**CSCI 136 Written Exam #3 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Fundamentals of Computer Science II**

**Spring 2018**

This exam consists of 17 problems on the following 9 pages.

You may use your notes, online slides, textbook, and even internet access during the exam. However, no collaboration or communication with others about the exam is permitted.

|  |  |  |
| --- | --- | --- |
| **Problem** | **Points** | **Score** |
| **1** | **4** |  |
| **2** | **4** |  |
| **3** | **4** |  |
| **4** | **4** |  |
| **5** | **4** |  |
| **6** | **4** |  |
| **7** | **4** |  |
| **8** | **4** |  |
| **9** | **4** |  |
| **10** | **4** |  |
| **11** | **4** |  |
| **12** | **4** |  |
| **13** | **10** |  |
| **14** | **15** |  |
| **15** | **7** |  |
| **16** | **10** |  |
| **17** | **10** |  |
| **Total** | **100** |  |

**Multiple choice** (4 points each). Circle the single ***best*** answer:

1. Consider the following shell script:

#!/bin/sh
# this is a comment
echo "The number of arguments is $#"
echo "The arguments are $\*"
echo "The first is $1"
echo "My process number is $$"
echo "Enter a number from the keyboard: "
read number
echo "The number you entered was $number"

What does $1 refer to in the line: echo "The first is $1"?

1. the string “$1”
2. one dollar
3. the second argument in the command line – the count starts at 0
4. the first argument in the command line
5. none of the above

2. You are compiling your C++ program and getting too many errors to read on the screen. You want to send the error output to a file so you can see the first few errors. Which of these commands would you use?

1. g++ -o MyProgram MyProgram.cpp 2> errors.txt
2. g++ -o MyProgram MyProgram.cpp > errors.txt
3. g++ -o MyProgram MyProgram.cpp < errors.txt
4. g++ -o MyProgram MyProgram.cpp | errors.txt
5. g++ -o MyProgram MyProgram.cpp >> errors.txt

3. A process in Linux (or any other operating system for that matter) is:

1. a C++ source code program
2. something that only runs in the background
3. a procedure for getting something done
4. a program after it has been compiled
5. a program in execution

4. In C++, unlike Java, which of the following is a valid main function?

1. public static void main (String [] args) { }
2. void static main (String [] args) { }
3. int main () { }
4. bool main () { }
5. int main (int args) { }

5. When you pass parameters into a function during a call to that function, and the function is declared as:

 int addition (int a, int b)

you are passing those values in by:

1. reference
2. value
3. pointers
4. calling the function correctly
5. number

6. Given the program shown below, what are the values printed to the screen for firstvalue and secondvalue? (Be sure to walk through the code – this is not the same example as on the slide.)

#include <iostream>

using namespace std;

int main ()

{

 int firstvalue = 5, secondvalue = 15;

 int \* p1, \* p2;

 p1 = &firstvalue;

 p2 = &secondvalue;

 \*p1 = 10;

 \*p2 = \*p1;

 p1 = p2;

 \*p1 = firstvalue - secondvalue;

 cout << "firstvalue is " << firstvalue << '\n';

 cout << "secondvalue is " << secondvalue << '\n';

 return 0;

}

1. firstvalue is 10, secondvalue is 20
2. firstvalue is 10, secondvalue is 0
3. firstvalue is 5, secondvalue is -10
4. firstvalue is 5, secondvalue is -5
5. firstvalue is 5, secondvalue is 15

7. You have declared a 10 element array of integers in C++ named arr. Which of the following is NOT a valid way of setting the 5th element in the array to 0?

1. arr[4] = 0;
2. \*(arr+4) = 0;
3. arr[2+2] = 0;
4. arr[5] = 0;
5. all of the above would work

8. A special member function of C++ classes that is used to clean up memory when the object is deleted is called a:

1. constructor
2. destructor
3. copy constructor
4. overloaded operator
5. copy destructor

9. You are writing a class in C++ in which you want any derived class to be able to access the member variables. Which keyword would you use before declaring the member variables?

1. no keyword, use the default
2. public
3. protected
4. private
5. friend

10. Of the following, which gets inherited by a derived class?

1. public member functions
2. constructors and destructor
3. assignment operator
4. friends
5. private members

11. A makefile is used to

1. create shell scripts
2. execute the commands in a file called make
3. create variables used in compiling programs
4. compile multi-file C++ programs in the correct order
5. none of the above

12. How many pizzas were delivered to our lab class on Wed. 4/11? Deep breath, yes, this is the freebie question!

1. A gazillion
2. What pizza?
3. Um… I didn’t count
4. Enough
5. Thanks!

**Short Answer** (52 points total).

13. **Linux** (10 points total). In each of the command line examples below, the $ is the prompt, not part of the command.

a) What does the following command do?

 $ javac \*.java 2>errors.txt

b) Assume you have a file called at\_names that contains the words cat, bat and hat, each on a separate line. What does the following command output?

 $ cat at\_names | sort

c) Using the same at\_names file as above, what is the result of executing the following command?

 $ grep “c.t” at\_names

d) You are running a program in the background called execute\_me that appears to be in an infinite loop and you want to stop the process. What commands would you run and why?

e) You are asked to submit your homework files as a tar file named “homework.tar. The files you need to submit are all the .cpp files in the directory. What is the command you would use to create the tar file?

14. **C++ and Java** (15 points total). You have the following Java code, but you need to run it on a machine that does not have Java on it (does such a thing exist?), so you need to convert it to C++. Next to each line of code, write the C++ equivalent. If a particular line of code is the same in both languages, leave the space blank. If there are lines you don’t need at all, write REMOVE in the blank. If there are additional lines you need, say ADD and then the line. Feel free to add variables as needed.

|  |  |
| --- | --- |
| import java.util.Scanner; |  |
| public class NumCount{ |  |
|  public static void main(String[] args) { |  |
|  Scanner kbd = new Scanner(System.in); |  |
|  int[] count = {0,0,0,0}; |  |
|  System.out.println("Enter ten numbers between 0 and 3."); |  |
|  for (int i = 0; i < 10; i++) { |  |
|  int num = kbd.nextInt(); |  |
|  count[num]++; } |  |
|  kbd.close(); |  |
|  for (int i = 0; i < count.length; i++) |  |
|  System.out.println("You entered " + count[i] + " " + i + "'s"); |  |
|  }} |  |

15. **Pointers** (7 points total). If the variables i and Ptr are stored in memory as shown below, what is the output of this C++ program?

|  |  |
| --- | --- |
| **Memory Address** | **Variable** |
| 1000 | i |
| 1002 |  |
| 1004 |  |
| 1006 |  |
| 1008 | Ptr |
| 1010 |  |
| 1012 |  |

#include<iostream>

using namespace std;

int main() {

 int i = 10;

 int \*Ptr;

 Ptr = &i;

 cout << i << endl;

 cout << &i << endl;

 cout << Ptr << endl;

 cout << &Ptr << endl;

 cout << \*Ptr << endl;

 cout << \*(&i) << endl;

}

16. **Dynamic Memory** (10 points total). What terrible awful thing does the code below do to the machine it is running on? (Don’t execute this code as-is – make sure you fix it first.) Why does this happen, and how can you fix it?

#include<iostream>

using namespace std;

int main()

{

 while (true)

 {

 int \* p = new int;

 \*p = 5;

 }

}

17. **Classes and Inheritance in C++** (10 points total). Given the code shown below, what will display when it is run? Explain, in terms of inheritance and polymorphism, why it displays what it does.

#include<iostream>

using namespace std;

class Base

{

public:

 virtual void display();

};

void Base::display()

{

 cout << "In base class \n";

}

class Derived : public Base

{

private:

 int value;

public:

 Derived(int v);

 virtual void display();

};

Derived::Derived(int v)

{

 value = v;

}

void Derived::display()

{

 cout << "In derived class, value is " << value << "\n";

}

int main()

{

 Base b;

 Derived d(4);

 b = d;

 b.display();

 Base \* bp = new Derived(7);

 bp->display();

}