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Program Structures & Algorithms
Fall 2021
Assignment No. 3

- **Tasks performed in the assignment:**

  Task 1:

  A. Implemented “Height-Weighted Quick Union with path compression”.
  B. Checked & passed all of the 13 test cases.

  Task 2: Developed Union-find client in the UF_Client.java file with two methods, i.e Count, Main.

  1. Count: A static method that returns the number of pairs in the implemented height weighted Quick union find.
  2. Main: For a given set of values of N, calls Count method to calculate the number of pairs for each value of N and prints to the console.

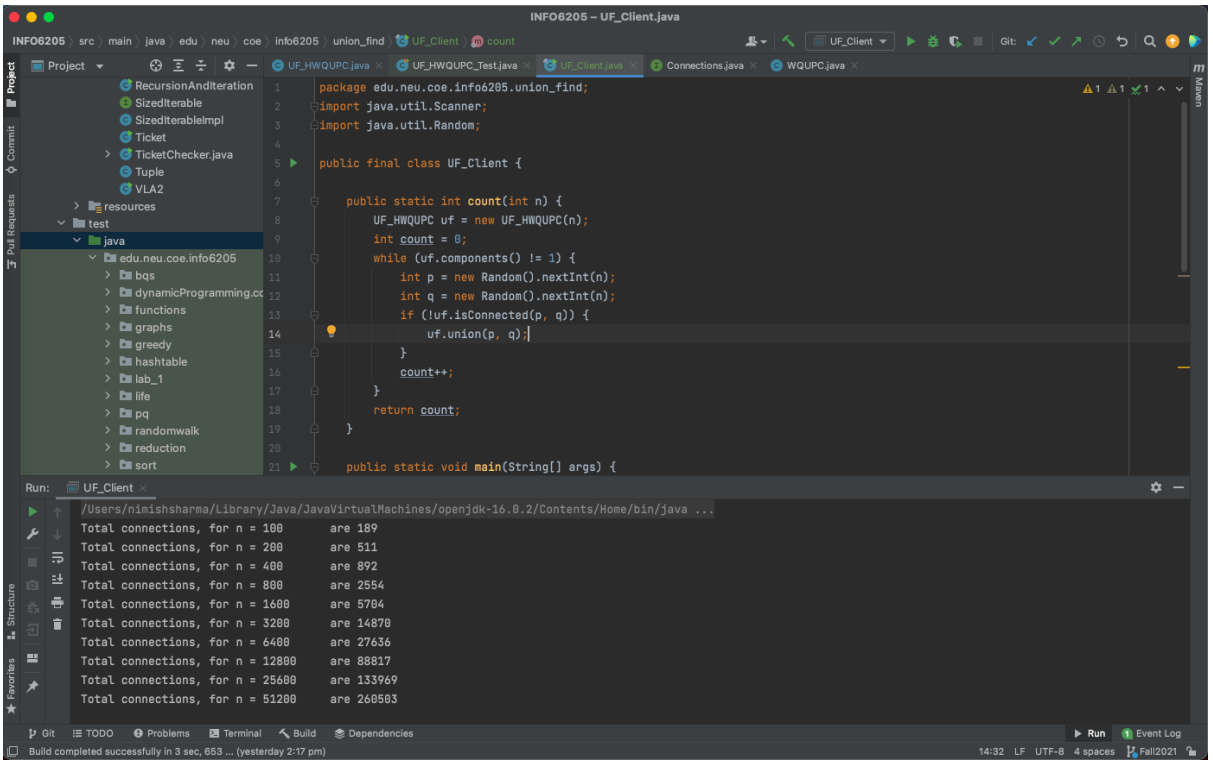
  Task 3:

  Plotted the graph with the output values generated by the main function for N values and derived the relationship between “Number of Objects” & “Number of Pairs”.

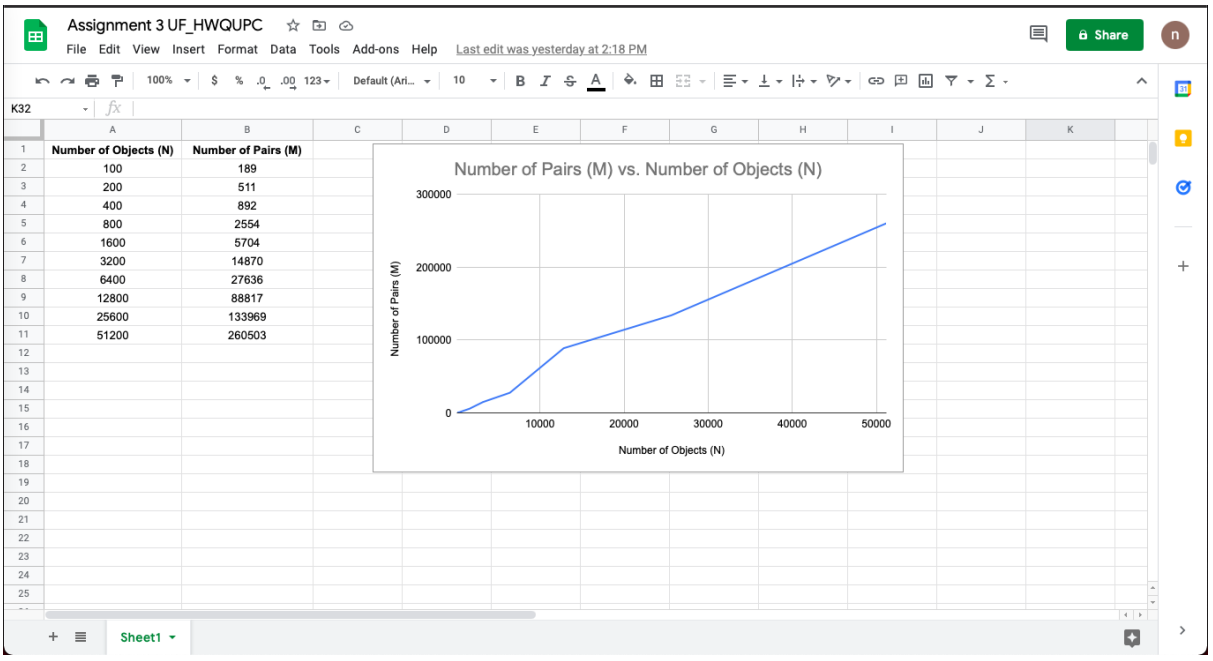
- **Relationship Conclusion:**

The relationship between number of objects(n) and number of pairs (m) appears to be “$m \propto n\log n$”.

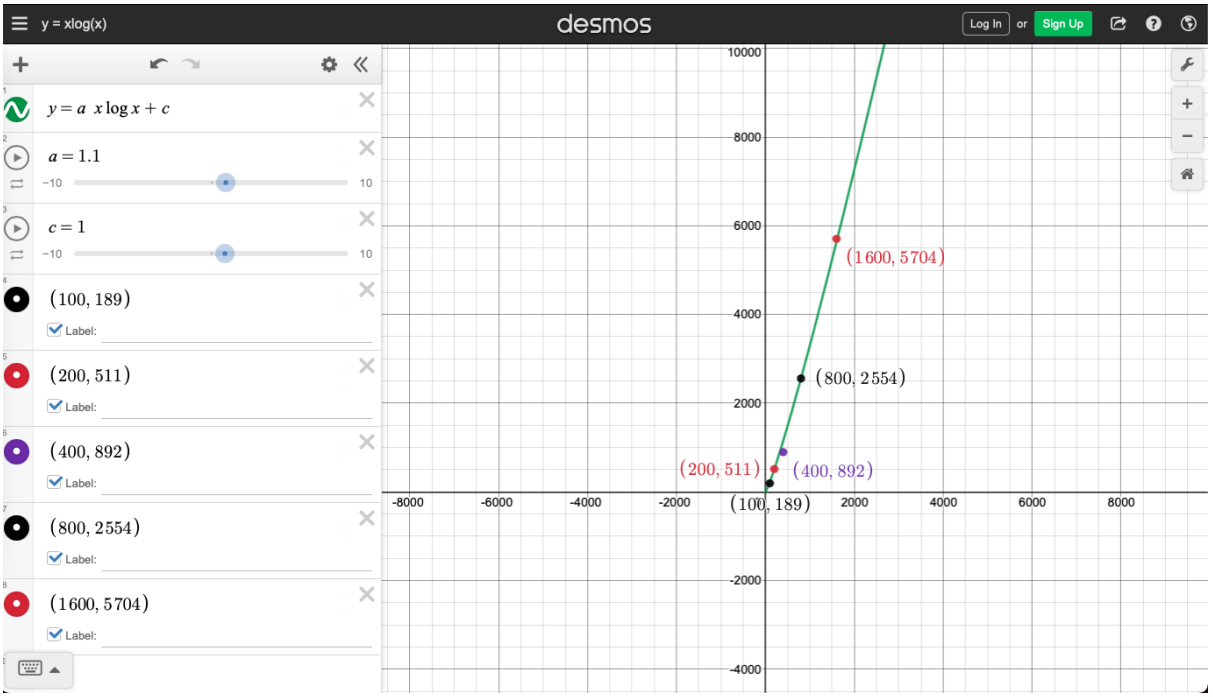
- **Evidence to support conclusion:**



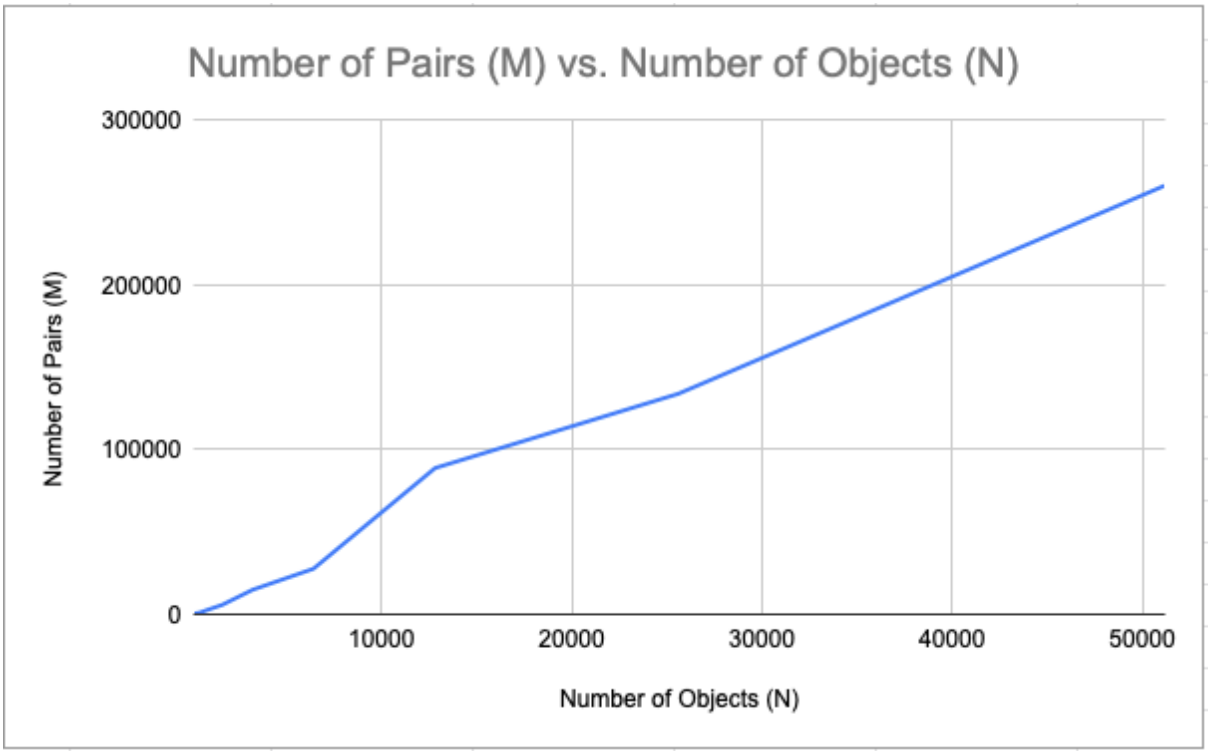
1. **Graph Output from the values generated by main()**:



2. **Graph Output validation by plotting ‘m’ and ‘n’ values in y = a * xlog x + c equation**:



- **Graphical Representation:**



- **Unit Test Result:**