

1) Which of the following statements is true with reference to an algorithm's runtime?

- a. The runtime of an algorithm is independent of the speed of the processor.
- b. The runtime of an algorithm is analyzed in terms of nanoseconds.
- *c. A single algorithm can execute more quickly on a faster processor.
- d. The runtime of an algorithm is independent of the input values.

2) A constant time operation is independent of ____.

- a. the programming language
- b. the output of the code
- *c. the input values of the code
- d. the hardware running the code

3) What is the runtime complexity notation for the following algorithm?

```
LowNum(listOfAgeGroups, listSize, myAge) {  
    for (ctr = 0; ctr < listSize; ++ctr) {  
        if (listOfAgeGroups[ctr] == myAge)  
            return ctr  
    }  
}
```

- a. $O(N^2)$
- b. $O(1)$
- *c. $O(N)$
- d. $O(N \cdot \log N)$

4) In a singly-linked list with 1 element, the tail pointer ____ and the next pointer of the head node ____.

- a. points to the last node, points to the first node
- b. is null, is null
- c. is null, points to the head node
- *d. points to the head node, is null

5) Identify the error in the following algorithm to search for a node in the singly-linked list of students.

```
ListSearch(students, key) {  
    curNode = students→head  
    while (curNode is null) {  
        if (curNode→data == key) {  
            return curNode  
        }  
        curNode = curNode→next  
    }  
    return null  
}
```

- a. The if condition should be `if (curNode→data != key)`.
- b. The statement `curNode = students→head` should be `curNode = students→tail`.
- c. The statement `curNode = curNode→next` should be `curNode = students→head`.
- *d. The while condition should be `while (curNode is not null)`.

6) Given a doubly-linked list (2, 3, 4, 5, 6, 7), node 2's pointer(s) point(s) to ____.

- a. node 3
- b. null
- *c. node 3 and null
- d. the head and node 3

7) Which of the following is an example of a recursive function?

a. Hiking in the forest trail: Go 3 miles. Follow the path until you reach the 3-mile marker. Follow the same path back.

b. Open MS Paint: Click on the start button. Click on All Apps. Scroll down to Windows Accessories. Select Microsoft Paint.

c. Ride a bicycle: Find a flat surface. Put on a helmet. Test the brakes. Plant one foot on the ground and start gliding.

*d. Trimming the hedges: Turn on the hedge trimmer. Run the hedge trimmer along the top and again on the sides for a section. Trim along each section of the hedge.

8) Assuming $\text{Fact}(0)$ is 1 and $\text{Fact}(n)$ returns $n * n-1 * n-2 * \dots$, which XXX is the base condition for the factorial function?

```
int Fact(int n) {  
    XXX  
    return 1;  
    else  
        return n * Fact(n - 1);  
}
```

a. $\text{if}(n == 1)$

*b. $\text{if}(n <= 1)$

c. $\text{if}(n >= 0)$

d. $\text{if}(n == 0)$

9)How many recursive calls are made while computing the sum of 3, 6, 9, 12 and 15?

```
#include <iostream>
using namespace std;

int ArithSum(int num) {
    if (num == 1) {
        cout << num * 3 << " ";
        return num * 3;
    }
    else {
        cout << num * 3 << ", ";
        return (num * 3 + ArithSum(num - 1));
    }
}

int main() {
    cout << "Sum of ";
    cout << "is " << ArithSum(5);
    return 0;
}
```

a. 2

b. 3

*c. 4

d. 5