**User’s Guide:**

This is programmed to take in a string, parse it, and build a Graphical interface from the file. It is designed to begin with a JFileChooser that allows the user to easily choose a file from their computer. If an error is given a dialogue pane pops up with the error message.

Here is a picture of the startup page:



Figure 1. Startup screen of program.

After initial screen the JFileChooser screen pops up:

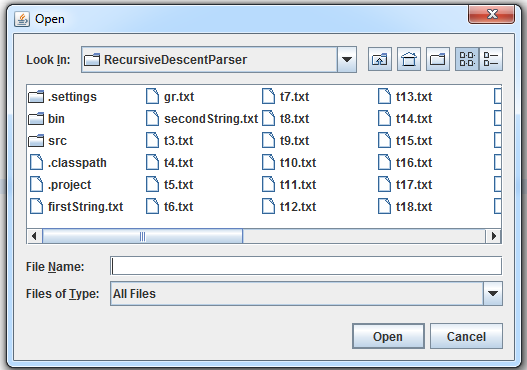


Figure 2. File Chooser to begin running program.

After the file is chosen the program begins parsing the document and either a successful Interface is built:

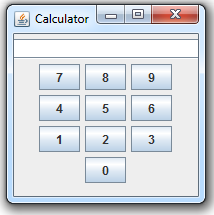


Figure 3. Successful Parse of String.

Or, an error pops up stating that a syntax Error occurred:

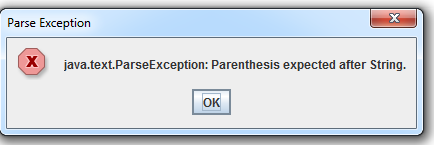


Figure 4. Recreation of Test 5 to Demonstrate error functionality.

Design Process:

Step one:

Create a Lexical Analyzer.

Outline for Lexical analyzer:

1. Define the tokens. These must be in their own class (CSE 413, 2006).
   * Decide what the definition of each token will be.
   * Assign string title to all tokens and int values if they are numbers.
   * Divide these similar to an enumeration.

1. Scan through file parsing each token separately (Holub, 1990).
   * Find a way to move statically through the file.
   * Stop after each token.
     + Possible case statement
     + If key word: go to end of word
     + If string: go to end of quote
       - Strings can be words
       - Strings can be numbers
   * Throw errors if the token is not legal for syntax.
   * Consume quotation marks as part of string; they are not tokens.

Step Two:

Create the Parser:

Outline for creating the Parser:

1. Each step of the rules must be follow precisely; study documentation and devise a plan.
   * Give errors if syntax is not followed.
   * If statements with throw clause after else.
   * Seven methods required to work together.
   * Must be recursive.
2. Define GUI to handle setting up initial window.
   * Sets frame title.
   * Sets window size.
   * Calls layout.
   * Calls Widget
3. Define layout.
   * Layout sets layout
   * Calls layout type to define the layout.
   * Returns to GUI.
4. Define layout\_type.
   * Layout type must find out if it is flow or grid.
   * If it is grid find rows and columns.
   * May also have optional gap numbers.
   * Returns layout to layout.
5. Define Widgets
   * Recursively called until all widgets are set
   * Panel must be added to recursively
   * Calls widget
   * Returns to GUI
6. Widget
   * Case statement for types of widget
     + Button
     + Group: \*NOTE \* this is not a component.
     + Label
     + Panel
     + Textfield
   * Each widget type must be read according to rule.
   * Widget should return true if done, else false.
   * Button groups calls radio buttons.
   * Panel calls layout and widgets.
   * Widget returns to widgets.
7. Radio Buttons:
   * Radio buttons are added to group and component.
   * Must be recursively defined to add radio buttons until no more buttons.
   * Calls radio button.
   * Returns to group.

Step 3. Define interface to choose file.

Additional component to the program to make file selection easier. This was added for ease of testing. A jOptionPane was also added to show syntax errors. This allows the program to stay open until the user is done with error testing (it closes upon successful build).

Lessons Learned:

1. Finding a resource such as a textbook with additional information can be extremely helpful. I managed to find an old textbook on compiler design that helped to understand the process of compiler design (Holub, 1990).
2. This is an extremely detailed assignment. Every punctuation sign must be accounted for. Quotation marks are especially hard because it defines a string. I first used them as tokens, but it was hard to define what was an end token and what was a beginning token. So, I simply consumed them with the string.
3. The widget method cannot return a component since radio group is not a component. Instead a container must be passed in and the widgets can then be added as they are built.
4. Tokens should be defined before anything else since this is what the analyzer is looking for.
5. Analyzer should be built second since the parse can’t work without a tokenizer.
6. Creating all your test files at once makes testing a lot easier.
7. If you have static variables the file and the variables must all be cleared upon error.

**Test plan:**

Two strings tested: initial string provided by school and a more advanced string that implements nested widgets. Note: the code for second GUI is test. Java. This has been included in the documentation but is not part of the parser package.

**Error files:**

All error files were modifications of these two files and are included on the excel. The excel goes in order according to the rules of the grammar.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test # | TEST CASE String | | Testing Issue | | expected results | | outcome | pass/fail | |
| 1 | widgets.  firstString.txt:  Window "Calculator" (200, 200) Layout Flow:  Textfield 20;  Panel Layout Grid(4, 3, 5, 5):  Button "7";  Button "8";  Button "9";  Button "4";  Button "5";  Button "6";  Button "1";  Button "2";  Button "3";  Label "";  Button "0";  End;  End. | | testing rendering of basic layout | |  | |  | Pass | |
| 2 | | Window "Favorite Fruit" (600, 200) Layout Flow:Label "Enter your Name:";Textfield 20;Panel Layout Flow:Label "Choose Your Favorite Fruit:"; Panel Layout Grid(3,2,5,5): Group Radio "Strawberries"; Radio "Bananas"; Radio "Oranges"; Radio "Cherries"; Radio "Mangoes"; Radio "Kiwi"; End; End; Button "Enter Your Selection";End;End. | | radio buttons and additional nested components including a panel within a panel | | |  | | --- | |  | | | | Pass | |

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| --- | --- | --- | --- | --- | --- |
| 3 | "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | file does not begins with the word window | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 4 | Window (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | window is not followed by a string | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 5 | Window "Calculator" 200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | string is not followed by Lparenthesis | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 6 | Window "Calculator" (, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | parenthesis is not followed by number | error |  | Pass |
| 7 | Window "Calculator" (200 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | number not followed by comma | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 8 | Window "Calculator" (200, ) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | comma not followed by number | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 9 | t9.txtWindow "Favorite Fruit" (600, 200 Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | number not followed by right parenthesis | error |  | Pass |
| 10 | Window "Favorite Fruit" (600, 200) Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | word layout not after parenthesis | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 11 | Window "Favorite Fruit" (600, 200) Layout : Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | layout not flow or grid | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 12 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid 3,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | grid not followed by Lpar | error |  | Pass |
| 13 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | Lpar not followed by number | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 14 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2 5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | number not followed by comma | error |  | Pass |
| 15 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | comma not followed by number | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 16 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2:  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | number not followed by Rpar or comma | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 17 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5 5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | number not followed by comma | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 18 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | comma not followed by number | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 19 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5:  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | number not followed by rPar | error |  | Pass |
| 20 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5)  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | Rpar not followed by colon…for grid | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 21 | Window "Favorite Fruit" (600, 200) Layout Flow Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | flow now followed by colon | error |  | Pass |

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| 22 | t22.txtWindow "Calculator" (200, 200) Layout Flow:  End; End. | Layout not followed by widgets | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 23 | Window "Calculator" (200, 200) Layout Flow: Textfield ; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | textfield not followed by number | error |  | Pass |

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| 24 | Window "Calculator" (200, 200) Layout Flow: Textfield 20 Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | number not followed by semi-colon | error |  | Pass |

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| 25 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | button not followed by string | error |  | Pass |

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| 26 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4" Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | string not followed by semicolon | error |  | Pass |

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| 27 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button 8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | string not started with qmark | error |  | Pass |

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| 28 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3; Label ""; Button "0"; End; End. | string does not end with qmark | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 29 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; | semicolon not followed by end or another widget | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 30 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group     End;  End;  Button "Enter Your Selection"; End; End. | group not followed by radio | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 31 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group   Radio;  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | radio not followed by string | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 32 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries"  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | string not followed by semicolon | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 33 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";    End;  Button "Enter Your Selection"; End; End. | group not followed by end | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 34 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3,2,5,5):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End  End;  Button "Enter Your Selection"; End; End. | end not followed by semicolon | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 35 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label; Button "0"; End; End. | label not followed by string | error |  | Pass |
| 36 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label "" Button "0"; End; End. | string not followed by semicolon | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 37 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End. | panel not followed by layout | error |  | Pass |
| 38 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5):  End; End. | layout not followed by widgets | error |  | Pass |
| 39 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; | widgets not followed by end | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 40 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End End. | end not followed by semicolon | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 41 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; | GUI does not have end | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 42 | Window "Calculator" (200, 200) Layout Flow: Textfield 20; Panel Layout Grid(4, 3, 5, 5): Button "7"; Button "8"; Button "9"; Button "4"; Button "5"; Button "6"; Button "1"; Button "2"; Button "3"; Label ""; Button "0"; End; End | end does not have period | error |  | Pass |

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| --- | --- | --- | --- | --- | --- |
| 43 | Window "Favorite Fruit" (600, 200) Layout Flow: Label "Enter your Name:"; Textfield 20; Panel Layout Flow: Label "Choose Your Favorite Fruit:";  Panel Layout Grid(3255):  Group   Radio "Strawberries";  Radio "Bananas";  Radio "Oranges";  Radio "Cherries";  Radio "Mangoes";  Radio "Kiwi";  End;  End;  Button "Enter Your Selection"; End; End. | only one big number in the grid parenthesis | error |  | Pass |

References:

C Program Formatter Written in Java. (n.d.). Retrieved April 08, 2018, from https://learn.umuc.edu/d2l/le/content/263991/viewContent/11046338/View

Sample code of the lexical analyzer

CSE 413 Autumn 2006. (n.d.). Retrieved April 08, 2018, from https://courses.cs.washington.edu/courses/cse413/06au/compiler/scanner.html

Holub, A. I. (1990). *Compiler design in C*. Englewood Cliffs, NJ: Prentice Hall.