LAB 11 ASSIGNMENT

Ch. 8 Arrays

Start: 03/27/2024 4:34 PM
Name: Imani Hollie

LAB 11.1 – ALGORITHMS

Algorithm 1: Write a pseudocode for a `String` array initialized with the following strings: `"Einstein", "Newton", "Copernicus", "Kepler"`

```
//Create an array with an initialization list by storing the values in
//the array elements in the order they appear on in the list
Constant Integer SIZE = 4
Declare String names(SIZE) = "Einstein", "Newton", "Copernicus", "Kepler"
```

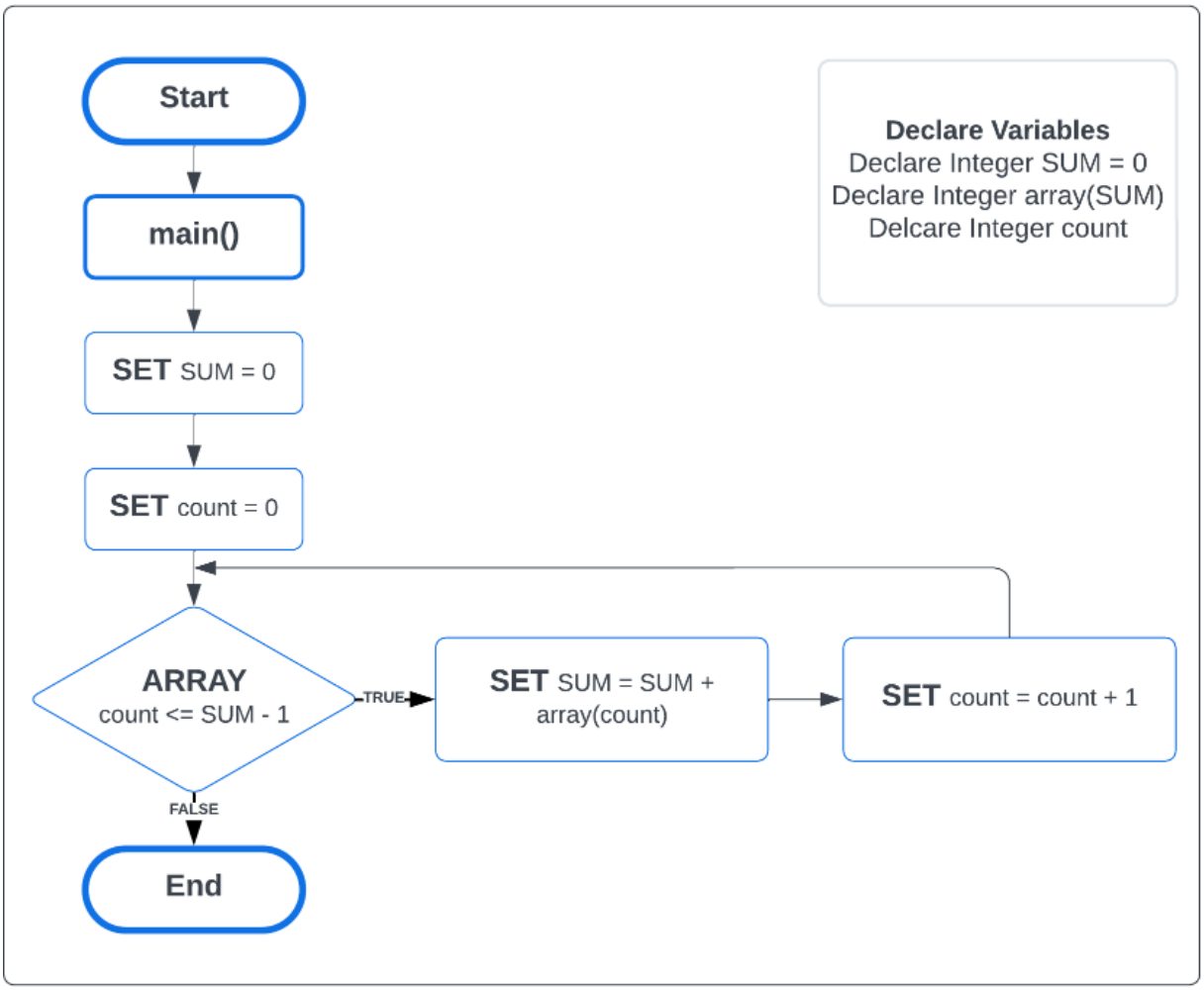
Algorithm 2: Assume `name` is an `Integer` array with 20 elements. Design a `For` loop that displays each element of the array.

```
//Initialize the name array with 20 elements
Constant Integer SIZE = 20
Declare Integer name(SIZE)
//Declare counter variable
Declare Integer count
//Utilize a For loop to display each element in the array
For count = 0 To SIZE - 1
   Display name(count)
End For
```

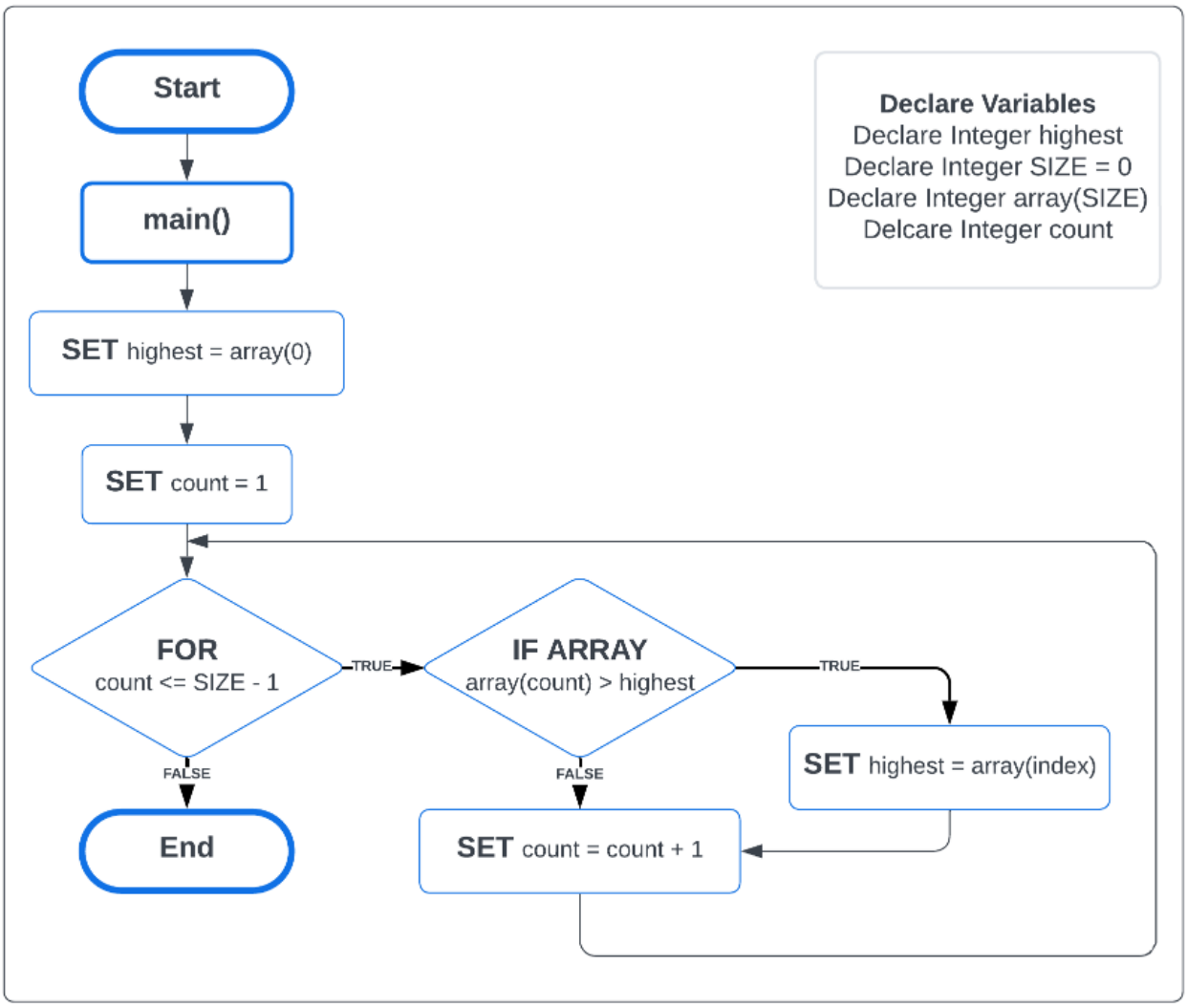
Algorithm 3: Assume the arrays `numberArray1` and `numberArray2` each have 100 elements. Design an algorithm that copies the values in `numberArray1` to `numberArray2`.

```
//Initialize numberArray1 and numberArray2 as Parallel Arrays
Constant Integer SIZE = 100
Declare Integer numberArray1(SIZE)
Declare Integer numberArray2(SIZE)
Declare Integer count
//Utilize a For loop
//Input count into both arrays as both their subscripts
For count = 0 To SIZE - 1
   Display numberArray1(count)
   Display numberArray2(count)
End For
```

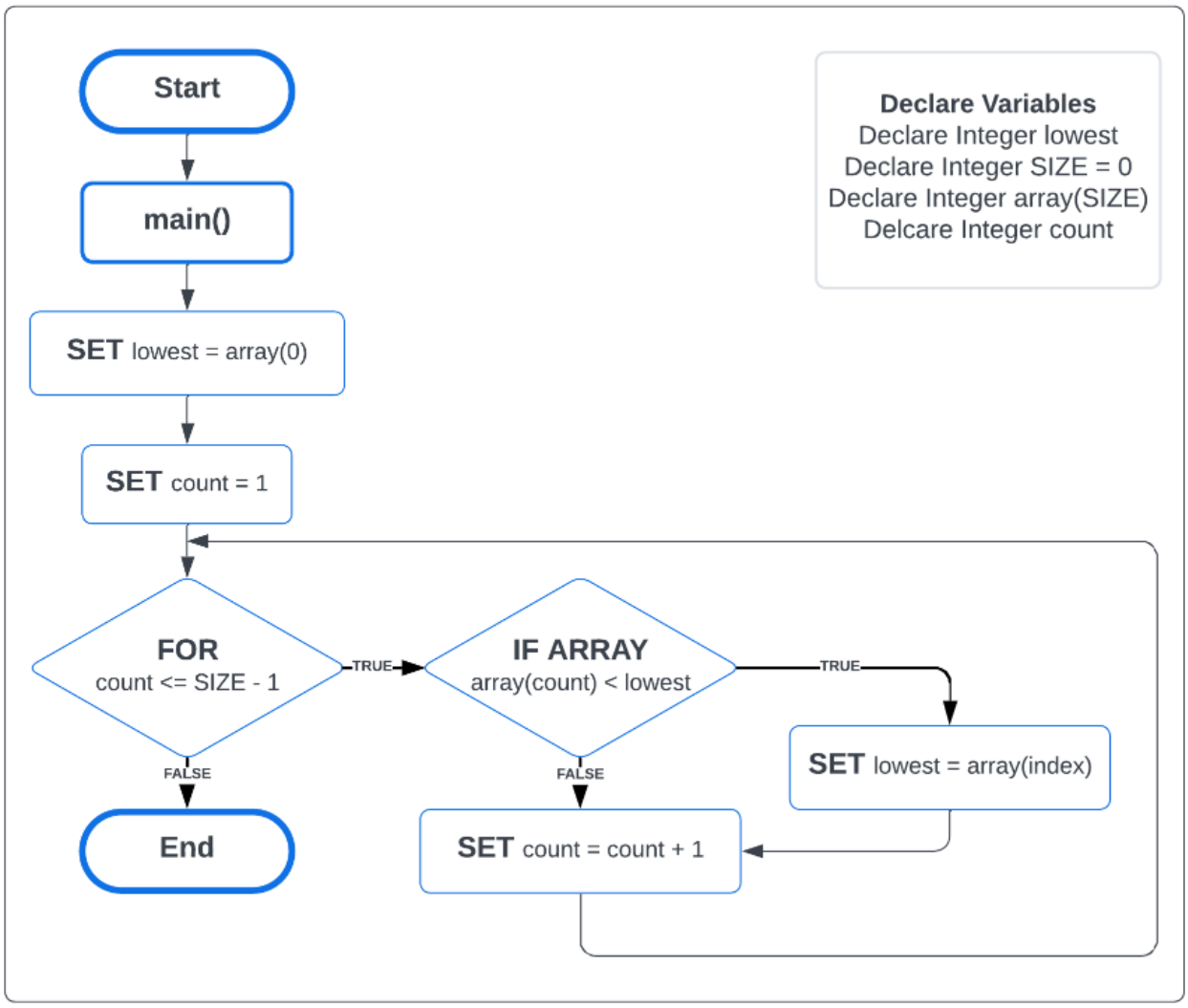
Algorithm 4: Draw a flowchart showing the general logic for totaling the values in an array.



Algorithm 5: Draw a flowchart showing the general logic for finding the highest value in an array.



Algorithm 6: Draw a flowchart showing the general logic for finding the lowest value in an array.



Algorithm 7: Assume the following declarations appear in a pseudocode program:

```
Constant Integer SIZE = 100
Declare Integer firstArray(SIZE)
Declare Integer secondArray(SIZE)
```

Also assume that values have been stored in each element of `firstArray`. Design an algorithm that copies the contents of `firstArray` to `secondArray`.

```
//This is the same thing as A3: Same pseudocode for Parallel Arrays
Constant Integer SIZE = 100
Declare Integer firstArray(SIZE)
Declare Integer secondArray(SIZE)
Declare Integer count
//By setting the secondArray to the firstArray, the elements are copied
//Essentially being a Parallel Array without having to write 2 lines
For count = 0 To SIZE - 1
   Set secondArray(count) = firstArray(count)
End For
```

Algorithm 8: Design an algorithm for a function that accepts an `Integer` array as an argument and returns the total of the values in the array.

```
//Utilize a module for readability
Module main()
   //Initialize the num array with 5 elements
   Constant Integer SIZE = 5
   Declare Integer array(SIZE) = 5, 6, 4, 8, 9
   //Declare container variable
   Declare Integer sum
   //Display sum of the elements
   Set sum = calTotal(array, SIZE)
   Display sum
End Module
//Utilize a function similarly to a module for readability
Function Integer calTotal(Integer num(), Integer numSIZE)
   //Declare counter variable
   Declare Integer count
   //Declare accumulator variable, and initialize it to 0
   Declare Integer total = 0
   //Calculate the sum of elements
   For count = 0 To numSIZE - 1
        Set total = total + num(count)
   End For
   Return total
End Function
```

Algorithm 9: Write a pseudocode algorithm that uses the `For Each` loop to display all of the values in the following array:

```
Constant Integer SIZE = 10
Declare Integer values(SIZE) = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
//Declare counter variable
Declare Integer count
//Utilize a For Each loop to display each element in the array
For Each count in values
   Display count
End For
```

LAB 11.2 – DEBUGGING EXERCISES

Exercise 1: What is the error in the following pseudocode?

```
1. //This program uses an array to display five names
2. Constant Integer SIZE = 5
3. Declare String name(SIZE) = "Meg", "Jack", "Steve", "Bill", "Lisa"
4. Declare Integer index
5. For index = 0 To SIZE
   6. Display names(index)
7. End For
```

An error occurs on Line 5, because the loop is set to iterate from 0 – 5, making it 6 elements and outside of parameters. To correct this, subtract 1 from the SIZE variable to keep it within bounds of the parameters, as follows:

```
1. //This program uses an array to display five names
2. Constant Integer SIZE = 5
3. Declare String name(SIZE) = "Meg", "Jack", "Steve", "Bill", "Lisa"
4. Declare Integer index
5. For index = 0 To SIZE - 1
   6. Display names(index)
7. End For
```

Exercise 2: What is the error in the following pseudocode?

```
1. //This program displays the highest value in the array
2. Declare Integer SIZE = 3
3. Declare Integer values(SIZE) = 1, 3, 4
4. Declare Integer index
5. Declare Integer highest
6. For index = 0 To SIZE - 1
   7. If values(index) > highest Then
      8. Set highest = values(index)
   9. End If
10. End For
11. Display "The highest number is ", highest
```

An error occurs on Line 5, because the highest variable isn't initialized, so when it's used in Line 7 it has an undefined value, To correct this, initialize the highest variable to the first value in the values array (0), as follows:

```
1. //This program displays the highest value in the array
2. Declare Integer SIZE = 3
3. Declare Integer values(SIZE) = 1, 3, 4
4. Declare Integer index
5. Declare Integer highest = values(0)
6. For index = 0 To SIZE - 1
   7. If values(index) > highest Then
      8. Set highest = values(index)
   9. End If
10. End For
11. Display "The highest number is ", highest
```

Exercise 3: What is the error in the following pseudocode?

```
1. //The searchName function accepts a string containing the name to search
2. //for, an array of strings containing the names, and an integer specifying
3. //the size of the array. The function searches for the name in the array.
4. //If the name is found, the string containing the name is returned;
5. //Otherwise a message indicating that the name was not found in the array
6. //is returned.
7. Function String searchName(String name, String names(), Integer size)
   8. Declare Boolean found
   9. Declare Integer index
   10. Declare String result
   11. //Step through the array searching for the specified name
   12. While found == False AND index <= size - 1
      13. If contains(names(index), name) Then
         14. Set found = True
      15. Else
         16. Set index = index + 1
      17. End If
   18. End While
   19. //Determine the result
   20. If found == True Then
      21. Set result = names(index)
   22. Else
      23. Set result = "That name was not found in the array."
   24. End If
   25. Return result
26. End Function
```

An error occurs on Lines 8 and 13: In Line 8 the variable found is declared but never initialized so it remains undefined; In Line 13 the names(array) is treated as a function instead of an array. To correct this, In Line 8 initialize the found variable to equal False, and in Line 13, set the names(index) array to be operated by the equal to operator (==) and the name variable, as follows:

```
1. //The searchName function accepts a string containing the name to search
2. //for, an array of strings containing the names, and an integer specifying
3. //the size of the array. The function searches for the name in the array.
4. //If the name is found, the string containing the name is returned;
5. //Otherwise a message indicating that the name was not found in the array
6. //is returned.
7. Function String searchName(String name, String names(), Integer size)
   8. Declare Boolean found = False
   9. Declare Integer index
   10. Declare String result
   11. //Step through the array searching for the specified name
   12. While found == False AND index <= size - 1
      13. If names(index) == name Then
         14. Set found = True
      15. Else
         16. Set index = index + 1
      17. End If
   18. End While
```

```
   //Determine the result
   If found == True Then
      Set result = names(index)
   Else
      Set result = "That name was not found in the array."
   End If
   Return result
End Function
```