

Answer questions as indicated. Closed book/Closed Notes/ NO PDAs (calculators, handhelds, cell phones, etc.) allowed.

1 Basic Concepts—20 points

Circle the correct answer. Each problem in this section is worth 2 points. If you are using a pen and need to change your answer, *write* true or false to the right of the question.

2 Program Analysis—20 points

Problem 1. There are numerous errors in the program below. **Circle only ten and describe why it is an error.** There is at most one error per line. Each error is worth two points.

```
/* test2.cpp */
#include <ostream.h>
#include <iomanip.h>
#include <stdlib.h>

int isPrime( long n );

int main()
{
    int nPrimes = 0
    ofstream oFile;
    oFile.open( primes.out, 'ios::out' );
    oFile >> "Primes:\n";

    /* count primes */
    for( long i = 2 : i <= 1000000 : i += 1 )
    {
        if( isPrime(i) )
            nPrimes += 1;
    }

    oFile << '\t' << setw(7) << nPrimes << endl;

    return 0;
}
```

```

int IsPrime( long n )
{
    int i == 2;
    while( i < n/2 )
        if( n % i == 0 )
            return 0;
        i++;

    return 1;
}

```

3 Program Output Analysis—24 points

Fill in the blank. Each problem in this section is worth 4 points.

Problems 12–14 refer to the following code fragment. x and y are integer variables.

```

if( x >= 5 && y <= 2 )
    cout << x - y;
else if( x <= 1 && y >= 2 )
    cout << x * y;
else
    cout << y / x;

```

Problem 2. What is the output if $x = 2$ and $y = 3$? _____

Problem 3. What is the output if $x = 5$ and $y = 2$? _____

Problem 4. What is the output if $x = 1$ and $y = 3$? _____

Problems 15 and 16 refer to the following program.

```

int main()
{
    int i, j = 3;
    for( i = 1 ; i < 10 ; i += 3 ) {
        j = func( i, j );
    }
}

int func( int j, int i )
{
    if( i*3-j%3 <= 5 )
        cout << "B I: " << i++ << " " << j++ << endl;
    else
        cout << "B II: " << ++i << " " << j << endl;

    return ++j;
}

```

Problem 5. _____

Problem 6. _____

Problem 7. _____

4 Functions—20 points

For all problems in this section, show all additional variable names and types that you choose to use. Use meaningful function names!

Problem 8 (5 points). Write a function that will print a table of the floor function `floor(x)`, for $x = 0.0$ to 10.0 in increments of 0.1 . Output is to be written to an output file stream.

Problem 9 (7 points). Write a function to test if a character is a valid starting character for an integer variable for the Fortran language. Integer variables must start with the letters i..n. Both lower and upper case letters are valid. There is no I/O in the function.

Problem 10 (8 points). Write a function that will find and return the minimum, maximum, and average of four real numbers. There is no I/O in the function.

5 Program—16 points

Show and use meaningful names (function and variables that you use when writing this program.

Problem 11. Write a *complete* program that counts the number of student absences. The attendance data is stored in a text file, one student record per line (see sample below). Missing dates start with a / and excused absences end with a *. Your program must include a function to calculate the number of absences.

Hints: Recall that the end of line character is `'\n'`. The number of absences is the number of missing dates minus the number of excused absences.

```
Jeff Smith      /17* /24
Andy Martin    /17
Joe Pyle                /29
Mary Rosen      /17*      /27* /29
Carl Zimmer     /24* /27
                October           November
```

Design: (6 points)

Program: (10 points)

Bonus Problem: Two points.