Exam 1 will be on Thursday, November 14. The exam is open book and open notes.

The exam will have three sections. In section 1 you will be asked to answer short answer questions related to all of the topics in the reading material. In section 2 you will be given a program or a portion of a program an asked to explain what the program does. In section 3 you will be asked to do the design and/or implementation of a program.

Topics covered include the following:
1. Declaration and use of constants and variables.
2. Use of arithmetic, relational, and logical operators.
3. Assignment statements.
4. Basic use of input and output statements (i.e., format manipulators will not be on the exam).
5. Implementation of functions, including how to define and use them, and (actual) arguments vs. (formal) parameters.
7. Memory maps.
8. Use of branch construct.
9. The switch selection structure.
10. Use of repetition constructs with for and while loops.

When you are asked to write code, you will not need to write comments, include directives, or output formatting beyond producing newlines in appropriate places.

No questions on formatted output or on structures will be included on the exam.
1. Answer the following questions about the program below:
   A) How many lines of output will be printed.
   B) Show what is printed by the program.

```c++
#include<iostream.h>
int MyFun(int, int&, int&);                   Printed results
int main()                       __________________________________________
{int a = 1, b = 2, c = 5;
 int x;
 x = MyFun(a, b, c);
cout << x << endl;
cout << a << b << c << endl;
return 0;
}
//                               __________________________________________
int MyFun(int j, int &k, int &n)
{cout << j << k << n << endl;   __________________________________________
n = 0;
j = 9;
k = 6;
cout << j << k << n << endl;
return j*k;
}
```

2. For the switch structure below, show what is printed for each input shown at the right.

```c++
int i;
cout << "Enter an integer ";
cin >> i;
switch (i)
{
case 0:
    cout << " A ";
    break;
case 3:
    cout << " C ";
case 4:
    cout << " D ";
    break;
default:
    cout << "Error ";
    break;
}
```

   A) Input is 4
   Printed output

   B) Input is 7
   Printed output

   C) Input is 3
   Printed output

3. How many line of print do each of the following produce?

```c++
for(i=1;i<10;i++)
{for(j=1;j<1000;j+=2)
 cout << i << j << endl;
}
```

   Lines of Print

```c++
for(i=1;i<10;i++)
{for(j=1;j<i;j++)
 cout << i*j << endl;
}
```

   Lines of Print
4. How many lines of print do each of the following segments produce?

A) int i, j, k;
   for(i=0; i<80; i++)
   {
     for(j=0; j<20; j++)
     {
       for(k=0; k<200; k++)
       {
         cout << i << j << k;
         cout << endl;
       }
     }
   }

Lines of Print _______________________

B) int i, j, k;
   i = -9; j = 1; k = 7;
   while(i)
   {
     while(j> -2)
     {
       cout << k << endl;
       j--; k = k - 2;
     }
     i++;
   }

Lines of Print _______________________

5. Evaluate the function given by \( y = x^3 - 3x^2 + 4x - 12 \) for values of \( x \) starting at 0 and incrementing by 1 until the value of \( y \) is greater than or equal to 1000. Print out the last value of \( x \) and \( y \) such that \( y \) is less than 1000.

6. Write a function prototype for a function named \( Arf \) which has two integer arguments which are passed by reference and which does not return any value.

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7. Write a single statement that creates an integer random number \( x \) such that \( 5 \leq x \leq 24 \).

_____________________________

8. What does the following program print?

```
#include<iostream.h>
int main()
{
    int i = 2;
    cout << i << endl;
    for(int i=0; i<4; i++)
    {
        cout << i << endl;
    }
    cout << i << endl;
}
```

Printed Results

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9. Write a function \( \text{TooBig} \) which will accept a single integer value as an argument and return the Boolean value of TRUE if and only if the integer is greater than 1000, otherwise return FALSE. You do not have to write a main program. Name your function TooBig.

10. Answer the following TRUE or FALSE

A) In C++ all variables must be declared before they can be used in a program

B) C++ does not permit the use of GLOBAL variables.

C) Functions in C++ may not call other functions.

D) IF blocks may not be placed inside the "else" section of another IF block.

E) The processing directive \#include <iostream> is necessary only if your program is going to do I/O.

11. Given below are some logical expressions which evaluate to either "TRUE" or "FALSE". Write the correct evaluation in the blank. Both \( m \) and \( n \) are of type int with \( m = 43 \) and \( n = 12 \).

\[(m \geq n \&\& n < 22)\]  
\[(m < n || n < 22)\]  
\(!(!!(m < 80) || n > 5))\]
12. Write a C++ program that inputs a single positive integer digit and prints out the corresponding word. For example, if a 3 was entered your program should print the word "three".

13. Write a program in C++ that inputs three integers from the keyboard and prints out the minimum and maximum with appropriate messages.

14. Write a C++ program that will prompt the user to enter numbers from the keyboard one at a time. The program should continue prompting for input until either the user has entered 100 numbers OR the user has entered the number 0. Your program should print the sum of the numbers that are greater than 10.

15. Explain the difference between passing parameters by value and passing them by reference.

16. The main program below calls a function named CUBE which is supposed to return the cube of the argument. Write the function.

```cpp
main()
{
    int x;
    x = cube(x);
}
```

17. Show what is printed by the following program.
```cpp
int ConfuseMe(int j, int i);
#include <iostream.h>
int ConfuseMe(int j, int i);
main()
{
    int i, j;
    i = 5; j = 3;
    cout << i << j << endl;
    cout << ConfuseMe(j, i) << endl;
    cout << i << j << endl;
    return 0;
}
```
```cpp
int ConfuseMe(int j, int i)
{
    i = 6; j = 9;
    cout << i << j << endl;
    return i + j;
}
```
18. The program below uses a switch structure. Answer the following questions:
   A) What does the program print if the number entered is a 9? __________
   B) What does the program print if the number entered is a 0? __________
   C) What does the program print if the number entered is a 1? __________

```c
#include<iostream.h>
main()
{int In, j = 2;
    cout << "Enter an integer...";
    cin >> In;
    switch (In)
    {case 0:
        j = 9;
        cout << (j + In)
        case 1:
        cout << In;
        break;
    default:
        cout << "Error";
        break;
    }
    return 0;
}
```

19. Given a function definition below. Write a main program which will evaluate this function beginning at x = 0 and continuing until the value of the function exceeds 1000. Your main program should print only the first value of x for which the function is greater than 1000.

```c
float F(float x)
{float y;
    float pi = 3.1415926;
    if (x < 0)
        y = -1;
    else
        y = x*x*x*sin(x*pi/180);
    return y;
}
```

20. Explain how using functions in programs can lead to programs that require much less memory space.

21. Write an equivalent while loop for the following for loop.

```c
int i;
for(i=-8;i>22;i=i+2)
{cout << i-1 << endl;
    if(i > 5)
        cout << i+1 << endl;
}