

Solutions

09.00am – 09.50am, Monday, March 21, 2016

**Problem 1** (*points*) 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:**

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

int main() {
    for (int n = 28; n < 388; n++) {
        cout << n << " ";
        if (n % 10 == 7) cout << endl;
    }
    return 0;
}
```

**Problem 2** (points)

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. No answer can use more than two lines. Assume 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:**

```
cout << "In C++ an endl makes a new line." << endl;
```

(b) Print the square of  $x$ .

**Answer:**

```
cout << x * x << endl;
```

(c) Print a random number with 4 digits.

**Answer:**

```
cout << rand() % 9000 + 1000 << endl;
```

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

**Answer:**

```
for (int n = 1; n < 1000; n++)  
    if ((n % 7 == 0) || ((n % 2 == 0) && (n > 400))) cout << n << endl;
```

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

**Answer:**

```
cout << sqrt(3.0 / 8) << endl;
```

**Problem 3** ( *points*) 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:**

5

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

**Answer:**

2

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

**Answer:**

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

**Answer:**

baba

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

**Answer:**

25

**Problem 4** (*points*) 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:**

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

int main() {
    int n;
    cout << "Enter a number: ";
    cin >> n;

    for (int row = 1; row <= n; row++) {
        for (int pattern = 1; pattern <= 2; pattern++) {
            for (int c = 1; c <= n; c++) {
                if (row == c || (row + c) == (n + 1))
                    cout << "*";
                else cout << " ";
            }
        }
        cout << endl;
    }
    return 0;
}
```

Solutions

09.00am – 09.50am, Monday, March 21, 2016

**Problem 1** (*points*) 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:**

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

int main() {
    for (int n = 980; n >= 666; n--) {
        cout << n << " ";
        if (n % 6 == 3) cout << endl;
    }
    cout << endl;
    return 0;
}
```

**Problem 2** (points)

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. No answer can use more than two lines. Assume 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:**

```
cout << "C++ output uses cout." << endl;
```

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

**Answer:**

```
cout << sqrt((double) y) << endl;
```

(c) Print a random 3 digit even number.

**Answer:**

```
cout << 2 * (rand() % 450) + 100 << endl;
```

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

**Answer:**

```
for (int n = 1; n < 1000; n++)  
    if ((n % 10 == 7) && (n % 3 == 0)) cout << n << endl;
```

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

**Answer:**

```
cout << (3.0 / 8) * (3.0 / 8) << endl;
```

**Problem 3** ( *points*) 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:**

4

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

**Answer:**

7

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

**Answer:**

a

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

**Answer:**

aaba

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

**Answer:**

9

**Problem 4** (*points*) 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:**

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

int main() {
    int n;
    cout << "Enter a number: ";
    cin >> n;

    for (int row = 1; row <= n; row++) {
        for (int pattern = 1; pattern <= 3; pattern++) {
            for (int c = 1; c <= n; c++) {
                if (c == 1 || row == n)
                    cout << "*";
                else cout << " ";
            }
            cout << " ";
        }
        cout << endl;
    }
    return 0;
}
```



Solutions

02.45pm – 03.35pm, Monday, March 21, 2016

**Problem 1** (*points*) 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:**

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

int main() {
    for (int n = 28; n < 388; n++) {
        cout << n;
        if (n % 10 == 7) cout << endl;
        else cout << ",";
    }
    return 0;
}
```

**Problem 2** (points)

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. No answer can use more than two lines. Assume 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:**

```
cout << "endl makes a line and for makes a loop" << endl;
```

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

**Answer:**

```
cout << (z + 1) * (z + 1) * (z + 1) << endl;
```

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

**Answer:**

```
cout << rand() % 90 + 10 << endl;
```

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

**Answer:**

```
for (int n = 100; n < 1000; n++)  
    if ((n % 10 == 7) || ((n % 2 == 0) && (n % 7 == 0))) cout << n << endl;
```

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

**Answer:**

```
cout << sqrt(3.0/7) << endl;
```

**Problem 3** ( *points*) 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:**

7

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

**Answer:**

3

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

**Answer:**

ab

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

**Answer:**

ababba

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

**Answer:**

81

**Problem 4** (*points*) 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:**

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

int main() {
    int n;
    cout << "Enter an odd number: ";
    cin >> n;

    for (int row = 1; row <= n; row++) {
        for (int pattern = 1; pattern <= 2; pattern++) {
            for (int c = 1; c <= n; c++) {
                if (c == 1 || row == 1 || row == n || row == (n + 1) / 2)
                    cout << "*";
                else cout << " ";
            }
            cout << " ";
        }
        cout << endl;
    }
    return 0;
}
```

Solutions

02.45pm – 03.35pm, Monday, March 21, 2016

**Problem 1** (*points*) 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:**

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

int main() {
    for (int n = 980; n >= 669; n--) {
        cout << n;
        if (n % 6 == 3) cout << endl;
        else cout << ".";
    }
    cout << endl;
    return 0;
}
```

**Problem 2** (points)

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. No answer can use more than two lines. Assume 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:**

```
cout << "Quote Hello but do not quote cout." << endl;
```

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

**Answer:**

```
cout << sqrt(sqrt((double) y)) << endl;
```

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

**Answer:**

```
cout << 3 * (rand() % 300) + 102 << endl;
```

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

**Answer:**

```
for (int n = 1; n < 1000; n++)  
    if ((n % 10 == 7) && ((n % 7) == 0)) cout << n << endl;
```

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

**Answer:**

```
cout << (5.0 / 8) * (5.0 / 8) << endl;
```

**Problem 3** ( *points*) 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:**

7

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

**Answer:**

16

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

**Answer:**

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

**Answer:**

azabza

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

**Answer:**

81

**Problem 4** (*points*) 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:**

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

int main() {
    int n;
    cout << "Enter an odd number: ";
    cin >> n;

    for (int row = 1; row <= n; row++) {
        for (int pattern = 1; pattern <= 3; pattern++) {
            for (int c = 1; c <= n; c++) {
                if (row == 1 || c == (n + 1) / 2)
                    cout << "*";
                else cout << " ";
            }
            cout << " ";
        }
        cout << endl;
    }
    return 0;
}
```