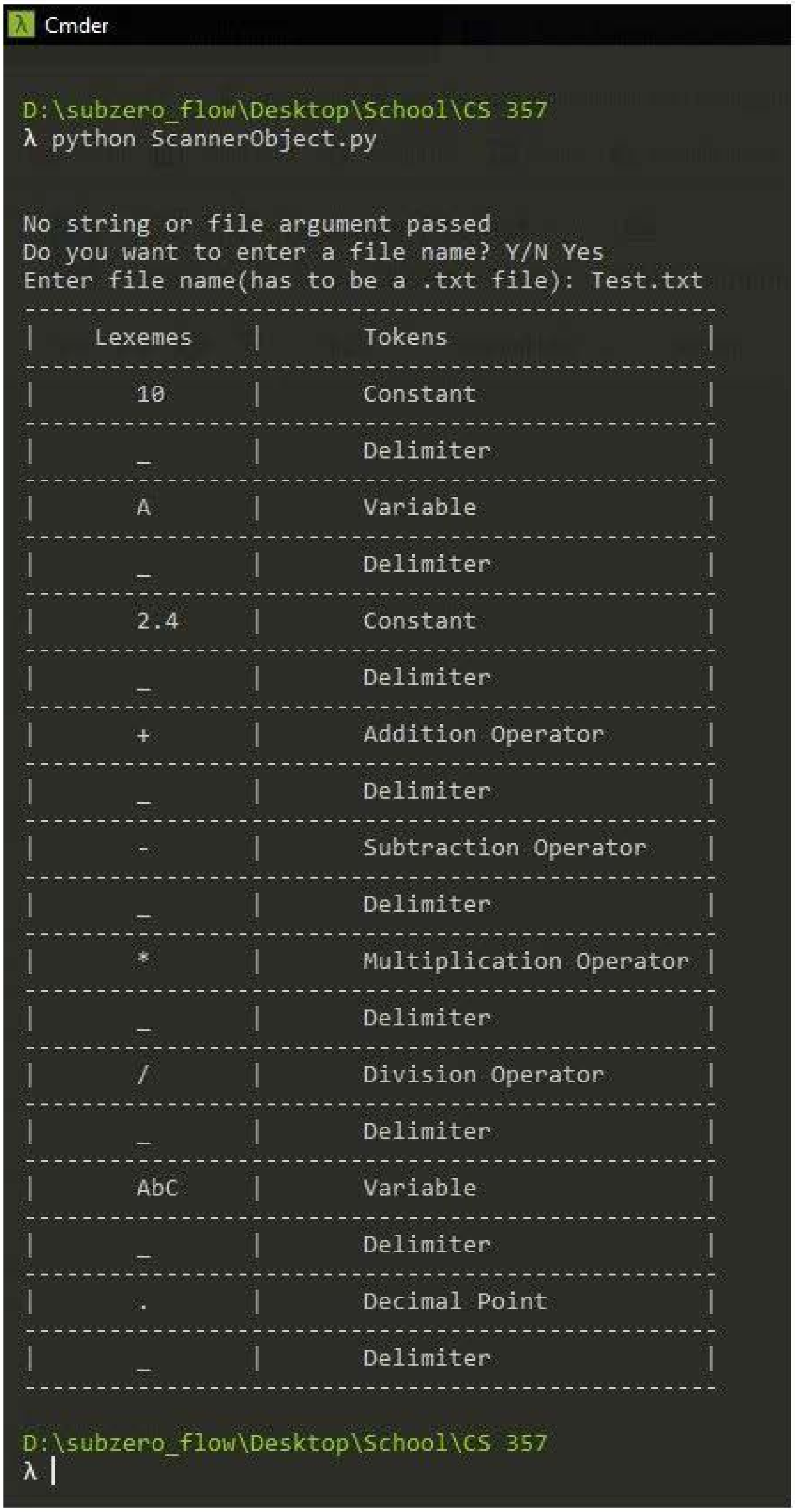
This test for when a user inputs a postfix expression into the argument.



Cmder

```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py 10_A_2.4_+_-_*_/_AbC_._
-------------------------------------------------
|    Lexemes    |       Tokens                  |
-------------------------------------------------
|       10      |       Constant                |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       A       |       Variable                |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       2.4     |       Constant                |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       +       |       Addition Operator       |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       -       |       Subtraction Operator    |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       *       |       Multiplication Operator |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       /       |       Division Operator       |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       AbC     |       Variable                |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------
|       .       |       Decimal Point           |
-------------------------------------------------
|       _       |       Delimiter               |
-------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ
```

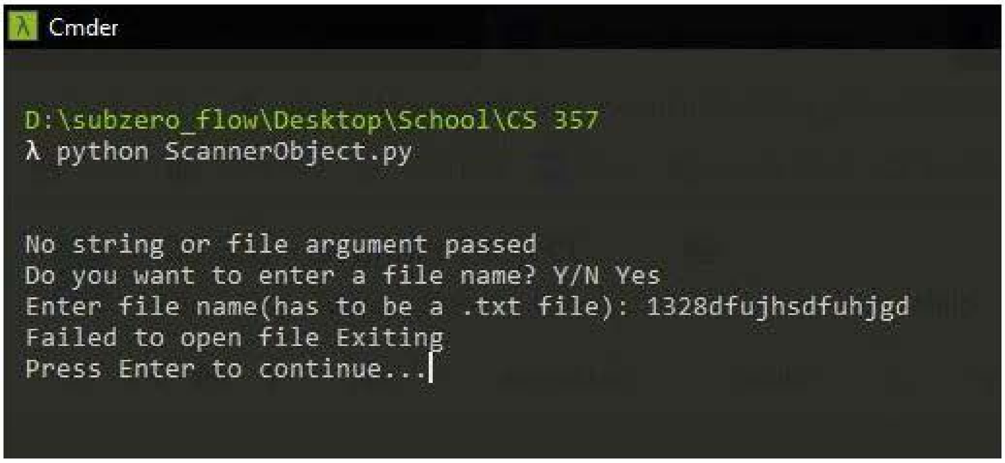
This test for when a user runs the python code and selects Yes to the prompt and enters a filename successfully.



Cmder

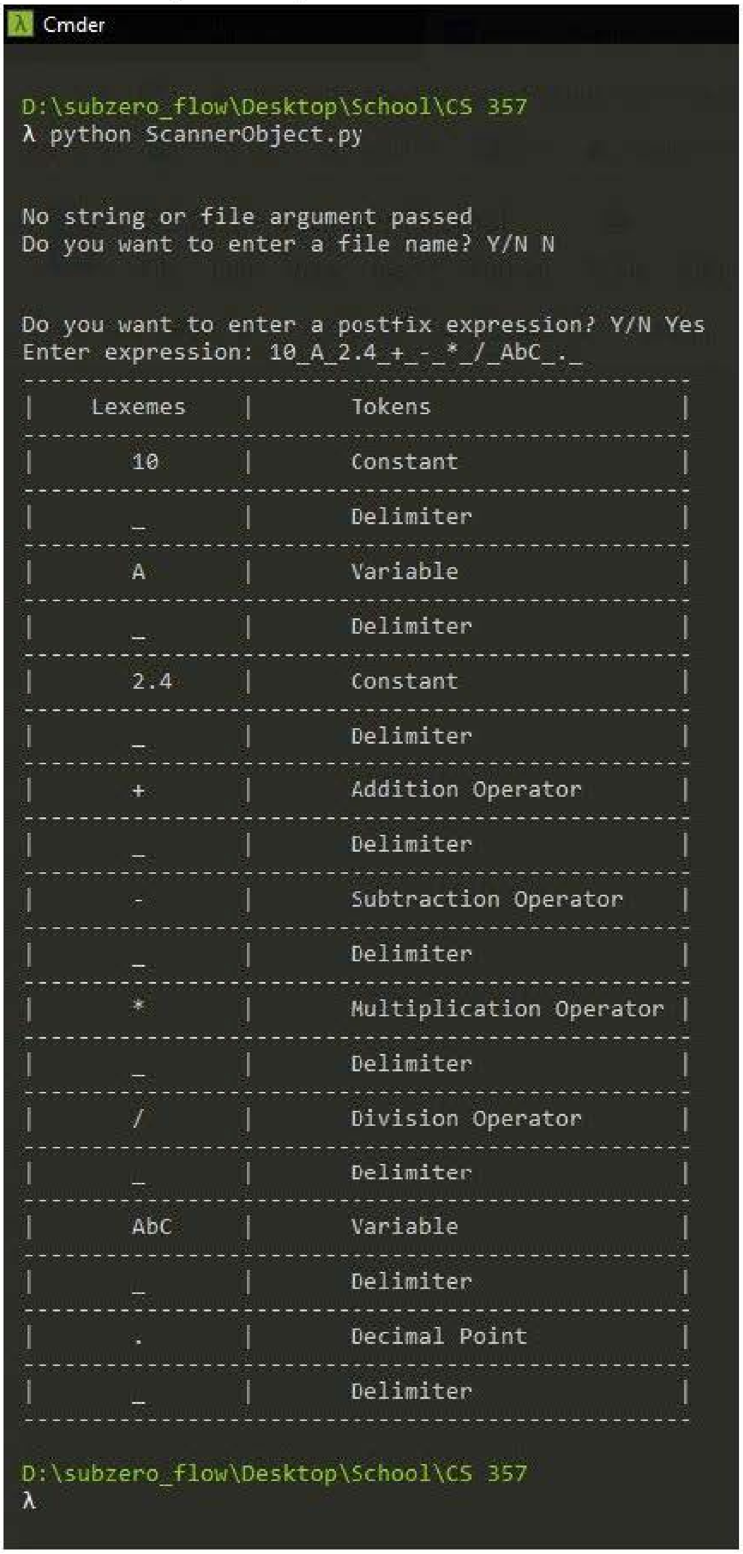
```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py


No string or file argument passed
Do you want to enter a file name? Y/N Yes
Enter file name(has to be a .txt file): Test.txt
---------------------------------------------------
|    Lexemes    |       Tokens                    |
---------------------------------------------------
|      10       |       Constant                  |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------
|      A        |       Variable                  |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------
|      2.4      |       Constant                  |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------
|      +        |       Addition Operator         |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------
|      -        |       Subtraction Operator      |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------
|      *        |       Multiplication Operator   |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------
|      /        |       Division Operator         |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------
|      AbC      |       Variable                  |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------
|      .        |       Decimal Point             |
---------------------------------------------------
|      _        |       Delimiter                 |
---------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ |
```

This test for when a user runs the python code and selects Yes to the prompt and enters a filename **unsuccessfully.**



```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py


No string or file argument passed
Do you want to enter a file name? Y/N Yes
Enter file name(has to be a .txt file): 1328dfujhsdfuhjgd
Failed to open file Exiting
Press Enter to continue...
```

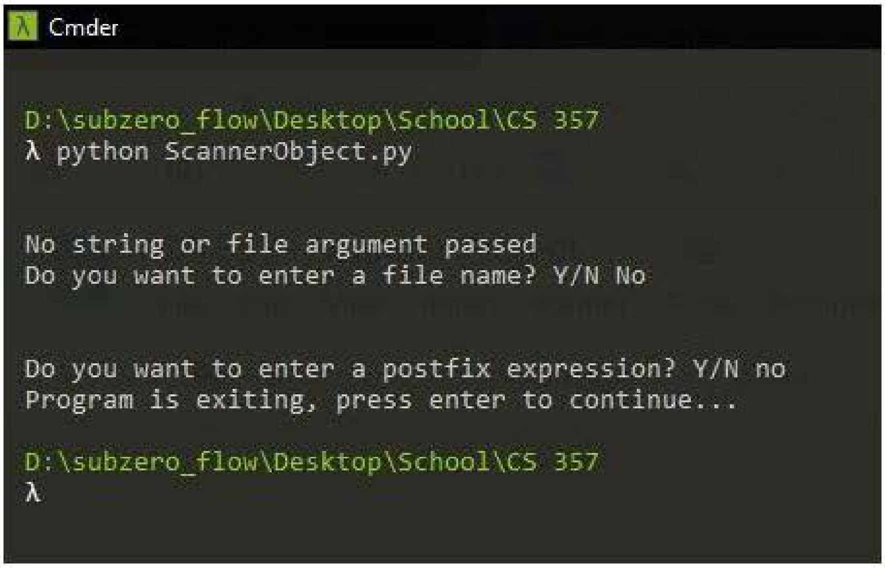
This test for when a user runs the python code and selects No to enter a filename. Then the user enters a postfix expression.



Cmder

```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py


No string or file argument passed
Do you want to enter a file name? Y/N N


Do you want to enter a postfix expression? Y/N Yes
Enter expression: 10_A_2.4_+_-_*_/_AbC_._
-------------------------------------------------
|    Lexemes    |        Tokens                 |
-------------------------------------------------
|       10      |        Constant               |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------
|       A       |        Variable               |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------
|       2.4     |        Constant               |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------
|       +       |        Addition Operator      |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------
|       -       |        Subtraction Operator   |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------
|       *       |        Multiplication Operator |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------
|       /       |        Division Operator      |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------
|       AbC     |        Variable               |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------
|       .       |        Decimal Point          |
-------------------------------------------------
|       _       |        Delimiter              |
-------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ
```

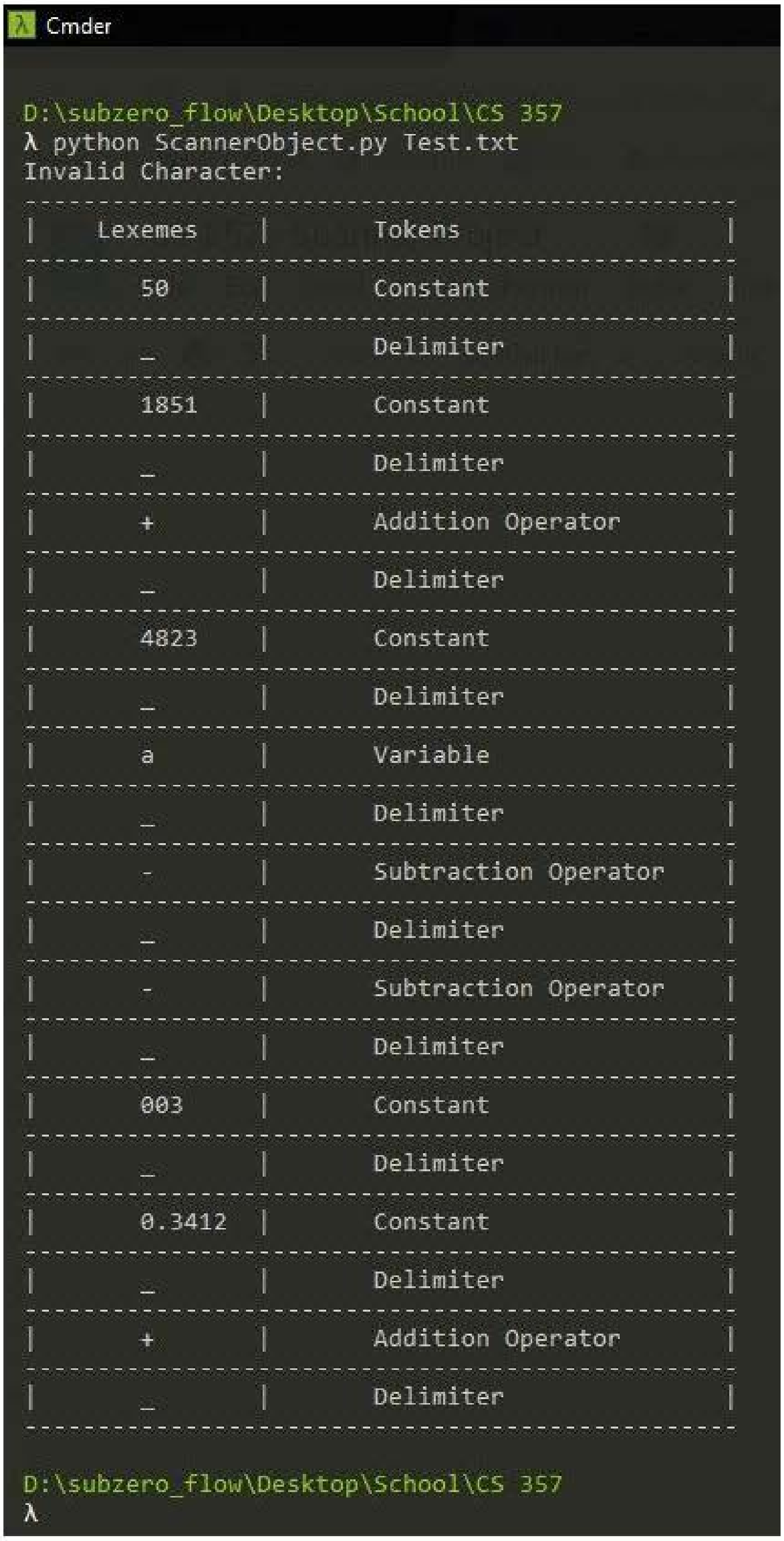
This test for when a user runs the python code and selects No to enter a filename. Then the user denies the prompt asking the user to enter a postfix expression



```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py


No string or file argument passed
Do you want to enter a file name? Y/N No


Do you want to enter a postfix expression? Y/N no
Program is exiting, press enter to continue...

D:\subzero_flow\Desktop\School\CS 357
λ
```

The following test cases will test for different cases using file input. (I cannot do other test cases such as when a user inputs a large expression through line argument, because I dont have paper to print all these test cases.) *Sorry :(*

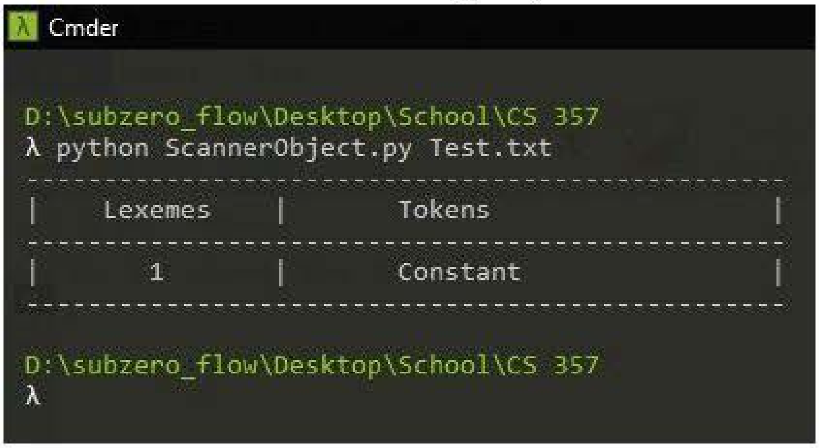
This test for a large user input.



Cmder

```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
Invalid Character:
-----------------------------------------------------
|    Lexemes    |       Tokens                      |
-----------------------------------------------------
|       50      |       Constant                    |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       1851    |       Constant                    |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       +       |       Addition Operator           |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       4823    |       Constant                    |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       a       |       Variable                    |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       -       |       Subtraction Operator        |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       -       |       Subtraction Operator        |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       003     |       Constant                    |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       0.3412  |       Constant                    |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------
|       +       |       Addition Operator           |
-----------------------------------------------------
|       _       |       Delimiter                   |
-----------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ
```

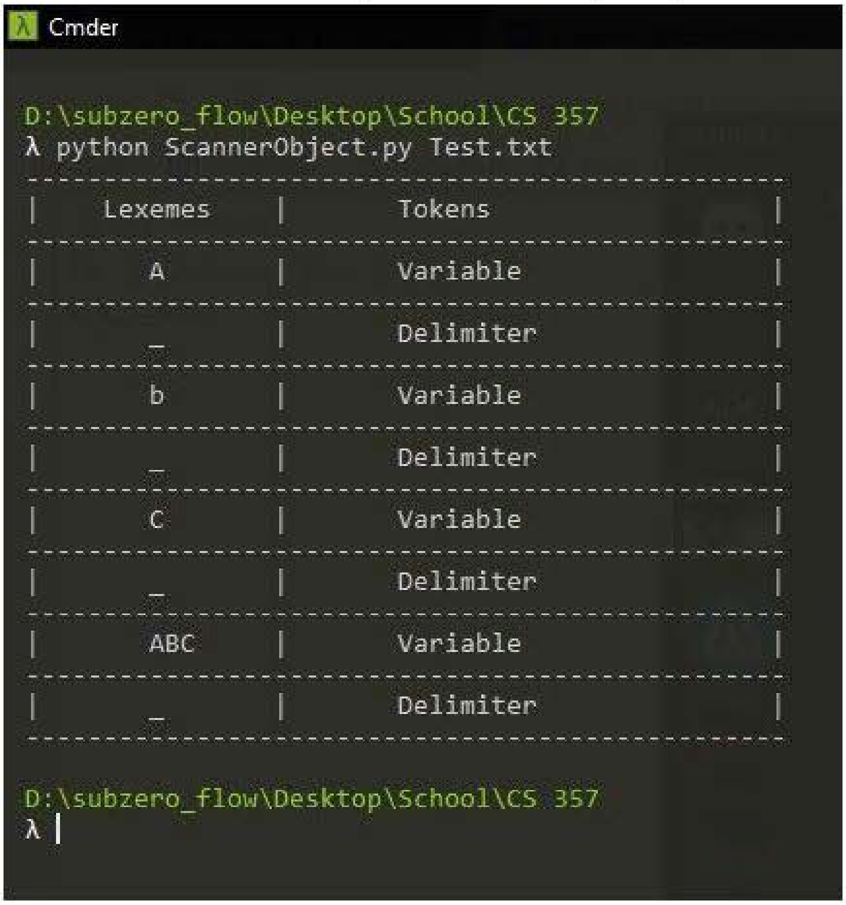
This test for when a user enters a single input.



Cmder

```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
-------------------------------------------------
|    Lexemes    |       Tokens                   |
-------------------------------------------------
|       1       |       Constant                 |
-------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ
```

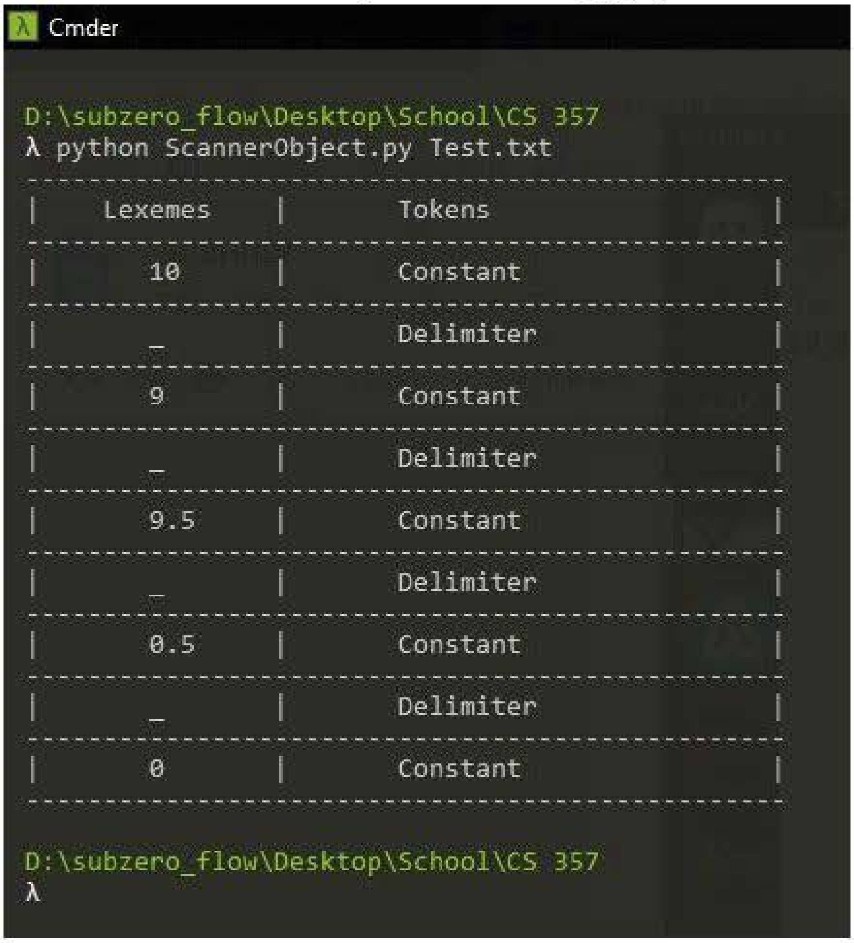
This test for when a user only enters variables (letters)



Cmder

```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
-------------------------------------------------
|    Lexemes    |       Tokens                   |
-------------------------------------------------
|       A       |       Variable                 |
-------------------------------------------------
|       _       |       Delimiter                |
-------------------------------------------------
|       b       |       Variable                 |
-------------------------------------------------
|       _       |       Delimiter                |
-------------------------------------------------
|       C       |       Variable                 |
-------------------------------------------------
|       _       |       Delimiter                |
-------------------------------------------------
|       ABC     |       Variable                 |
-------------------------------------------------
|       _       |       Delimiter                |
-------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ |
```

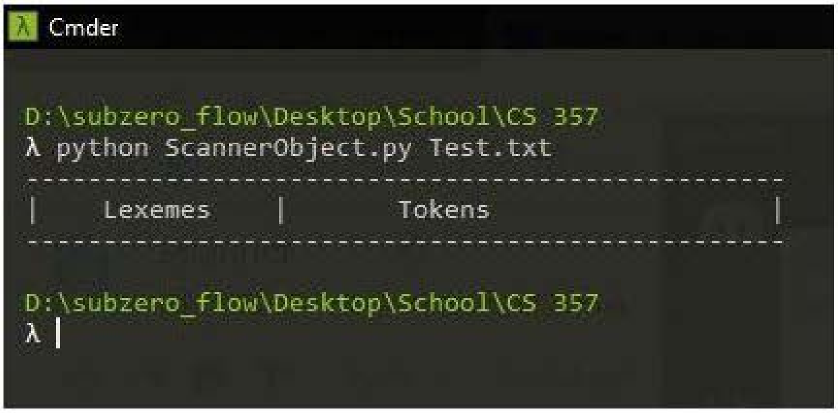
This test for when a user only enters constant (digits)



Cmder

```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
-------------------------------------------------------------------------
|    Lexemes     |          Tokens                                     |
-------------------------------------------------------------------------
|      10        |          Constant                                   |
-------------------------------------------------------------------------
|      _         |          Delimiter                                  |
-------------------------------------------------------------------------
|      9         |          Constant                                   |
-------------------------------------------------------------------------
|      _         |          Delimiter                                  |
-------------------------------------------------------------------------
|      9.5       |          Constant                                   |
-------------------------------------------------------------------------
|      _         |          Delimiter                                  |
-------------------------------------------------------------------------
|      0.5       |          Constant                                   |
-------------------------------------------------------------------------
|      _         |          Delimiter                                  |
-------------------------------------------------------------------------
|      0         |          Constant                                   |
-------------------------------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ
```

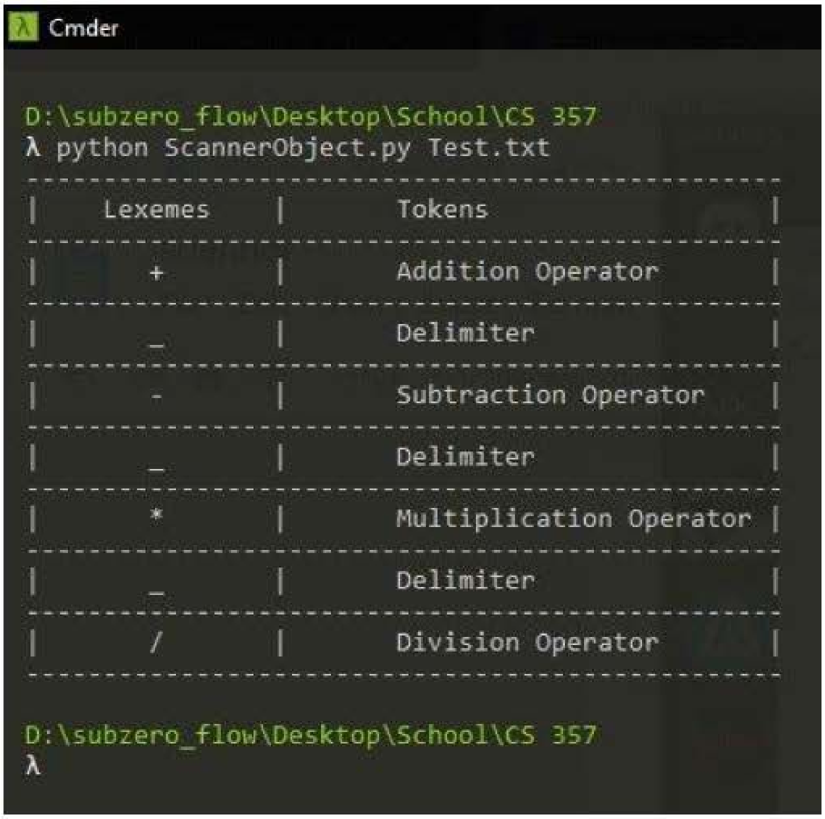
This test for when a user inputs nothing.



Cmder

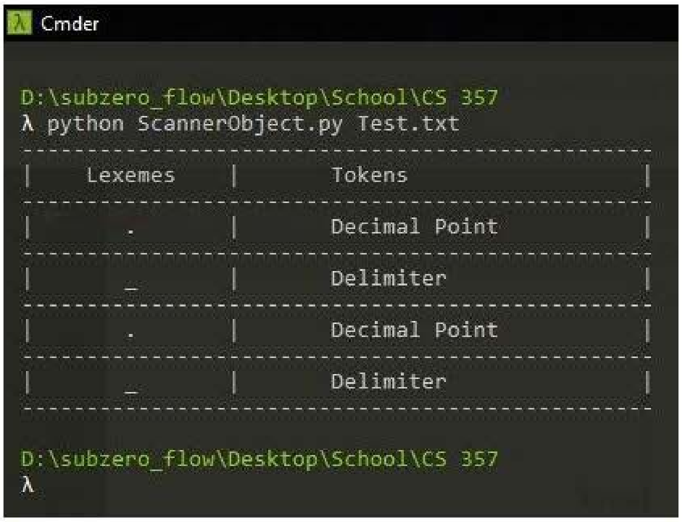
```
D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
-------------------------------------------------------------------------
|    Lexemes     |          Tokens                                     |
-------------------------------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ |
```

This test for when a user enters only operators.(Side note: my code recognizes the different types of operators and list it as their unique tokens instead of calling all of them operators.



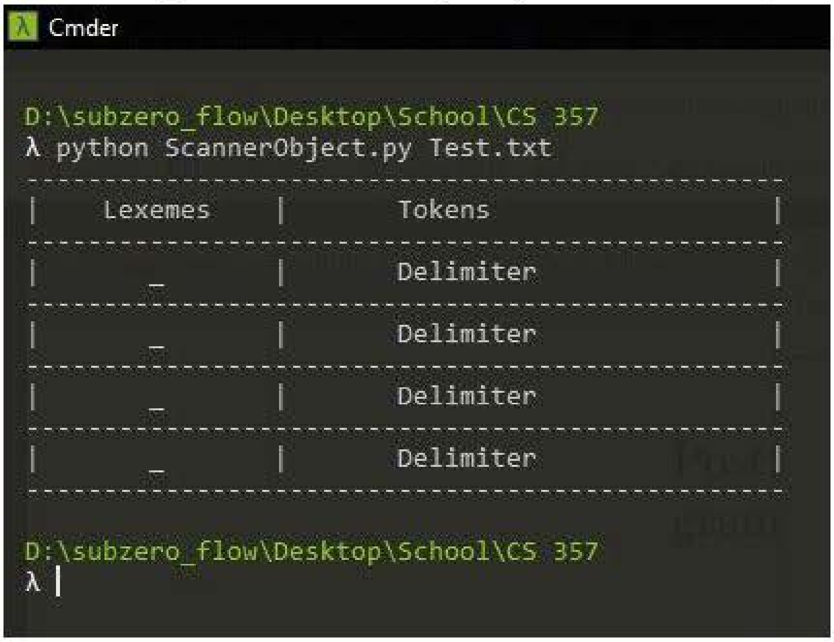
```
Cmder

D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
-------------------------------------------------
|    Lexemes     |        Tokens                |
-------------------------------------------------
|       +        |        Addition Operator     |
-------------------------------------------------
|       _        |        Delimiter             |
-------------------------------------------------
|       -        |        Subtraction Operator  |
-------------------------------------------------
|       _        |        Delimiter             |
-------------------------------------------------
|       *        |        Multiplication Operator |
-------------------------------------------------
|       _        |        Delimiter             |
-------------------------------------------------
|       /        |        Division Operator     |
-------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ
```

This test for when a user enters a decimal point "."
I programmed my code to specifically recognize decimal points as their own token. I felt that this is what you wanted.



```
Cmder

D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
-------------------------------------------------
|    Lexemes     |        Tokens                |
-------------------------------------------------
|       .        |        Decimal Point         |
-------------------------------------------------
|       _        |        Delimiter             |
-------------------------------------------------
|       .        |        Decimal Point         |
-------------------------------------------------
|       _        |        Delimiter             |
-------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ
```

This test case, test for when a user just inputs delimiters only



```
Cmder

D:\subzero_flow\Desktop\School\CS 357
λ python ScannerObject.py Test.txt
------------------------------------------------
|    Lexemes    |        Tokens                |
------------------------------------------------
|       _       |        Delimiter             |
------------------------------------------------
|       _       |        Delimiter             |
------------------------------------------------
|       _       |        Delimiter             |
------------------------------------------------
|       _       |        Delimiter             |
------------------------------------------------

D:\subzero_flow\Desktop\School\CS 357
λ |
```

Overall this satisfies what I wanted it to be and I believe I met all the requirements my professor wanted me to meet. Along with working on my own I did features that was "required" for people who worked as a group. My code can read from a file and user inputs.I tried every possible test case I could think of. Hope this is a good project.