Program Structures & Algorithms

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Assignment No. 3

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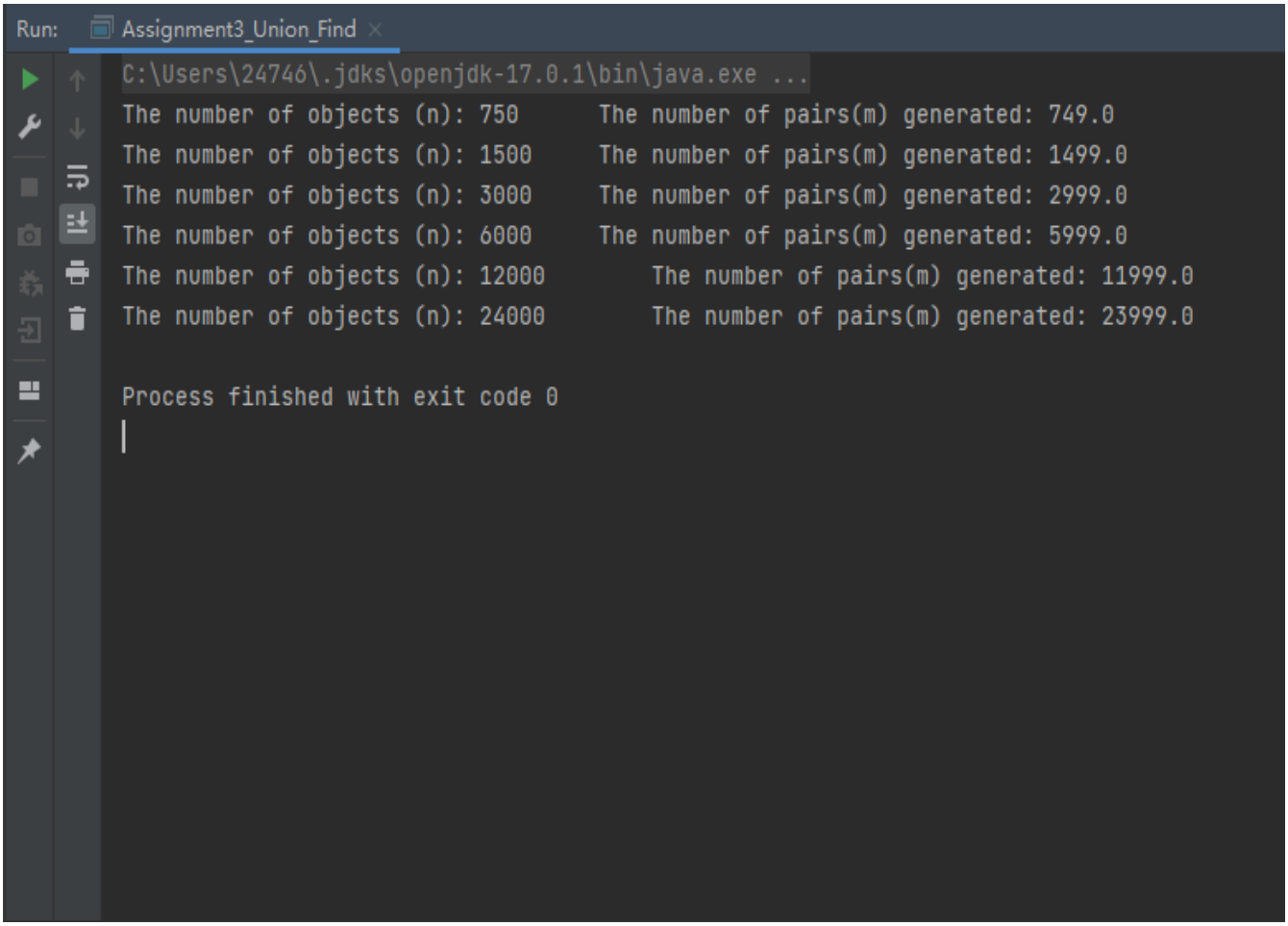
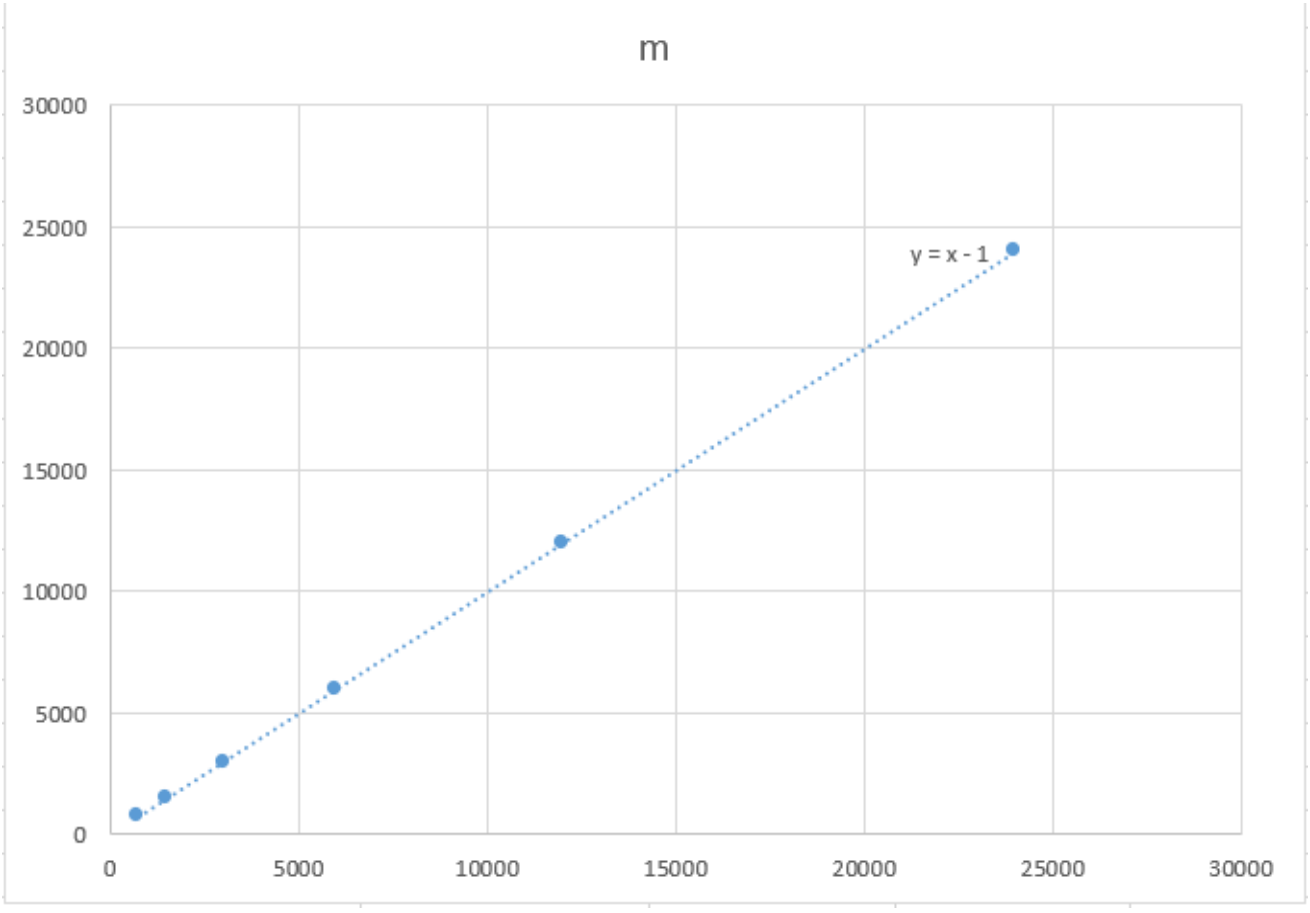
- **Task**

  When using the height-weighted Quick Union with path Compression. Determine the relationship between the number of objects (*n*) and the number of pairs (*m*) generated to accomplish this (i.e. to reduce the number of components from *n* to 1).

- **Output screenshot**



- **Relationship Conclusion**
  - Which we can find that m = n – 1.
  - And the reason is that at the beginning of the whole program. There are n component since we have n sites. The first time we generate a pair of integers I and j where i != j. We reduce the component to n-1.
  - And the second time we generate a pair of integers the not connect with each other. There are two situations.
    - The first is that we connect a new site to the small component we generated in step 1.
    - Or we generate a new component that different from the component we generate in the first step.
  - But in both situations, we reduce the number of component by 1.
  - So, as we can see, every time we union two site together that not connected before. No matter what the situation is, we reduce the number of components by 1.
  - If we want to reduce the number of components from n to 1. We need generate n-1 pairs to accomplish that.
- **Evidence / Graph**



- **Unit tests result**