New York University – Tandon School of Engineering
Brooklyn, NY 11201

CS1124
1st Midterm exam – 22 June 2016
Prof. Katz

Name: _____

Net ID:_____

Section 1: Multiple Choice (10 Questions, 3 points per question)
Section 2: Long Answer (4 questions; 5 points per question)
Section 3: Short Answer (10 Questions, 5 points per question)

This exam is CLOSED BOOK
You have two hours to complete this exam

Anyone found cheating on this exam will immediately fail. Anyone who is found writing after time has been called will also fail. Do not open this test booklet until you are instructed to do so. If you have a question please ask only the proctor of the exam!

Multiple Choice (circle your answers)

1) (4 pts) We have a function which will print out, to the screen, a dynamic array of integers. The prototype for the function will be:

```
void resize(_____  p);
```

What should the data type be for the parameter p?

a) int*	c) & int	e) const int*
b) int*&	d) * int	f) const int*&

2) (4 pts) Given the code:

```
int * p=new int(0);
int * q=NULL;
delete p;
p = new int(0);
cout<<*q<<endl;
```

what common coding error have we made?

a) memory leak
b) dangling pointer
c) dereferencing NULL
d) none of the above; or no error.

3) (4 pts) You are writing a function which will return the size of an arbitrary integer array. What is the delimiter which indicates that you have reached the end?
a) '\0'
b) 0
c) NULL
d) (there is none)

Short Answer

4) (4 pts)Given an array was created on the heap and Ptr points to that array, provide the code to delete it.

```
for (size_t i = 0; i < capacity; i++){
    delete arr[capacity];
    }
delete [] arr;
```

5) (4 pts)If we didn't have the "->" operator, how would you write the expression:

`p->data` (*p).data

6) (4 pts each)Given:

```
struct SomeStruct {
        int data;
};
```

Write a single line of code for each item below, answer them individually below but assume they are one right after the other in a program.

a. Define a variable named `ptr` that can point to an object of type `SomeStruct`.

SomeStruct* ptr;

b. Create an object of type `SomeStruct` on the heap, using `ptr` to hold its address.

ptr = new SomeStruct;

c. Set the data field to 17 for the object that `ptr` is pointing to.

(*ptr).data = 17;

d. Free up the memory for the object that `ptr` is pointing to.

delete ptr;

e. Reset ptr to a known location which can later be detected.

ptr = nullptr;

7) (5 pts each) What is the output of the following program?

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

int main() {
 int x = 2;
 int y = 4;
 int arr[] = {1, 2, 3, 5, 8, 13, 21, 34, 55};
 int* p = arr + 3;
 int* q = p + x;
 cout << "A: " << *q << endl;
 p = &y;
 *q = *p + x;
 *p = q[3];
 cout  << "B: " << *q++ << endl;
 cout  << "C: " << *q << endl;
 cout  << "D: " << y << endl;
}
```

Output:

A:

B:

13
6
21
55

C:

D:

PROGRAMMING

8) (20 pts) Design a function which, when passed an integer array, its current size and the new capacity, will resize and sort the array while resizing. Efficiency matters so do not resize and then sort.

```
void resize(int* arr, int size, int newCapacity){
int* temp = new int[newCapacity]
for (int i = 0; i < size; i++){
int min_index = 0;
for (int j = i+ 1; j < size; j++){
if (arr[j] < arr[i]){
min_index = j
}
}
temp[i] = arr[min_index];
int swap = arr[min_index];
arr[min_index] = arr[i];
arr[i] = swap;
}
delete[] arr;
arr = temp;
}
```

9) (20 pts) Design a function which will read in integers from a file and save them, in sorted order, in an array. You may use the function from problem 8, but you are not required to do so.

```
ifstream file;
string fileName;
cin >> fileName;
file.open(fileName);
if (!file){ cerr << “failed to open the file”; }
int read;
int size = 0;
int* arr = new int[size];
while (file >> read){
arr[size++] = read;
}
resize(arr, size, size);
```