## 1 Exercises

**Exercise 1.** Suppose we are using the UF data structure to solve the dynamic connectivity problem with 10 sites and input pairs (1, 2), (7, 8), (1, 6), (0, 5), (3, 8), (2, 3), (6, 7), (2, 7), and (4, 9), arriving in that order.

- a. How many components does UF identify?
- b. What are those components?
- c. Will the number of components or their membership change if the input pairs arrive in a different order than above?
- d. Suppose we process the pairs using QuickFindUF. What are the values in the id array after all the pairs are processed?
- e. Suppose we process the pairs using QuickUnionUF. What are the values in the parent array after all the pairs are processed?
- f. Suppose we process the pairs using WeightedQuickUnionUF. What are the values in the parent and size arrays after all the pairs are processed?

## 2 Solutions

## Solution 1.

## a. 3

- b.  $\{0,5\},\{4,9\},$  and  $\{1,2,3,6,7,8\}$
- c. No
- d. id = {5, 8, 8, 8, 9, 5, 8, 8, 9}
- e. parent = {5, 2, 6, 8, 9, 5, 8, 8, 8, 9}
- f. parent = {0, 1, 1, 7, 4, 0, 1, 1, 7, 4}, size = {2, 6, 1, 1, 2, 1, 1, 3, 1, 1}