

The first midterm will cover topics up to and including using standard C++ functions.

**Questions might include:**

Problems that require you to write a complete C++ program.

Problems that require you to write a few statements of C++.

Problems that ask you to specify the output that is produced by a C++ program.

Problems that ask you to identify and fix errors in C++ statements and programs.

The following problems have been used on previous midterm exams in CS111. The exam will have 4 problems.

**Problem 1** Write a complete C++ program that asks the user to type a big integer  $n$ . It should then ask 4 times for the user to type a smaller value of  $n$  and then terminate the program. However, if the user ever enters a value that is not smaller it should immediately say *Goodbye* and terminate the program.

Partial credit will be given for programs that perform some of the required steps but excessively long or complicated programs will lose credit.

Examples of two sample runs of the program:

venus> ./a.out		venus> ./a.out
Type a big integer n: 100		Type a big integer n: 100
Type a smaller value of n: 20		Type a smaller value of n: 0
Type a smaller value of n: 10		Type a smaller value of n: 0
Type a smaller value of n: 2		Goodbye
Type a smaller value of n: 1		venus>
venus>		

**Answer:**

**Problem 2**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Most answers need no more than two lines. No solution can use more than four lines. Assume that the following variables have been declared.

```
int x, y, age; double z; string name, a, b;
```

(a) Print a prompt and then read values from the screen for variables  $x$  and  $y$  (in this order).

**Answer:**

(b) If  $x$  is negative, assign  $name$  as *Freddy* otherwise as *Jack*

**Answer:**

(c) Print  $name$  a total of  $y$  times on different output lines.

**Answer:**

(d) Until  $x$  and  $y$  are not equal, repeatedly make the user enter a new value for  $y$

**Answer:**

(e) Print the last digit of the larger of  $x$  and  $y$

**Answer:**

**Problem 3** Consider the following C++ program. Suppose that a user runs the program and enters 10 and then 4 as input.

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

int main() {
    int a, b, c;
    cout << "Enter two\npositive integers\n";           // line (a)
    cin >> a >> b;

    if ((a > b) && (b > 4)) cout << a - b << endl;       // line (b)
    else cout << b - a << endl;

    c = a + b;
    for (int n = (c / 2); n <= (c * 2); n += 3) cout << n; // line (c)
    cout << endl;

    cout << c + b / a << endl;                           // line (d)

    cout << (c + b) % a << endl;                         // line (e)

    return 0;
}
```

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

**Answer:**

(b) What is the output from the instruction beginning at line (b)?

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 4** Write a complete C++ program that asks the user for a number  $n$  and prints  $n$  upward diagonal stripes (each with height  $n$  and width  $n$ ) in a horizontal sequence.

For example, if the user specified 4 for  $n$ , the program would print as follows:

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

(Each stripe should begin in the column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 5** Write a complete C++ program that asks the user to type a big integer  $n$ . It should then ask 5 times for the user to type a bigger value of  $n$  and then thank the user. However, if the user ever enters a value that is not bigger it should immediately exit with no message.

Partial credit will be given for programs that perform some of the required steps but excessively long or complicated programs will lose credit.

Examples of two sample runs of the program:

<pre>venus&gt; ./a.out Type a big integer n: 100 Type a bigger value of n: 200 Type a bigger value of n: 300 Type a bigger value of n: 400 Type a bigger value of n: 500 Type a bigger value of n: 600 Thank you venus&gt;</pre>	<pre>venus&gt; ./a.out Type a big integer n: 100 Type a bigger value of n: 200 Type a bigger value of n: 150 venus&gt;</pre>
--	--

**Answer:**

### Problem 6

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Most answers need no more than two lines. No solution can use more than four lines. Assume that the following variables have been declared.

```
int x, y, age; double z; string name, a, b;
```

(a) Print a prompt and read the value of *name* and of *age* from the screen (in this order).

**Answer:**

(b) Until *age* is between 10 and 110, repeatedly make the user enter a new value for *age*

**Answer:**

(c) Print the tens and units digits of *age* (on two lines, in this order):

**Answer:**

(d) if the user's *name* is Freddy set *x* to 4 otherwise set *x* to 5

**Answer:**

(e) Print the user's *name* a total of *x* times separated by spaces

**Answer:**

**Problem 7** Consider the following C++ program. Suppose that a user runs the program and enters 6 and then 5 as input.

```

#include <iostream>
using namespace std;

int main() {
    int a, b, c;
    cout << "Enter two\npositive integers\n";           // line (a)
    cin >> a >> b;

    if ((a > b) && (b > 4)) cout << a - b << endl;       // line (b)
    else cout << b - a << endl;

    c = a + b;
    for (int n = (c / 2); n <= (c * 2); n += 3) cout << n; // line (c)
    cout << endl;

    cout << c + b / a << endl;                             // line (d)

    cout << (c + b) % a << endl;                             // line (e)

    return 0;
}

```

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

**Answer:**

(b) What is the output from the instruction beginning at line (b)?

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 8** Write a complete C++ program that asks the user for an odd number  $n$  and prints  $n$  large X patterns (each with height  $n$  and width  $n$ ) in a horizontal sequence.

For example, if the user specified 5 for  $n$ , the program would print as follows:

```

*   **  **  **  **  *
* *  * *  * *  * *  * *
  *   *   *   *   *
* *  * *  * *  * *  * *
*   **  **  **  **  *

```

(Each X should begin in the column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 9** Write a complete C++ program that asks the user 5 questions. The first question asks the user to think of a multiple of 1, the second question asks for a multiple of 2, and so on. However, if the user ever enters a value that is not a multiple as required the program should immediately say *Wrong* and terminate.

Partial credit will be given for programs that perform some of the required steps but excessively long or complicated programs will lose credit.

Examples of two sample runs of the program:

venus> ./a.out		venus> ./a.out
Think of a multiple of 1: 4		Think of a multiple of 1: 4
Think of a multiple of 2: 4		Think of a multiple of 2: 4
Think of a multiple of 3: 6		Think of a multiple of 3: 4
Think of a multiple of 4: 4		Wrong
Think of a multiple of 5: 5		venus>
venus>		

**Answer:**

### Problem 10

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Most answers need no more than two lines. No solution can use more than four lines. Assume that the following variables have been declared.

```
int x, y, age; double z; string name, a, b;
```

(a) Print a prompt and read values from the screen for  $y$  and  $x$  (in this order).

**Answer:**

(b) If  $y$  is an even number, assign  $name$  as Freddy otherwise as Jack

**Answer:**

(c) Print  $name$  a total of  $x$  times on one line, separated by spaces

**Answer:**

(d) Until  $x$  and  $y$  are not equal, repeatedly subtract 1 from  $x$  and divide  $y$  by 2

**Answer:**

(e) Print the last digit of the larger of  $x$  and  $y$ .

**Answer:**

**Problem 11** Consider the following C++ program. Suppose that a user runs the program and enters 10 and then 4 as input.

```

#include <iostream>
using namespace std;

int main() {
    int a, b, c;
    cout << "Enter two\npositive integers\n";           // line (a)
    cin >> a >> b;

    if ((a > b) && (b > 2)) cout << a - b << endl;       // line (b)
    else cout << b - a << endl;

    c = a + b;
    for (int n = (c / 2); n <= (c * 2); n *= 2) cout << n; // line (c)
    cout << endl;

    cout << c + b / a << endl;                             // line (d)

    cout << (c + b) % a << endl;                           // line (e)

    return 0;
}

```

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

**Answer:**

(b) What is the output from the instruction beginning at line (b)?

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 12** Write a complete C++ program that asks the user for a number  $n$  and prints  $n$  squares made of \* symbols each with an upward diagonal stripe made of O symbols. Each square has height  $n$  and width  $n$  and the squares form a horizontal sequence.

For example, if the user specified 4 for  $n$ , the program would print as follows:

```

***O ***O ***O ***O
**O* **O* **O* **O*
*O** *O** *O** *O**
O*** O*** O*** O***

```

(Between each pair of squares leave a gap of one blank column.)

**Answer:**

**Problem 13** Write a complete C++ program that asks the user 4 questions. The first question asks the user to think of a number that ends in 1, the second question asks for a number ending in 2, and so on. If the user correctly answers all 4 questions the program should print a message *Well done*. However, if the user ever enters a value with the wrong last digit the program should immediately terminate.

Partial credit will be given for programs that perform some of the required steps but excessively long or complicated programs will lose credit.

Examples of two sample runs of the program:

<pre>venus&gt; ./a.out Think of a number that ends in 1: 11 Think of a number that ends in 2: 12 Think of a number that ends in 3: 13 Think of a number that ends in 4: 14 Well done venus&gt;</pre>	<pre>venus&gt; ./a.out Think of a number that ends in 1: 11 Think of a number that ends in 2: 10 venus&gt;</pre>
--	--

**Answer:**

#### Problem 14

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Most answers need no more than two lines. No solution can use more than four lines. Assume that the following variables have been declared.

```
int x, y, age; double z; string name, a, b;
```

(a) Print a prompt and read the value of *age* and *name* from the screen (in this order).

**Answer:**

(b) Until *age* is between 10 and 120, repeatedly make the user enter a new value for *age*

**Answer:**

(c) Set *x* as the tens digit and *y* as the units digit of *age*

**Answer:**

(d) if the user's *name* is Freddy set *x* to *y* otherwise set *y* to *x*

**Answer:**

(e) Print a 2 digit number whose first digit is *x* and second digit is *y*

**Answer:**

**Problem 15** Consider the following C++ program. Suppose that a user runs the program and enters 4 and then 7 as input.

```

#include <iostream>
using namespace std;

int main() {
    int a, b, c;
    cout << "Enter two\npositive integers\n";           // line (a)
    cin >> a >> b;

    if ((a > b) && (b > 2)) cout << a - b << endl;       // line (b)
    else cout << b - a << endl;

    c = a + b;
    for (int n = (c / 2); n <= (c * 2); n *= 2) cout << n; // line (c)
    cout << endl;

    cout << c + b / a << endl;                             // line (d)

    cout << (c + b) % a << endl;                             // line (e)

    return 0;
}

```

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

**Answer:**

(b) What is the output from the instruction beginning at line (b)?

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 16** Write a complete C++ program that asks the user for a number  $n$  and prints  $n$  upward diagonal stripes (each with height  $n$  and width  $n$ ) in a horizontal sequence.

For example, if the user specified 4 for  $n$ , the program would print as follows:

```

    *   *   *   *
  *   *   *   *
*   *   *   *
*   *   *   *

```

(Each stripe should begin in the column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 17** The following C++ program has errors at the lines marked a,b,c,d, and e. For each answer write a single line of C++ that fixes all errors in the corresponding line. Do not change anything that is correct.



```

#include <iostream>                // line a
using namespace std;

int main{                          // line b

    int x = 1, y = 2;

    for (int x == 1; x < 10; x++); // line c

    cout << y % y endl;           // line d

    return;                        // line e
}

```

(a) Correct line (a):

**Answer:**

(b) Correct line (b):

**Answer:**

(c) Correct line (c):

**Answer:**

(d) Correct line (d):

**Answer:**

(e) Correct line (e):

**Answer:**

### Problem 18

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 x and y have been declared.

```
int x; double y;
```

(a) Read a value of x typed on the screen by the user

**Answer:**

(b) If x is negative, replace x by the 4th power of its value

**Answer:**

(c) Print on the screen the last 2 digits of x.

**Answer:**

(d) Print on the screen a random number between 1 and x (inclusive).

**Answer:**

(e) Set y to the exact value of the quotient of x by 100.

**Answer:**

**Problem 19** Consider the following C++ program. Suppose that a user runs the program and enters -10 as input.

```

#include <iostream>
using namespace std;

int main() {
    int a;
    cout << "Enter a\npositive integer\n";           // line (a)
    cin >> a;

    cout << a << - a << a - a << endl;             // line (b)

    for (int n = a; n <= 0; n += 4) cout << n;       // line (c)
    cout << endl;

    cout << a + 20 / 3 << endl;                     // line (d)

    cout << (a + 20) % 3 << endl;                   // line (e)

    return 0;
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 20** Write a complete C++ program that asks the user to enter a positive integer  $n$ . If  $n$  is not positive the program should print a message *Not positive. Enter another:* and continue to do this until the user enters a positive integer. Then the program should print  $n$  squares of \*s with decreasing size that begin with an  $n \times n$  square and end with a  $1 \times 1$  square. The right hand edges of the squares should line up. (Partial credit will be given for the parts of the program that you complete successfully.) Excessively long solutions lines might lose some credit.

For example, here is a sample run of the program:

```

Enter a positive integer n: -3
Not positive. Enter another: 4
****
****
****
****
****
***
***
***
**
**
*

```

**Answer:**

**Problem 21** The following C++ program has errors at the lines marked a,b,c,d, and e. For each answer write a single line of C++ that fixes all errors in the corresponding line. Do not change anything that is correct.

```

#include <Iostream>                // line a
using namespace std;

Int main()                        // line b

    int z = 5; double y = 12.0;

    for (z = 1; z < 10; z--);      // line c

    cout << y % z << endl;        // line d

    return z                      // line e
}

```

(a) Correct line (a):

**Answer:**

(b) Correct line (b):

**Answer:**

(c) Correct line (c):

**Answer:**

(d) Correct line (d):

**Answer:**

(e) Correct line (e):

**Answer:**

## Problem 22

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 x and y have been declared.

```
int y; double x;
```

(a) Read a value of x typed on the screen by the user.

**Answer:**

(b) If x is negative, replace x by the 2nd power of its value.

**Answer:**

(c) Make y be the closest integer to x (round up half).

**Answer:**

(d) Print to the screen a random number between 0 and y (inclusive).

**Answer:**

(e) Set x to the exact value of the quotient of y by 13.

**Answer:**

**Problem 23** Consider the following C++ program. Suppose that a user runs the program and enters 6 as input.

```

#include <iostream>
using namespace std;

int main() {
    int a;
    cout << "Enter a\npositive integer\n";           // line (a)
    cin >> a;

    cout << a << - a << a - a << endl;              // line (b)

    for (int n = a; n <= 0; n += 4) cout << n;        // line (c)
    cout << endl;

    cout << a + 20 / 3 << endl;                       // line (d)

    cout << (a + 20) % 3 << endl;                     // line (e)

    return 0;
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 24** Write a complete C++ program that asks the user to enter an odd positive integer  $n$ . If  $n$  is illegal the program must terminate at once. Otherwise the program should print squares of \*s. that begin with an  $n \times n$  square and end with a  $1 \times 1$  square and such that the sizes of squares decrease by 2 as they go down the page. The right hand edges of the squares should line up. (Partial credit will be given for the parts of the program that you complete successfully.) Excessively long solutions lines might lose some credit.

For example, here is a sample run of the program:

```

Enter an odd positive integer n: 5
*****
*****
*****
*****
*****
***
***
***
***
*

```

**Answer:**

**Problem 25** The following C++ program has errors at the lines marked a,b,c,d, and e. For each answer write a single line of C++ that fixes all errors in the corresponding line. Do not change anything that is correct.

```

#include <iostream>.                // line a
using namespace std;

int main(){({                       // line b

    int x = 1; y = 2;              // line c

    for (int x == 1; x == 1; x++); // line d

    cout << y % y << endl;

    Return 10;                     // line e
}

```

(a) Correct line (a):

**Answer:**

(b) Correct line (b):

**Answer:**

(c) Correct line (c):

**Answer:**

(d) Correct line (d):

**Answer:**

(e) Correct line (e):

**Answer:**

### Problem 26

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 *name* and *age* have been declared.

```
int age;  string name;
```

(a) Read values of name and age typed on the screen by the user

**Answer:**

(b) If the name is Freddy, divide the age by 10 and use that as age.

**Answer:**

(c) Print on the screen the last 2 digits of the age.

**Answer:**

(d) Print on the screen a random number between 1 and age (inclusive).

**Answer:**

(e) Print the users name 5 times on 5 lines of the screen.

**Answer:**

**Problem 27** Consider the following C++ program. Suppose that a user runs the program and enters -20 as input.

```

#include <iostream>
using namespace std;

int main() {
    int a;
    cout << "Enter a\npositive integer\n";           // line (a)
    cin >> a;

    cout << a << - a << a - a << endl;              // line (b)

    for (int n = a; n <= 0; n += 4) cout << n;        // line (c)
    cout << endl;

    cout << a + 20 / 3 << endl;                       // line (d)

    cout << (a + 20) % 3 << endl;                     // line (e)

    return 0;
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 28** Write a complete C++ program that asks the user to enter a positive integer  $n$ . If  $n$  is not positive the program should print a message *Not positive. Enter another:* and continue to do this until the user enters a positive integer. Then the program should print a square of side  $n$  that is made up from a large letter L made of #'s in the left column and bottom row, then a slightly smaller L made made of o's inside it, then a smaller L made of #'s and so on. (Partial credit will be given for the parts of the program that you complete successfully.) Excessively long solutions lines might lose some credit.

For example, here is a sample run of the program:

```

Enter a positive integer n: -5
Not positive. Enter another: 7
#o#o#o#
#o#o#oo
#o#o###
#o#oooo
#o#####
#oooooo
#####

```

**Answer:**

**Problem 29** The following C++ program has errors at the lines marked a,b,c,d, and e. For each answer write a single line of C++ that fixes all errors in the corresponding line. Do not change anything that is correct.

```

include <iostream>                // line a
using namespace std;

int main() {

    int z = 5, double y = 12.0;    // line b

    for (z = 1; z !> 10; z++);      // line c

    cout << (int) y % z << endl;    // line d

    Return z.                      // line e
}

```

(a) Correct line (a):

**Answer:**

(b) Correct line (b):

**Answer:**

(c) Correct line (c):

**Answer:**

(d) Correct line (d):

**Answer:**

(e) Correct line (e):

**Answer:**

### Problem 30

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 *score* and *name* have been declared.

```
string name; double score;
```

(a) Read the score and name typed on the screen by the user.

**Answer:**

(b) If the name is not Freddy add a bonus of 10 to the score.

**Answer:**

(c) Print the closest integer to the score (round up half).

**Answer:**

(d) Print to the screen a random integer between 1 and score.

**Answer:**

(e) Print the user's name 20 times on one line of output.

**Answer:**

**Problem 31** Consider the following C++ program. Suppose that a user runs the program and enters 20 as input.

```

#include <iostream>
using namespace std;

int main() {
    int a;
    cout << "Enter a\npositive integer\n";           // line (a)
    cin >> a;

    cout << a << - a << a - a << endl;             // line (b)

    for (int n = a; n <= 0; n += 4) cout << n;        // line (c)
    cout << endl;

    cout << a + 20 / 3 << endl;                       // line (d)

    cout << (a + 20) % 3 << endl;                     // line (e)

    return 0;
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 32** Write a complete C++ program that asks the user to enter a positive integer  $n$ . If  $n$  is not positive the program must terminate at once. Then the program should print a square of side  $n$  that is made up from a large backwards letter L made of #’s in the right column and bottom row, then a slightly smaller reversed L made made of o’s inside it, then a smaller reversed L made of #’s and so on. (Partial credit will be given for the parts of the program that you complete successfully.) Excessively long solutions lines might lose some credit.

For example, here is a sample run of the program:

```

Enter a positive integer n: 7
#o#o#o#
oo#o#o#
###o#o#
oooo#o#
#####o#
ooooooo#
#####

```

**Answer:**

**Problem 33** The following C++ program has errors at the lines marked a,b,c,d, and e. For each answer write a single line of C++ that fixes the errors in the corresponding line.



```

#include <iostream>
    using namespace std           // line a

int main();                      // line b

{   int x = 1;

    while (0 < x < 5) {          // line c

        cout >> x % x >> "\n\n" // line d

        x = x++;                // line e

    }
    return 0;
}

```

(a) Correct line (a):

**Answer:**

(b) Correct line (b):

**Answer:**

(c) Correct line (c):

**Answer:**

(d) Correct line (d):

**Answer:**

(e) Correct line (e):

**Answer:**

### Problem 34

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 an integer variable  $x$  has been declared.

(a) Prompt the user to enter a value for  $x$ .

**Answer:**

(b) Read the value of  $x$  given by the user

**Answer:**

(c) If  $x$  is negative, replace  $x$  by the value of  $5 - x$

**Answer:**

(d) Print the square root of  $x$ .

**Answer:**

(e) On one output line, print  $x$  random numbers in the range 10 to 17 (inclusive)

**Answer:**

**Problem 35**     Consider the following C++ program.

```

#include <iostream>
using namespace std;

string fun(int x) {
    if (x < 0) return "Negative ";
    if ((x > 10) && (x < 100)) return "Big ";
    return "x + x ";
}

int main() {
    int a = 4, b = 3;

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

    cout << (a * b) % 10 << endl;                     // line (b)

    for (int n = 4; n <= 6; n++) cout << n + b;       // line (c)
    cout << endl;

    cout << fun(-1) << endl;                           // line (d)

    cout << fun(200) << endl;                           // line (e)

    return 0;
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 36** Write a complete C++ program that asks the user to enter a positive integer  $n$ . If  $n$  is not positive the program should exit immediately. Otherwise the program should print a square with  $n$  rows that is cut by its diagonal (from upper left to lower right) into a lower triangle showing the symbol \$ and an upper triangle showing the symbol =.

For example, if the user specified 5 for  $n$ , the program would print as follows:

```

$====
$$===
$$$==
$$$$=
$$$$$

```

**Answer:**

**Problem 37** The following C++ program has errors at the lines marked a,b,c,d, and e. For each answer write a single line of C++ that fixes the errors in the corresponding line.

```

#include <iostream>
Using      namespace std;           // line a

int main{}                           // line b

{   int x = 5;

    while (0 < x - 1 < 5) {          // line c

        cout >> x / (x + x % 1) endl // line d

        x = x--;                     // line e

    }
    return 0;
}

```

(a) Correct line (a):

**Answer:**

(b) Correct line (b):

**Answer:**

(c) Correct line (c):

**Answer:**

(d) Correct line (d):

**Answer:**

(e) Correct line (e):

**Answer:**

### Problem 38

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 an integer variables x and y have been declared.

(a) Prompt the user to enter positive values for x and y.

**Answer:**

(b) Read the values of x and y given by the user

**Answer:**

(c) If x or y is not positive, exit the program

**Answer:**

(d) Print the square root of x + y.

**Answer:**

(e) On one output line, print x random numbers in the range 1 to y (inclusive)

**Answer:**

**Problem 39**     Consider the following C++ program.

```

#include <iostream>
using namespace std;

string fun(int x) {
    if (x < 0) return "Negative ";
    if ((x > 5) || (x < 1)) return "Big ";
    return "x % x";
}

int main() {
    int a = 4, b = 3;

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

    cout << (a + b) % 10 << endl;           // line (b)

    for (int n = 6; n >= 4; n--) cout << n - b; // line (c)
    cout << endl;

    cout << fun(-1) << endl;                // line (d)

    cout << fun(20) << endl;                // line (e)

    return 0;
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 40** Write a complete C++ program that asks the user to enter a positive integer  $n$ . If  $n$  is not positive the program should exit immediately. Otherwise the program should print a square with  $n$  rows. The square is cut by the diagonal (from lower left to upper right) into two triangles. The lower triangle should be made from the symbol \$ and an upper triangle from the symbol =.

For example, if the user specified 5 for  $n$ , the program would print as follows:

```

=====
=====$
===$$
==$$$
=$$$$

```

**Answer:**

**Problem 41** 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:**

#### **Problem 42**

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:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 43**     Consider the following C++ program.

```
#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:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 44** 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:**

**Problem 45** 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:**

#### **Problem 46**

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:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 47** Consider the following C++ program.

```
#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:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 48** 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 point upwards.

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

```

  *
 ***
*****
  *
 ***
*****
  *
 ***
*****

```

**Answer:**

**Problem 49** 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  $n$  columns and  $(n + 1)/2$  rows that points upwards.

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

```

  *
 ***
*****
*****
*****

```

**Answer:**

**Problem 50** Write a complete C++ program that prints the numbers from 28 to 387 with 10 numbers (separated by spaces) on each line.

The output from your program should begin

```

28 29 30 31 32 33 34 35 36 37
38 39 40 41 42 43 44 45 46 47

```

**Answer:**

**Problem 51**

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 the following variables have been declared and have legal values

```
int x = 18;
```

(a) Print to the user's screen the sentence: *In C++ an endl makes a new line.*

**Answer:**

(b) Print the square of  $x$ .

**Answer:**

(c) Print a random number with 4 digits.

**Answer:**

(d) Print all numbers less than 1000 that are either divisible 7 or are even and greater than 400.

**Answer:**

(e) Print the square root of  $3/8$ .

**Answer:**

**Problem 52** Consider the following C++ program.



```

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

int main() {
    double x = 9.0, y = 16.0, z = 25.0;
    string a = "b", b = "a";
    cout << sqrt(z) << endl;           // line (a)
    cout << sqrt(sqrt(y)) << endl;     // line (b)
    if ((x + y) != z) cout << b << endl; // line (c)
    cout << a << "a" << "b" << b << endl; // line (d)
    if (a == "b") cout << z; else cout << x; // line (e)
    cout << endl;
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 53** Write a complete C++ program that asks the user for a number  $n$  and prints 2 large copies of an X pattern (each with height  $n$ ) in a horizontal sequence.

For example, if the user specified 5 for  $n$ , the program would print as follows:

```

*   **  *
* *  * *
*   *
* *  * *
*   **  *

```

(Each X pattern should begin in the column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 54** Write a complete C++ program that prints the numbers from 980 down to 666 with 6 numbers (separated by spaces) on each line.

The output from your program should begin

```

980 979 978 977 976 975
974 973 972 971 970 969

```

**Answer:**

**Problem 55**

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 the following variables have been declared and have legal values

```
int y = 12;
```

(a) Print to the user's screen the sentence: *C++ output uses cout*.

**Answer:**

(b) Print the square root of  $y$ .

**Answer:**

(c) Print a random 3 digit even number.

**Answer:**

(d) Print all numbers less than 1000 that end in a 7 and are divisible by 3.

**Answer:**

(e) Print the square of  $3/8$ .

**Answer:**

**Problem 56** Consider the following C++ program.

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

int main() {
    double x = 9.0, y = 16.0, z = 25.0;
    string a = "a", b = "a";
    cout << sqrt(y) << endl;           // line (a)
    cout << sqrt(y) + sqrt(x) << endl;  // line (b)
    if ((x + y) == z) cout << b << endl; // line (c)
    cout << a << "a" << "b" << b << endl; // line (d)
    if (a == "b") cout << z; else cout << x; // line (e)
    cout << endl;
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 57** Write a complete C++ program that asks the user for a number  $n$  and prints 3 large copies of an L pattern (each with height  $n$ ) in a horizontal sequence.

For example, if the user specified 4 for  $n$ , the program would print as follows:

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

(Each L pattern should begin after a gap of one column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 58** Write a complete C++ program that prints the numbers from 28 to 387 with 10 numbers (separated by commas) on each line.

The output from your program should begin

```
28,29,30,31,32,33,34,35,36,37
38,39,40,41,42,43,44,45,46,47
```

**Answer:**

**Problem 59**

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 the following variables have been declared and have legal values

```
int z = 5;
```

(a) Print to the user's screen the words: *endl makes a line and for makes a loop*

**Answer:**

(b) Print the cube of  $z + 1$ .

**Answer:**

(c) Print a random 2 digit number to the user's screen.

**Answer:**

(d) Print all three digit numbers that either end in a 7 or are even and divisible by 7.

**Answer:**

(e) Print the square root of  $3/7$ .

**Answer:**

**Problem 60** Consider the following C++ program.

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

int main() {
    double x = 49.0, y = 81.0, z = 25.0;
    string a = "ab", b = "ba";
    cout << sqrt(x) << endl;                // line (a)
    cout << sqrt(sqrt(y)) << endl;           // line (b)
    if ((x + y) != z) cout << a << endl;     // line (c)
    cout << a << "a" << "b" << b << endl;    // line (d)
    if (a == "b") cout << x; else cout << y; // line (e)
    cout << endl;
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 61** Write a complete C++ program that asks the user for a number  $n$  and prints 2 large copies of an E pattern (each with height  $n$  that is odd) in a horizontal sequence.

For example, if the user specified 5 for  $n$ , the program would print as follows:

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

(Each E pattern should begin after a gap of one column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 62** Write a complete C++ program that prints the numbers from 980 down to 669 with 6 numbers (separated by periods) on each line.

The output from your program should begin

```
980.979.978.977.976.975
974.973.972.971.970.969
```

**Answer:**

**Problem 63**

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 the following variables have been declared and have legal values

```
int y = 12;
```

(a) Print to the user's screen the sentence: *Quote Hello but do not quote cout.*

**Answer:**

(b) Print the square root of the square root of  $y$ .

**Answer:**

(c) Print a random 3 digit number that is divisible by 3.

**Answer:**

(d) Print all numbers less than 1000 that end in a 7 and are divisible by 7.

**Answer:**

(e) Print the square of  $5/8$ .

**Answer:**

**Problem 64** Consider the following C++ program.

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

int main() {
    double x = 81.0, y = 49.0, z = 36.0;
    string a = "az", b = "za";
    cout << sqrt(y) << endl;           // line (a)
    cout << sqrt(y) + sqrt(x) << endl;  // line (b)
    if ((x + y) == z) cout << b << endl; // line (c)
    cout << a << "a" << "b" << b << endl; // line (d)
    if (a == "b") cout << z; else cout << x; // line (e)
    cout << endl;
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 65** Write a complete C++ program that asks the user for a number  $n$  and prints 3 large copies of a T pattern (each with height  $n$  that is odd) in a horizontal sequence.

For example, if the user specified 5 for  $n$ , the program would print as follows:

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

(Each T pattern should begin after a gap of one column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 66** Write a complete C++ program that does the following.

1. It asks the user to enter a temperature in degrees celsius.
2. If the temperature is greater than 40, the program should once ask the user to enter a different value.
3. The program calculates and prints the fahrenheit value of temperature using the formula:

$$Fahrenheit = \frac{9}{5}Celsius + 32$$

Here is an example of how the program should work:

```
Enter the temperature in degrees celsius: 60
Enter a different value: 60
Fahrenheit: 140.0
```

**Answer:**

**Problem 67**

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 the following variables have been declared and have legal values

```
int a, b;
string word, second;
```

- (a) Ask for, and read the value for *second* from the user.

**Answer:**

- (b) Print the cube of *b*.

**Answer:**

- (c) Print the number *a* without its last digit.

**Answer:**

- (d) If *word* and *second* are equal print the value of *a*, otherwise print the value of *b*.

**Answer:**

- (e) Print *a* copies of the value of *word* on one line separated by single spaces.

**Answer:**

**Problem 68** Consider the following C++ program.

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

int main() {
    int p = 36, q = 49, r = 25;
    string a = "yes";
    string x = "no";
    if (a == x) cout << p; else cout << q; // line (a)
    cout << endl;
    if ((p <= q) && (r <= q)) cout << "ok" << endl; // line (b)
    if ((a == x) || ("x" == "x")) r+=5; cout << r << endl; // line (c)
    if (!(p % 2) < (q % 2)) cout << "gg"; else cout << "ll"; // line (d)
    cout << endl;
    while (p > r) p--; cout << p << "\n"; // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 69** Write a complete C++ program that does the following.

1. It asks the user to enter a temperature in degrees fahrenheit.
2. If the temperature  $f$  does not satisfy  $0 \leq f \leq 100$  the program should print the message *Out of range* and terminate.
3. The program calculates and prints the celsius value of temperature using the formula:

$$Celsius = \frac{5}{9}(Fahrenheit - 32)$$

Here is an example of how the program should work:

```
Enter the temperature in degrees fahrenheit: 68
Celsius: 20.0
```

**Answer:**

**Problem 70**

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 the following variables have been declared and have legal values

```
int x, y;
string name, message;
```

(a) Ask for, and read the value for *name* from the user.

**Answer:**

(b) Print the square of  $y$ .

**Answer:**

(c) Print the last digit of  $x + y$ .

**Answer:**

(d) If  $x$  is not greater than  $y$  print the value of *name*, otherwise print the value of *message*.

**Answer:**

(e) Print  $x$  copies of the value of  $x$  followed by  $y$  copies of the value of *message*.

**Answer:**

**Problem 71** Consider the following C++ program.

```

#include <iostream>
using namespace std;

int main() {
    int p = 31, q = 23, r = 15;
    string a = "abc";
    string x = "abc";
    if (a == x) cout << p; else cout << q;           // line (a)
    cout << endl;
    if ((p <= q) && (p <= r)) cout << "a" << endl;    // line (b)
    if ((a == x) || ("a" == "x")) r++; cout << r << endl; // line (c)
    if (!((p % 2) < (q % 2))) cout << "no"; else cout << "yes"; // line (d)
    cout << endl;
    while (p < r) p++; cout << p << "\n";           // line (e)
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 72** Write a complete C++ program that asks the user for a number  $n$  and prints  $n$  diagonal stripes (each with height  $n$  and width  $n$ ) in a horizontal sequence.

For example, if the user specified 4 for  $n$ , the program would print as follows:

```

*   *   *   *
*   *   *   *
 *   *   *   *
  *   *   *   *

```

(Each stripe should begin in the column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 73** Write a complete C++ program that does the following.

1. It asks the user to enter the base and height of a triangle.
2. If either the base or height is less than or equal to 0, the program should immediately terminate.
3. The program calculates and prints the area of the triangle using the formula:

$$Area = \frac{1}{2} Base \times Height$$

Here is an example of how the program should work:

```

Enter the base and height of a triangle:  8 10
Area: 40.0

```

**Answer:**



**Problem 74**

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 the following variables have been declared and have legal values

```
int x, y;
string name, message;
```

(a) Ask for, and read the value for *name* from the user.

**Answer:**

(b) Print the cube of *x*.

**Answer:**

(c) Print the last digit of *y*.

**Answer:**

(d) If *x* is greater than *y* print the value of *x*, otherwise print the value of *message*.

**Answer:**

(e) Print *x* copies of the value of *name* followed by *y* copies of the value of *message*.

**Answer:**

**Problem 75** Consider the following C++ program.

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

int main() {
    int p = 11, q = 13, r = 15;
    string a = "x";
    string x = "xx";
    if (a == x) cout << p; else cout << q;           // line (a)
    cout << endl;
    if ((p <= q) && (p <= r)) cout << "a" << endl;    // line (b)
    if ((a == x) || ("a" == "x")) r++; cout << r << endl; // line (c)
    if (!((p % 2) < (q % 2))) cout << "no"; else cout << "yes"; // line (d)
    cout << endl;
    while (p < r) p++; cout << p << "\n";           // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 76** Write a complete C++ program that asks the user for a number  $n$  and prints  $n$  triangles (each with height  $n$ ) in a horizontal sequence.

For example, if the user specified 4 for  $n$ , the program would print as follows:

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

(Each triangle should begin in the column after the previous one ends. Do not try to check whether the user input is legal or sensible.)

**Answer:**

**Problem 77** Write a complete C++ program that does the following.

1. It asks the user to enter an integer between 100 and 9999.
2. If the entered number is out of range, the program forces the user to enter more numbers until one in the correct range is given.
3. Then the program prints the digits in the number (in reverse) on separate lines.

Here is an example of how the program should work:

```
Enter an integer between 100 and 9999: 8976
6
7
9
8
```

**Answer:**

**Problem 78**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Your answers must be short and must fit in the spaces provided. Assume the following variables have been declared

```
int x, y;
```

- (a) Prompt for, and read values for  $x$  and  $y$  from the user.

**Answer:**

- (b) Print  $x$  copies of the number  $y$ , without spaces on one line of output.

**Answer:**

- (c) Print the remainder when  $x$  is divided by  $y$

**Answer:**

- (d) If  $x$  and  $y$  are both between 10 and 99 print 6 copies of the word "Hello" on a single line.

**Answer:**

- (e) Print the average of  $x$  and  $y$

**Answer:**

**Problem 79** Consider the following C++ program.

```

#include <iostream>
using namespace std;

int main() {
    int x = 7, y = 10, z = 65;
    string freddy = "fred";
    string fred = "freddy";
    cout << "fred" << " " << fred << endl;           // line (a)
    cout << (z % y) / x << endl;                       // line (b)
    if ((x > y) && (y > x)) cout << fred << endl;       // line (c)
    cout << fred << freddy << endl;                   // line (d)
    cout << x << "*" << y << "=" << z << "\n";       // line (e)
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 80** Write a complete C++ program that asks the user for a height  $h$  and prints a white X pattern (made of spaces) against a dark background made of Xs.

For example, if the user specified 7 for  $h$ , the program would print as follows:

```

XXXXX
X XXX X
XX X XX
XXX XXX
XX X XX
X XXX X
XXXXX

```

**Answer:**

**Problem 81** Write a complete C++ program that does the following.

1. It asks the user to enter a 2-digit integer.
  2. If the entered number does not have 2 digits, the program forces the user to enter further integers until one with 2 digits is given.
  3. The program then prints the bigger of the 2 digits in the user's number (either digit in case they are the same).
- Here is an example of how the program should work:

```

Enter a 2-digit integer: 123
That does not have 2 digits. Try again: 35
The bigger digit is 5

```

**Answer:**

**Problem 82**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Your answers must be short and must fit in the spaces provided. Assume the following variables have been declared

```
int x, y;  string name;
```

(a) Prompt for, and read values for x, y and name from the user.

**Answer:**

(b) If y is 0 print "Illegal Division" otherwise the exact value of x divided by y is printed

**Answer:**

(c) Drop any minus sign in x or y to make sure they are both positive.

**Answer:**

(d) Say Hello to the user (eg "Hello Freddy") x times on x different lines.

**Answer:**

(e) Print the bigger of x and y followed by the smaller.

**Answer:**

**Problem 83** Consider the following C++ program.

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

int main() {
    int x = 7, y = 10, z = 65;
    string freddy = "fred";
    string fred = "freddy";
    for (int c = x; c < y; c++) cout << freddy; cout << endl; // line (a)
    cout << (z % y) / (y % x) << endl; // line (b)
    if ((x > y) || (y > x)) cout << fred << endl; // line (c)
    cout << fred << " * " << (y - x) << endl; // line (d)
    cout << x << "%" << y << "=" << "x % y" << "\n"; // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 84** Write a complete C++ program that asks the user for a width  $w$  and prints a white arrow pattern (made of spaces) against a dark background made of Xs.

For example, if the user specified 5 for  $w$ , the program would print as follows:

```

XXXX
X XXX
XX XX
XXX X
XXXX
XXX X
XX XX
X XXX
XXXX

```

**Answer:**

**Problem 85** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is between 1 and 21.
2. It repeatedly reads  $n$  from the user until the supplied value of  $n$  is legal.
3. It prints out a picture of an  $n \times n$  square formed of  $X$  characters except that a diagonal stripe, formed by the diagonal and any position immediately to its right, is printed using an  $O$  character.

Here is an example of how the program should work:

```

Give me an integer between 1 and 21:  5
OOXXX
XOOXX
XXOOX
XXXOO
XXXXO

```

**Answer:**

**Problem 86** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is between 1 and 15.
2. It terminates at once if the user enters an illegal value for  $n$ .
3. It prints out a picture using (+ signs) of a diagonal line that extends over  $n$  rows and has a width of 3 characters in each row.

Here is an example of how the program should work:

```

Give me an integer between 1 and 15:  6
+++
+++
+++
+++
+++
+++
+++

```

**Answer:**

**Problem 87** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is between 1 and 15.
2. It repeatedly reads  $n$  from the user until the supplied value of  $n$  is legal.
3. It prints out a picture of an  $n \times n$  square formed of  $O$  characters except that a diagonal stripe, formed by the diagonal and any position immediately to its left, is left blank.

Here is an example of how the program should work:

```
Give me an integer between 1 and 15: 6
00000
 0000
0 000
00 00
000 0
0000
```

**Answer:**

**Problem 88** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is between 1 and 21.
2. It terminates at once if the user enters an illegal value for  $n$ .
3. It prints out a picture using (+ signs) of left sloping diagonal line with length  $n$ .

Here is an example of how the program should work:

```
Give me an integer between 1 and 21: 5
  +
  +
 +
 +
 +
```

**Answer:**

**Problem 89** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is between 1 and 9.
2. It repeatedly reads  $n$  from the user until the supplied value of  $n$  is legal.
3. It prints out a picture of a triangle with  $n$  rows, in which the symbol used to print each row is the row's number.

Here is an example of how the program should work:

```
Give me an integer between 1 and 9: 5
1
22
333
4444
55555
```

**Answer:**

**Problem 90** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is between 1 and 9.
2. It exits immediately if  $n$  is illegal.
3. It prints out a picture of a triangle with  $n$  rows, in which the symbol used to print each column is the column's number.

Here is an example of how the program should work:

```
Give me an integer between 1 and 9: 5
1
12
123
1234
12345
```

**Answer:**

**Problem 91** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is between 1 and 9.
2. It repeatedly reads  $n$  from the user until the supplied value of  $n$  is legal.
3. It prints out a picture of an upside down triangle with  $n$  rows, in which the symbol used to print each row is the row's number.

Here is an example of how the program should work:

```
Give me an integer between 1 and 9: 5
11111
2222
333
44
5
```

**Answer:**

**Problem 92** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is between 1 and 9.
2. It exits immediately if  $n$  is illegal.
3. It prints out a picture of an upside down triangle with  $n$  rows, in which the symbol used to print each column is the column's number.

Here is an example of how the program should work:

```
Give me an integer between 1 and 9: 5
12345
1234
123
12
1
```

**Answer:**

**Problem 93** A number is called *upward* if its last digit is greater than the previous digit. Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is greater than 9.
2. It terminates when given illegal input.
3. It prints out whether  $n$  is upward.

Here is an example of how the program should work:

```
Give me an integer greater than 9: 95424
```

```
Upward
```

**Answer:**

**Problem 94** A number is called *evil* if its last two digits add to 13. Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is greater than 666.
2. It terminates when given illegal input.
3. It prints out whether  $n$  is evil.

Here is an example of how the program should work:

Give me an integer greater than 666: 667

Evil

**Answer:**

**Problem 95** A number is called *flat* if its last two digits are equal. Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is greater than 9.
2. It terminates when given illegal input.
3. It prints out whether  $n$  is flat.

Here is an example of how the program should work:

Give me an integer greater than 9: 95424

Not flat

**Answer:**

**Problem 96** A number is called *lucky* if the product of its last two digits ends in a 3. Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is greater than 666.
2. It terminates when given illegal input.
3. It prints out whether  $n$  is lucky.

Here is an example of how the program should work:

Give me an integer greater than 666: 697

Lucky

**Answer:**

**Problem 97** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is greater than 9.
2. It terminates when given illegal input.
3. It prints out the first 2 digits of  $n$  (in order, on one line).

Here is an example of how the program should work:

Give me an integer greater than 9: 95424

95

**Answer:**

**Problem 98** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer  $n$ .
2. It terminates when given illegal input.
3. It prints out the product of the digits of  $n$ .

Here is an example of how the program should work:



Give me a positive integer: 41311

12

**Answer:**

**Problem 99** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer  $n$  that is greater than 99.
2. It terminates when given illegal input.
3. It prints out the first 3 digits of  $n$  (in order, on one line).

Here is an example of how the program should work:

Give me an integer greater than 99: 95424

954

**Answer:**

**Problem 100** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer  $n$ .
2. It terminates when given illegal input.
3. It prints out the sum of those digits of  $n$  that are even numbers.

Here is an example of how the program should work:

Give me a positive integer: 41815

12

**Answer:**

**Problem 101** Consider the following C++ program.

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

int main() {
    int x = 123;
    cout << x % 10 << endl;           // line (a)
    cout << x / 10 << endl;           // line (b)
    if (x > 50) cout << "Big" << endl; // line (c)
    cout << endl;
    while (x > 0) { cout << "1"; x /= 10;} // line (d)
    cout << endl;
    cout << x << endl;               // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 102** Consider the following C++ program.

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

int main() {
    int x = 2345;
    cout << x % 10 << endl;           // line (a)
    cout << x / 10 << endl;           // line (b)
    if (x > 5000) cout << "Big" << endl; // line (c)
    cout << endl;
    while (x > 0) { cout << "*"; x /= 10;} // line (d)
    cout << endl;
    cout << x + 5 << endl;           // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 103** Consider the following C++ program.

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

int main() {
    int x = 31;
    cout << x % 10 << endl;           // line (a)
    cout << x / 10 << endl;           // line (b)
    if (x > 50) cout << "Big" << endl; // line (c)
    cout << endl;
    while (x > 0) { cout << "1"; x /= 10;} // line (d)
    cout << endl;
    cout << x * x << endl;           // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 104** Consider the following C++ program.

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

int main() {
    int x = 5432;
    cout << x % 10 << endl;           // line (a)
    cout << x / 10 << endl;           // line (b)
    if (x > 5000) cout << "Big" << endl; // line (c)
    cout << endl;
    while (x > 0) { cout << "A"; x /= 10;} // line (d)
    cout << endl;
    cout << x - 5 << endl;           // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 105** Consider the following C++ program.

```

#include <iostream>
using namespace std;

int main() {
    int y,x = 12;
    cout << x + x * 10 << endl;           // line (a)
    cout << x / 100 << endl;               // line (b)
    for (y = 10; y < x; y++) cout << y;    // line (c)
    cout << endl;
    if (x > 50) cout << x; else cout << 2 * x; // line (d)
    cout << endl;
    cout << x << "*" << x << endl;        // line (e)
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 106** Consider the following C++ program.

```

#include <iostream>
using namespace std;

int main() {
    int y,x = 210;
    cout << x + x * 10 << endl;           // line (a)
    cout << x / 100 << endl;               // line (b)
    for (y = 210; y < x; y++) cout << y;    // line (c)
    cout << endl;
    if (x > 50) cout << x; else cout << 2 * x; // line (d)
    cout << endl;
    cout << x << "*" << x << endl;        // line (e)
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 107** Consider the following C++ program.

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

int main() {
    int y,x = 13;
    cout << x + x * 10 << endl;           // line (a)
    cout << x / 100 << endl;               // line (b)
    for (y = 10; y < x; y++) cout << y;    // line (c)
    cout << endl;
    if (x > 50) cout << x; else cout << 2 * x; // line (d)
    cout << endl;
    cout << x << "*" << x << endl;        // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 108** Consider the following C++ program.

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

int main() {
    int y,x = 211;
    cout << x + x * 10 << endl;           // line (a)
    cout << x / 100 << endl;               // line (b)
    for (y = 210; y < x; y++) cout << y;    // line (c)
    cout << endl;
    if (x > 50) cout << x; else cout << 2 * x; // line (d)
    cout << endl;
    cout << x << "*" << x << endl;        // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 109**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y;
```

(a) Print y copies of the word Hello on a single line of output.

**Answer:**

(b) Print the value of x as a percentage of y, with output like 75.0%.

**Answer:**

(c) Read new values for x and y from the user.

**Answer:**

(d) Replace y by its absolute value.

**Answer:**

(e) Print the first digit of y

**Answer:**

**Problem 110**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y;
```

(a) Print x copies of the number y on a single line of output.

**Answer:**

(b) Print the value of y as a percentage of x, with output like 75.0%.

**Answer:**

(c) Read a new value for y and then for x from the user.

**Answer:**

(d) Replace y by the absolute value of x - y.

**Answer:**

(e) If y is greater than 10, print the second digit of y

**Answer:**

**Problem 111**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y;
```

(a) Read new values for x and y from the user.

**Answer:**

(b) Print the value of x as a percentage of y, with output like 75.0%.

**Answer:**

(c) Print x copies of the word *cin* on a single line of output.

**Answer:**

(d) Replace y by the absolute value of x.

**Answer:**

(e) Print the first digit of y

**Answer:**

### Problem 112

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y;
```

(a) Read a new value for y and then for x from the user.

**Answer:**

(b) Print y copies of the number x on a single line of output.

**Answer:**

(c) Print 75.0% on a single line.

**Answer:**

(d) Replace y by the absolute value of - x - y.

**Answer:**

(e) If y is greater than 10, print the second digit of y

**Answer:**

### Problem 113

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized, and x is positive

```
int x, y;
```

(a) Print x copies of the last digit of x on a single line of output.

**Answer:**

(b) Print the exact value the quotient of x by y, as a decimal

**Answer:**

(c) Exit the program if y is negative

**Answer:**

(d) Replace y by its absolute value.

**Answer:**

(e) Print the first digit of x

**Answer:**

**Problem 114**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized, and x is positive

```
int x, y;
```

(a) Exit the program if y is positive

**Answer:**

(b) Print -y copies of the the string "y >= 0; "

**Answer:**

(c) Print the exact value the quotient of y by x, as a decimal

**Answer:**

(d) Replace y by the absolute value of x + y.

**Answer:**

(e) Print the first digit of y

**Answer:**

**Problem 115**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized, and x is positive

```
int x, y;
```

(a) Exit the program if y is negative

**Answer:**

(b) Print x copies of the last digit of y on a single line of output.

**Answer:**

(c) Print the exact value the quotient of x by y, as a decimal

**Answer:**

(d) Replace y by its absolute value.

**Answer:**

(e) Print the first digit of x followed by the last digit of y

**Answer:**

**Problem 116**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized, and x is positive

```
int x, y;
```



(a) Print the exact value the quotient of y by x, as a decimal

**Answer:**

(b) Exit the program if y is positive

**Answer:**

(c) Print -y copies of the the string "y >= 0; "

**Answer:**

(d) Replace y by the absolute value of x - y.

**Answer:**

(e) Print the first digit of y followed by the last digit of x

**Answer:**

**Problem 117** Write a complete C++ program that does the following. The program prints a rectangular pattern of Os and Xs. The pattern has 200 rows and 50 columns. Every third row is made of Os and the other rows are made of Xs.

For example, a similar pattern with 7 rows and 5 columns would appear as follows.

```
XXXXX
XXXXX
00000
XXXXX
XXXXX
00000
XXXXX
```

**Answer:**

**Problem 118** Write a complete C++ program that does the following. The program prints a rectangular pattern of Os and Xs. The pattern has 50 rows and 60 columns. Every fourth column is made of Os and the other columns are made of Xs.

For example, a similar pattern with 7 rows and 9 columns would appear as follows.

```
XXXOXXXOX
XXXOXXXOX
XXXOXXXOX
XXXOXXXOX
XXXOXXXOX
XXXOXXXOX
XXXOXXXOX
```

**Answer:**

**Problem 119** Write a complete C++ program that does the following. The program prints a rectangular pattern of Os and Xs. The pattern has 101 rows and 51 columns. The middle row and column are made of Os but all other entries in the pattern are Xs.

For example, a similar pattern with 7 rows and 5 columns would appear as follows.

```
XXOXX
XXOXX
XXOXX
00000
XXOXX
XXOXX
XXOXX
```

**Answer:**

**Problem 120** Write a complete C++ program that does the following. The program prints a square pattern of Os and Xs. The pattern has 52 rows and 52 columns. The entries on the two diagonals of the square are made of Os but all other entries in the pattern are Xs.

For example, a similar pattern with 7 rows and 7 columns would appear as follows.

```
OXXXXXO
XOXXXOX
XXOXOXX
XXXOXXX
XXOXOXX
XOXXXOX
OXXXXXO
```

**Answer:**

**Problem 121** Write a complete C++ program that does the following. The user is given 3 chances to enter a secret password which is FRED. If the user fails the program terminates, otherwise it says Hello. Here is a sample run.

```
What is the password? Freddy
Wrong. Try again: Fred
Wrong. Try again: FRED
Hello.
```

**Answer:**

**Problem 122** Write a complete C++ program that does the following. The user is given 3 chances to guess a secret number, which is 7. Whenever the user makes an incorrect guess, the program announces whether the guess was too big or too small. If the user succeeds, the program says "Congratulations!" otherwise it says "Sorry. The secret number is 7." Here is a sample run.

```
Can you guess my number? 10
Too big. Try again: 5
Too small. Try again: 8
Sorry. The secret number is 7.
```

**Answer:**

**Problem 123** Write a complete C++ program that does the following. The user is given 5 chances to enter a secret password which is 007. If the user fails the program says Goodbye, otherwise it says Hello. Here is a sample run.

```
What is the password? 7
Wrong. Try again: 700
Wrong. Try again: 007
Hello.
```

**Answer:**

**Problem 124** Write a complete C++ program that does the following. The user is given 5 chances to guess a secret number, which is 7. Whenever the user makes an incorrect guess, the program announces whether the guess was too big or too small. If the user succeeds, the program says "Congratulations!" otherwise it says "Sorry. The secret number is 7." Here is a sample run.

Can you guess my number? 10  
Too big. Try again: 5  
Too small. Try again: 7  
Congratulations!

**Answer:**

### Problem 125

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y;
```

(a) Print 12 copies of the word Hello on a single line of output.

**Answer:**

(b) Print the remainder when variable x is divided by variable y.

**Answer:**

(c) Print the square root of 19. Use a C++ function for the calculation.

**Answer:**

(d) Print a random number in the range 23 to 34, inclusive. Use a C++ function.

**Answer:**

(e) Print the digits of the variable x backwards. So if x is 25, print 52.

**Answer:**

### Problem 126

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int a, b;
```

(a) Print the quotient when variable b is divided by variable a.

**Answer:**

(b) Print b copies of the word Hi on a single line of output.

**Answer:**

(c) Print a random number in the range 33 to 53, inclusive. Use a C++ function.

**Answer:**

(d) Print the square root of 91. Use a C++ function for the calculation.

**Answer:**

(e) Print the digits of a + b backwards. So if a + b is 25, print 52.

**Answer:**

### Problem 127

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y;
```

(a) Print y copies of the word Hello on a single line of output.

**Answer:**

(b) Print the remainder when variable x is divided by variable y.

**Answer:**

(c) Print the square root of the square root of 19. Use a C++ function for the calculation.

**Answer:**

(d) Print a random number in the range 123 to 126, inclusive. Use a C++ function.

**Answer:**

(e) Print the digits of the variable y backwards. So if y is 25, print 52.

**Answer:**

### Problem 128

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int a, b;
```

(a) Print the exact quotient when variable b is divided by the sum of a and b.

**Answer:**

(b) Print b copies of the word Hi on a single line of output.

**Answer:**

(c) Print a random number in the range 33 to 153, inclusive. Use a C++ function.

**Answer:**

(d) Print the square root of the cube of 91. Use a C++ function for the calculation.

**Answer:**

(e) Print the digits of  $a * b$  backwards. So if  $a * b$  is 25, print 52.

**Answer:**

### Problem 129

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y, z;
```

(a) Print x copies of the number y on a single line of output.

**Answer:**

(b) Print the exact average of x, y and z.

**Answer:**

(c) Print the square root of 5. Use a C++ function for the calculation.

**Answer:**

(d) Print a random number in the range 1 to 6, inclusive. Use a C++ function.

**Answer:**

(e) Print the first digit of the variable x.

**Answer:**

### Problem 130

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y, z;
```

(a) Print the bigger of x and y.

**Answer:**

(b) Print x copies of the exact average of y and z on a single line of output.

**Answer:**

(c) Print a random number in the range 11 to 16, inclusive. Use a C++ function.

**Answer:**

(d) Print the square root of 8. Use a C++ function for the calculation.

**Answer:**

(e) Print the first digit of the sum  $x + y$ .

**Answer:**

### Problem 131

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y, z;
```

(a) Print y copies of the number x on a single line of output.

**Answer:**

(b) Print the exact average of y and z.

**Answer:**

(c) Print the square root of 50. Use a C++ function for the calculation.

**Answer:**

(d) Print a random number in the range 3 to 8, inclusive. Use a C++ function.

**Answer:**

(e) Print the first digit of the variable z.

**Answer:**

**Problem 132**

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Assume the following variables have been declared and initialized with positive values.

```
int x, y, z;
```

(a) Print the smaller of x and y.

**Answer:**

(b) Print z copies of the exact average of x and y on a single line of output.

**Answer:**

(c) Print a random number in the range 13 to 18, inclusive. Use a C++ function.

**Answer:**

(d) Print the square root of 80. Use a C++ function for the calculation.

**Answer:**

(e) Print the first digit of the sum  $y + z$ .

**Answer:**

**Problem 133** Consider the following C++ program.

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

int main() {
    int x = 4, y = 11, z = 91;
    string freddy = "Fred";
    string fred = "Freddy";
    cout << "fred" << endl;           // line (a)
    cout << z / y << endl;             // line (b)
    if ((y > x) && (y > z)) cout << fred << endl; // line (c)
    cout << fred << freddy << endl;    // line (d)
    cout << x << "x" << fred << "=" << z << "\n"; // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 134** Consider the following C++ program.

```

#include <iostream>
using namespace std;

int main() {
    int x = 12, y = 11, z = 9;
    string freddy = "Freddy";
    string fred = "Fred";
    cout << z % y << endl;           // line (a)
    cout << fred << endl;             // line (b)
    cout << "fred" << freddy << endl; // line (c)
    if ((x > y) && (y > z)) cout << freddy << endl; // line (d)
    cout << x << y << "+" << z << "=" << x*y+z << "\n"; // line (e)
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 135** Consider the following C++ program.

```

#include <iostream>
using namespace std;

int main() {
    int x = 4, y = 11, z = 9;
    string freddy = "Fred";
    string fred = "Freddy";
    cout << "freddy" << endl;           // line (a)
    cout << (double) (z / x) << endl;    // line (b)
    if ((y > x) && (y > z)) cout << fred << endl; // line (c)
    cout << fred << fred << endl;        // line (d)
    cout << x << "x" << fred << "=" << z << "\n"; // line (e)
}

```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 136** Consider the following C++ program.

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

int main() {
    int x = 12, y = 11, z = 19;
    string freddy = "Freddy";
    string fred = "Fred";
    cout << (double) (z % y) << endl;           // line (a)
    cout << fred << endl;                       // line (b)
    cout << "freddy" << freddy << endl;         // line (c)
    if ((x > y) && (y > z)) cout << freddy << endl; // line (d)
    cout << x << y << "+" << z << "=" << x*y+z << "\n"; // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 137** Consider the following C++ program.

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

int main() {
    int x = 14, y = 11, z = 9;
    string freddy = "Freddy";
    string fred = "Fred";
    cout << "fred" << endl;                     // line (a)
    cout << z / y << endl;                       // line (b)
    if ((y > x) && (y > z)) cout << fred << endl; // line (c)
    cout << fred << freddy << endl;             // line (d)
    cout << x << "x" << fred << "=" << z << "\n"; // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**



**Problem 138** Consider the following C++ program.

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

int main() {
    int x = 12, y = 11, z = 19;
    string freddy = "Fred";
    string fred = "Freddy";
    cout << z % y << endl; // line (a)
    cout << fred << endl; // line (b)
    cout << "fred" << freddy << endl; // line (c)
    if ((x > y) && (y > z)) cout << freddy << endl; // line (d)
    cout << x << y << "+" << z << "=" << x*y+z << "\n"; // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 139** Consider the following C++ program.

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

int main() {
    int x = 14, y = 11, z = 9;
    string freddy = "Freddy";
    string fred = "Freddy";
    cout << "freddy" << endl; // line (a)
    cout << (double) (z / x) << endl; // line (b)
    if ((y > x) && (y > z)) cout << fred << endl; // line (c)
    cout << fred << fred << endl; // line (d)
    cout << x << "x" << fred << "=" << z << "\n"; // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 140** Consider the following C++ program.

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

int main() {
    int x = 19, y = 12, z = 11;
    string freddy = "Fred";
    string fred = "Fred";
    cout << (double) (z % y) << endl;           // line (a)
    cout << fred << endl;                       // line (b)
    cout << "freddy" << freddy << endl;         // line (c)
    if ((x > y) && (y > z)) cout << freddy << endl; // line (d)
    cout << x << y << "+" << z << "=" << x*y+z << "\n"; // line (e)
}
```

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

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

**Answer:**

**Problem 141** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter an integer between 1 and 20.
- (2) If the user enters an illegal number, the program repeatedly asks the user to correct their number.
- (3) If the user has not entered a correct number after 10 attempts, the program chooses 10 as the user's number.
- (4) The program prints the cube of the user's number.

An example run of the program follows.

```
Enter an integer between 1 and 20: 100
Out of range. Enter an integer between 1 and 20: -1
Out of range. Enter an integer between 1 and 20: 5
The cube of your number is 125.
```

**Answer:**

**Problem 142** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter an integer between 100 and 200.
- (2) If the user enters an illegal number, the program repeatedly asks the user to correct their number.
- (3) If the user has not entered a correct number after 3 attempts, the program exits.
- (4) The program repeatedly generates and prints random numbers between 1 and 1000 until it generates the user's number when it stops.

An example run of the program follows.

Enter an integer between 100 and 200: 100  
Random numbers: 7 873 924 428 100

**Answer:**

**Problem 143** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter an integer between 10 and 100.
- (2) If the user enters an illegal number, the program repeatedly asks the user to correct their number.
- (3) If the user has not entered a correct number after 5 attempts, the program chooses 10 as the user's number.
- (4) The program prints the square root of the user's number.

An example run of the program follows.

Enter an integer between 10 and 100: 1  
Out of range. Enter an integer between 10 and 100: 25  
The square root of your number is 5.

**Answer:**

**Problem 144** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter an integer between 50 and 100.
- (2) If the user enters an illegal number, the program repeatedly asks the user to correct their number.
- (3) If the user has not entered a correct number after 4 attempts, the program exits.
- (4) The program repeatedly generates and prints random numbers between 1 and 1000 until it generates an exact divisor of the user's number when it stops.

An example run of the program follows.

Enter an integer between 50 and 100: 60  
Random numbers: 7 873 924 428 100 30

**Answer:**

**Problem 145** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter two integers  $a$  and  $b$  with values between 1 and 20.
- (2) If either of the user's numbers is illegal the program asks the user to reenter both numbers. This continues until two legal numbers have been entered.
- (3) The program prints an  $a \times a$  square of Xs and an adjacent  $b \times b$  square of Ys. The squares should use top edges that lie in the same line.

An example run of the program follows.

Enter two integers between 1 and 20: 5 3

```
XXXXXXYY
XXXXXXYY
XXXXXXYY
XXXXX
XXXXX
```

**Answer:**

**Problem 146** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter two integers  $a$  and  $b$  with values between 4 and 14.
- (2) If either of the user's numbers is illegal the program terminates.
- (3) The program prints an  $a \times a$  square of Xs right on top of a  $b \times b$  square of Ys. The squares should line up so that their left edges lie on the same line.

An example run of the program follows.

```
Enter two integers between 1 and 20: 5 4
```

```
XXXXX
XXXXX
XXXXX
XXXXX
XXXXX
YYYY
YYYY
YYYY
YYYY
```

**Answer:**

**Problem 147** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter two integers  $a$  and  $b$  with values between 1 and 10.
- (2) If either of the user's numbers is illegal the program asks the user to reenter both numbers. This continues until two legal numbers have been entered.
- (3) The program prints an  $a \times a$  square of Xs and an adjacent  $b \times b$  square of Ys. The squares should use bottom edges that lie in the same line.

An example run of the program follows.

```
Enter two integers between 1 and 10: 5 3
```

```
XXXXX
XXXXX
XXXXXXYY
XXXXXXYY
XXXXXXYY
```

**Answer:**

**Problem 148** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter two integers  $a$  and  $b$  with values between 4 and 14.
- (2) If either of the user's numbers is illegal the program terminates.
- (3) The program prints an  $a \times a$  square of Xs right on top of a  $b \times b$  square of Ys. The squares should be lined up so that their right edges lie on the same line.

An example run of the program follows.

```
Enter two integers between 4 and 14: 5 4
```

```
XXXXX
XXXXX
XXXXX
```

```
XXXXX
XXXXX
YYYY
YYYY
YYYY
YYYY
```

**Answer:**

**Problem 149** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter two integers  $a$  and  $b$  with values between 1 and 20.
- (2) If either of the user's numbers is illegal the program asks the user to reenter both numbers. This continues until two legal numbers have been entered.
- (3) The program prints  $a$  rows each of which contains  $a$  columns of Xs, but each pair of rows is separated by  $b$  blank lines.

An example run of the program follows.

```
Enter two integers between 1 and 20: 4 2
XXXX
```

```
XXXX
```

```
XXXX
```

```
XXXX
```

**Answer:**

**Problem 150** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter two integers  $a$  and  $b$  with values between 2 and 10.
- (2) If either of the user's numbers is illegal the program terminates at once.
- (3) The program prints  $a + b$  rows each of which contains  $a$  columns of Xs, but each pair of columns is separated by  $b$  blank columns.

An example run of the program follows.

```
Enter two integers between 2 and 10: 3 2
X  X  X
X  X  X
X  X  X
X  X  X
X  X  X
```

**Answer:**

**Problem 151** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter two integers  $a$  and  $b$  with values between 1 and 15.
- (2) If either of the user's numbers is illegal the program asks the user to reenter both numbers. This continues until two legal numbers have been entered.
- (3) The program prints  $a$  rows each of which contains  $a * b$  columns of Xs, but after every  $b$  complete rows it inserts an extra blank line.

An example run of the program follows.

```
Enter two integers between 1 and 15: 5 2
XXXXXXXXXX
XXXXXXXXXX

XXXXXXXXXX
XXXXXXXXXX

XXXXXXXXXX
```

**Answer:**

**Problem 152** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter two integers  $a$  and  $b$  with values between 3 and 12.
- (2) If either of the user's numbers is illegal the program terminates at once.
- (3) The program prints  $a + b$  rows each of which contains  $a * b$  columns of Xs, but after each group of  $b$  complete columns the program prints a | symbol.

An example run of the program follows.

```
Enter two integers between 3 and 12: 4 5
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
XXXXX|XXXXX|XXXXX|XXXXX|
```

**Answer:**

**Problem 153** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters an illegal integer for  $n$ , the program terminates.
- (3) The program prints all positive integers less than  $n$  that are multiples of 5 (one number per line).

For example if the user enters 23 for  $n$  the program would output

```
5
10
15
20
```

**Answer:**

**Problem 154** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following declarations have been made and the declared variables have been set to have legal values.

```
string firstName, lastName;  
int x, y, z;  
double pi;
```

(i) Print to the screen the message:

pi is 22/7

**Answer:**

(ii) Print to the screen the value of  $x + y + z$ .

**Answer:**

(iii) Read in the values of x, y, and z (in this order).

**Answer:**

(iv) If the value of firstName is Freddy, print the message Goodbye. Otherwise print Hello.

**Answer:**

(v) Prompt the user to enter a first name and last name and read their response to appropriate variables.

**Answer:**

**Problem 155** Consider the following C++ program. What is the exact output from the program in response to each of the following user inputs?

```
#include <iostream>  
using namespace std;  
int main() {  
    int x, y;  
    cout << "Please enter two positive integers: ";  
    cin >> x >> y;  
    if (x <= 0) cout << "Illegal ";  
    if (y <= 0) {  
        cout << "Goodbye! " << endl;  
        return 0;  
    }  
    if ((x % 2 == 0) || (y % 2 == 0)) cout << x * y << " ";  
    if ((x <= 0) && (y > 10)) cout << -x << " ";  
    if (!(y > x)) cout << y;  
    cout << endl;  
    return 0;  
}
```

(a) The user enters: -5 4

(b) The user enters: 4 -5

(c) The user enters: 10 1

(d) The user enters: 1 10

(e) The user enters: 1 1

**Problem 156** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. The program asks the user to enter a positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $n$  has been entered.
3. The program prints a triangular pattern with side  $n$ . Its horizontal side is at the top and its vertical side is at the right.

For example, if the user enters 4 for  $n$  the program should print the following picture.

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

**Answer:**

**Problem 157** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter an integer  $n$  greater than 10.
- (2) If the user enters an illegal integer for  $n$ , the program terminates.
- (3) The program prints all positive integers between  $n$  and  $2n$  (inclusive) that are multiples of 5 (one number per line).

For example if the user enters 13 for  $n$  the program would output

```
15
20
25
```

**Answer:**

**Problem 158** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following declarations have been made and the declared variables have been set to have legal values.

```
string firstName, lastName;
int x, y, z;
double pi;
```

- (i) Print to the screen the message:

```
x is greater than y
```

**Answer:**

- (ii) Print to the screen the value of  $xy + z$ .

**Answer:**

- (iii) Read in the values of  $z$ ,  $y$ , and  $x$  (in this order).

**Answer:**

- (iv) If the value of `firstName` is `Freddy`, print the message `No`. Otherwise print the value of  $x$ .

**Answer:**

- (v) Use the approximation  $22/7$  to set the value of  $pi$ .

**Answer:**



**Problem 159** Consider the following C++ program. What is the exact output from the program in response to each of the following user inputs?

```
#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (x <= 3) cout << "Error ";
    if (y <= 3) {
        cout << "Aha! " << endl;
        return 0;
    }
    if ((x % 2 != 0) && (y % 2 == 0)) cout << x * y << " ";
    if ((x <= 0) || (y > 10)) cout << -x << " ";
    if (!(y == x)) cout << y;
    cout << endl;
    return 0;
}
```

- (a) The user enters: -5 4
- (b) The user enters: 4 -5
- (c) The user enters: 10 1
- (d) The user enters: 1 10
- (e) The user enters: 10 10

**Problem 160** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. The program asks the user to enter a positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program should terminate immediately.
3. The program prints two copies of a triangular pattern with side  $n$ . Each triangle has a horizontal side at the top and a vertical side at the right. The second copy is underneath the first.

For example, if the user enters 3 for  $n$  the program should print the following picture.

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

**Answer:**

**Problem 161** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter an integer  $n$  that is between 20 and 40 (inclusive).
- (2) If the user enters an illegal integer for  $n$ , the program terminates.
- (3) The program prints all positive integers less than or equal to  $n/5$  (one number per line).

For example if the user enters 28 for  $n$  the program would output

1  
2  
3  
4  
5

**Answer:**

**Problem 162** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following declarations have been made and the declared variables have been set to have legal values.

```
string firstName, lastName;  
int x, y, z;  
double pi;
```

(i) Print to the screen the message:

Your firstName is x

**Answer:**

(ii) Print to the screen the remainder when  $x + y$  is divided by  $z$ .

**Answer:**

(iii) Read in the values of firstName and lastName (in this order).

**Answer:**

(iv) If the value of firstName is not Freddy, print the message Hello. Otherwise end the program.

**Answer:**

(v) Prompt the user to enter values for x, y and z and read their response to appropriate variables.

**Answer:**

**Problem 163** Consider the following C++ program. What is the exact output from the program in response to each of the following user inputs?

```
#include <iostream>  
using namespace std;  
int main() {  
    int x, y;  
    cout << "Please enter two positive integers: ";  
    cin >> x >> y;  
    if (x <= 0) cout << "Illegal ";  
    if (y <= 0) {  
        cout << "Goodbye! " << endl;  
        return 0;  
    }  
    if ((x % 2 == 0) || (y % 2 == 0)) cout << x * y << " ";  
    if ((x <= 0) && (y > 10)) cout << -x << " ";  
    if (!(y > x)) cout << y;  
    cout << endl;  
    return 0;  
}
```

- (a) The user enters: -12 -12
- (b) The user enters: -12 12
- (c) The user enters: 1 12
- (d) The user enters: 1 13
- (e) The user enters: 12 12

**Problem 164** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. The program asks the user to enter a positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $n$  has been entered.
3. The program prints a triangular pattern with side  $n$ . Its horizontal side is at the bottom and its vertical side is at the right.

For example, if the user enters 4 for  $n$  the program should print the following picture.

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

**Answer:**

**Problem 165** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$  that is less than 40.
- (2) If the user enters an illegal integer for  $n$ , the program terminates.
- (3) The program prints all even positive integers less than  $n$  (one number per line).

For example if the user enters 9 for  $n$  the program would output

```
2
4
6
8
```

**Answer:**

**Problem 166** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following declarations have been made and the declared variables have been set to have legal values.

```
string firstName, lastName;
int x, y, z;
double pi;
```

- (i) Print to the screen the message:

```
x + y + z is positive
```

**Answer:**

(ii) Print to the screen the quotient of  $x + z$  by  $y$ . (Use integer division.)

**Answer:**

(iii) Read in the values of  $x$  and  $\pi$  (in this order).

**Answer:**

(iv) If the value of `firstName` is Freddy, print the value of  $\pi$ . Otherwise print Hello.

**Answer:**

(v) If  $x$  is positive and  $z$  is negative print the value of  $y$ .

**Answer:**

**Problem 167** Consider the following C++ program. What is the exact output from the program in response to each of the following user inputs?

```
#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (x <= 3) cout << "Error ";
    if (y <= 3) {
        cout << "Aha! " << endl;
        return 0;
    }
    if ((x % 2 != 0) && (y % 2 == 0)) cout << x * y << " ";
    if ((x <= 0) || (y > 10)) cout << -x << " ";
    if (!(y == x)) cout << y;
    cout << endl;
    return 0;
}
```

- (a) The user enters: -6 5
- (b) The user enters: 5 -6
- (c) The user enters: 11 2
- (d) The user enters: 2 11
- (e) The user enters: 11 11

**Problem 168** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. The program asks the user to enter a positive integer.
  2. The program reads a value  $n$  entered by the user. If the value is not legal, the program should terminate immediately.
  3. The program prints two copies of a triangular pattern with side  $n$ . Each triangle has a horizontal side at the bottom and a vertical side at the right. The second copy is underneath the first.
- For example, if the user enters 3 for  $n$  the program should print the following picture.

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

**Answer:**

**Problem 169** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters an illegal integer for  $n$ , the program terminates.
- (3) The program prints all positive integers less than  $n$  that leave a remainder of 2 when they are divided by 5 (one number per line).

For example if the user enters 23 for  $n$  the program would output

```
2
7
12
17
22
```

**Answer:**

**Problem 170** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following declarations have been made and the declared variables have been set to have legal values.

```
string firstName, lastName;
int x, y, z;
double pi;
```

- (i) Print to the screen the message:

```
PI is 22/7
```

**Answer:**

- (ii) Print to the screen the value of  $x/y + z$  (use integer division).

**Answer:**

- (iii) Read in the values of  $x$  and  $y$  (in this order).

**Answer:**

- (iv) If the value of `firstName` is `Freddy`, exit the program. Otherwise print `Hello`.

**Answer:**

- (v) Prompt the user to enter a last name and first name and read their response to appropriate variables.

**Answer:**

**Problem 171** Consider the following C++ program. What is the exact output from the program in response to each of the following user inputs?

```

#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (x <= 0) cout << "Illegal ";
    if (y <= 0) {
        cout << "Goodbye! " << endl;
        return 0;
    }
    if ((x % 2 == 0) || (y % 2 == 0)) cout << x * y << " ";
    if ((x <= 0) && (y > 10)) cout << -x << " ";
    if (!(y > x)) cout << y;
    cout << endl;
    return 0;
}

```

- (a) The user enters: -4 5
- (b) The user enters: 5 -4
- (c) The user enters: 11 2
- (d) The user enters: 2 11
- (e) The user enters: 2 2

**Problem 172** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. The program asks the user to enter a positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $n$  has been entered.
3. The program prints two adjacent triangular patterns with side  $n$ . Each triangle has a horizontal side at the top and a vertical side at the right.

For example, if the user enters 4 for  $n$  the program should print the following picture.

```

****  ****
***   ***
**    **
*     *

```

**Answer:**

**Problem 173** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter an integer  $n$  greater than 10.
- (2) If the user enters an illegal integer for  $n$ , the program terminates.
- (3) The program prints all positive integers between  $n$  and  $2n$  (inclusive) that leave a remainder of 1 when divided by 5 (one number per line).

For example if the user enters 13 for  $n$  the program would output

```

16
21
26

```

**Answer:**

**Problem 174** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following declarations have been made and the declared variables have been set to have legal values.

```
string firstName, lastName;  
int x, y, z;  
double pi;
```

(i) Print to the screen the message:

$x + y = 7$

**Answer:**

(ii) Print to the screen quotient when xy is divided by z. (Use integer division.)

**Answer:**

(iii) Read in the values of z, y, and x (in this order).

**Answer:**

(iv) Use the approximation 22/7 to set the value of pi.

**Answer:**

(v) If the value of firstName is not Freddy, print the message No. Otherwise print the value of x.

**Answer:**

**Problem 175** Consider the following C++ program. What is the exact output from the program in response to each of the following user inputs?

```
#include <iostream>  
using namespace std;  
int main() {  
    int x, y;  
    cout << "Please enter two positive integers: ";  
    cin >> x >> y;  
    if (x <= 3) cout << "Error ";  
    if (y <= 3) {  
        cout << "Aha! " << endl;  
        return 0;  
    }  
    if ((x % 2 != 0) && (y % 2 == 0)) cout << x * y << " ";  
    if ((x <= 0) || (y > 10)) cout << -x << " ";  
    if (!(y == x)) cout << y;  
    cout << endl;  
    return 0;  
}
```

(a) The user enters: 4 -5

(b) The user enters: -5 4

(c) The user enters: 10 10

(d) The user enters: 5 10

(e) The user enters: 10 5

**Problem 176** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. The program asks the user to enter a positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program should terminate immediately.
3. The program prints two copies of a triangular pattern with side  $n$ . Each triangle has a horizontal side at the top and a vertical side at the right. The second copy should be underneath and to the right of the first.

For example, if the user enters 3 for  $n$  the program should print the following picture.

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

**Answer:**

**Problem 177** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter an integer  $n$  that is between 20 and 40 (inclusive).
- (2) If the user enters an illegal integer for  $n$ , the program terminates.
- (3) The program prints all positive odd integers that are less than or equal to  $n/5$  (one number per line).

For example if the user enters 28 for  $n$  the program would output

```
1
3
5
```

**Answer:**

**Problem 178** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following declarations have been made and the declared variables have been set to have legal values.

```
string firstName, lastName;
int x, y, z;
double pi;
```

- (i) Print to the screen the message:

```
Your name is x
```

**Answer:**

- (ii) Print to the screen the quotient when  $x$  is divided by  $yz$  (use integer division).

**Answer:**

- (iii) Read in the values of `firstName` and `lastName` (in this order).

**Answer:**

- (iv) If the value of  $x$  is 5 or `firstName` is not `Freddy`, print the message `Hello`. Otherwise end the program.

**Answer:**

- (v) Prompt the user to enter values for  $x$ ,  $y$  and  $z$  and read their response for  $x$  only.

**Answer:**



**Problem 179** Consider the following C++ program. What is the exact output from the program in response to each of the following user inputs?

```
#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (x <= 0) cout << "Illegal ";
    if (y <= 0) {
        cout << "Goodbye! " << endl;
        return 0;
    }
    if ((x % 2 == 0) || (y % 2 == 0)) cout << x * y << " ";
    if ((x <= 0) && (y > 10)) cout << -x << " ";
    if (!(y > x)) cout << y;
    cout << endl;
    return 0;
}
```

- (a) The user enters: -12 -12
- (b) The user enters: 12 -12
- (c) The user enters: 12 12
- (d) The user enters: 1 12
- (e) The user enters: 1 13

**Problem 180** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. The program asks the user to enter a positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $n$  has been entered.
3. The program prints two adjacent triangular patterns with side  $n$ . Each triangle has a horizontal side at the bottom and a vertical side at the right.

For example, if the user enters 4 for  $n$  the program should print the following picture.

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

**Answer:**

**Problem 181** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$  that is less than 40.
- (2) If the user enters an illegal integer for  $n$ , the program terminates.
- (3) The program prints all positive integers that square to a number less than  $n$  (one number per line).

For example if the user enters 9 for  $n$  the program would output

```
1
2
```

**Answer:**

**Problem 182** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following declarations have been made and the declared variables have been set to have legal values.

```
string firstName, lastName;  
int x, y, z;  
double pi;
```

(i) Print to the screen the message:

`x % y + z is positive`

**Answer:**

(ii) Print to the screen the quotient of  $x + z$  by  $x + y$  (use integer division).

**Answer:**

(iii) Read in the values of `pi` and `y` (in this order).

**Answer:**

(iv) If the value of `firstName` is `Freddy` and `y` is equal to `z`, print the value of `pi`. Otherwise print `No`.

**Answer:**

(v) If `x` is positive and `z` is not even print the value of `y`.

**Answer:**

**Problem 183** Consider the following C++ program. What is the exact output from the program in response to each of the following user inputs?

```
#include <iostream>  
using namespace std;  
int main() {  
    int x, y;  
    cout << "Please enter two positive integers: ";  
    cin >> x >> y;  
    if (x <= 3) cout << "Error ";  
    if (y <= 3) {  
        cout << "Aha! " << endl;  
        return 0;  
    }  
    if ((x % 2 != 0) && (y % 2 == 0)) cout << x * y << " ";  
    if ((x <= 0) || (y > 10)) cout << -x << " ";  
    if (!(y == x)) cout << y;  
    cout << endl;  
    return 0;  
}
```

(a) The user enters: 5 -6

(b) The user enters: -6 5

(c) The user enters: 11 11

(d) The user enters: 3 11

(e) The user enters: 11 5

**Problem 184** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. The program asks the user to enter a positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program should terminate immediately.
3. The program prints two copies of a triangular pattern with side  $n$ . Each triangle has a horizontal side at the bottom and a vertical side at the right. The second copy should be underneath and to the right of the first.

For example, if the user enters 3 for  $n$  the program should print the following picture.

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

**Answer:**

**Problem 185** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters a non-positive integer for  $n$ , the program terminates.
- (3) The program prints a triangle with  $n$  rows using the number  $r$  to make the characters on row number  $r$ .

For example, if the user enters 4 for  $n$  the output is as follows:

```
1
22
333
4444
```

**Answer:**

**Problem 186** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (i) Print to the screen the message:

```
2 + 2 = 3
```

**Answer:**

- (ii) Print the square root of 10.

**Answer:**

- (iii) Print a random number  $r$  with  $7 \leq r \leq 27$ . (An appropriate C++ function must be used to make the random number.)

**Answer:**

- (iv) Ask the user to enter their age. If their answer does not satisfy  $5 \leq age \leq 99$  exit the program immediately.

**Answer:**

- (v) Print to the screen every two digit number  $n$  that is an exact multiple of 3. Print one number per line. (For example 15 would be printed but 14 would not be printed since  $15 = 5 \times 3$ .)

**Answer:**

**Problem 187** Consider the following C++ program. What is the output from the program in response to the following user input?

```
#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit (1);
    }
    if (y <= 0)
        cout << "Are you positive?\n";
    while (y < 10) {
        cout << y;
        y = y + x;
    }
    cout << y << endl;
    return 0;
}
```

- (a) The user enters: -5 5
- (b) The user enters: 5 -5
- (c) The user enters: 10 1
- (d) The user enters: 1 10
- (e) The user enters: 1 1

**Problem 188** Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer less than 1000.
2. If the entered number is out of range, the message “Wrong!” is printed and the program terminates.
3. Otherwise the program prints the product of the digits in the number that was entered.

Here is an example of how the program should work:

```
Enter a positive integer less than 1000: 89
Product of digits: 72
```

**Answer:**

**Problem 189** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) Until the user enters a positive integer for  $n$ , the program makes the user enter another choice for  $n$ .
- (3) The program prints a triangle with  $n$  rows, where the rows are formed by using the characters  $X$  and  $O$  in sequence.

For example, if the user enters 4 for  $n$  the output is as follows:

```
X
OO
XXX
OOOO
```

**Answer:**

**Problem 190** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print to the screen the message:

1 x 2 x 3 x 4 = 24

**Answer:**

(ii) Print a random number  $r$  with  $11 \leq r \leq 29$ . (An appropriate C++ function must be used to make the random number.)

**Answer:**

(iii) Print the sum of the square roots of 11 and 12.

**Answer:**

(iv) Ask the user to enter their age. If their answer does not satisfy  $0 \leq age \leq 1000$  exit the program immediately.

**Answer:**

(v) Print to the screen every four digit number  $n$  that is divisible by both 6 and 10. Print one number per line. (For example 6000 would be printed but 5999 would not be printed since  $6000 = 6 \times 1000 = 10 \times 600$ .)

**Answer:**

**Problem 191** Consider the following C++ program. What is the output from the program in response to the following user input?

```
#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (y <= 0) {
        cout << "Illegal" << endl;
        exit (1);
    }
    if (x <= 0)
        cout << "Are you positive?\n";
    while (x < 10) {
        cout << x;
        x = y + x;
    }
    cout << y << endl;
    return 0;
}
```

- (a) The user enters: -5 5
- (b) The user enters: 5 -5
- (c) The user enters: 10 1
- (d) The user enters: 1 10
- (e) The user enters: 1 1

**Problem 192** Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer less than 5000.
2. If the entered number is out of range, the message “Wrong!” is printed and the program terminates.
3. Otherwise the program prints the sum of the square roots of the digits in the number that was entered.

Here is an example of how the program should work:

Enter a positive integer less than 5000: 994  
Sum of square roots of digits: 8

**Answer:**

**Problem 193** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters a non-positive integer for  $n$ , the program terminates.
- (3) The program prints a triangle with  $n$  rows using the number  $c$  to make the characters in column number  $c$ . For example, if the user enters 4 for  $n$  the output is as follows:

```
1
12
123
1234
```

**Answer:**

**Problem 194** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (i) Print to the screen the message:

```
Hello
Hello Hello
```

**Answer:**

- (ii) Print the square root of 2.

**Answer:**

- (iii) Print a random number  $r$  with  $-7 \leq r \leq 0$ . (An appropriate C++ function must be used to make the random number.)

**Answer:**

- (iv) Ask the user to enter their age. If their answer does not satisfy  $5 \leq age \leq 99$  print the word "Illegal".

**Answer:**

- (v) Print to the screen every two digit number  $n$  that ends in the digit 4. Print one number per line. (For example 14 would be printed but 15 would not be printed.)

**Answer:**

**Problem 195** Consider the following C++ program. What is the output from the program in response to the following user input?

```

#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit (1);
    }
    if (y <= 0)
        cout << "Are you positive?\n";
    while (y < 20) {
        cout << y;
        y = y + 2 * x;
    }
    cout << y << endl;
    return 0;
}

```

- (a) The user enters: -5 5
- (b) The user enters: 5 -5
- (c) The user enters: 10 1
- (d) The user enters: 1 10
- (e) The user enters: 1 1

**Problem 196** Write a complete C++ program that does the following.

1. It asks the user to enter an integer between 1000 and 9999.
2. If the entered number is out of range, the message “Wrong!” is printed and the program terminates.
3. Otherwise the program prints the two two digit number made from the first pair and last pair of digits (one number per line).

Here is an example of how the program should work:

```

Enter an integer between 1000 and 9999: 4567
45
67

```

**Answer:**

**Problem 197** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) Until the user enters a positive integer for  $n$ , the program makes the user enter another choice for  $n$ .
- (3) The program prints a triangle with  $n$  rows, where the columns are formed by using the characters  $X$  and  $O$  in sequence.

For example, if the user enters 4 for  $n$  the output is as follows:

```

X
XO
XOX
XOXO

```

**Answer:**

**Problem 198** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print to the screen the message:

$2 \times 2 = 22$

**Answer:**

(iii) Print a random number  $r$  with  $0 \leq r \leq 10$ . (An appropriate C++ function must be used to make the random number.)

**Answer:**

(ii) Print twice the square root of 17.

**Answer:**

(iv) Ask the user to enter their age. If their answer does not satisfy  $1 \leq age \leq 90$  make them try exactly one more time.

**Answer:**

(v) Print to the screen every four digit number  $n$  that is a perfect square (of an integer). Print one number per line. (For example 1600 would be printed but 1599 would not be printed since  $1600 = 40 \times 40$ .)

**Answer:**

**Problem 199** Consider the following C++ program. What is the output from the program in response to the following user input?

```
#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (y <= 0) {
        cout << "Illegal" << endl;
        exit (1);
    }
    if (x <= 0)
        cout << "Are you positive?\n";
    while (x < 20) {
        cout << y;
        x = x + 2 * y;
    }
    cout << x << endl;
    return 0;
}
```

(a) The user enters: -5 5

(b) The user enters: 5 -5

(c) The user enters: 10 1

(d) The user enters: 1 10

(e) The user enters: 1 1



**Problem 200** Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer less than 5000.
2. If the entered number is out of range, the message “Wrong!” is printed and the program terminates.
3. Otherwise the program prints the squares of the individual digits in the number number that was entered. (Print one square per line).

Here is an example of how the program should work:

```
Enter a positive integer less than 5000: 994
16
81
81
```

**Answer:**

**Problem 201** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters a non-positive integer for  $n$ , the program terminates.
- (3) The program prints a square with  $n$  rows and  $n$  columns using the letter X on or above the main diagonal and the letter O below it.

For example, if the user enters 4 for  $n$  the output is as follows:

```
XXXX
OXXX
OXXX
OXXX
```

**Answer:**

**Problem 202** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (i) Print to the screen the message:

```
007 = 7
```

**Answer:**

- (ii) Print the numbers from 1 to 1000 to the screen, one number per line.

**Answer:**

- (iii) Print the numbers from 1 to 1000 to the screen, ten numbers per line.

**Answer:**

- (iv) Ask the user to enter their name, if they enter the name “Freddy” exit the program immediately.

**Answer:**

- (v) Print to the screen every two digit number  $n$  that is not an exact multiple of 3. Print one number per line. (For example 14 would be printed but 15 would not be printed since  $15 = 5 \times 3$ .)

**Answer:**

**Problem 203** Consider the following C++ program. What is the output from the program in response to the following user input?

```

#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (y <= 0) y = x;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit (1);
    }
    if (x <= 10) cout << y << x << endl;
    while (y > 0) {
        cout << y;
        y = y / 10;
    }
    cout << x << endl;
    return 0;
}

```

- (a) The user enters: -5 5
- (b) The user enters: 5 -5
- (c) The user enters: -5 -5
- (d) The user enters: 567 123
- (e) The user enters: 567 0

**Problem 204** Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer with 2 digits.
2. If the entered number is out of range, the message “Too difficult!” is printed and the program terminates.
3. Otherwise the program prints the sum of the two digits in the number that was entered.

Here is an example of how the program should work:

```

Enter a 2-digit integer: 89
Sum of digits: 17

```

**Answer:**

**Problem 205** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters a non-positive integer for  $n$ , the program terminates.
- (3) The program prints a square with  $n$  rows and  $n$  columns using the letter A on or below the main diagonal and the letter B above it.

For example, if the user enters 4 for  $n$  the output is as follows:

```

ABBB
AABB
AAAB
AAAA

```

**Answer:**

**Problem 206** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print to the screen the message:

007 \* 007 = 49

**Answer:**

(ii) Print the even numbers from 2 to 400 to the screen, one number per line.

**Answer:**

(iii) Print the even numbers from 2 to 400 to the screen, ten numbers per line.

**Answer:**

(iv) Ask the user to enter their name, if they enter the name “Freddy” print “Hello” to the screen, otherwise print nothing.

**Answer:**

(v) Print to the screen every number  $n$  that is less than 100 and is either an exact multiple of 3 or an exact multiple of 5. Print one number per line. (For example 14 would not be printed but 15 would be printed.)

**Answer:**

**Problem 207** Consider the following C++ program. What is the output from the program in response to the following user input?

```
#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (x <= 0) x = y;
    if (y <= 0) {
        cout << "Illegal" << endl;
        exit (1);
    }
    if (x <= 10) cout << y << x << endl;
    while (y > 0) {
        cout << y;
        y = y / 10;
    }
    cout << x << endl;
    return 0;
}
```

- (a) The user enters: -5 5
- (b) The user enters: 5 -5
- (c) The user enters: -5 -5
- (d) The user enters: 567 123
- (e) The user enters: 567 0

**Problem 208** Write a complete C++ program that does the following.

1. It asks the user to enter two different positive integers each of which has 2 digits.
2. If the input is illegal, the message “Too easy!” is printed and the program terminates.
3. Otherwise the program prints the absolute value of the difference of the numbers that were entered.

Here is an example of how the program should work:

Enter two different 2-digit integers:    89 91  
Absolute difference: 2

**Answer:**

**Problem 209**    Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters a non-positive integer for  $n$ , the program terminates.
- (3) The program prints a square with  $n$  rows and  $n$  columns using the letter X on odd numbered rows and O on even numbered rows.

For example, if the user enters 4 for  $n$  the output is as follows:

```
XXXX
0000
XXXX
0000
```

**Answer:**

**Problem 210**    Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (i) Print to the screen the message:

```
007 = Bond
```

**Answer:**

- (ii) Print the numbers from -100 to 100 to the screen, one number per line.

**Answer:**

- (iii) Print the numbers from -100 to 100 to the screen, three numbers per line.

**Answer:**

- (iv) Ask the user to enter their name, if they enter the name "007" exit the program immediately.

**Answer:**

- (v) Print to the screen every four digit number  $n$  that is not an exact multiple of 7. Print one number per line. (For example 1000 would be printed but 1001 would not be printed since  $1001 = 7 \times 143$ .)

**Answer:**

**Problem 211**    Consider the following C++ program. What is the output from the program in response to the following user input?

```

#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (y <= 0) y = x + 1;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit (1);
    }
    if (x <= 10) cout << y << x << endl;
    while (y > 100) {
        cout << y;
        y = y / 100;
    }
    cout << x << endl;
    return 0;
}

```

- (a) The user enters: -5 5
- (b) The user enters: 5 -5
- (c) The user enters: -5 -5
- (d) The user enters: 567 123
- (e) The user enters: 567 0

**Problem 212** Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer with 2 digits.
  2. If the entered number is out of range, the message “Too difficult!” is printed and the program terminates.
  3. Otherwise the program prints the absolute value of the difference of the two digits in the number that was entered.
- Here is an example of how the program should work:

```

Enter a 2-digit integer: 79
Absolute difference: 2

```

**Answer:**

**Problem 213** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters a non-positive integer for  $n$ , the program terminates.
- (3) The program prints a square with  $n$  rows and  $n$  columns using the letter A on odd numbered columns and B on even numbered columns.

For example, if the user enters 4 for  $n$  the output is as follows:

```

ABAB
ABAB
ABAB
ABAB

```

**Answer:**

**Problem 214** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print to the screen the message:

000 + 7 = 007

**Answer:**

(ii) Print the even numbers from -200 to 200 to the screen, one number per line.

**Answer:**

(iii) Print the even numbers from -200 to 200 to the screen, three numbers per line.

**Answer:**

(iv) Ask the user to enter their name, if they enter the name "007" print the message "James Bond" otherwise print their name.

**Answer:**

(v) Print to the screen every four digit number  $n$  that is an exact multiple of 7 and an exact multiple of 11. Print one number per line. (For example 1000 would not be printed but 1001 would be printed since  $1001 = 7 \times 143$  and  $1001 = 11 \times 91$ .)

**Answer:**

**Problem 215** Consider the following C++ program. What is the output from the program in response to the following user input?

```
#include <iostream>
using namespace std;
int main() {
    int x, y;
    cout << "Please enter two positive integers: ";
    cin >> x >> y;
    if (x <= 0) x = y + 1;
    if (y <= 0) {
        cout << "Illegal" << endl;
        exit (1);
    }
    if (x <= 10) cout << y << x << endl;
    while (y > 100) {
        cout << y;
        y = y / 100;
    }
    cout << x << endl;
    return 0;
}
```

(a) The user enters: -5 5

(b) The user enters: 5 -5

(c) The user enters: -5 -5

(d) The user enters: 567 123

(e) The user enters: 567 0

**Problem 216** Write a complete C++ program that does the following.

1. It asks the user to enter two different positive integers each of which has 2 digits.
2. If the input is illegal, the message “Illegal!” is printed and the program terminates.
3. Otherwise the program prints the larger of the numbers that were entered.

Here is an example of how the program should work:

```
Enter two different 2-digit integers:  89 91
Larger: 91
```

**Answer:**

**Problem 217** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters a non-positive integer for  $n$ , the program terminates.
- (3) The program prints a rectangle of \* symbols with  $n$  rows and twice as many columns as rows.

For example, if the user enters 4 for  $n$  the output is as follows:

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

**Answer:**

**Problem 218** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following variables have been declared, and if necessary have values, for each part:

```
int number;
double x, y;
```

Declare any other variables that you use.

- (i) Print all integers from  $number$  down to 10. For example if  $number$  is 13, the output should be 13 12 11 10. (If  $number < 10$ , nothing is printed.)

**Answer:**

- (ii) Print the value of the sum of squares of  $x$  and  $y$ .

**Answer:**

- (iii) Calculate  $x$  as the decimal that represents the fraction  $5/7$ .

**Answer:**

- (iv) Print the sum of the square roots of all the numbers from 1048576 to 5764801.

**Answer:**

- (v) Print every three digit number  $n$  for which the next to last digit of  $n^2$  is 2. For example, 111 is printed because  $111^2 = 12321$ . (This number ends in the digits 21 and its next to last digit is 2.)

**Answer:**

**Problem 219** Consider the following C++ program. What is the output from the program in response to the following user inputs?

```

#include <iostream>
using namespace std;

int main () {
    int n;
    cout << "Please give me an integer: ";
    cin >> n;
    if (n < 10) {
        cout << "Integer is too small." << endl;
        if (n < 0) return 0;
    }
    if (n % 2 == 0) cout << 3 * n / 2 << endl;
    else if (n % 4 == 1) cout << 3 * ((n - 1) / 4) + 1;
    else cout << 3 * ((n + 1) / 4) - 1;
    cout << endl;
    return 0;
}

```

- (a) The user enters: -9
- (b) The user enters: 9
- (c) The user enters: 10
- (d) The user enters: 11
- (e) The user enters: 21

**Problem 220** Write a complete C++ program that does the following.

1. It repeatedly, asks the user to enter an integer.
  2. If the entered number is negative, the word “Negative” is printed and the program terminates.
  3. Otherwise the square root of the number is calculated and the nearest integer to this square root is printed.
- Here is an example of how the program should work:

```

Enter an integer: 100
10
Enter an integer: 97
10
Enter an integer: 101
10
Enter an integer: -100
Negative

```

**Answer:**

**Problem 221** Write a complete C++ program that does the following.

1. It asks the user to enter an integer.
2. If the entered number is even it divides the number by 2.
3. Otherwise the program multiplies the number by 3 and adds 1.
4. It prints the result.

Here is an example of how the program should work:

```

Enter an integer: 5
The answer is: 16

```

**Answer:**



**Problem 222** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following variables have been declared, and if necessary have values, for each part:

```
int number;
double x, y;
```

Declare any other variables that you use.

(i) Print all integers from 1 through number.

**Answer:**

(ii) Print the value of the larger of x and y.

**Answer:**

(iii) Calculate x as the decimal that represents the fraction  $1/7$ .

**Answer:**

(iv) Print the sum of the square roots of the numbers 19683, 19684, and 19685.

**Answer:**

(v) Print every three digit number  $n$  for which the square of  $n$  ends with the digits 21. For example, 111 is printed because  $111^2 = 12321$ .

**Answer:**

**Problem 223** Consider the following C++ program. What is the output from the program in response to the following user inputs?

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

int main () {
    int n;
    cout << "Please give me an integer: ";
    cin >> n;
    if (n < 10) {
        cout << "Integer is too small." << endl;
        if (n < 0) return 0;
    }
    if (n % 3 == 0) cout << "n = " << n << endl;
    else cout << "CSCI 111" << endl;
    while (n > 20) {
        cout << n << ", ";
        n = n - 10;
    }
    cout << endl;
    return 0;
}
```

(a) The user enters: -1

(b) The user enters: 0

(c) The user enters: 1

(d) The user enters: 19

(e) The user enters: 111

**Problem 224** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

- (1) The program asks the user to enter a positive integer  $n$ .
- (2) If the user enters a non-positive integer for  $n$ , the program terminates.
- (3) The program prints a triangle with  $n$  rows whose straight vertical edge is at the right of the picture.

For example, if the user enters 4 for  $n$  the output is as follows:

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

**Answer:**

**Problem 225** Write a complete C++ program that does the following.

1. It asks the user to enter a decimal number that is greater than 0 and less than 10.
2. If the entered number is not within the desired range the program exits.
3. Otherwise the program prints the square of the number.

Here is an example of how the program should work:

```
Enter a number greater than 0 and less than 10:  2.5
The square is:  6.25
```

**Answer:**

**Problem 226** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (a) Print to the screen the message:

```
2 + 2 = 5
```

- (b) Print all the odd numbers from 1 to 1000 to the screen (one number per line).

- (c) Ask the user enter a number that is not a multiple of 10. If the user gives an incorrect response force the user to keep entering a number until legal answer is received.

- (d) Ask the user to enter a number and print its square root if it is positive. (Otherwise do not print anything.)

- (e) Read an integer greater than 2 from the user, then print it in reverse. (If the user enters the number 125, the program should print 521.)

**Problem 227** Consider the following C++ program. Write exactly what output is produced in response to the given user inputs.

```

#include <iostream>
using namespace std;

int main(){
    int age;
    string name;
    cout << "Please enter your name and age: ";
    cin >> name >> age;

    if (name == "Kamil") exit(0);
    if (age < 0) {
        name = "Kamil";
        age = 5;
    }
    if (name == "Peter") {
        cout << "You rat!" << endl;
        return 0;
    }
    if (age >= 100) {
        cout << "Goodbye Kamil!" << endl;
    }
    cout << " Hello " << name << " you are about " << age << endl;
    return 0;
}

```

- (i) The user enters: Freddy 17
- (ii) The user enters: Peter 19
- (iii) The user enters: Kamil 19
- (iv) The user enters: Andrew -20
- (v) The user enters: Carl 200

**Problem 228** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

The program prints a table with 100 lines of output. On output line number  $x$  the program should list the first  $x$  odd numbers.

For example, the first 4 lines of output read as follows:

```

1
1 3
1 3 5
1 3 5 7

```

**Answer:**

**Problem 229** Write a complete C++ program that asks a user to enter their day and month of birth. If the user's birthday is March 14<sup>th</sup>, the program wishes the user a Happy Birthday, otherwise it just says Hello. For example, the program could run as follows:

```

What is your day and month of birth:  14 March
Happy Birthday.

```

**Problem 230** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (a) Print to the screen the message (the word Hello repeats 10 times):

Hello Hello Hello Hello Hello Hello Hello Hello Hello Hello

- (b) Read an integer from the user and print the integer without its last digit. (For example if the user enters 19683, the program would print 1968.)
- (c) Print the square root of 19683 to the output screen:
- (d) Ask the user enter a name. If the user says Freddy, force the user to keep entering a name until something else is received.
- (e) Print a random number between 1000 and 9999 to the screen.

**Problem 231** Consider the following C++ program. Write exactly what output is produced in response to the given user inputs.

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

int main(){
    int n, m;
    cout << "Please two integers: ";
    cin >> m >> n;

    if (n == 0 && m == 0) cout << n << endl;;
    if (n == 0 || m == 0) exit(1);
    if (n < 0 && m < 0) cout << " Negative" << endl;
    else {
        if (n < m) cout << n << endl;
    }
    if (m > 7) cout << " 7" << n << endl;
    return 0;
}
```

- (i) The user enters: 0 0
- (ii) The user enters: 0 10
- (iii) The user enters: -10 -10
- (iv) The user enters: 10 -10
- (v) The user enters: 10 10

**Problem 232** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer that is at least 3.
  2. The program reads a value  $x$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $x$  has been entered.
  3. The program prints a picture with  $x$  columns. The picture should display a left pointing arrow pattern.
- For example, if the user enters 4 for  $x$  the program should print the following picture.

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

**Answer:**

**Problem 233** Write a complete C++ program that does the following.

1. It asks the user to enter their favorite positive integer.
2. The program prints the square root of that integer.

Here is an example of how the program should work:

```
Enter your favorite positive integer: 25
It has square root: 5.0
```

**Answer:**

**Problem 234** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(a) Print to the screen the message:

```
2 + 2 = 4
```

(b) Print all the numbers from 1 to 1000 to the screen (one number per line).

(c) Ask the user enter a multiple of 3. If the user gives an incorrect response force the user to keep entering a number until a multiple of 3 is received.

(d) Print 10 random numbers each between 10 and 20 to the output screen:

(e) Read an integer greater than 2 from the user, then print its largest factor. (For this problem, a factor of  $x$  is a number  $f$  with  $1 \leq f < x$  that divides into  $x$  without remainder.)

**Problem 235** Consider the following C++ program. Write exactly what output is produced in response to the given user inputs.

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

int main(){
    int n;  string name;
    cout << "Please enter your name and an integer: ";
    cin >> name >> n;

    if (n == 0 && name == "Freddy") cout << name << endl;;
    if (n == 0 || name == "Freddy") exit(1);
    if (n < 0) cout << " Negative" << endl;
    else {
        cout << " name " << name << " name " << endl;
    }
    if (n > 7) cout << " 7 " << endl;
    return 0;
}
```

(i) The user enters: Freddy 0

(ii) The user enters: Freddy 10

(iii) The user enters: Fred -10

(iv) The user enters: Fred 5

(v) The user enters: Fred 10

**Problem 236** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

The program prints a table with 100 lines of output. On output line number  $x$  the program should list the numbers from  $x$  to  $x^2$  together with their sum.

For example, the first 4 lines of output read as follows:

```
1 the sum is 1
2 3 4 the sum is 9
3 4 5 6 7 8 9 the sum is 42
4 5 6 7 8 9 10 11 12 13 14 15 16 the sum is 130
```

**Answer:**

**Problem 237** Write a complete C++ program that does the following.

1. It asks the user to enter the number of quarters, dimes, nickels and cents that they are carrying.
2. The program then reports the total amount of change that the user has.

Here is an example of how the program should work:

```
How many quarters do you have? 7
How many dimes do you have? 2
How many nickels do you have? 3
How many cents do you have ? 6
That makes 216 cents in change.
```

**Answer:**

**Problem 238** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(a) Print a random number between -1 and -9 to the output screen:

(b) Print (to the output screen) the sum of the square roots of the numbers 1, 2, 3, 4, 5 and 6.

(c) Ask the user to enter the word "Hello". Force the user to keep entering a new word until an input equal to "Hello" is received.

(d) Print twelve random negative numbers.

(e) Print the largest integer whose square root is less than 1729.

**Problem 239** Consider the following C++ program. Write exactly what output is produced in response to the given user inputs.

```

#include <iostream>
using namespace std;

int main(){
    int n, m;  string name;
    cout << "Please enter two integers followed by your name: ";
    cin >> m >> n >> name;

    if(n == 0) exit(1);
    if(m >= n) cout << name;
    if(m % n == 1) cout << name << name;
    else while (n > 7) {
        cout << n;
        n = n - m;
    }
    cout << endl;
    return 0;
}

```

- (i) The user enters: 2 2 Freddy
- (ii) The user enters: 0 7 007
- (iii) The user enters: 1 10 X
- (iv) The user enters: 1 2 3
- (v) The user enters: 11 111 Freddy

**Problem 240** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an odd positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program terminates.
3. The program prints an  $n \times n$  grid displaying a large letter  $X$ . The left half of the  $X$  should be made with the character  $+$ , the right half should be made with the character  $x$  and the very center should be a  $*$ .

For example, if the user enters 7 for  $n$  the program should print the following picture.

```

+      x
+      x
+  x
+      *
+  x
+      x
+      x
+      x

```

**Answer:**

**Problem 241** Write a complete C++ program that does the following.

1. It asks the user to enter their age (which is assumed to be a positive integer).
2. The program should print the word *Hello* once for each year of the user's age.

Here is an example of how the program should work:

```

Enter your age: 5
Hello Hello Hello Hello Hello

```

**Answer:**

**Problem 242** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (a) Print a random number that has 3 digits to the output screen:
- (b) Print (to the output screen) the smallest integer whose square root is larger than 3141.5926:
- (c) Ask the user to type a password and then to type it again. Print *Error* if the two words are different.
- (d) Read a positive integer greater than 2 from the user, and print its largest factor. (For this problem a number  $f$  is a factor of the number  $x$  if  $1 \leq f \leq x - 1$  and  $f$  divides into  $x$  without remainder.)
- (e) Read a name from the user. If necessary, repeatedly ask the user to reenter a name until the user has said *Freddy*.

**Problem 243** Consider the following C++ program. Write exactly what output is produced in response to the given user inputs.

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

int main(){
    int n, m;
    cout << "Please enter two integers: ";
    cin >> n >> m;

    if (n > m) cout << n % m << endl;
    else {
        for (int r = 1; r < n; r++) {
            for (int c = 1; c < m - n - 1; c++) {
                cout << "++";
            }
            cout << endl;
            if (n == 10) exit(1);
        }
    }
    return 0;
}
```

- (i) The user enters: 10 9
- (ii) The user enters: 3 7
- (iii) The user enters: 3 15
- (iv) The user enters: 10 15
- (v) The user enters: -1 5

**Problem 244** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer.
  2. If the input is illegal, the program should terminate.
  3. The program prints the digits of the number in reverse order (separated by spaces) and then gives their sum.
- For example, if the user enters 19683 the program should print the following output.

3 8 6 9 1 sum to 27

**Answer:**



**Problem 245** Write a complete C++ program that does the following.

1. It asks the user to enter their age (which is assumed to be a positive integer).
2. If the user is a teenager, the program should print *Hello Teenager* otherwise it should just print *Hello*.

Here is an example of how the program should work:

```
Enter your age: 15
Hello Teenager
```

**Answer:**

**Problem 246** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (a) Print 5 random numbers each between 1 and 9 to the output screen:
- (b) Print (to the output screen) the square root of 19683:
- (c) Ask the user enter a positive integer and if the user gives a non-positive response force the user to keep entering a number until a positive input is received.
- (d) Read an integer greater than 2 from the user, then print its smallest factor. (For this problem, a factor of  $x$  is a number  $f$  with  $2 \leq f \leq x$  that divides into  $x$  without remainder.)
- (e) Read a name from the user and exit the program if the name is *Freddy*.

**Problem 247** Consider the following C++ program. Write exactly what output is produced in response to the given user inputs.

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

int main(){
    int n; string name;
    cout << "Please enter your name and an integer: ";
    cin >> name >> n;

    if(n == 0) cout << name;
    if(n >= 100) exit(1);
    if(n % 5 == 1) cout << name << name;
    else while (n > 7) {
        cout << n;
        n = n - 2;
    }
    cout << endl;
    return 0;
}
```

- (i) The user enters: Freddy 0
- (ii) The user enters: 007 6
- (iii) The user enters: Fred 10
- (iv) The user enters: 9 11
- (v) The user enters: Freddy 111

**Problem 248** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer.
2. The program reads a value  $n$  entered by the user. If the value is not legal, the program terminates.
3. The program prints a table with  $n$  lines of output. On output line number  $x$  the program should list the numbers from 1 to  $x$  together with their sum.

For example, if the user enters 7 for  $n$  the program should print the following table.

```
1 the sum is 1
1 2 the sum is 3
1 2 3 the sum is 6
1 2 3 4 the sum is 10
1 2 3 4 5 the sum is 15
1 2 3 4 5 6 the sum is 21
1 2 3 4 5 6 7 the sum is 28
```

**Answer:**

**Problem 249** Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer  $x$ .
2. The program reads the number entered by the user. If  $x$  is not a positive integer, the program should terminate.
3. The program prints a countdown from  $x$  to 1.

Here is an example of how the program should work:

```
Enter a positive integer: 5
5 4 3 2 1
```

**Answer:**

**Problem 250** Consider the following C++ program. Explain what output is produced in response to the given user inputs.

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

int print1(int x){
    cout << "Odd" << endl;
    return 1;
}

int print2(int x){
    cout << x*x << endl;
    return x;
}

int main(){
    int n;
    cout << "Please enter a positive integer: ";
    cin >> n;

    if(n <= 0){
        cout << "No good!" << endl; exit(1);
    }

    if (n < 10) {
```

```

        cout << n % 2 << endl; exit(0);
    }
    if (n > 11) cout << print1(n) << endl;
    if (n % 2 == 1) print2(n);
    else print1(n);
    return 0;
}

```

- (i) The user enters: 0
- (ii) The user enters: 9
- (iii) The user enters: 10
- (iv) The user enters: 11
- (v) The user enters: 12

**Problem 251** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (a) Print (to the output screen) the message:

*Very Easy Question*

- (b) Print (to the output screen) the square root of 11:
- (c) Make the user enter 6 decimal values and print their product.
- (d) The header line for a function *add3* that calculates the sum of three input integer values. (A header line is a title line, or prototype.)
- (e) Print the value of a randomly selected integer between 31 and 41. (The program should make a random selection using the function *rand*. Output values of 31 and 41 are allowed.).

**Problem 252** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an even positive integer.
  2. The program reads a value  $n$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $n$  has been entered.
  3. The program prints an  $n \times n$  pattern of \* symbols in the shape of a large letter  $U$ .
- For example, if the user enters 6 for  $n$  the program should print the following picture.

```

*   *
*   *
*   *
*   *
*   *
*****

```

**Answer:**

**Problem 253** Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer  $x$ .
2. The program reads the number entered by the user. If  $x$  is not a positive integer, the program should terminate.
3. The program repeatedly prints the word *Hello* a total of  $x$  times.

Here is an example of how the program should work:

```

Enter a positive integer: 3
Hello Hello Hello

```

**Answer:**

**Problem 254** Consider the following C++ program. Explain what output is produced in response to the given user inputs.

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

void print1(int x){
    cout << "Odd" << endl;
}

void print2(int x){
    cout << "Even" << endl;
}

int main(){
    int n;
    cout << "Please enter an integer: ";
    cin >> n;

    if(n == 0) cout << "Hello" << endl;
    if(n <= 10) cout << "Goodbye" << endl;
    if(n > 10 && n%2 == 1) print1(n);
    if(n > 10 && n%2 == 0) print2(n);
    if (n < 0) print2(n);
    return 0;
}
```

- (i) The user enters: 12
- (ii) The user enters: 11
- (iii) The user enters: 10
- (iv) The user enters: 0
- (v) The user enters: -1

**Problem 255** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

- (a) Print (to the output screen) the message:

*Easy Question*

- (b) Print (to the output screen) a message made from the first 20 integers:

*1234567891011121314151617181920*

- (c) Make the user enter 6 decimal values and print their sum.

- (d) The header line for a function *max3* that calculates the maximum of three input decimal values. (A header line is a title line, or prototype.)

- (e) Print the value of a randomly selected teen age. (The program should make a random selection using the function *rand*. A teen age is a number between 13 and 19. ).

**Problem 256** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an odd positive integer.
  2. The program reads a value  $n$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $n$  has been entered.
  3. The program prints an  $n \times n$  pattern of \* symbols in the shape of a large letter  $T$ .
- For example, if the user enters 7 for  $n$  the program should print the following picture.

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

**Answer:**

**Problem 257** Write a complete C++ program that does the following.

1. It asks the user to enter a positive number  $x$ .
2. The program reads the number entered by the user. If  $x$  is not positive, the program should terminate.
3. The program prints the square root of  $x$ .

Here is an example of how the program should work:

```
Enter a positive number: 6.25
The square root is: 2.5
```

**Answer:**

**Problem 258** Consider the following C++ program. Explain what output is produced in response to the given user inputs.

```
int main() {
    int x;
    cout << "Enter a positive integer: ";
    cin >> x;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit(1);
    }
    for (int i = 1; i <= x % 10; i++)
        cout << x << i << ".";
    cout << x/10 << endl;
}
```

- (i) The user enters: 0
- (ii) The user enters: 1
- (iii) The user enters: 11
- (iv) The user enters: 44
- (v) The user enters: 40

**Problem 259** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(a) Print (to the output screen) the message:

$2 + 2 = 4$

(b) Read and store a first name, a middle initial, and a last name as entered by the user.

(c) Make the user enter 6 integer values and print the product.

(d) Print the message *odd* if the integer variable  $x$  stores an odd value, otherwise print the message *even*.

(e) Print the value of a randomly selected two digit integer. (The program should make a random selection using the function *rand*).

**Problem 260** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an odd positive integer.

2. The program reads a value  $n$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $n$  has been entered.

3. The program prints an  $n \times n$  pattern in the shape of a star. The pattern should appear as a large X printed from copies of the letter X that lies over a large + printed from copies of the character +.

For example, if the user enters 7 for  $n$  the program should print the following picture.

```
X  +  X
X  +  X
  X+X
+++X+++
  X+X
X  +  X
X  +  X
```

**Answer:**

**Problem 261** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(a) Print (to the output screen) the message:

*Problem 1(a).*

(b) Read and store a name as entered by the user.

(c) Print the value of the larger of two variables  $x$  and  $y$  each of which has type int. (For example, if  $x$  is 0 and  $y$  is 3, the larger value 3 is printed.)

(d) Make the user enter 10 integer values and print the sum.

**Problem 262** Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer  $x$ .

2. The program reads the number entered by the user. If  $x$  is not positive, the program should terminate.

3. The program prints  $x$  randomly generated dice rolls.

Here is an example of how the program should work:

```
Enter a positive number: 3
The dice rolled: 4 1 6
```

**Answer:**

**Problem 263** The following C++ program applies 5 different functions. Supply title lines (prototypes) for the 5 functions. Do not supply any blocks of code for the functions.

```
int main() {  
    int x, c, r;  
    x = readData();  
    for (c = 0; c < 5; c++) printValues(x, c);  
    x = adjust(x + 2);  
    r = max3(x, c, 10);  
    return fun(x + c, r - c);  
}
```

(a)

(b)

(c)

(d)

(e)

**Problem 264** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer.
2. The program reads a value  $x$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $x$  has been entered.
3. The program prints a triangular display which has the number  $x$  on its top row. Each later row is obtained by omitting the last digit from the number on the previous row.

For example, if the user enters 19683 for  $x$  the program should print the following picture.

```
19683  
1968  
196  
19  
1
```

**Answer:**

**Problem 265** Write a complete C++ program that does the following.

1. It asks the user to enter a positive even integer.
2. The program reads the number entered by the user. If the value is illegal, the program should terminate.
3. The program calculates and prints the square of the number.

Here is an example of how the program should work:

```
Enter a positive even number: 6  
The square is 36.
```

**Answer:**

**Problem 266** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print (to the output screen) the message:

*Today is March 19, 2008.*

(ii) Read and store an age entered by the user.

(iii) Print the average 2 variables  $x$  and  $y$  each of which has type int. (For example, if  $x$  is 0 and  $y$  is 3, the average is 1.5 and a decimal number must be printed.)

(iv) Make the user repeatedly enter a value for an integer variable  $x$  until the value entered is larger than 10.

**Problem 267** Consider the following C++ program. Explain what output is produced in response to the given user inputs.

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

int fun1(int x) {
    int ans = x / 10;
    return ans;
}
void fun2(int x) {
    cout << x << "* ";
}
void fun3(int x) {
    cout << "fun3 ";
}
int main() {
    int x;
    cout << "Enter an integer: ";
    cin >> x;
    if (x < 10) {
        cout << "Too small!" << endl; exit(1);
    }
    if (x == 10) fun3(x);
    if (x >= 20) fun2(x);
    if (x <= 20) cout << fun1(x);
    cout << endl;
    return 0;
}
```

(i) The user enters: 5

(ii) The user enters: 15

(iii) The user enters: 25

(iv) The user enters: 10

(v) The user enters: 20



**Problem 268**

Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter an integer that is at least 2.
2. The program reads a value  $x$  entered by the user. If the value is not legal, the program repeatedly makes the user type in another value until a legal value of  $x$  has been entered. (Note legal means greater than 1.)
3. The program prints a picture with  $x$  rows. The first row should show the first  $x$  positive integers, the next row the first  $x - 1$  positive integers, until eventually the last row shows only the number 1.

For example, if the user enters 5 for  $x$  the program should print the following picture.

```
12345
1234
123
12
1
```

**Answer:**

**Problem 269** Consider the following C++ program. Explain what output is produced in response to the given user inputs.

```
#include <iostream>
using namespace std;
int main() {
    int x;
    cout << "Enter a positive integer: ";
    cin >> x;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit(1);
    }
    if (x <= 100) {
        cout << x;
    }
    else {
        cout << x/100 << x%10 << endl;
    }
    return 0;
}
```

(i) The user enters: -50

(ii) The user enters: 0

(iii) The user enters: 99

(iv) The user enters: 456

(v) The user enters: 4560

**Problem 270** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print (to the output screen) the message:

*Easy!*

(ii) Read and store a name entered by the user.

(iii) Print the value of the larger of 2 variables  $x$  and  $y$  each of which has type double.

(iv) Print the difference between 2 variables  $a$  and  $b$  each of which has type int. (The printed difference should not be negative. For example the difference between 4 and 7 is 3, so too is the difference between 7 and 4.)

**Problem 271** Write a complete C++ program that does the following.

1. It asks the user to enter a positive number.
2. The program reads the number entered by the user. If the value is not positive, the program should terminate.
3. The program calculates and prints the last digit of the entered number.

Here is an example of how the program should work:

```
Enter a positive number: 56
last digit is 6.
```

**Answer:**

**Problem 272**

Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer value,  $x$ .
2. The program reads a value entered by the user. If the value is not positive, the program repeatedly makes the user type in another value until a positive value of  $x$  has been entered. (Note positive means greater than 0.)
3. The program prints an  $x \times x$  rectangle outlined with \* symbols.

For example, if the user enters 5 for  $x$  the program should print the following pattern.

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

**Answer:**

**Problem 273** The following C++ program is supposed to ask a user to enter their name and date of birth. It then greets the user and wishes a happy birthday if it is the user's birthday. The program has a number of errors. Rewrite the program to fix the errors.

```
#Include <iostream>;
#include <string>;
Using namespace std;
main() {
cout << "Enter your name and the month, day, and year of your birth: "
int name, month, day, year;
cin >> name >> day >> month >> year;
cout << "Hello " << name << endl;
if (month = 3 || day = 14) {
cout << "Happy birthday" << endl;
}
```

### Problem 274

Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer value,  $x$ .
2. The program reads a value entered by the user. If the value is not positive, the program repeatedly makes the user type in another value until a positive value of  $x$  has been entered. (Note positive means greater than 0.)
3. The program calculates and prints out  $x^x$ . (The value of  $x^x$  is  $x \times x \times x \times \dots \times x$ , a product of  $x$  copies of the number  $x$ .)

**Problem 275** Consider the following C++ program. Explain what output is produced in response to the given user inputs.

```
#include <iostream>
using namespace std;
int main() {
    int x;
    cout << "Enter a positive integer: ";
    cin >> x;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit(1);
    }
    while (x > 0) {
        cout << x % 10;
        x = x / 10;
    }
    cout << x << endl;
}
```

- (i) The user enters: -50
- (ii) The user enters: 7
- (iii) The user enters: 467
- (iv) The user enters a positive integer. (Explain how the output is related to the integer that the user enters.)

**Problem 276** The following C++ program is supposed to ask a user to enter three different integers. It then prints the middle value of the three input numbers. (For example, if the user types 10 5 15, the program should print 10.) The program has several errors. Rewrite the program to fix the errors and arrange the program so that it is easier for a human to read.

```
# <iostream>;
using namespace std;
int main
{
int x, y, z;
    cout << "Enter three different integers: " endl;
cin >> "x" >> "y" >> "z" endl;
    if ((x > y > z) && (z > y > x)); cout << y;
    if ((y > x > z) && (z > x > y)); cout << x;
    if ((z > y > x) && (x > y > z)); cout << y; return; };
```

### Problem 277

Write a complete C++ program that does the following.

1. It asks the user to enter a positive integer value,  $x$ .
2. The program reads a value entered by the user. If the value is not positive, the program repeatedly makes the user type in another value until a positive value of  $x$  has been entered. (Note positive means greater than 0.)
3. The program prints out a triangle with  $x$  rows that points downwards. For example, if the user enters 3 for  $x$  the program should print:

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

**Problem 278** Consider the following C++ program. Write the exact output that is produced in response to the given user inputs.

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

int fun(int a) {
    int b;
    b = a / 10;
    return b;
}

int main() {
    int x, y;
    cout << "Enter a positive integer: ";
    cin >> x;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit(1);
    }
    y = fun(x);
    cout << x << y << endl;
    return 0;
}
```

- (i) The user enters: -50
- (ii) The user enters: 7
- (iii) The user enters: 467

**Problem 279** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print (to the output screen) the greeting:

*Hello. This is an easy question.*

(ii) Get the user to enter their first name, which is to be stored as the variable *name*.

(iii) Print the sum of the numbers from 1 to 1000 onto the screen. (The output should be the value of  $1 + 2 + \dots + 999 + 1000$ ).

(iv) Get the user to enter an integer value. Print the message *POSITIVE* if it is greater than zero, or *NEGATIVE* if it is less than zero. Do not take any action if the user enters zero.

**Problem 280** Consider the following C++ program. Explain what output is produced in response to the given user inputs.

```
#include <iostream>
using namespace std;
void multiPrint(int y) {
    for (int i = 1; i <= y; i++)
        cout << y << "!";
    return;
}
int main() {
    int x;
    cout << "Enter a positive integer: ";
    cin >> x;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit(1);
    }
    if (x > 2) multiPrint(x);
    cout << x << endl;
    return 0;
}
```

(i) The user enters: -50

(ii) The user enters: 1

(iii) The user enters: 4

**Problem 281** Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter their 4 digit id number.
2. The program reads the number entered by the user and stores it as the variable *x*. If the value of *x* is not in the range from 1000 to 9999, the program repeatedly makes the user type in another number until a proper id number has been entered.
3. The program calculates and prints out the last digit of the id number.

For example: A typical interaction with a user might be as follows. (The user responses are shown as bold.)

Enter your 4 digit id: **56789**

Illegal, try again: **25**

Illegal, try again: **9995**

The last digit of your id is 5.

**Problem 282** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print (to the output screen) the greeting:

*Hello. Today is 10/25/2006.*

(ii) Get the user to enter their age, which is to be stored as the variable *age*.

(iii) Get the user to enter a positive integer value. Exit if the user enters a non-positive value, otherwise:

Print the message *EVEN* if the value is even, or *ODD* if it is odd.

(iv) Get the user to enter a name. If the user enters the name *Freddy*, tell the user to enter a different name and force the user to re-enter a name until it is different from *Freddy*.

**Problem 283** Consider the following C++ program. Explain what output is produced in response to the given user inputs.

```
int main() {
    int x;
    cout << "Enter a positive integer: ";
    cin >> x;
    if (x <= 0) {
        cout << "Illegal" << endl;
        exit(1);
    }
    if (x < 10) cout << x--;
    else {
        if ((x % 10) == 0) cout << x / 10;
        cout << x * 10;
    }
    cout << endl;
}
```

(i) The user enters: -50

(ii) The user enters: 0

(iii) The user enters: 9

(iv) The user enters: 456

(v) The user enters: 4560

#### Problem 284

Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer value, *x*.

2. The program reads a value entered by the user. If the value is not positive, the program repeatedly makes the user type in another value until a positive value of *x* has been entered. (Note positive means greater than 0.)

3. The program prints a triangular pattern that is *x* rows high. The characters 0 and 1 are used to print the pattern. Odd numbered rows are printed using a 1 and even numbered rows are printed using a 0.

For example, if the user enters 4 for *x* the program should print the following pattern with 4 rows.

```
1
00
111
0000
```

**Answer:**

**Problem 285** Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions.

(i) Print (to the output screen) the greeting:

*Hello.*

(ii) Get the user to enter their age. Then print out whichever the following messages applies:

*You are over 25*

*You are not over 25*

(iii) Ask the user to enter an even number.

Make the user re-enter the number as often as is needed until the number is even.

(iv) Print the average value of 3 variables  $x$ ,  $y$ , and  $z$  each of which has type double.

(v) Calculate and print the decimal that represents the fraction  $\frac{1}{7}$ .

**Problem 286** Write a complete C++ program that does the following.

1. It asks the user to enter a number of cents that is between 0 and 99.
2. The program reads the number entered by the user. If the value is not in the right range, the program should terminate.
3. The program calculates and prints out the most efficient combination of quarters, nickels, dimes, and pennies that provide the sum entered by the user.

Here is an example of how the program should work:

```
How many cents? 57
quarters: 2
dimes: 0
nickels: 1
pennies: 2
```

**Answer:**

**Problem 287**

Write a complete C++ program that does the following. (Programs that correctly carry out some of the tasks will receive partial credit.)

1. It asks the user to enter a positive integer value,  $x$ .
2. The program reads a value entered by the user. If the value is not positive, the program repeatedly makes the user type in another value until a positive value of  $x$  has been entered. (Note positive means greater than 0.)
3. The program prints an  $x \times x$  square pattern of \* symbols in such a way that rows and columns are separated by rows and columns of - symbols.

For example, if the user enters 3 for  $x$  the program should print the following pattern (there are 3 rows and 3 columns that contain \*'s, but there are other rows and columns with only -'s).

```
*-*-*
-----
*-*-*
-----
*-*-*
```

**Answer:**