12-F1

优先级队列

左式堆：沿藤合并

God's right hand is gentle

But terrible is his left hand

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堆合并

❖ H = merge(A, B)：将堆A和B合二为一

//不妨设|A| = n ≥ m = |B|

❖ 方法一：A.insert(B.delMax())

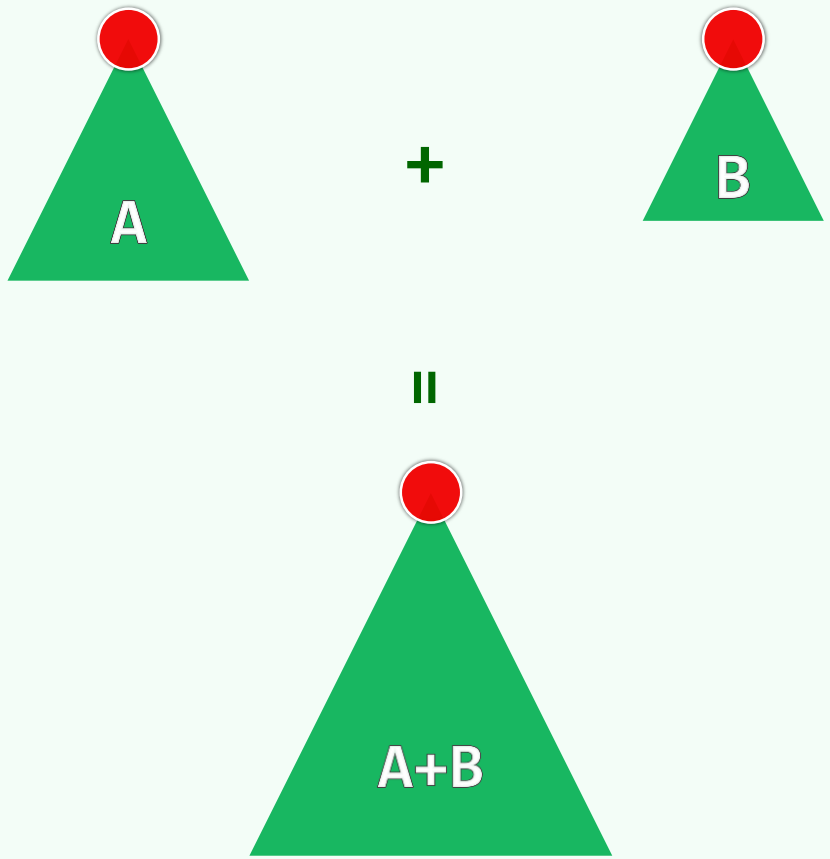
$$m \cdot (\log m + \log (n+m))$$
$$= \mathcal{O}(m \cdot \log (n+m))$$

❖ 方法二：union(A, B).heapify(n + m)

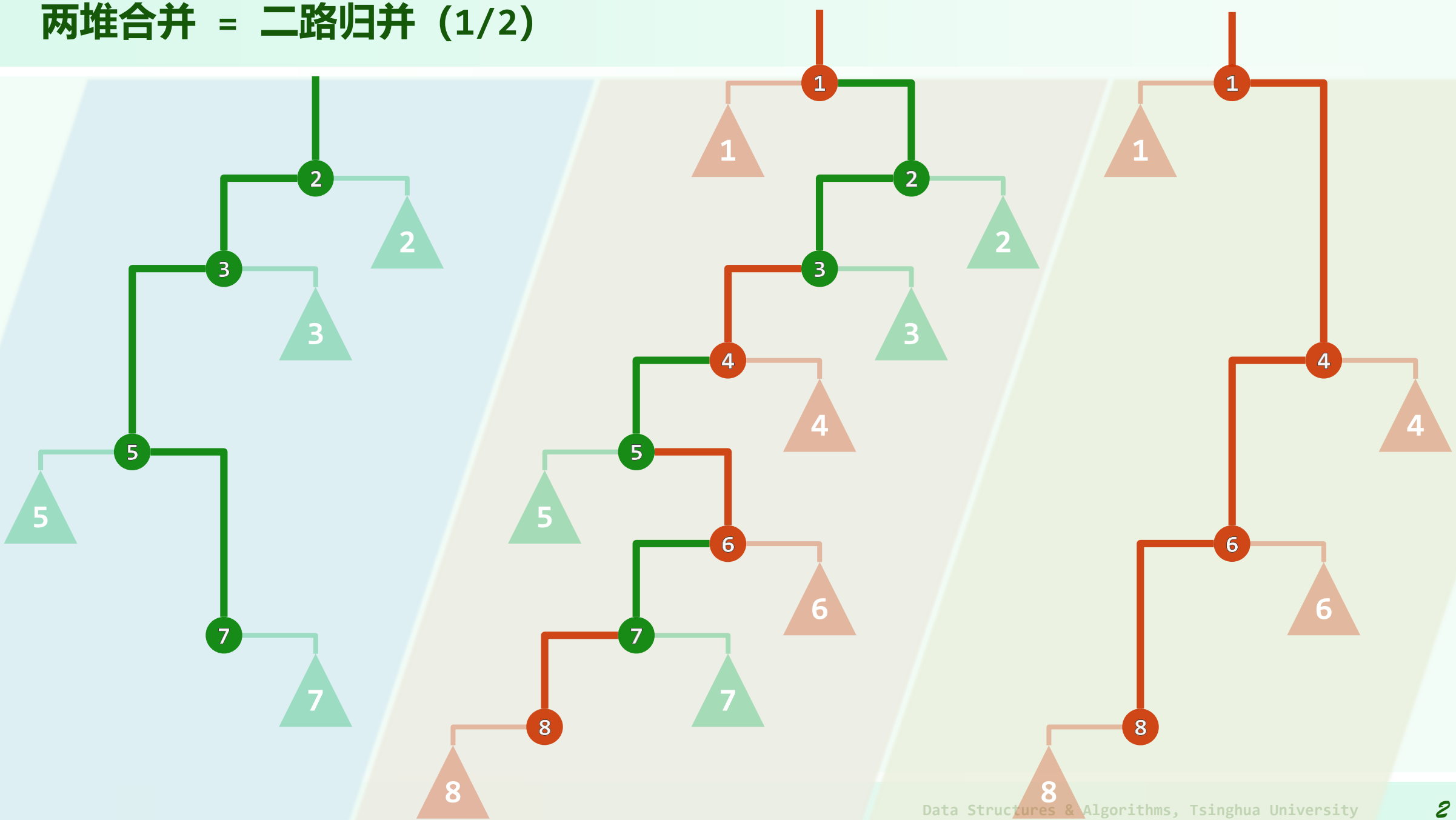
$$= \mathcal{O}(n+m)$$

❖ 有没有更好的办法？比如...

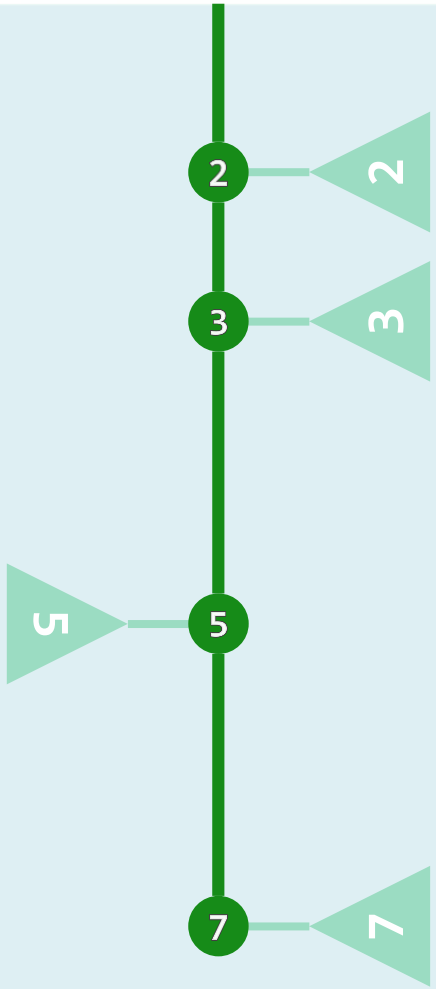
❖ 可否奢望在... $\mathcal{O}(\log n)$ ...时间内实现merge()？

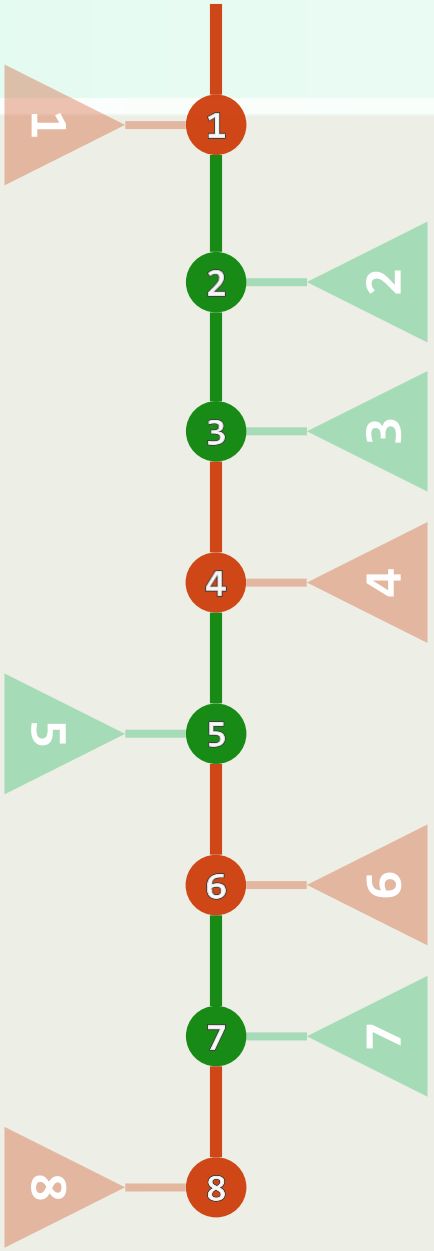


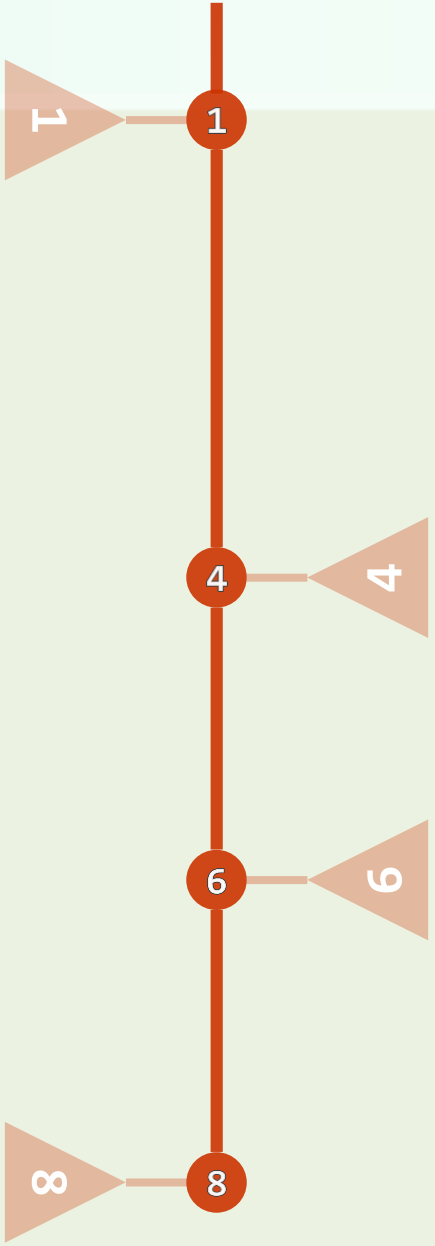
两堆合并 = 二路归并（1/2）



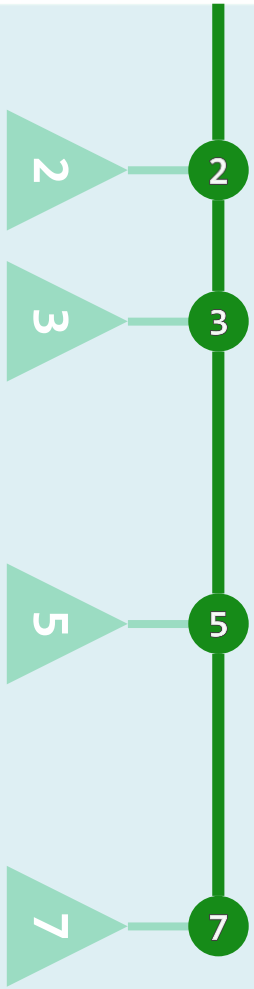
两堆合并 = 二路归并（2/2）

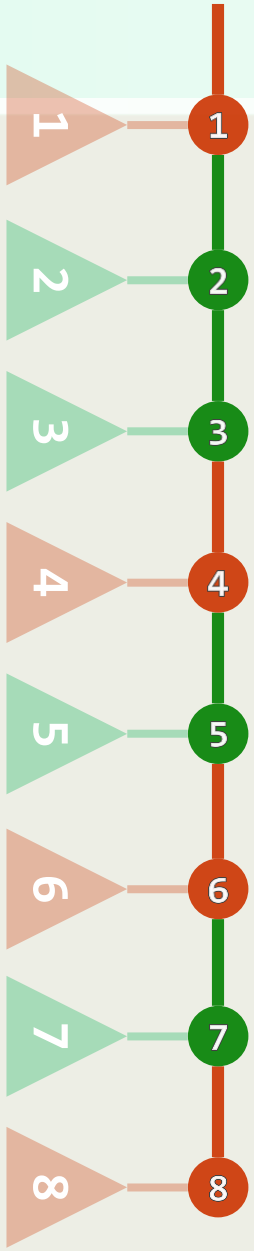


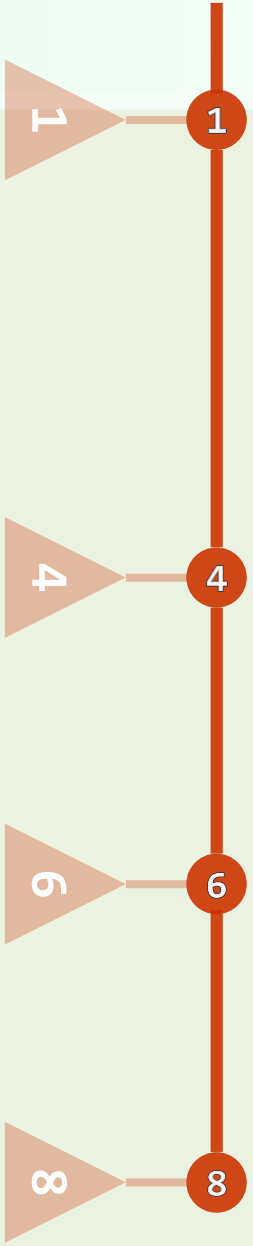




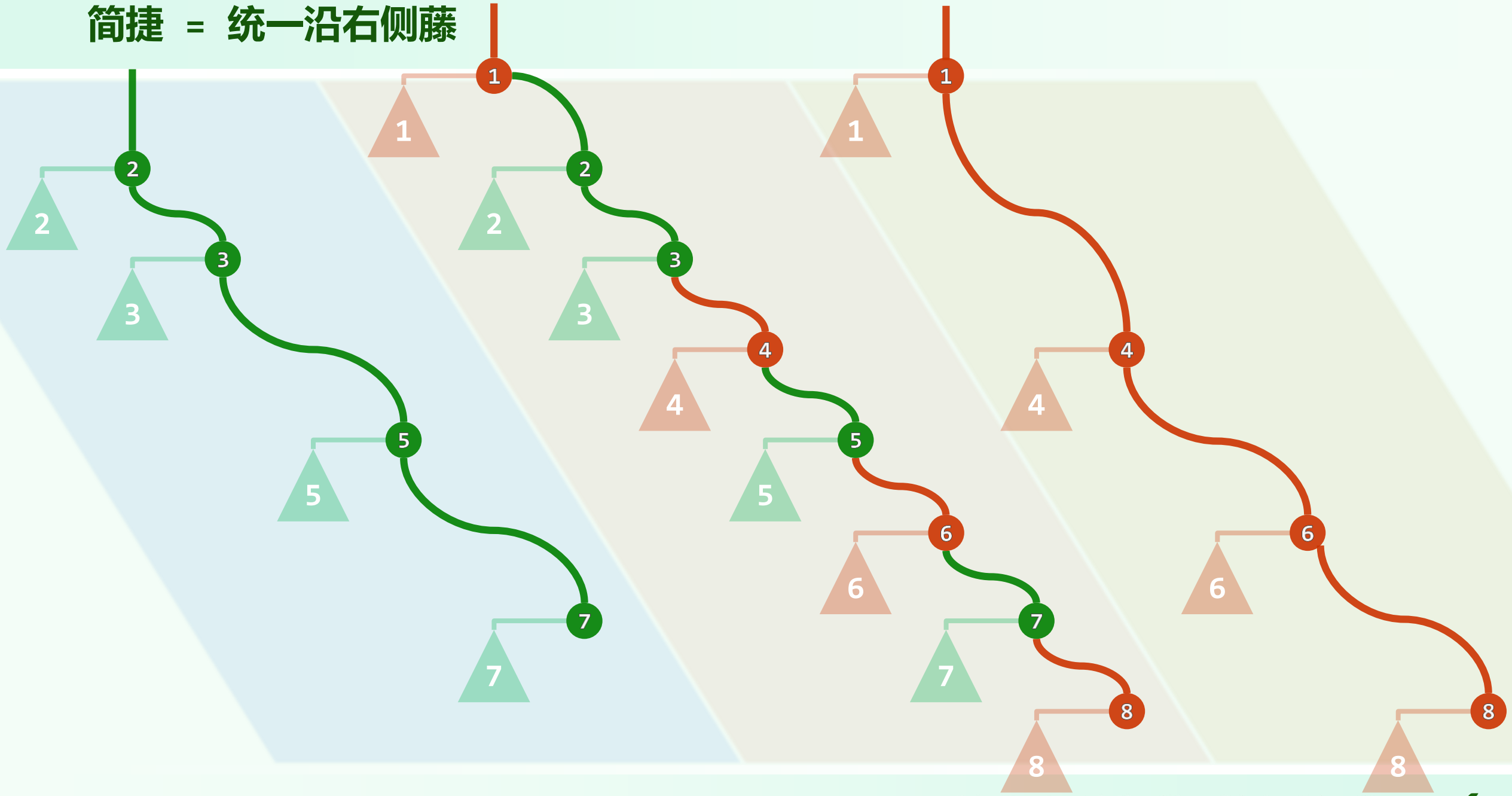
简捷 = 统一沿右侧藤







简捷 = 统一沿右侧藤



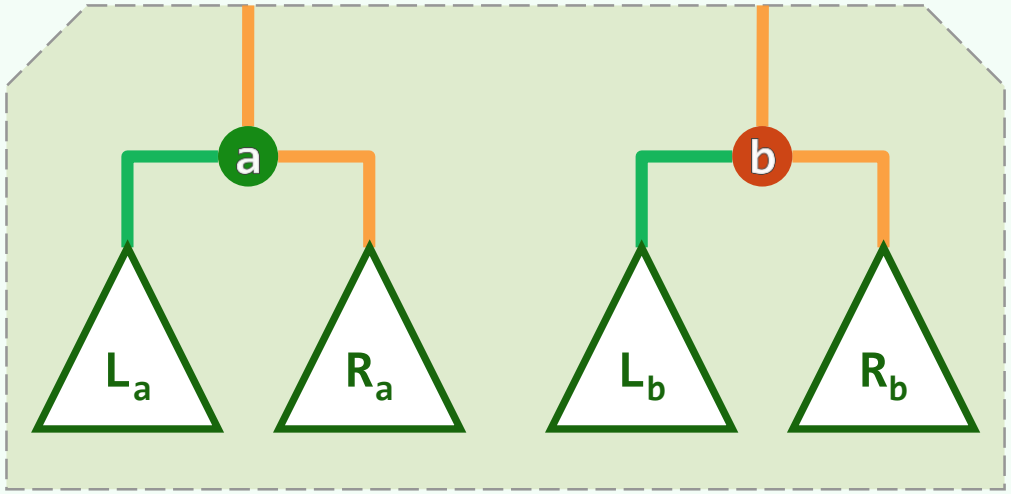
LeftHeap = PQ + BinTree

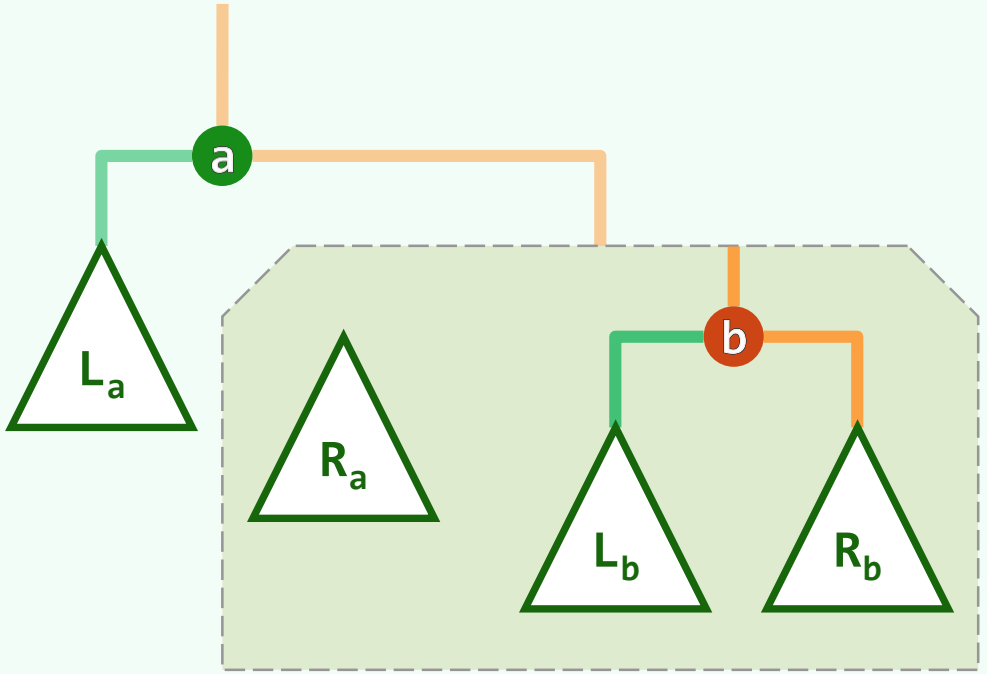
```
template <typename T> class PQ_LeftHeap : public PQ<T>, public BinTree<T> {

public:  T & getMax() { return _root->data; }
         void insert(T); T delMax(); //均基于统一的合并操作实现...

         PQ_LeftHeap( PQ_LeftHeap & A, PQ_LeftHeap & B ) {
            _root = merge( A._root, B._root ); _size = A._size + B._size;
            A._root = B._root = NULL; A._size = B._size = 0;
         }
};

template <typename T> BinNodePosi<T> merge( BinNodePosi<T>, BinNodePosi<T> );
```

递归实现

所需时间 ∝ 右侧藤总长

$\cancel{\mathcal{O}(n)}$ $\mathcal{O}(\log n)$





如何...控制藤长

以...持续高效地合并?