Methodology

Section 1: getInput()

This section handles retrieving data from the user. Input is taken using a Scanner object and stored into a string.

Section 2: parse()

This sections handles finding independent variables and sub-expressions. It does this by going through the user’s input string character by character and handling them. If a character is a letter, then it is added if it is not already in the list of variables. If the character is a ‘(‘, then it’s index is added to a stack, when a corresponding ‘)’ is found the previous index from the stack is taken and a substring between the brackets is found, if this string is not in the expressions map already it gets added. Finally, the total number of rows needed for the variables truth values is found to be 2 ^ (number of variables).

Section 3: evaluate()

This section calculates truth values for each variable and expression and puts them in the truth table. It does this by iterating through the table by column and then row. If the column should hold a variable then the variable is stored at the first row of that column, otherwise the expression’s key is stored at the top of this column. Next the values of the variable/expression are obtained, finally these values are iterated through and put into the rows under the current column.

Section 4: printVariables()

This section prints out the variables by using an iterator to go through the elements of the list and printing each.

Section 5: printExpressions()

This section prints out the expressions by iterating through the length of the expressions and finding a key using the index and then prints the key and expression for that key.

Section 6: printTruthTable()

This section prints out the truth table by iterating through column and rows. If the row is the title (first) row then the title is simply printed, otherwise, the rows are padded to be in the middle of the title.

Helper Section 1: indexOf(list, object)

Helper Section 2: contains(map, object)

Helper Section 3: toPostfix(input)

Helper Section 4: getTruthValues(expression)

Helper Section 5: getTruthColumn(variable)

Helper Section 6: negate(input)

Helper Section 7: or(input1, input2)

Helper Section 8: and(input1, input2)

Proof

indexOf(list, object)

Analysis

indexOf(list, object) = 5n+5 units

This method is O(n) for C = 10 and N0 = 1 because 5n+5 is always less than or equal to 10n