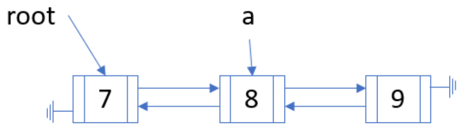
5 Practice Multiple Choice Questions

Question 1

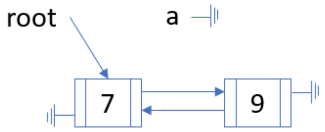
The nodes of a **doubly-linked** list are defined like this:

```
struct Node {
   int data;
   Node* next;
   Node* prev;
};
```

Consider these two lists (both `root` and a are of type `Node*`):



Before List



After List

i) Suppose `f` is defined like this:

```
void f(Node* p) {
   p->next->prev = p->prev;
   p->prev->next = p->next;
   delete p;
   p = nullptr;
}
```

This code fragment applied to the **Before List** creates the **After List**:

```
f(a);
```

ii) This code fragment applied to the **Before List** creates the **After List**:

```
root->next->next->prev = root;
root->next = root->next->next;
delete a;
a = nullptr;
```

a) i) and ii) are both true

b) i) and ii) are both false

c) i) is false and ii) is true

d) i) is true and ii) is false

Question 2

What is the tightest O-notation expression for $f(n)$? Assume all the logs are to the same base.

$$f(n) = \log n^1 + \log n^2 + \cdots + \log n^{n-1} + \log n^n$$

a) $O(\log n)$
b) $O(n \log n)$
c) $O(n^2 \log n)$
d) $O(n^2)$

Question 3

Suppose you want to **reverse** the elements of a stack S using just extra stacks, and no other container data structures.

i) You can reverse the elements of S using one extra stack.
ii) You can reverse the elements of S using two, or more, extra stacks.

a) i) and ii) are both true
b) i) and ii) are both false
c) i) is false and ii) is true
d) i) is true and ii) is false

Question 4

Consider a non-empty tree **T** where each node has 30 or fewer children. Suppose you delete a node **x** from **T**, and also delete all the edges going into and coming out of **x**.

Which one of the following is **NOT** a number of trees that could remain after the deletion?

a) 1
b) 2
c) 30
d) 31
e) all of the above are a number of trees that could remain after the deletion

Question 5

Suppose an open addressed hash table (i.e. one *without* buckets) with a good hash function has a load factor of λ. What is the **probability** that a random key will be hashed to an empty location?

a) λ
b) $\frac{1}{\lambda}$
c) $1 - \lambda$
d) $\frac{1}{1-\lambda}$
e) this cannot be determined only knowing λ