

Solutions

09.00am – 09.50am, Tuesday, October 13, 2015

Problem 1 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:

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

int main() {
    double base, height;
    double area;

    cout << "Enter the base and height of a triangle:";
    cin >> base >> height;
    if ((base <= 0) || (height <= 0))
        return 0;
    area = base * height / 2.0;
    cout << "Area: " << area << endl;
    return 0;
}
```

Problem 2

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:

```
cout << "Enter your name: ";
cin >> name;
```

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

Answer:

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

(c) Print the last digit of y .

Answer:

```
cout << y % 10 << endl;
```

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

Answer:

```
if (x > y) cout << x << endl;
else cout << message << endl;
```

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

Answer:

```
for (int a = 1; a <= x; a++) cout << name;
for (int a = 1; a <= y; a++) cout << message;
```

Problem 3 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:

13

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

Answer:

a

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

Answer:

15

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

Answer:

no

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

Answer:

15

Problem 4 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:

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

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

    for (int r = 1; r <= n; r++) {
        for (int triangle = 1; triangle <= n; triangle++) {
            for (int c = 1; c <= n; c++) {
                if (r >= c) cout << "*";
                else cout << " ";
            }
        }
        cout << endl;
    }
    return 0;
}
```

Solutions

11.10am – 12.00noon, Tuesday, October 13, 2015

Problem 1 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:

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

int main() {
    double celsius, fahrenheit;

    cout << "Enter the temperature in degrees fahrenheit: ";
    cin >> fahrenheit;
    if (!((fahrenheit >= 0) && (fahrenheit <= 100))) {
        cout << "Out of range." << endl;
        return 0;
    }
    celsius = 5.0 / 9 * (fahrenheit - 32);
    cout << "Celsius: " << celsius << endl;
    return 0;
}
```

Problem 2

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:

```
cout << "Enter your name: ";
cin >> name;
```

- (b) Print the square of *y*.

Answer:

```
cout << y * y << endl;
```

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

Answer:

```
cout << (x + y) % 10 << endl;
```

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

Answer:

```
if (!(x > y)) cout << name << endl;
else cout << message << endl;
```

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

Answer:

```
for (int a = 1; a <= x; a++) cout << x;
for (int a = 1; a <= y; a++) cout << message;
```

Problem 3 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:

31

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

Answer:

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

Answer:

16

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

Answer:

no

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

Answer:

31

Problem 4 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:

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

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

    for (int r = 1; r <= n; r++) {
        for (int stripe = 1; stripe <= n; stripe++) {
            for (int c = 1; c <= n; c++) {
                if (r == c) cout << "*";
                else cout << " ";
            }
        }
        cout << endl;
    }
    return 0;
}
```

Solutions

11.10am – 12.00noon, Tuesday, October 13, 2015

Problem 1 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:

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

int main() {
    double celsius, fahrenheit;

    cout << "Enter the temperature in degrees celsius: ";
    cin >> celsius;
    if (celsius > 40) {
        cout << "Enter a different value: ";
        cin >> celsius;
    }
    fahrenheit = 9.0 / 5 * celsius + 32;
    cout << "Fahrenheit: " << fahrenheit << endl;
    return 0;
}
```

Problem 2

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:

```
cout << "Enter second: ";
cin >> second;
```

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

Answer:

```
cout << b * b * b << endl;
```

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

Answer:

```
cout << a / 10 << endl;
```

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

Answer:

```
if (word == second) cout << a << endl;
else cout << b << endl;
```

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

Answer:

```
for (int x = 1; x <= a; x++) cout << word << " ";
cout << endl;
```

Problem 3 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:

49

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

Answer:

ok

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

Answer:

30

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

Answer:

11

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

Answer:

30

Problem 4 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:

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

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

    for (int r = 1; r <= n; r++) {
        for (int stripe = 1; stripe <= n; stripe++) {
            for (int c = 1; c <= n; c++) {
                if (r == c) cout << "*";
                else cout << " ";
            }
        }
        cout << endl;
    }
    return 0;
}
```