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## ADS-Mid-Term

✖ 判断题 5

A. 单选题 3

🔧 程序填空题 1

2-1 In proving the amortized bound of a Merge operation in skew heaps, the potential of a skew heap is defined to be the total number of right heavy nodes. Then we can prove that, in an  $N$ -node skew heap, the amortized cost for a Merge operation is exactly \_\_\_\_.

**Hint:**

Define the weight of a node,  $w(x)$ , to be the number of descendants of  $x$  (including  $x$ ). A non-root node is said to be *heavy* if its weight is greater than half the weight of its parent.

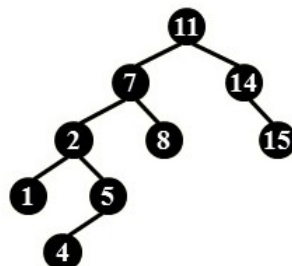
- **Lemma 1:** At most one child is heavy, of all children of any node.
- **Lemma 2:** On any path from node  $x$  down to a descendant  $y$ , there are at most  $\lfloor \log_2 \frac{w(x)}{w(y)} \rfloor$  light nodes, excluding  $x$ .

(1分)

- ☐ A.  $\lfloor \log_2 N \rfloor + 1$
- ☒ B.  $2\lfloor \log_2 N \rfloor + 1$
- ☐ C.  $3\lfloor \log_2 N \rfloor + 1$
- ☐ D.  $4\lfloor \log_2 N \rfloor + 1$

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2-2 For the result of accessing the keys 4 and 8 in order in the splay tree given in the figure, which one of the following statements is FALSE? (1分)



- ☐ A. 8 is the root
- ☐ B. 4 and 11 are siblings
- ☒ C. 7 and 14 are siblings
- ☐ D. 4 is the parent of 7

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2-3 To solve a problem with input size  $N$  by divide and conquer algorithm, among the following methods, \_\_\_\_ is the worst. (1分)

- ☐ A. divide into 2 sub-problems of equal complexity  $N/3$  and conquer in  $O(N)$
- ☐ B. divide into 2 sub-problems of equal complexity  $N/3$  and conquer in  $O(N \log N)$
- ☒ C. divide into 3 sub-problems of equal complexity  $N/2$  and conquer in  $O(N)$
- ☐ D. divide into 3 sub-problems of equal complexity  $N/3$  and conquer in  $O(N \log N)$

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