Test #1

Name: __________________________________________

Login: __________ Lab Section: __________

Honor code acknowledgment (signature) __________________________________________

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<tr>
<td>Name</td>
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<td>Problem 1</td>
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<td>Problem 2</td>
<td>12 pts.</td>
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<td>Problem 3</td>
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<td>Problem 4</td>
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<td>Problem 6</td>
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<td>Problem 7</td>
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<td>TOTAL:</td>
<td>50 pts.</td>
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This test has 7 questions on 9 pages. Be sure your test has them all.

This is an open-book test. You have at least 50 minutes to complete it. That means you should spend no more than 1 minute per point. If the number You may consult any books, notes, or other inanimate objects (other than computers or calculators) available to you. You may use any program text supplied in lectures, assignments, or solutions.

Please write your answers in the spaces provided in the test. Make sure to put your name, login, and lab section in the space provided below. Put your login and initials clearly on each page of this test (worth 1 point) and on any additional sheets of paper you use for your answers.

Don’t panic. Just read all the questions carefully to begin with, and first try to answer those parts about which you feel most confident. Do not be alarmed if some of the answers are obvious.
**PROBLEM 1**: *(What’s my name (4 points))*

Complete the code below that prompts the user for a first and last name and prints them out last name, first. When executed the output should look like this

```
Enter first name: Jeff
Enter last name: Forbes
Forbes, Jeff
```

Complete the code below

```cpp
string first, last;
cout << "Enter first name: ";
cin >> first;
cout << "Enter last name: ";
cin >> last;
```
PROBLEM 2 :  (Multiple Choice (2 points each/12 points total))

MC Problem 1:
What does this C code do (assuming a and b are ints)?

\[
\begin{align*}
a &= a + b; \\
b &= a - b; \\
a &= a - b;
\end{align*}
\]

A. Swaps the values of a and b
B. Stores value of pi in a
C. Sets a and b to 0
D. None of the above

MC Problem 2:
A loop invariant is:

A. The expression that updates the variables in a loop test
B. The expression that initializes loop counter variables
C. A boolean expression that is true each time a loop test is evaluated.
D. A model where the loop continues until reaching a \texttt{break} statement. For example:

\[
\begin{align*}
\text{while (true)} \\
&\{ \\
&\quad \ldots \\
&\quad \text{if (condition) break;}
\}
\end{align*}
\]

MC Problem 3:
What is the value of \(x\) after the following statement?

\[
\text{int } x = 7 + 5 * 9 / 4 - 10 \% 3;
\]

A. 16
B. 15
C. 2
D. 15.25
E. 17
MC Problem 4:
Indicate how many times the loop body below will be executed

```java
int k;
for (int i=1; i <= 10; i = i + 1)
{
    k = i;
}
```

A. none  
B. 5 times  
C. 10 times  
D. 11 times  
E. infinite

MC Problem 5:
Indicate how many times the loop body will be executed

```java
int k;
for (int i=1; i <= 10; i = i + 1)
{
    k = i++;
}
```

A. none  
B. 5 times  
C. 10 times  
D. 11 times  
E. infinite
MC Problem 6:
What is the value of the variable x after the following loop?

```java
int x = 0;
int counter = 1;
while (counter < 5 ) {
    counter = counter + 1;
    x = x + counter * counter;
}
```

A. 54  
B. 55  
C. 29  
D. 30  
E. 90
PROBLEM 3:  *(Top & Bottom (4 points))*
For each code fragment below, write what the output would be.

I. int i = 10;
   while (i > 4) {
      cout << i << " ",
      i = i - 1;
   }

II. int i = 22;
    do {
      i = i - 2;
      cout << i << " ",
    } while (i >= 10);

PROBLEM 4:  *(Word Play (8 points))*
After executing the following code, what are the values of the variables below:

```cpp
int i = 3;
int a;
bool b;
string yes = "Stick to";
string no = "the rivers";
string s,t;
i = yes.length();
if (yes.find("tic") != string::npos)
   s = yes.substring(0,4);
else
   s = "slimpy";

t = yes + no;
t = t.substring(6,t.length());
b = (t.length() > 0);
```

A. i  
B. s  
C. t  
D. b
PROBLEM 5: (On any given day (6 points))
Write code that prints out a random day this year. First, pick a random month, then pick a random day in that month and print that in the standard format (e.g. February 15 2002).

```cpp
#include <iostream>
using namespace std;
#include "dice.h"
#include "date.h"

int main()
{
```

Random Extra Credit

Who said, “The programmer, like the poet, works only slightly removed from pure thought-stuff?” (1 point)
PROBLEM 6:  (Counting Os (8 points))

Write a function ZeroDigits that returns the number of occurrences of 0 (zero) in a number. ZeroDigits(5005) should return 2, while ZeroDigits(4) should both return 0.

```c
int ZeroDigits(int n)
// pre: n is greater than 0
// post: returns number of 0 digits in n
```

Random Extra Credit

What company built the first CPU to have a clock speed of 1 GHz (1 billion clock steps per second)? (1 point)

Who lead that design team? (1 point)
PROBLEM 7:  (What you may be doing for the next 20 years after graduation (7 points))

Write a function that will print out the outstanding balance at the beginning of each month for a loan with initial balance: balance. Interest is charged at a rate of interest% at the end of each month, and a monthly repayment of payment is made immediately after the interest has been charged.

As an example, say balance is 100000, interest is 0.5% and payment is a whopping 1000. The balance at the beginning of month 0 is the full amount $100000. At the end of this month, the interest of 100000 x 0.5% = 500 dollars charged. A payment of $1000, so the balance at the beginning of month 1 is $99500.

The output should show the month number and the outstanding balance for as long as there is still a positive balance. Here is some sample output

0 100000
1 99500
2 98997.5
...

The prototype is below

void showMonthlyBalance(double balance, double payment, double interest)