Problem 1   *(10 points)* Write a complete C++ program that asks the user to enter a positive integer that leaves a remainder of either 3 or 4 when it is divided by 7. If the user gives incorrect input, the program should ask the user to try again as often as necessary. When the user succeeds, the program should report how many attempts were needed.

Sample output might be:

```
Enter a positive integer that is 3 or 4 modulo 7:    -3
Wrong.  Try again: 9
Wrong.  Try again: 10
Good.  You passed after 3 attempts.
```

Answer:

```cpp
#include <iostream>
using namespace std;

int main() {
   int x, attempts = 1;
   cout <<  "Enter a positive number that is 3 or 4 modulo 7: ";
   cin >> x;
   while(x <= 0 || x % 7 < 3 || x % 7 > 4) {
       cout << "Wrong.  Try again: ";
       cin >> x;
       attempts++;
   }
   cout << "Good you passed after " << attempts << " attempts.\n";
   return 0;
}
```

Problem 2   *(10 points)*

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. No answer can use more than two lines. Assume that int variables x, y, z have been declared and have legal values

(a) Print to the user's screen the word:*Hello*

Answer:

```
cout << "Hello" << endl;
```

(b) Print the (integer) quotient that is found when y is divided by the product of x and z.

Answer:

```
cout << y / (x * z) << endl;
```

(c) Print the exact value of $1/z$.

Answer:

```
cout << 1.0 / z << endl;
```

(d) Change z so that it stores the last digit of y.

Answer:

```
z = y % 10;
```

(e) Print all the numbers from 1 to z. (Put all numbers on the same line. Put spaces between numbers).

Answer:

```
for (int n = 1; n <= z; n++) cout << n << " ";
```

Problem 3   *(10 points)* Consider the following C++ program.

```cpp
#include <iostream>
#include <cmath>
using namespace std;

int main() {
    int  x = 4, y = 4, z = 11, w = 7;
    string a = "x", b = "y", c = "a";

    cout << a << c << x << z << endl;                            // line (a)

    cout << a << "a" << "x" << a << endl;                        // line (b)

    if (x == y) cout << "x" << "==" << y << endl;               // line (c)

    if ((x == y) || (a == b)) cout << x << "==" << "y" << endl;  // line (d)

    while (x <= w) {x++; cout << x;}   cout << endl;            // line (e)

    cout << endl;
    return 0;
}
```

(a) What is the output at line (a)?

Answer:

xa411

(b) What is the output at line (b)?

Answer:

xaxx

(c) What is the output at line (c)?

Answer:

x==4

(d) What is the output at line (d)?

Answer:

4==y

(e) What is the output at line (e)?

Answer:

5678

Problem 4   *(10 points)* Write a complete C++ program that asks the user to enter an odd positive integer n. If n is even or negative the program should exit. Otherwise the program should print a triangle with n rows and $(n + 1)/2$ columns that points to the right.

For example, if the user specified 9 for n, the program would print as follows:

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

Answer:

```cpp
#include <iostream>
using namespace std;

int main() {
    int n;
    cout << "Type an odd positive integer: ";
    cin >> n;
    if (n <= 0 || n % 2 == 0) return 0;
    for (int r = 1; r <= n; r++) {
        for (int c = 1; c <= (n + 1)/2; c++) {
            if (c <= r &&  c + r <= (n + 1)) cout << "*";
            else cout << " ";
        }
        cout << endl;
    }
    return 0;
}
```

Problem 1 *(10 points)* Write a complete C++ program that asks the user to enter a positive integer x. If the user enters a non-positive number the program should ask the user to try again as often as necessary. After the user has entered a positive value, the program should find (but not print) the remainders when x is divided by 7 and 8. It should then print the larger of these two remainders. (In case the two remainders are equal either can be printed.)

Sample output might be:

```
Enter a positive number: -4
Not positive.  Try again: 0
Not positive.  Try again: -2
Not positive.  Try again: 20
Bigger remainder is:  6
```

Answer:

```cpp
#include <iostream>
using namespace std;

int main() {
   int x;
   cout <<  "Enter a positive number: ";
   cin >> x;
   while(x <= 0) {
       cout << "Not positive.  Try again: ";
       cin >> x;
   }
   cout << "Bigger remainder is:  ";
   if (x % 7 > x % 8) cout << x % 7;
   else cout << x % 8;
   cout << endl;
   return 0;
}
```

Problem 2   *(10 points)*

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. No answer can use more than two lines. Assume that int variables x, y, z have been declared and have legal values

(a) Print z copies of the word *Hello*. Make each copy on its own line of output.

Answer:

```
for (int i = 1; i <= z; i++) cout << "Hello" << endl;
```

(b) Print the (integer) quotient that is found when y is divided by z.

Answer:

```
cout << y / z << endl;
```

(c) Print the exact value of $1/xyz$.

Answer:

```
cout << 1.0 / (x * y * z) << endl;
```

(d) Change z so that it stores the quotient of y by x.

Answer:

```
z = y / x;
```

(e) If $x \leq y \leq z$ then print x, otherwise print z.

Answer:

```
if (x <= y && y <= z) cout << x << endl;
else cout << z << endl;
```

Problem 3 *(10 points)* Consider the following C++ program.

```cpp
#include <iostream>
#include <cmath>
using namespace std;

int main() {
    int  x = 7, y = 7, z = 11, w = 1;
    string a = "b", b = "a", c = "y";

    cout << a << c << x << z << endl;                       // line (a)

    cout << a << "a" << "x" << a << endl;                   // line (b)

    if (x == y) cout << "x" << "==" << y << endl;           // line (c)

    if ((x == y) && (a == b)) cout << x << "==" << "y" << endl;  // line (d)

    while (x >= w) {x -= 2; cout << x;}  cout << endl;      // line (e)

    cout << endl;
    return 0;
}
```

(a) What is the output at line (a)?

Answer:

by711

(b) What is the output at line (b)?

Answer:

baxb

(c) What is the output at line (c)?

Answer:

x==7

(d) What is the output at line (d)?

Answer:

(e) What is the output at line (e)?

Answer:

531-1

Problem 4 *(10 points)* Write a complete C++ program that asks the user to enter a positive integer n. If n is not positive the program should exit. Otherwise the program should print n triangles in a vertical stack. Each triangle should have $2n - 1$ columns and n rows and should points upwards.

For example, if the user specified 3 for n, the program should print as follows:

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

Answer:

```cpp
#include <iostream>
using namespace std;

int main() {
    int n;
    cout << "Type a positive integer: ";
    cin >> n;
    if (n <= 0) return 0;
    for (int triangle = 1; triangle <= n; triangle ++) {
        for (int r = n; r >= 1; r--) {
            for (int c = 1; c <= 2*n -1; c++) {
                if (c < r ||  c + r > 2*n) cout << " ";
                else cout << "*";
            }
            cout << endl;
        }
    }
    return 0;
}
```