CS 161 Exam I:
True (A)/False(B) (2 pts)
1. The following two declarations are the same:
   char city[8] = "Dallas";
   char city[] = "Dallas";
   F

2. Recursive functions usually take more memory space than non-recursive functions.
   T

3. In some cases, using recursion enables you to give a natural, straightforward, simple solution to a program that would otherwise be difficult to solve.
   F

4. Not all recursive functions can be replaced by a non-recursive function.
   F

5. In C++, the array elements are automatically initialized to zero when an array is created.
   F

6. In some 1-D arrays, the array elements do not necessarily have to be contiguous.
   F

7. When deallocating a dynamic 2-d array on the heap, you delete the row pointers first and then you delete the columns for each row pointer.
   F

8. The following function declaration guarantees the values in the array argument are not changed.
   void function1(int array[][4], int numRows);
   F

9. A multidimensional array can have elements of different data types.
   T

10. To solve a problem recursively, you must identify at least one case in which the problem can be solved without recursion.
    T

11. The size of a dynamic array is defined at runtime.
    T

12. The stack is used to control recursion.
    T

13. Indices of an array are numbered starting at one for the first element.
    F

14. With a 2-d dynamic array on the heap, you are required to specify the stride in the parameters of a function.
    F

15. The following statement declares 3 integer pointers.
    int* p1, p2, p3;
    F

16. You cannot use a C++ reference to create dynamic memory on the heap.
    T

17. Just like pointers, you can change what any C++ reference refers to at any point.
    F

Multiple Choice (3 pts)
18. Which of the following is correct?
   A. int a(2);
   B. int a[];
   C. int a = new int[2];
   D. int a() = new int[2];
   E. int a[2];
19. Which of the following function declarations are illegal?
   a. void t1(int x, int y = 0, int z);
   b. void t4(int x = 0, int y = 0, int z = 0);
   c. void t2(int x = 0, int y = 0, int z);
   d. void t3(int x, int y = 0, int z = 0);
   e. e and c

20. What is the printout of the following code?
   ```cpp
   void f(int &p1, int p2) {
       p1++;
       p2++;
   }
   int main() {
       int x1 = 1;
       int x2 = 1;
       f(x1, x2);
       cout << "x1 is " << x1 << " x2 is " << x2;
   }
   ```
   a. x1 is 2 x2 is 2
   b. x1 is 1 x2 is 2
   c. x1 is 1 x2 is 1
   d. x1 is 2 x2 is 1

21. Analyze the following code:
   ```cpp
   void f(int x[], int length) {
       for (int i = 0; i < length; i++)
           cout << " " << x[i];
   }
   int main() {
       int x[] = {0, 1, 2, 3, 4, 5};
       f(x, 5);
   }
   ```
   a. The program displays 0 1 2 3 4 5.
   b. The program displays 0 1 2 3 4 and then raises a runtime exception.
   c. The program displays 0 1 2 3 4.
   d. The program displays 0 1 2 3 4 5 and then raises a runtime exception.

22. Fill in the code to complete the following function for computing factorial.
   ```cpp
   /*Return the factorial for a specified index */
   long factorial(int n) {
       if (n == 0) // Base case
           return 1;
       else
           return ___________ ; // Recursive call
   }
   ```
   A. factorial(n - 1) * n
   B. n
   C. n * factorial(n - 1)
   D. n * (n - 1)
   E. A and C

23. Which index value do you use to access the last element in double list[5]?
   A. 5
   B. 6
   C. 0
   D. 4
24. What is the printout of the following code?
```cpp
cchar city[7] = "Dallas";
cout << strlen(city);
```

a. 7  
**b. 6**  
c. 5  
d. 8

25. Analyze the following code:
```cpp
void reverse(int list[], const int size, int newList[]) {
    for (int i = 0; i < size; i++)
        newList[i] = list[size - 1 - i];
}
int main() {
    int list[] = {1, 2, 3, 4, 5};
    int newList[5];
    reverse(list, 5, newList);
    for (int i = 0; i < 5; i++)
        cout << newList[i] << " ";
}
```

A. The program displays 1 2 3 4 5 and then raises an ArrayIndexOutOfBoundsException.  
B. The program displays 1 2 3 4 6.  
**C. The program displays 5 4 3 2 1.**  
D. The program displays 5 4 3 2 1 and then raises an ArrayIndexOutOfBoundsException.

26. What is the output of the following code?
```cpp
int main() {
    int x[3] = {120, 200, 16};
    for (int i = 0; i < 3; i++)
        cout << x[i] << " ";
}
```

A. 200 120 16  
**B. 16 120 200**  
C. 120 200 16  
D. 16 200 120

27. Which of the following statements are invalid?
A. int i[4] = {3, 4, 3, 2};  
B. int i[] = {3, 4, 3, 2};  
C. double d[30];  
D. int[] i = {3, 4, 3, 2};  
**E. B and D.**

28. When you pass the name of an array to a function, the function receives __________.
A. the length of the array  
B. a copy of the array  
C. the address of the array  
D. a copy of the first element

29. Which of the following statements are correct to delete a dynamic variable/object from a pointer p?
A. delete [] p;  
B. delete [] *p;  
**C. delete *p;**  
D. delete p;
30. If you declare an array double list[] = {3.4, 2.0, 3.5, 5.5}, list[1] is ________.
   A. 3.4
   B. undefined
   C. 2.0
   D. 5.5
   E. 3.4

31. Suppose you declare the following:
   
   ```cpp
double *pValue, radius = 5.0;
   ```

   Which of the following statements are not allowed?
   A. *pValue = &radius;
   B. cout << *pValue;
   C. radius++;
   D. *pValue = 0;
   E. (*pValue)++;  

32. What is the output of the following code?
   ```cpp
   int main() {
       int list[] = {10, 20, 30, 40};
       cout << *(list + 1) << " 
       << *list + 1 << endl;
       return 0;
   }
   ```
   A. 10 10
   B. 20 11
   C. 30 30
   D. 20 20

33. What is the output of the following code?
   ```cpp
   void f1(int x, int &y, int *z) {
       x++;
       y++;
       (*z)++;
   }
   int main() {
       int i = 1, j = 1, k = 1;
       f1(i, j, &k);
       cout << "i is " << i;
       cout << " j is " << j;
       cout << " k is " << k << endl;
       return 0;
   }
   ```
   a. i is 2 j is 2 k is 2
   b. i is 1 j is 2 k is 3
   c. i is 1 j is 1 k is 1
   d. i is 1 j is 2 k is 2

34. Suppose you declare an array double list[] = {1, 3.4, 5.5, 3.5} and compiler stores it in the memory starting with address 04BFA810. Assume a double value takes eight bytes on a computer. &list[1] is ________.
   a. 04BFA818
   b. 04BFA810
   c. 3.4
   d. 1
35. Suppose you declare `int count = 5`; which of the following is true?
   A. &count is 5
   B. *count is the address of count
   C. *count is 5
   D. &count is the address of count

36. Given the definition and code fragment:
   ```java
   int matrix[2][3];
   int k = 0;
   for (int i = 0; i < 2; i++)
       for (int j = 0; j < 3; j++)
           matrix[i][j] = ++k;
   ```
   The value of `matrix[1][2]` is
   a. 2
   b. 3
   c. 4
   d. 5
   e. 6

37. Which of the following function declarations can be passed the following array?
   ```java
   char myArray[6][8];
   ```
   A. void f1(char a[][], int sizeOfFirst);
   B. void f1(char a[][8], int sizeOfFirst);
   C. void f1(char& a, int sizeOfFirst);
   D. void f1(char a[6][8], int sizeOfFirst);
   E. B and D

38. Analyze the following code.
   ```java
   int main() {
       char *p;
       cout << "Enter a string: ";
       cin >> p;
       cout << p << endl;
       return 0;
   }
   ```
   a. If you run the program and enter abc, unpredictable characters will be displayed.
   b. If you run the program and enter abc, abc will be displayed.
   c. If you run the program and enter abc, nothing will be displayed. The program runs without errors.
   d. If you run the program and enter abc, a runtime error will occur, because p is used without being initialized.

39. How many times will the following function call itself, not including the initial call to the function, if 5 is passed as the argument?
   ```java
   void showMessage(int n){
       if (n > 0)
           { cout << "Good day!" << endl;
             showMessage(n - 1);
           }
   }
   ```
   a. 1
   b. 4
   c. 5
   d. An infinite number of times
**Extra Credit (2 pts):**

40. Which of the following statements are correct?
   - A. `char charArray[2][2] = {{'a', 'b'}, {'c', 'd'}};`
   - B. `char charArray[][2] = {{'a', 'b'}, {'c', 'd'}};`
   - C. `char charArray[2][] = {{'a', 'b'}, {'c', 'd'}};`
   - D. All of the above

41. What is the output of the following code?
```cpp
int main() {
    int list[] = {1, 1, 1, 1};
    *(list) = *(list) + 1;
    *(list + 1) = *(list + 1) + 2;
    *(list + 2) = *(list + 2) + 3;
    *(list + 3) = *(list + 3) + 4;
    cout << list[0] << " " << list[3] << endl;
    return 0;
}
```
   - a. 2 2
   - b. 3 5
   - c. 2 5
   - d. 1 2
   - e. 3 4

42. True (A)/False (B) You can declare an array on the stack using a variable for the size, i.e. `int x[size]`, rather than a literal value or constant.

43. In the Towers of Hanoi algorithm, how many times does the recursive `towers()` function call itself, not including the initial call, to move 3 disks with the two recursive calls in the case if(number of disks>=1)?
   - A. 10
   - B. 14
   - C. 3
   - D. 7

44. Suppose you declare an array `double list[] = {1, 3.4, 5.5, 3.5}`. `&list[1]` is same as _______.
   - A. list[1]
   - B. list
   - C. list[0]
   - D. list + 1
   - E. list + 2