THE UNIVERSITY OF VERMONT
COLLEGE OF ENGINEERING &
MATHEMATICAL SCIENCES

Priority Queue with Max Heap

CS 124 / Department of Computer Science

Motivation

Let's say we have some backlog of jobs we'd like done. Also suppose some jobs are more important or more urgent than others -- that is, each job has some priority associated with it. We'd like to work through this backlog of jobs handling the higher-priority jobs first.

One way to do this is with a *priority queue*, where the priority queue consists of a binary heap.

Implementation

As we've seen before, we can impose one of two orderings on a binary heap.

- Each child has a value less than or equal to the value of its parent. We call this a *max heap*, because the *maximum* value will be at the root.

- Each child has a value greater than or equal to the value of its parent. We call this a *min heap*, because the *minimum* value will be at the root.

Since we've already seen min heap in action in the previous lecture, let's use a max heap for this priority queue.

Priority queue

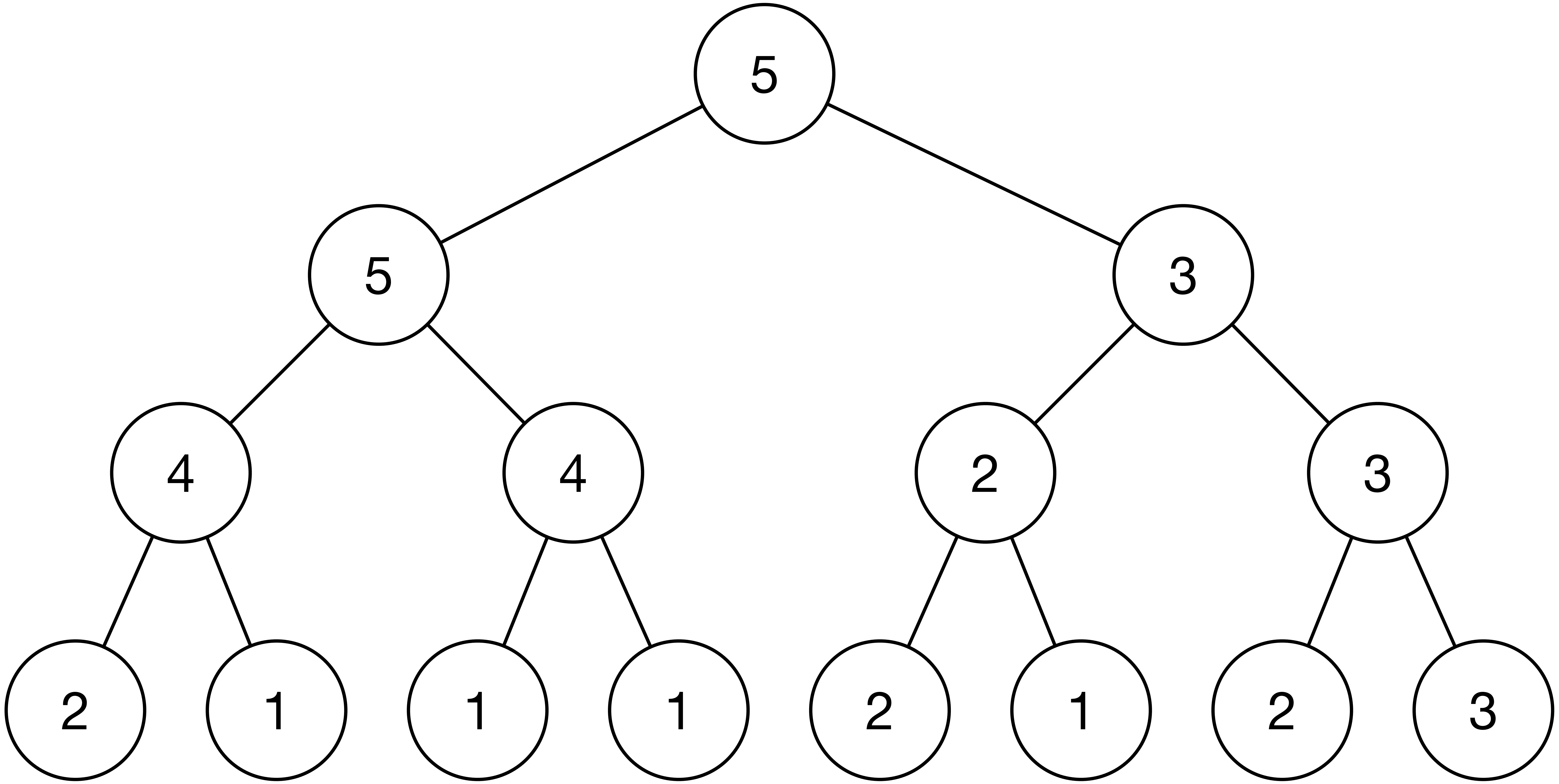
Suppose we have a scale of priorities of integer values from 1 to 5, with 1 representing the lowest priority and 5 representing the highest priority.

Suppose we have 15 jobs with the following priorities:

5, 4, 2, 2, 1, 3, 2, 4, 1, 1, 5, 2, 1, 3, 3

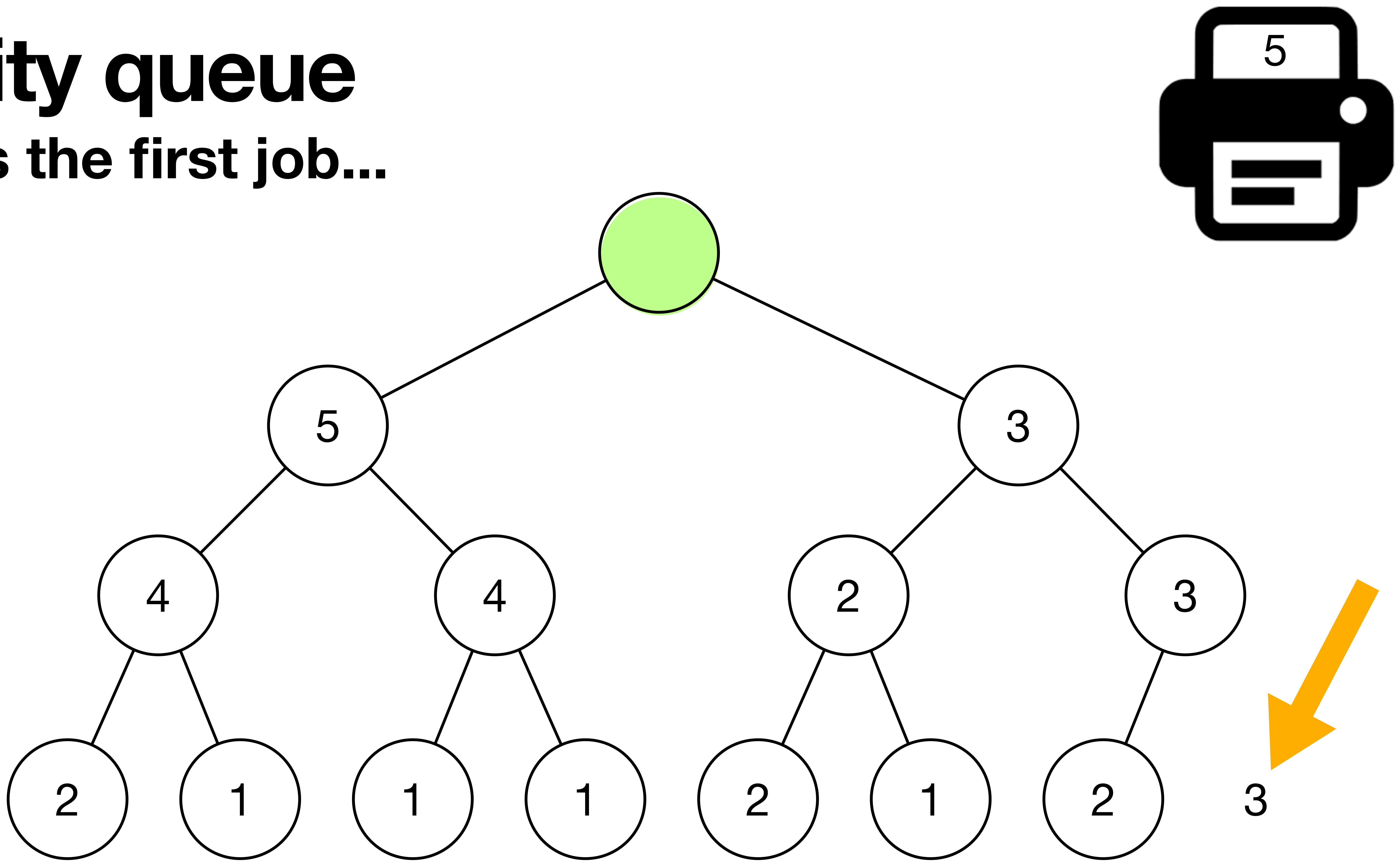
First, we construct a binary heap. We can insert values one at a time, and perform the necessary percolations to ensure that the structure property and the heap order property are preserved. Remember, here we have a max heap.

Priority queue



Priority queue

Process the first job...



Priority queue

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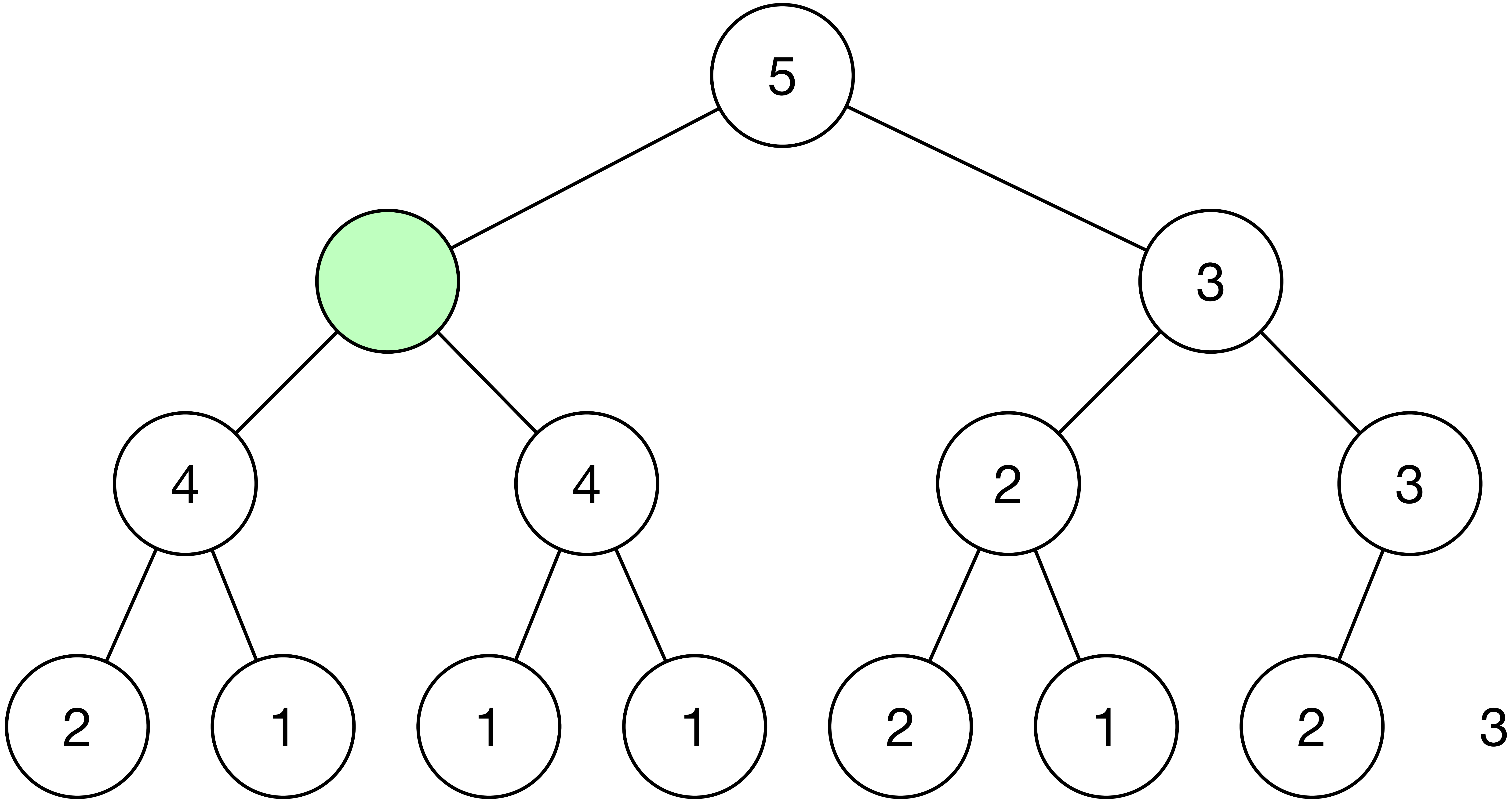

Priority queue

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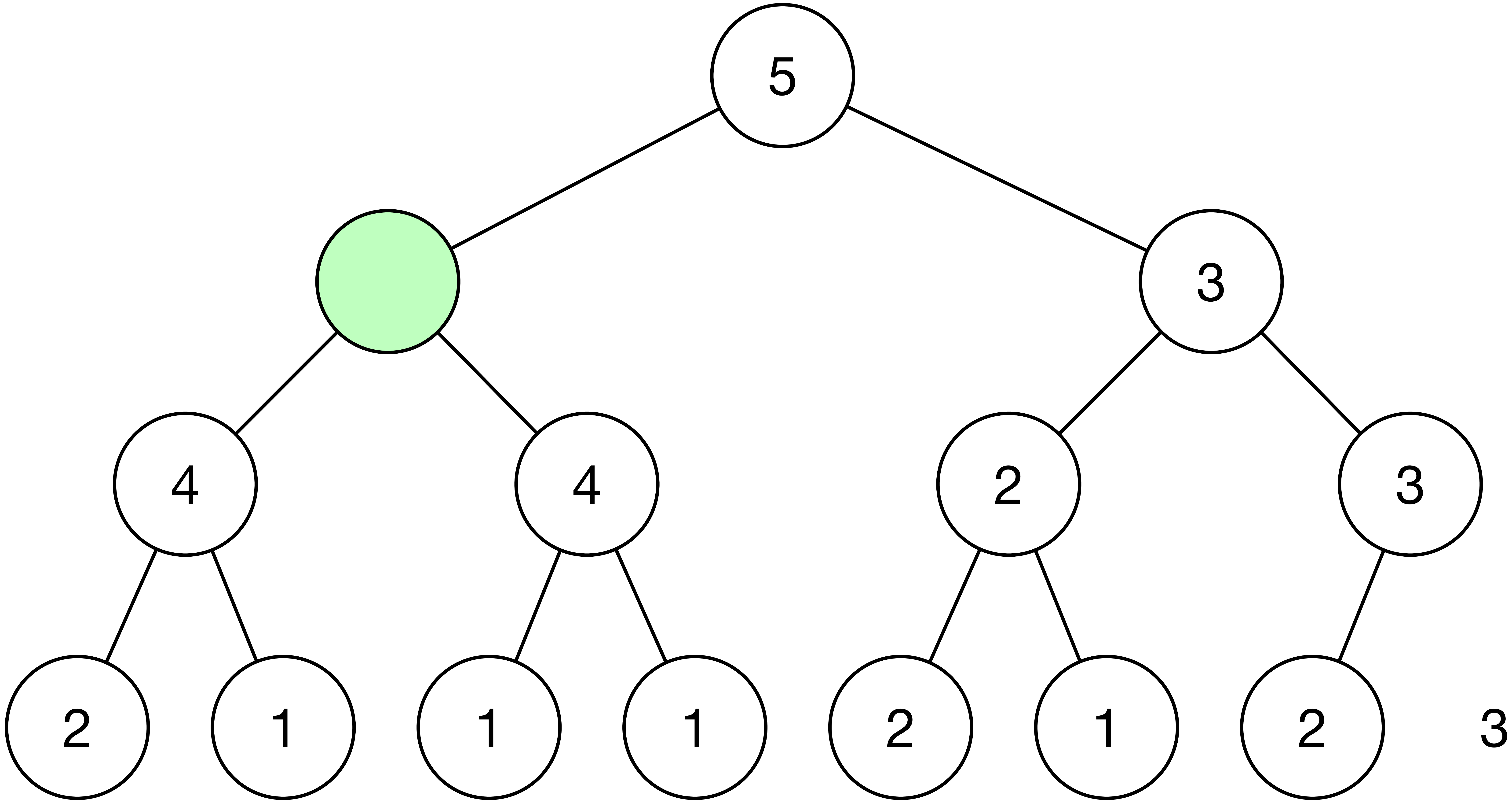
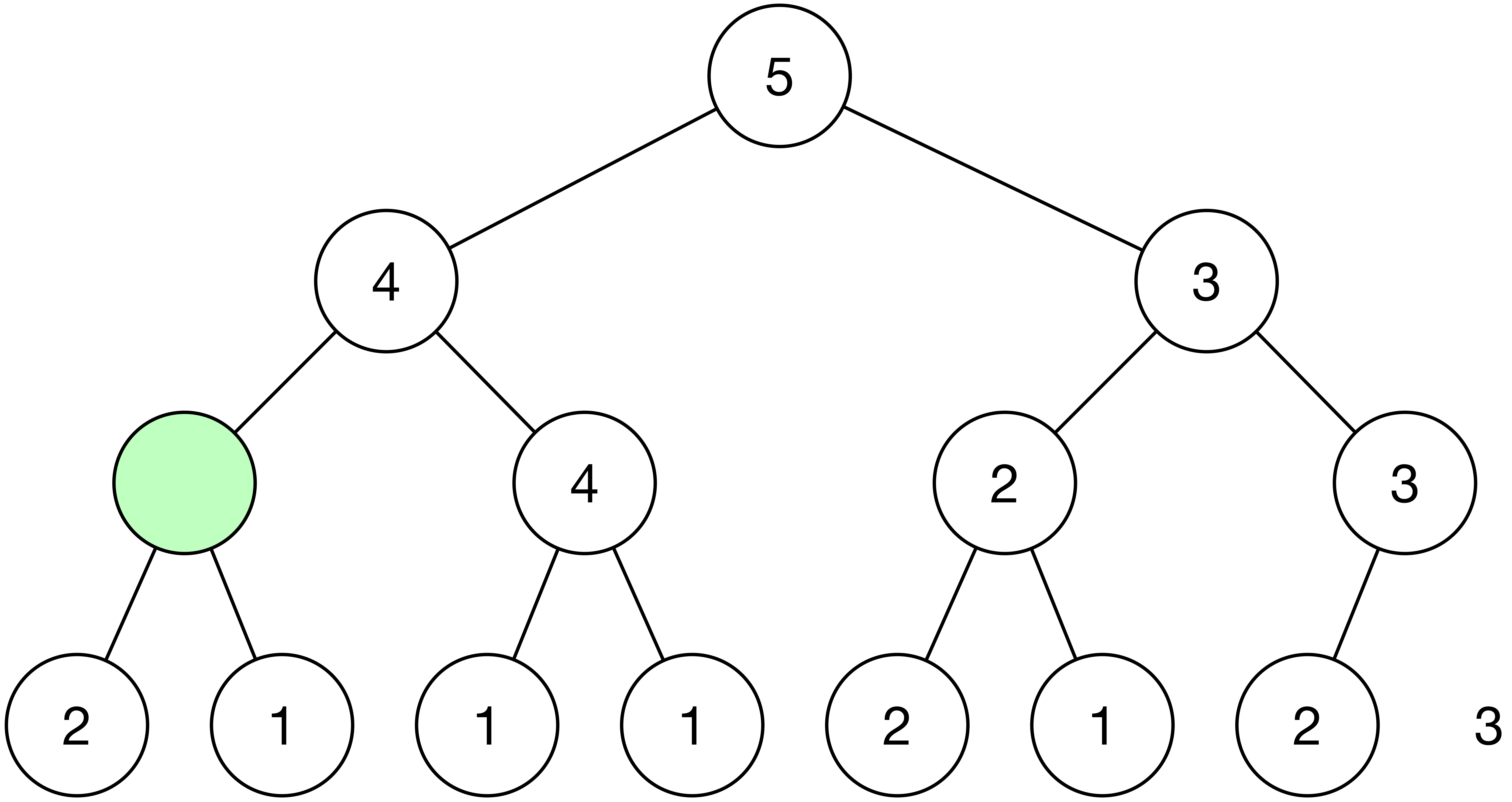


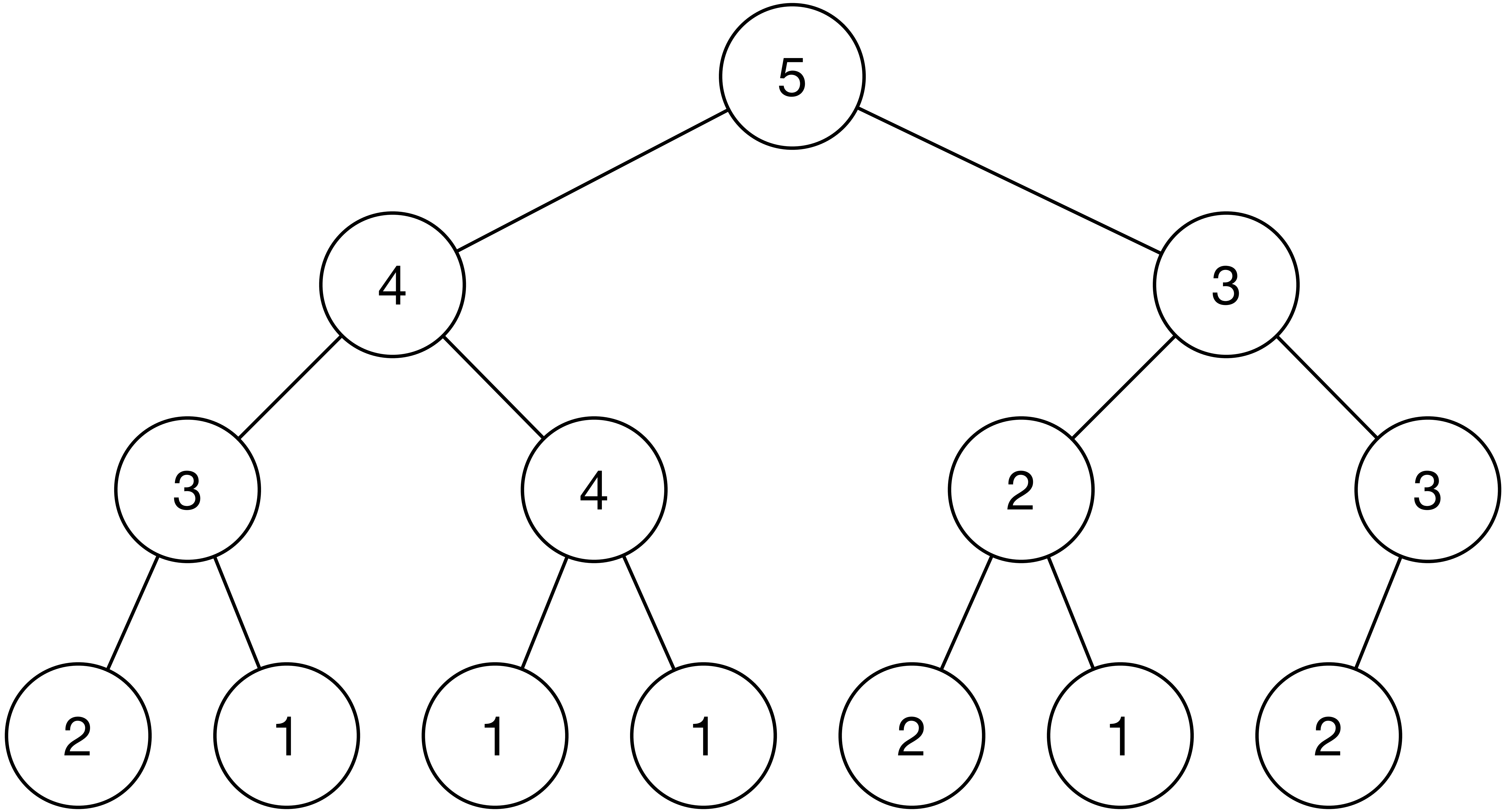
Priority queue

Process the first job...



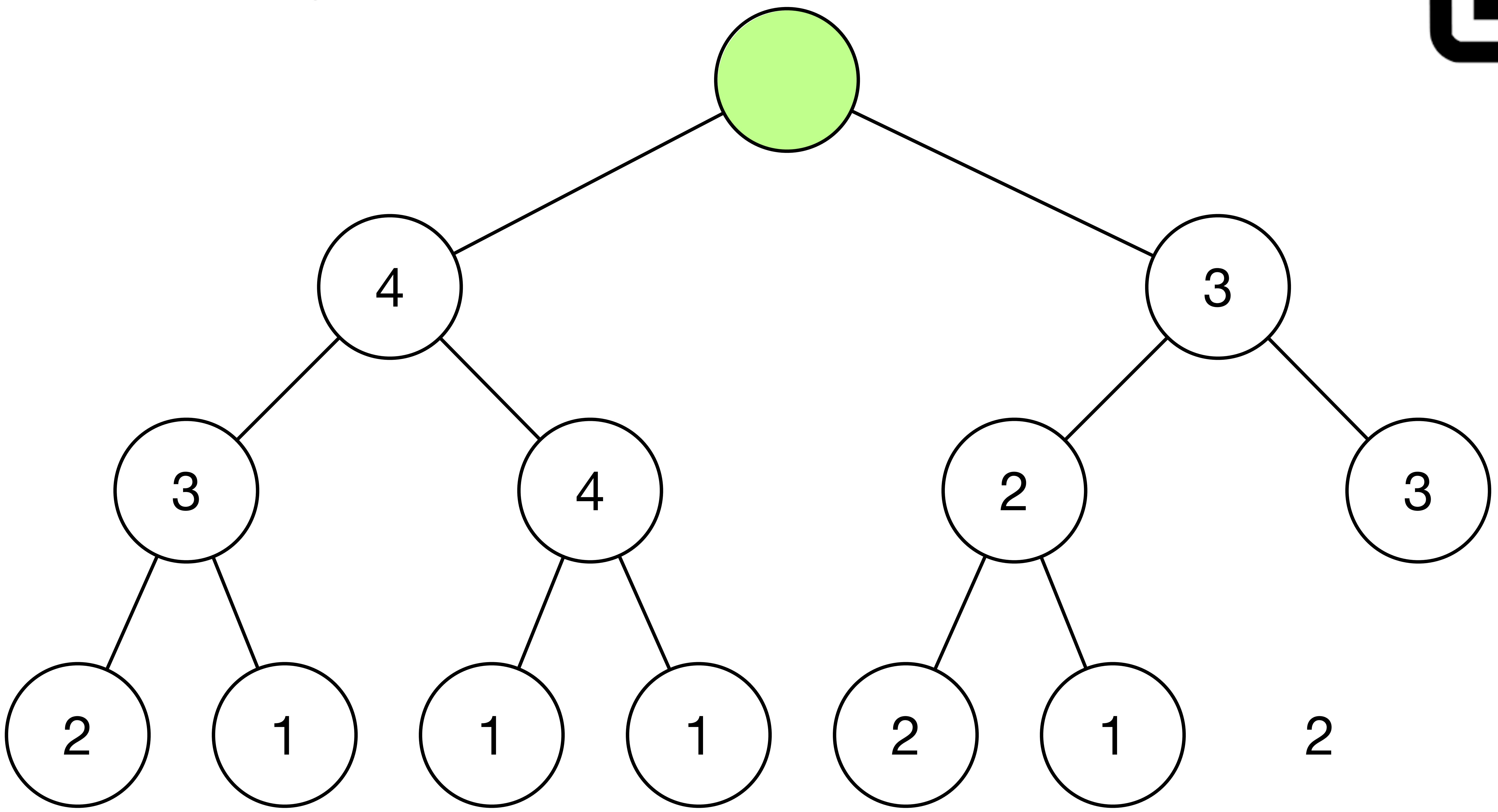
Priority queue

Process the first job. Done!



Priority queue

Process the next job...



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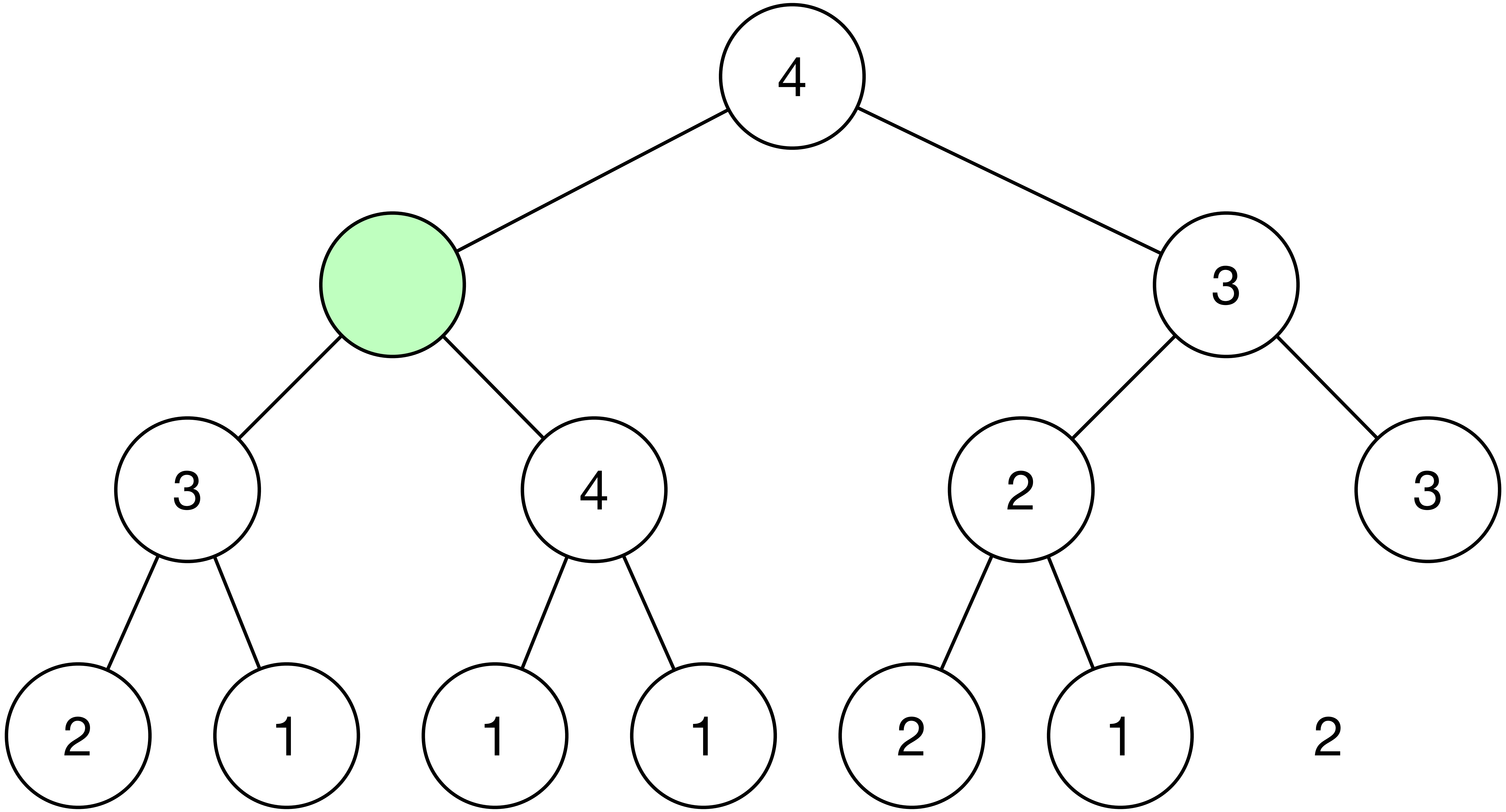
Priority queue

Process the next job...



Priority queue

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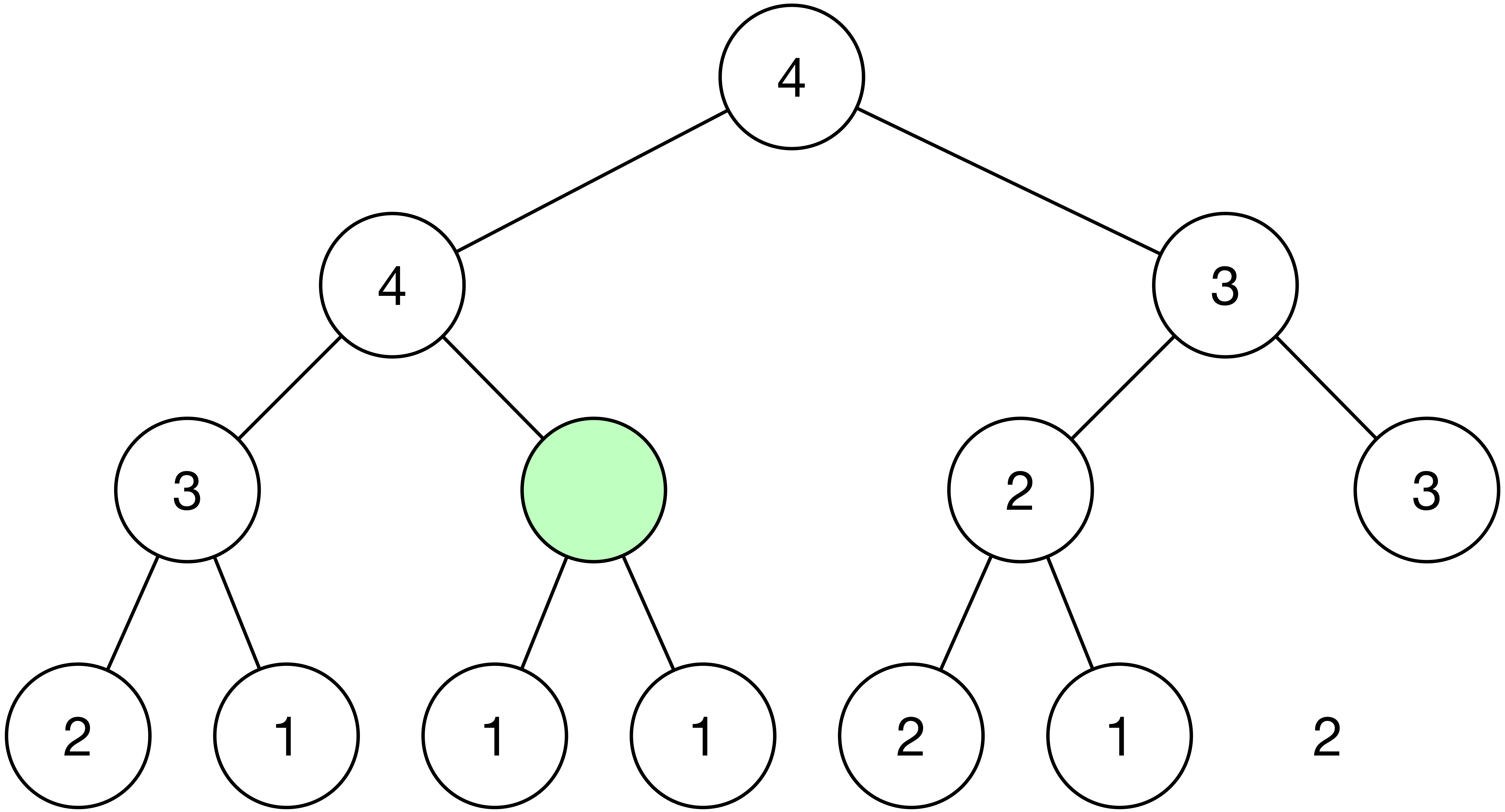
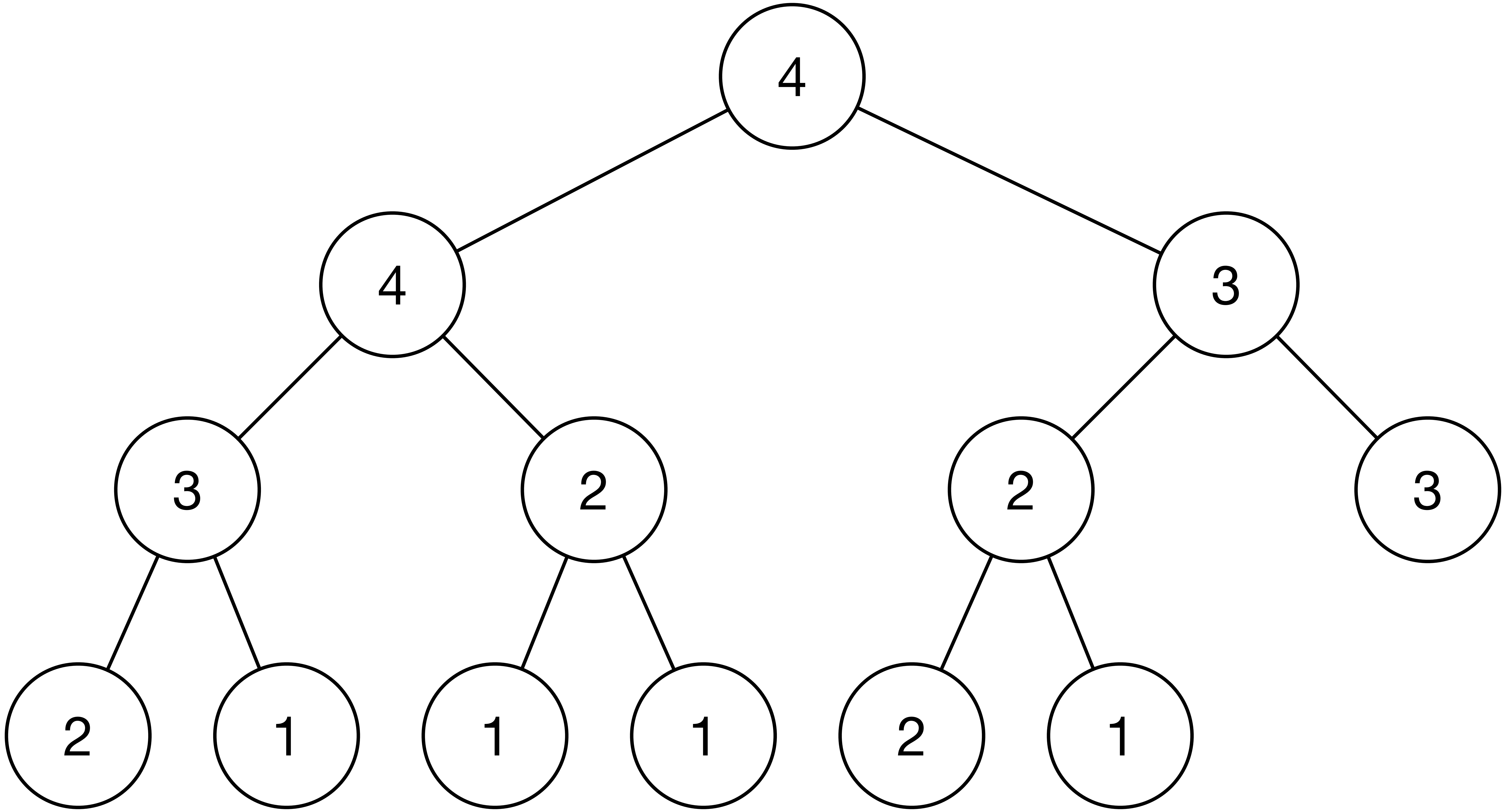


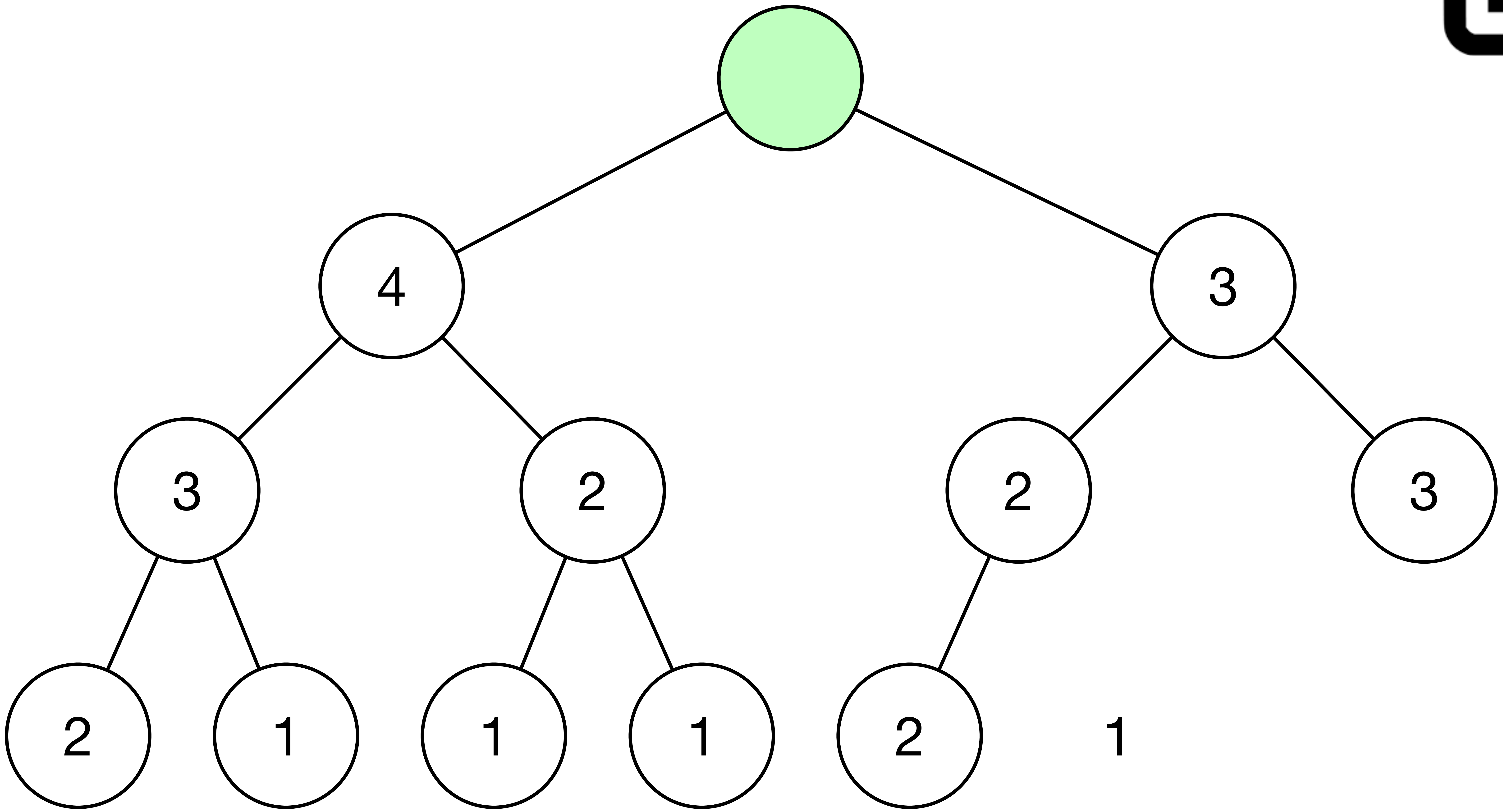
Priority queue

Process the next job. Done!



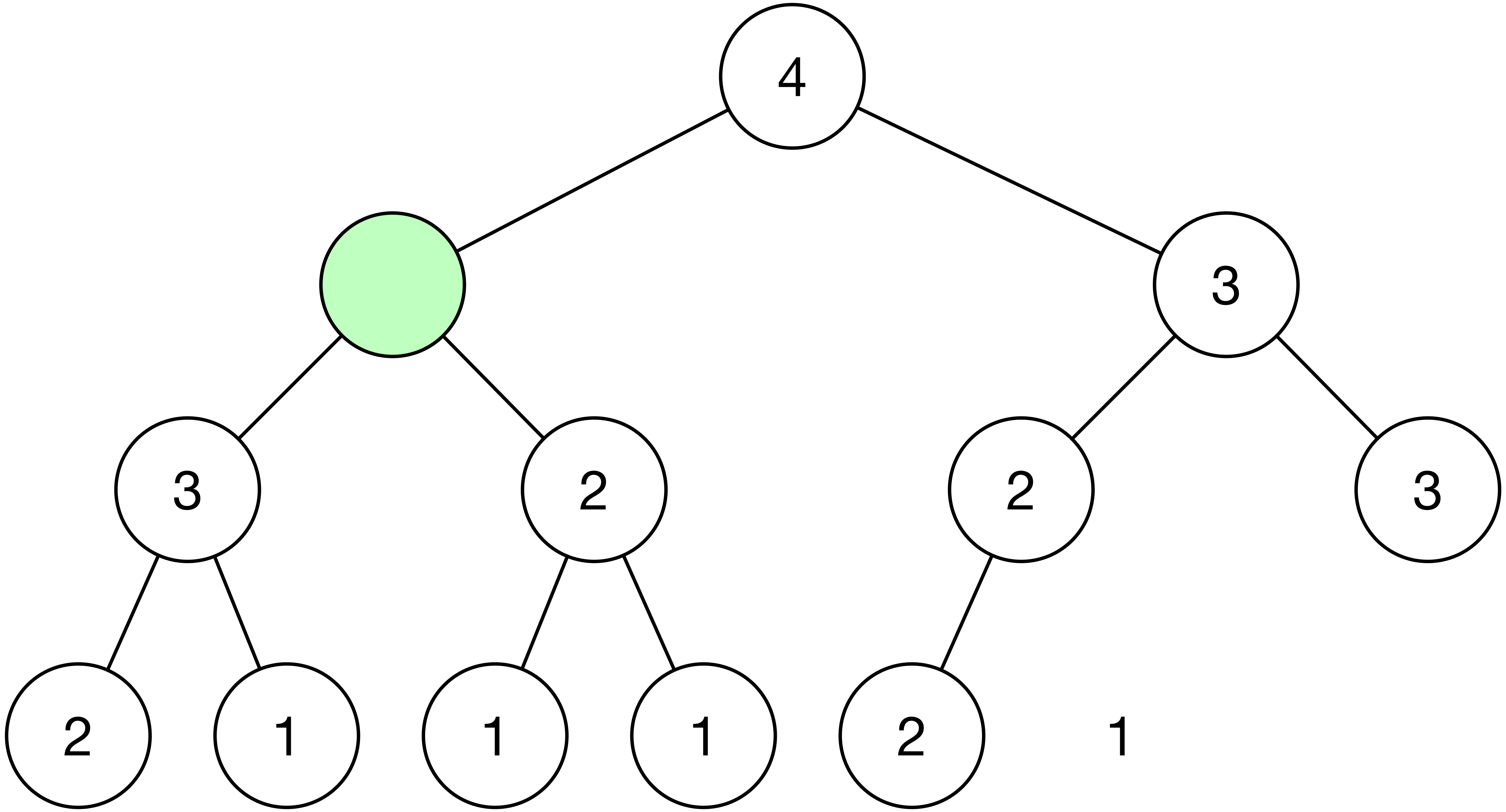
Priority queue

Process one more job...



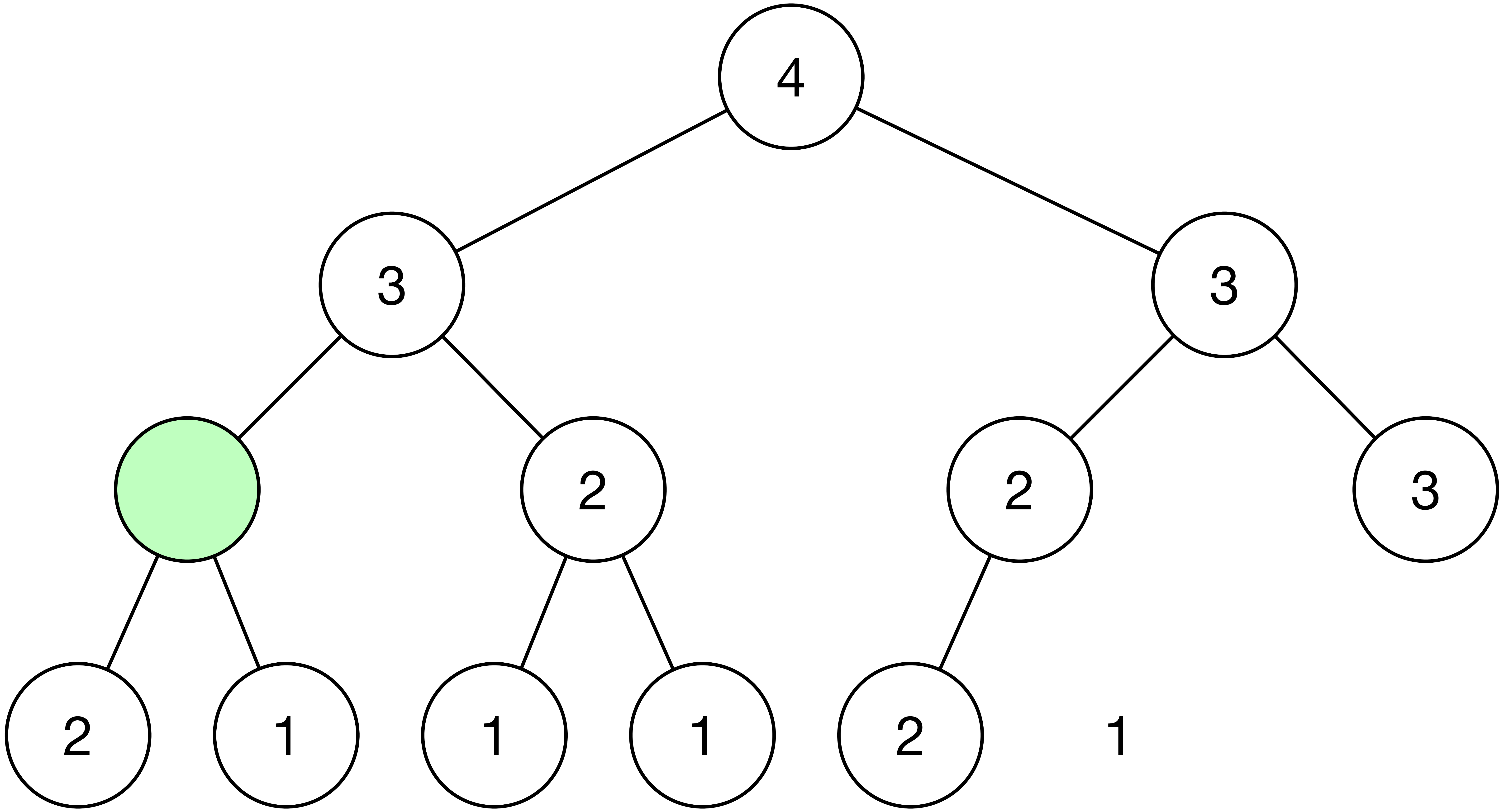
Priority queue

Process one more job...



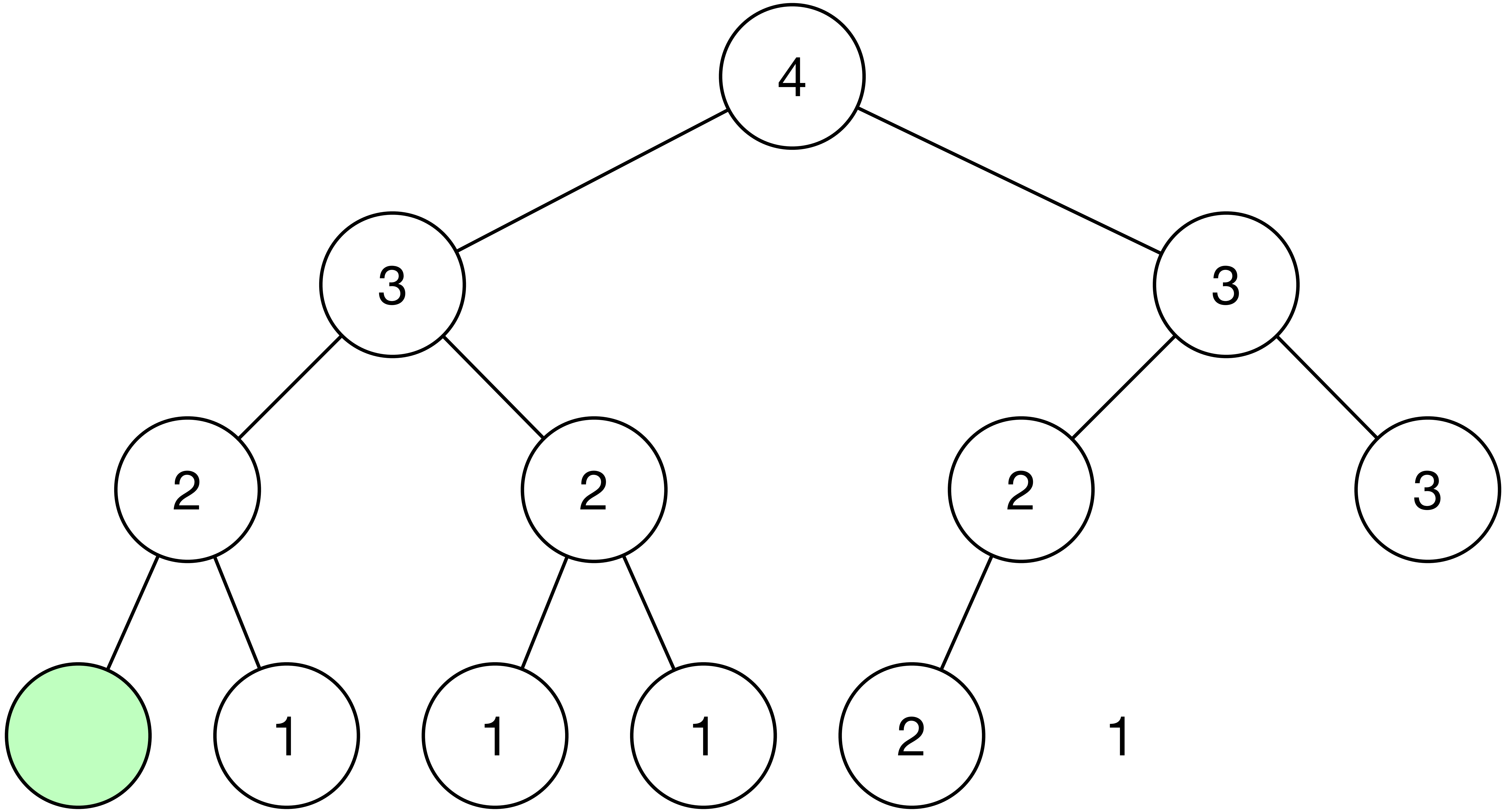
Priority queue

Process one more job...



Priority queue

Process one more job...



Priority queue

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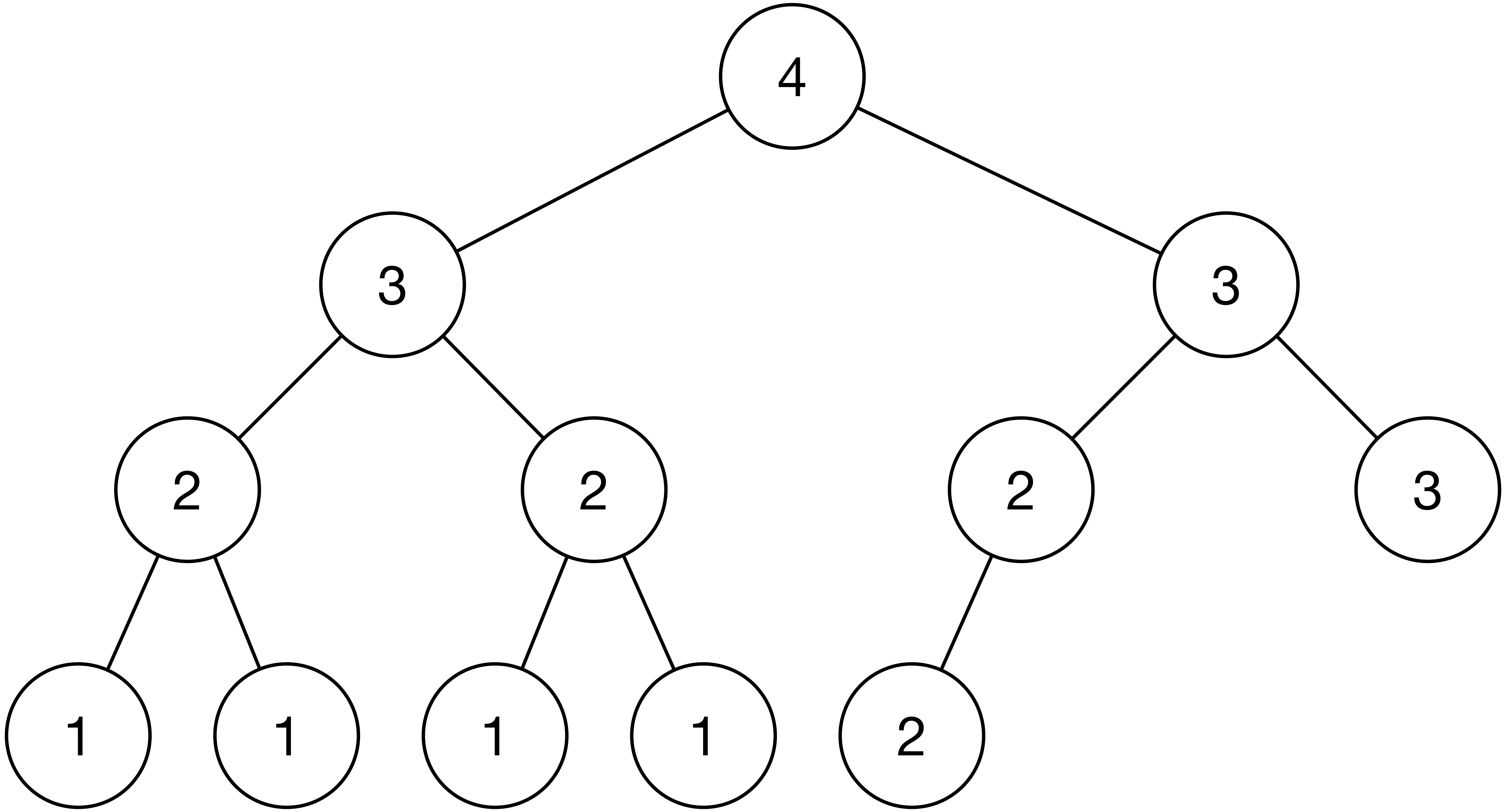
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