Disjoint Sets

Here is a video walkthrough of the solutions.

For each of the arrays below, write whether this could be the array representation of a weighted quick union with path compression and explain your reasoning.

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      i:   0   1   2   3   4   5   6   7   8   9
      ----------------------------------------
A. a[i]:   1   2   3   0   1   1   1   4   4   5
B. a[i]:   9   0   0   0   0   0   9   9   9 -10
C. a[i]:   1   2   3   4   5   6   7   8   9 -10
D. a[i]: -10   0   0   0   0   1   1   1   6   2
E. a[i]: -10   0   0   0   0   1   1   1   6   8
F. a[i]:  -7   0   0   1   1   3   3  -3   7   7
```

Solution:

A. Impossible: has a cycle 0-1, 1-2, 2-3, and 3-0 in the parent-link representation.

B. Impossible: the nodes 1, 2, 3, 4, and 5 must link to 0 when 0 is a root; hence, 0 would not link to 9 because 0 is the root of the larger tree.

C. Impossible: tree rooted at 9 has height 9 >lg 10.

D. Possible: 8-6, 7-1, 6-1, 5-1, 9-2, 3-0, 4-0, 2-0, 1-0.

E. Impossible: tree rooted at 0 has height 4 >lg 10.

F. Impossible: tree rooted at 0 has height 3 >lg 7.