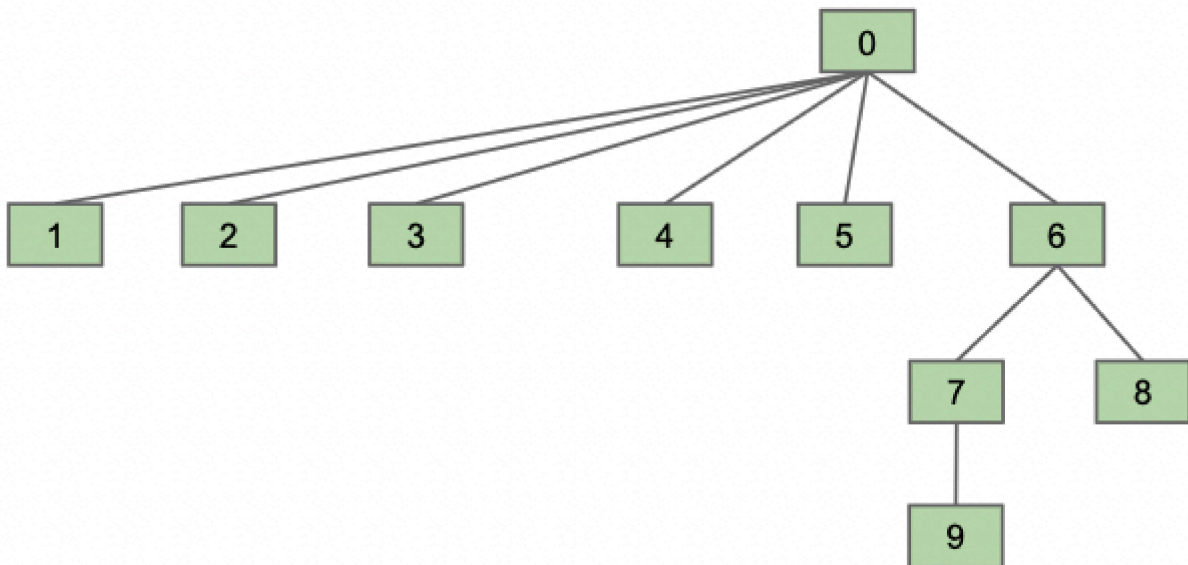# 14.6 Exercises

Factual

1. [Problem 2](#) from the Spring 2016 Midterm 2.
2. [Problem 1d](#) from the Spring 2015 Midterm 2.
3. Suppose we have the following WQU with path compression. What is the height of the tree after we call `isConnected(8, 9)` ?

> Problem 1

> Problem 2

> Problem 3

Conceptual

1. Which of the following arrays could represent a valid weighted quick union structure?

   ☑ `[8, 0, 4, 0, 0, 4, 0, 4, 2, 0]`

   ☑ `[4, -8, 8, 2, 1, -2, 1, 1, 4, 5]`

   ☑ `[3, 3, 5, 9, 3, 6, 3, 4, 1, -10]`

   ☑ `[2, -10, 1, 1, 1, 1, 1, 2, 1, 7]`

   > Problem 1

Procedural

1. Define a *fully connected* WQU as one where all elements are in the same set. What is the maximum and minimum height of a fully connected WQU with 6 elements?

2. Suppose we have a WQU of height H. What is the minimum number of elements that must be in the WQU?

   > Problem 1

   > Problem 2

Metacognitive

1. Problem 3 from the Spring 2017 Midterm 2.

2. Suppose we create a WQU with N items, then we perform M_C union operations and M_U union operations. Using big O notation, what is the runtime of this sequence of operations?

3. Using the same variables as problem 2, describe a sequence of operations that would result in a runtime of $O(N + M_U + M_C)$.

4. Write a `int find(int p)` method for the WQU with path compression. It should perform path compression as described in lecture: any node on the path from root to our target node should have its parent reset to the root. It takes in the target node `p` and returns the root of the tree `p` is in.

> Problem 1

> Problem 2

> Problem 3

> Problem 4

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