General Instructions

- **DO NOT WRITE YOUR NAME ON ANY PAGE EXCEPT THIS ONE!**
- You have 50 minutes
- **Pace Yourself!!!!!**

Pay attention to the point values. When there are 10 minutes left, skim through and be sure you have at least written *something* for the questions that are worth many points.

- Read *all* the directions *carefully* on each problem.
- Good luck.
1. (30 pts) Write a complete C++ program to solve the following problem, including

- an opening comment (don’t put your name in the comment! -2 pts if you do!)
- all necessary “stuff” that goes before the main program
- a full main program complete with comments

**Problem Statement:** Ask the user of the program to input three integers that are all different. Output the “middle” of the three numbers; that is, the one that is “in-between” the other two.

**Examples:**

<table>
<thead>
<tr>
<th>input</th>
<th>output</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 3 2</td>
<td>The middle number is 3</td>
</tr>
<tr>
<td>7 8 1</td>
<td>The middle numbers is 7</td>
</tr>
<tr>
<td>-2 0 -5</td>
<td>The middle number is -2</td>
</tr>
<tr>
<td>3 9 4</td>
<td>The middle number is 4</td>
</tr>
</tbody>
</table>

Your program should provide appropriate prompts to the user, and should also label the output appropriately and neatly. Your program should also check for an error condition: if any of the numbers is equal to any of the other numbers, then print an error message, and terminate the program immediately.

Examples of bad input would be -1 -1 0, 4 3 4, 2 2 2, etc.
Extra space in case you need it
2. (10 pts) In lab3, you wrote a function called “outlineBox” that took three parameters, and produced boxes such as the following:

```
outlineBox(5, 3, 'b');
```

```
outlineBox(3, 7, '*');
```

```
********
*    *
********
```

The function `drawP` in the program listed below should operate in a similar manner.

The function should draw a picture on standard output in the shape of the letter P of the given height and width, followed by a blank line. Example output is on the next page.

If width is less than 3, or height is less than 5, the function simply draws nothing (no error message is produced, and no blank line is printed; the function just returns.)

Also, height must be an odd number so that the bottom of the “sticking out part of the P is half way between the top and the bottom”. If height is not odd, the function should print nothing and just return.

The complete program appears below (with the body of function `drawP` omitted), with sample output on the following page. You may fill in the function in the space provided, or rewrite the complete function in the blank space on the next page (beside or below the sample output.)

```cpp
// e02.cc Exam question for CISC181
// P. Conrad, 10/04/04

#include <iostream>
using namespace std;

void drawP(int height, int width, char c) {

}

int main(void) {
    drawP(5, 3, 's');
    drawP(7, 4, 'y');
    drawP(9, 6, 'x');
    drawP(6, 4, 'a');
    drawP(5, 5, 'z');
    return 0;
}
```
Output:

> g++ e02.cc
> ./a.out

sss
s s
sss
s
s

YYYY
y y
y y
YYYY
y
y
y

xxxxxxxx
x x
x x
x x
xxxxxxxx
x
x
x
x

zzzzz
z z
zzzzz
z
z
>


3. Number conversions:

(a) (3 pts) Convert 109 from decimal to binary

(b) (3 pts) Convert 109 from decimal to octal
   (hint: refer back to previous problem)

(c) (3 pts) Convert 1AF from hexadecimal to decimal

(d) (3 pts) Convert the following from binary to hexadecimal:
   0101 0100 1010 1010 1001 0101 1001 0111
4. Consider the C++ program on the following page.

   (a) (4 pts) Give the output when the input is 3

   

   (b) (4 pts) Give the output when the input is 64

   

   (c) (1 pts) What relational operator appears in this program?

   (d) (2 pts) List two relational operators that are in C++ but do NOT appear in this program (give the C++ symbols.)
```cpp
#include <iostream>
using namespace std;

int main(void)
{
    int x;
    cout << "Enter x: ";
    cin >> x;

    int i=1;
    while (i <= x)
    {
        cout << "*";
        i *=2;
    }
    cout << endl;
}
```
Extra space in case you need it
5. Consider the C++ program on the following page.

(a) (8 pts) Give the output

(b) The program on the following page contains one function definition other than main. What is
   • (2 pts) What is the name of that function?

   • (2 pts) What are the names of the formal parameters to that function

   • (2 pts) Circle the unary operators that appear inside the body of that function. Circle only the unary operators and their operands (nothing else).
   (If you circle the wrong thing accidentally and want to change your answer, just find some other way to indicate clearly what the unary operators are.)
// e01.cc  Exam question for CISC181  
// P. Conrad, 10/04/04

#include <iostream>
using namespace std;

int mysteryFunc(int x, int y)
{
    x = 2 * y + x * 5 + (-y)/2;
    ++y;
    cout << "x= " << x << endl;
    return y;
}

int main(void)
{
    int a, b, c;
    a = 3;
    b = 5;
    c = 7;

    cout << "a= " << a << endl;
    a = mysteryFunc(b,c);
    cout << "a= " << a<<endl;
    cout << "b= " << b << endl;
    cout << "c= " << c << endl;
}
Short Answer

6. You are interviewing for a summer job that involves C++ programming. The person conducting the job interview wants to test your knowledge of C++, so she asks you to look at the following error message:

Undefined symbol
int testFunc(int,int)
sampleProgram.o
ld: fatal: Symbol referencing errors. No output written to sampleProgram.o
*** Error code 1

She asks you two questions. How do you respond?

7. (3 pts) “Which phase of compilation is this error coming from: the pre-processor, the compiler, or the linker?”

8. (3 pts) “If you got this error message when compiling this program, what would you look for to try to fix it?”

(Whether you get the job or not... and the four points, depends on how specific and correct your answer is, not how long it is. Don’t write a book, just get to the main point quickly.)
HTML and the Web

9. (10 pts) It’s a year in the future, and you are taking CISC321. Your current working directory, ~/cisc321/lab05 contains files results.dat, and results.png. You are instructed to make these files available on a web page called http://udel.edu/~userid/cisc321/lab05. That web page should consist of only a directory listing of the files, available for download.

Don’t assume that any of the necessary directories already exist. You need to create all of them.

Also, don’t assume that you are starting out in any particular working directory. Either start with a command that puts you in a specific working directory, or use only commands that will work regardless of your current working directory.

List the complete sequence of commands you need to type to accomplish this.

Hints: (which you might not get if this were a real exam!)

- For this question, you don’t need to do any HTML coding.
- You need a command to make the necessary directories. In this example, three directories need to be created.
- You need a command to move the files.
- You need a command to make the files readable on the web.
10. HTML includes something called “elements” and “tags”.

- (2 pts) Write an example of a complete “element” in HTML, that includes both an open tag and a close tag.

- (1 pts) Underline the close tag. Don’t underline anything else except the close tag.

- (2 pts) Explain how a browser is supposed to interpret the element that you gave as an answer above. (What would does the browser do differently because the text in the element is tagged? Does it look different? Behave differently?)

  An accurate one-sentence explanation is enough. Don’t write a book.
Total Points: 100