

Write all responses on separate paper. You may not use a compiler, though a hand-held calculator is ok.

1. Which of the following declarations are illegal, and why? Be sure to state your reasons.
  - a. `int float;`
  - b. `float F3.7;`
  - c. `bool true?;`
  - d. `unsigned next-number;`
  
2. Each of the following program fragments has at least one error. Locate the error(s), classify each error as either a syntax error, or a logical error and suggest how it could be corrected (assume that the usual preprocessor commands `#include <iostream>`; `using namespace std;` are present)
  - a. 

```
#include <iostream>
using namespace std;
int main() {
    int n17 == 17;
    cout << n/2 << endl;
}
```
  
  - b. 

```
#include <iostream>
using namespace std;
int main() {
    float n /= 10.1;
    cout << n*10.1;
}
```
  
  - c. 

```
int i;
double pi;
pi = 1.0;
for (i=2; i<n, i=++i)
{ if(i%2 = 1)
    pi = pi - (1.0 / ((2.0*i)+1));
  else
    pi = pi + (1.0 / ((2.0*i)+1));
}
pi = pi * 4.0;
```
  
3. What is output to the console by each of the following statement?
  - a. `cout << 1 + 2 * 3 / 4 << endl;`
  - b. `cout << 1 * 2 + 3 / 4 + 2 << endl;`
  - c. `cout << 2 * (2 + 3) / 4 << endl;`
  - d. `cout << 1 / 2 * 2 + 3 << endl;`
  - e. `cout << 1. / 2 * 2 + 3 << endl;`

4. Determine what is print to the console by the following code fragment, assuming the declarations

```
int a=2, b=3, c=4, d=5; double A[4] = {1.1, 2.2, 3.3, 4.4};
```

If the code is badly formed, explain why.

- `cout << b/(a+d%c);`
- `if(a-b>0 && 1/(b-5)==0) cout << "ok";`
- `if(a = 3) cout << d/A[0]; else cout << a/A[0];`
- `do { cout << A[c--]; while(c>0);`
- `while(--a>=0) cout << A[a];`

5. Consider the following complete program.

```
#include <iostream>
using namespace std;
int size = 10;
int main() {
    int a, b;
    cout << "\nEnter two prime numbers: ";
    cin >> a >> b;
    for(int k = 1; k < size; ++k)
    {
        if(k%a==0) cout << a;
        else if(k%b==0) cout << b;
        else cout << a+b;
        cout << endl;
    }
}
```

- What is the scope of the variable "size"?
  - What is the scope of the variable "a"?
  - What is the scope of the variable "k"?
  - What is the output on the console of this program?
6. Implement the following function which uses Horner's method to evaluate the polynomial  $2x^5 - 7x^4 + 6x^3 + 9x^2 + 8x - 5$ :

```
double p(double x);
// Returns  $2x^5 - 7x^4 + 6x^3 + 9x^2 + 8x - 5$ .
// EXAMPLE: p(4.1) returns 931.70732
```

7. Implement the following `compare()` function:

```
int compare(vector<double> x, vector<double> y, int n);
// Returns 0 if x and y are the same size and x[i]==y[i] for all i
// or returns -1 if x[i] < y[i] for 0 <= i < n
// or returns 1 if x[i] > y[i] for 0 <= i < n.
// PRECONDITION: x and y both have at least n elements.
```

8. Write a C++ program to implement the flow chart to the right. Note that the structure of the algorithm suits to for loops followed by a while loop with a for loop and a while loop nested in it.

9. The sum of the first  $n$  cubes is given by  $1 + 2^3 + 3^3 + \dots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$ . Write a complete program that checks this formula by inputting  $n$  and then computing and comparing the values of both sides of the equation. Do not use the `cmath` library.

10. Write a program that adds the computes the smallest value of  $n$  so that  $1 + \frac{1}{8} + \frac{1}{27} + \dots + \frac{1}{n^3} > 1.2$ . Do not use the `cmath` library.

