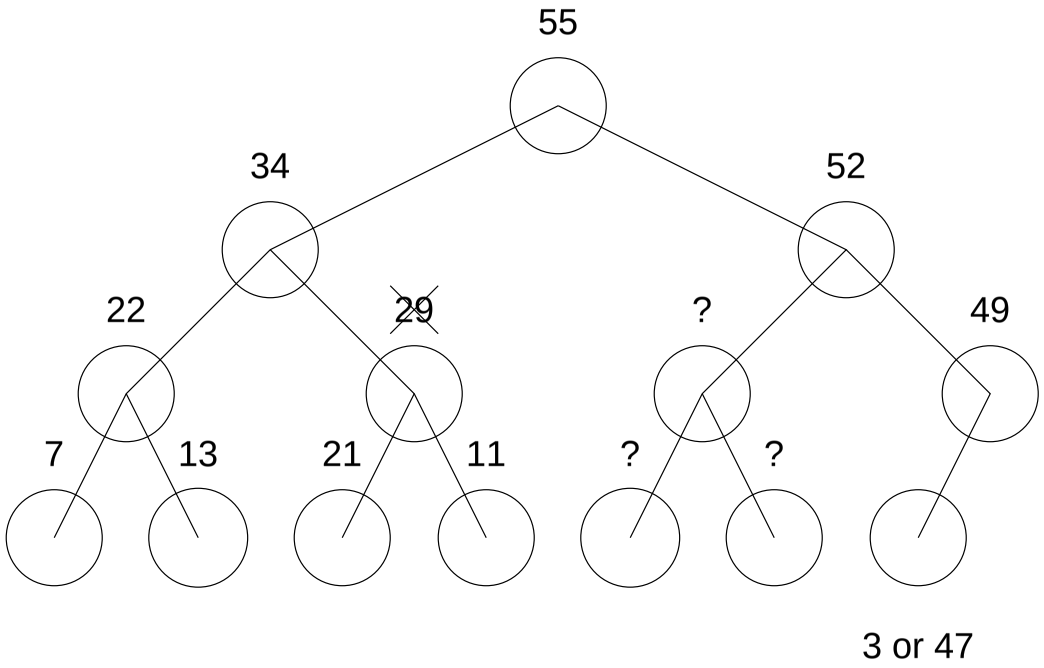
Overview

- Removal of a non-root node from a heap
- Quicksort
- Binary Trees

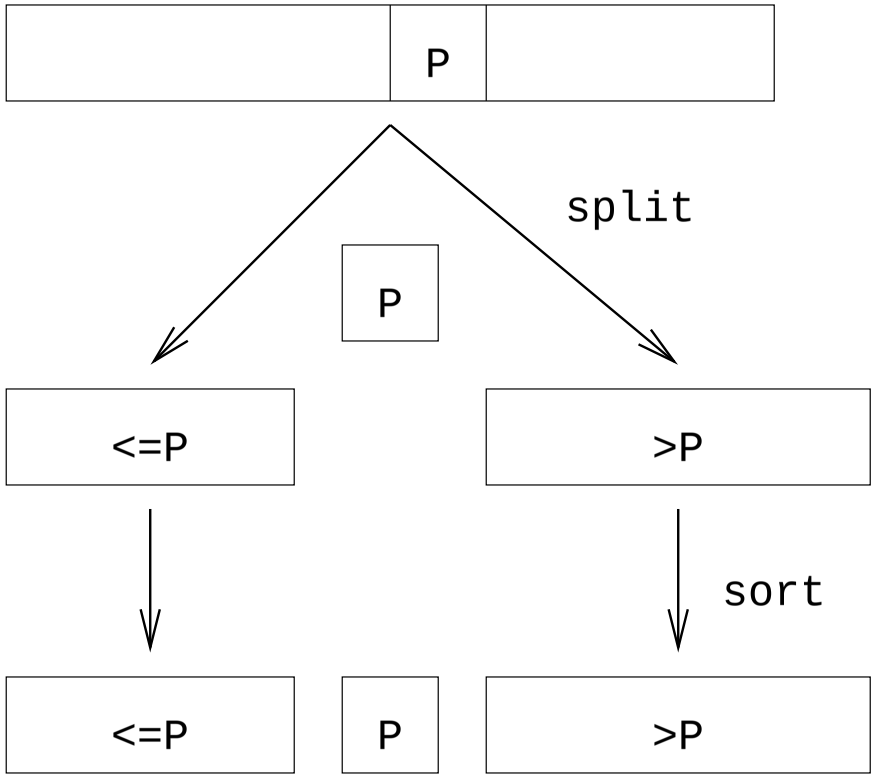
Removal Of A Non-root Node From A Heap

- Consider removing the node with the key 29 from the following heap.



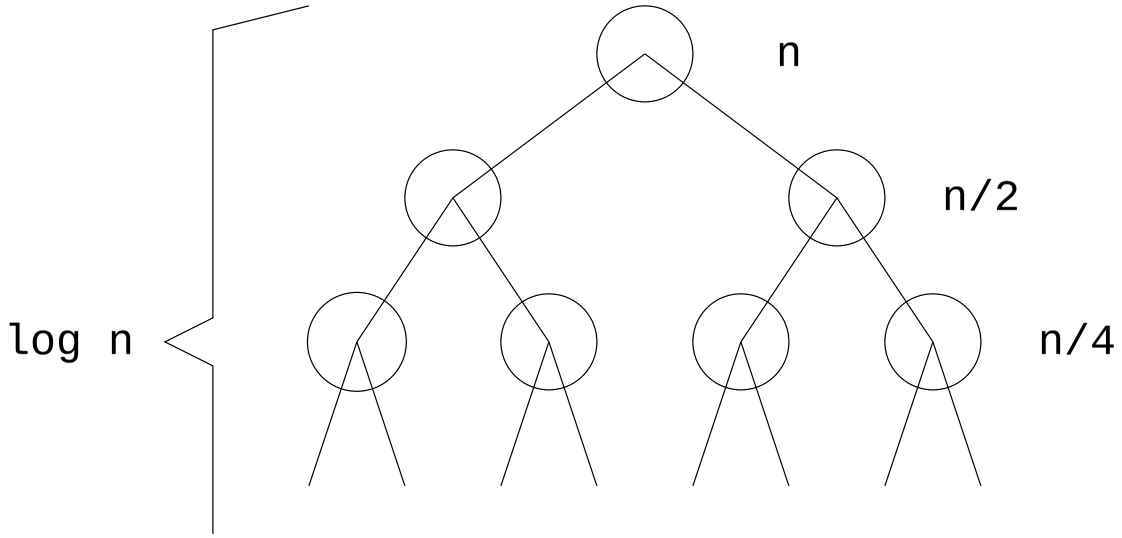
Quick Sort

- Quick Sort is a *hard-split, easy-join* method.
- The following diagram illustrate one step.



Quick Sort (cont.)

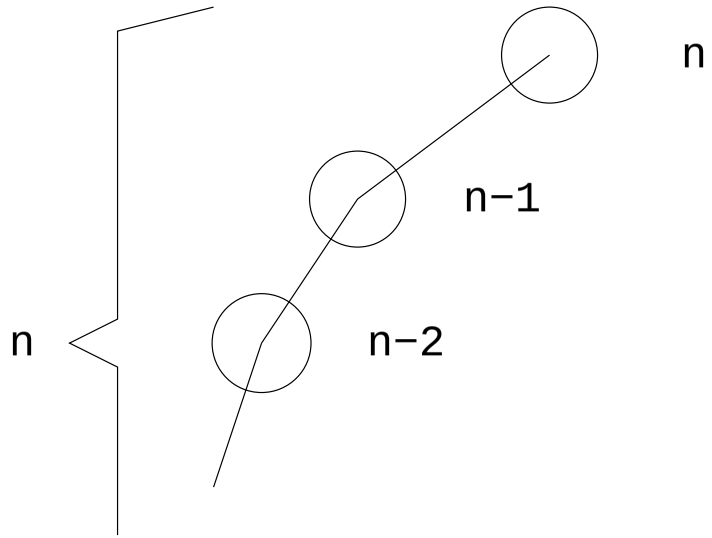
- If the pivot chosen by `split()` divides the array into two (almost) equal-sized parts, each element is `split()` $log\ n$ times.



- Thus, in this case, Quick Sort takes $O(n\ log\ n)$ steps.

Quick Sort (cont.)

- On the other hand, an unfortunate choice of the pivot could divide the array into two parts, one that contains no elements and another that contains $n - 1$ elements.



- In this case, Quick Sort takes $O(n^2)$ steps.

Quick Sort (cont.)

- Various strategies are used to choose the pivot. (None is perfect.)
  - Pick the first element (worst-case scenario is a nearly-sorted or nearly-inverse-sorted array).
  - Take the median of the first, last, and middle elements. This is often used in practice, since it behaves well on the nearly-sorted case, which can be quite common in some applications.