MA144: Problem Solving and Computer Programming

Lecture-12

switch, nested loops

Write a program to create a calculator (using nested `if-else`)

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

int main()
{  double a,b ;
   char op;
   cout<<"enter two numbers\n";
   cin>>a>>b;
   cout<<"enter an operator (+, -, *, /): ";
   cin>>op;
     if(op=='+')
       cout<<a<<'+'<<b<<'='<<a+b;
      else if(op=='-')
        cout<<a<<'-'<<b<<'='<<a-b;
       else if(op=='*')
        cout<<a<<'X'<<b<<'='<<a*b;
        else if(op=='/')
        cout<<a<<'/'<<b<<'='<<a/b;
        else cout<<"invalid operator";
    return 0;
}
```

```
enter two numbers
3 6
enter an operator (+, -, *, /): +
3+6=9
```

```
enter two numbers
3 4
enter an operator (+, -, *, /): /
3/4=0.75
```

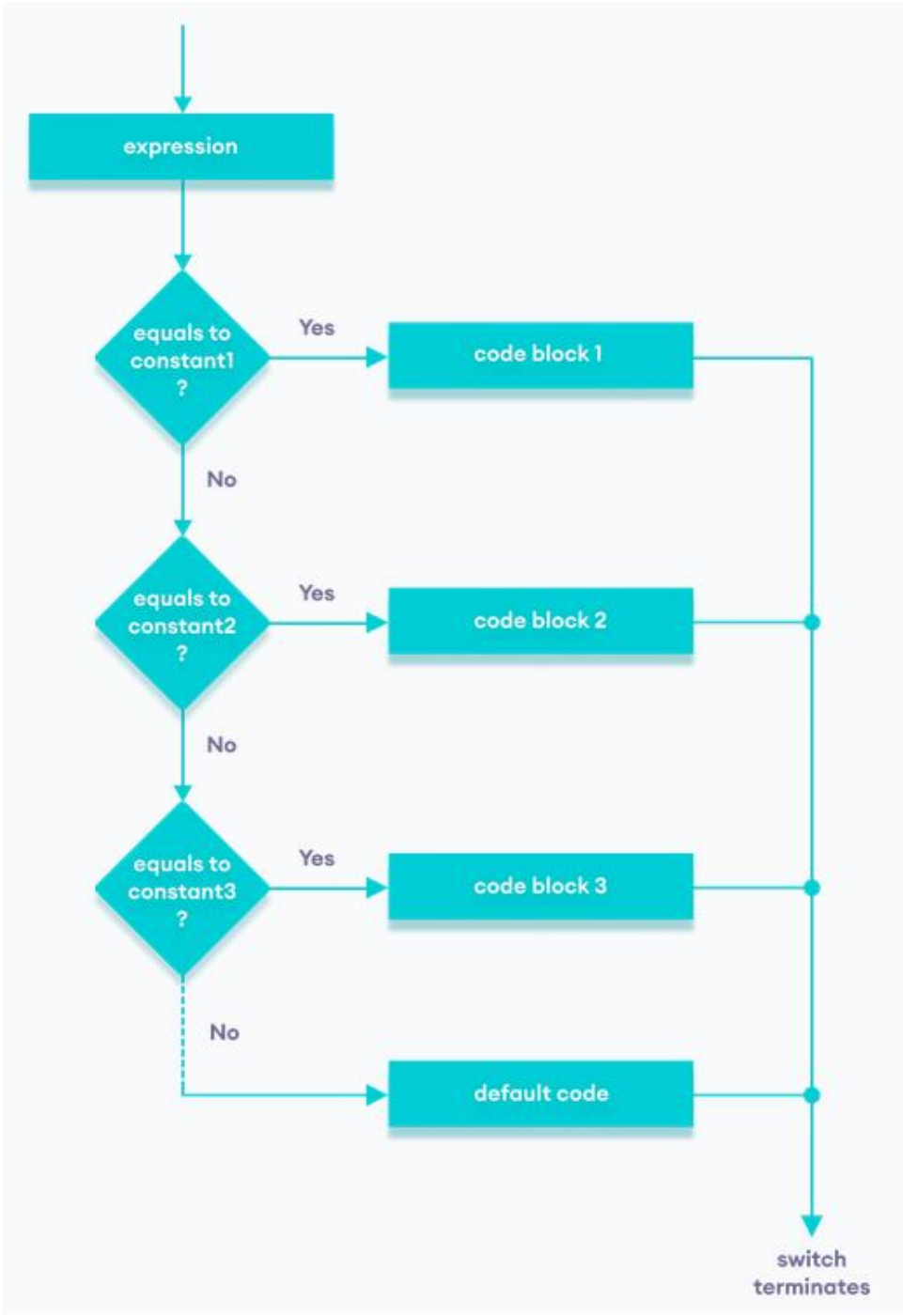
```
enter two numbers
4 9
enter an operator (+, -, *, /): 9
invalid operator
```

`switch` Statement

```
switch (Controlling_Expression)
{
 case Constant_1:
 Statement_Sequence_1
 break;

 case Constant_2:
 Statement_Sequence_2
 break;

 case Constant_3:
 Statement_Sequence_n
 break;

 default:
 Default_Statement_Sequence
}
```

switch Statement

break and default are optional


expression
equals to constant1 ?
Yes
code block 1
No
equals to constant2 ?
Yes
code block 2
No
equals to constant3 ?
Yes
code block 3
No
default code
switch terminates

Write a program to create a calculator.

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

int main() {
    char oper;
    float num1, num2;

    cout << "Enter two numbers: " << endl;
    cin >> num1 >> num2;
    cout << "Enter an operator (+, -, *, /): ";
    cin >> oper;

    switch (oper) {
        case '+':
            cout << num1 << " + " << num2 << " = " << num1 + num2;
            break;
        case '-':
            cout << num1 << " - " << num2 << " = " << num1 - num2;
            break;
        case '*':
            cout << num1 << " * " << num2 << " = " << num1 * num2;
            break;
        case '/':
            cout << num1 << " / " << num2 << " = " << num1 / num2;
            break;
        default:

            cout << "Error! The operator is not correct";
            break;
     }
    return 0;

    }
```

```
Enter two numbers:
8 2
Enter an operator (+, -, *, /): /
8 / 2 = 4
```

```
Enter two numbers:
5 8
Enter an operator (+, -, *, /): 9
Error! The operator is not correct
```

Ignoring default

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

int main() {
    char oper;
    float num1, num2;

    cout << "Enter two numbers: " << endl;
    cin >> num1 >> num2;
    cout << "Enter an operator (+, -, *, /): ";
    cin >> oper;

    switch (oper) {
        case '+':
            cout << num1 << " + " << num2 << " = " << num1 + num2;
            break;
        case '-':
            cout << num1 << " - " << num2 << " = " << num1 - num2;
            break;
        case '*':
            cout << num1 << " * " << num2 << " = " << num1 * num2;
            break;
        case '/':
            cout << num1 << " / " << num2 << " = " << num1 / num2;
            break;

        }
    return 0;
    }
```

```
Enter two numbers:
8 2
Enter an operator (+, -, *, /): #
```

Braces are not necessary to describe the body of any case statement

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

int main() {
    char oper;
    float num1, num2;

    cout << "Enter two numbers: " << endl;
    cin >> num1 >> num2;
    cout << "Enter an operator (+, -, *, /): ";
    cin >> oper;

    switch (oper) {
        case '+':
            cout << num1 << " + " << num2 << " = " << num1 + num2;
            cout<<endl<< "the operation is addition";
            break;
        case '-':
            cout << num1 << " - " << num2 << " = " << num1 - num2;
            break;
        default:
            cout<<"invalid operator";
     }
    return 0;
    }
```

```
Enter two numbers:
3 10
Enter an operator (+, -, *, /): +
3 + 10 = 13
the operation is addition
```

Ignoring break

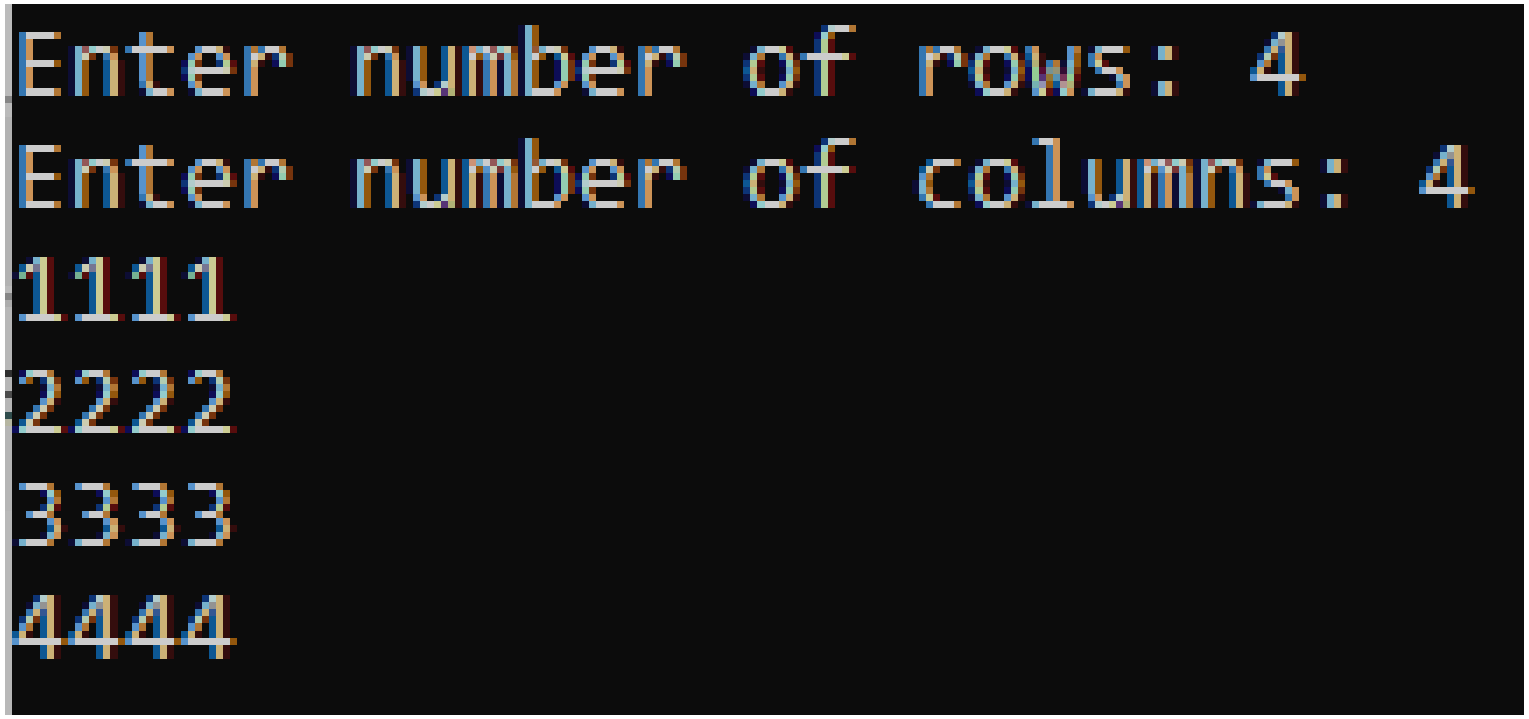
```
#include <iostream>
using namespace std;

int main() {
    char oper;
    float num1, num2;

    cout << "Enter two numbers: " << endl;
    cin >> num1 >> num2;
    cout << "Enter an operator (+, -, *, /): ";
    cin >> oper;

    switch (oper) {
        case '+':
            cout << num1 << " + " << num2 << " = " << num1 + num2;
            cout<<endl<< "the operation is addition"<<endl;

        case '-':
            cout << num1 << " - " << num2 << " = " << num1 - num2;
            break;
        default:
            cout<<"invalid operator";
         }
    return 0;
    }
```

```
Enter two numbers:
8 3
Enter an operator (+, -, *, /): +
8 + 3 = 11
the operation is addition
8 - 3 = 5
```

Nested loops

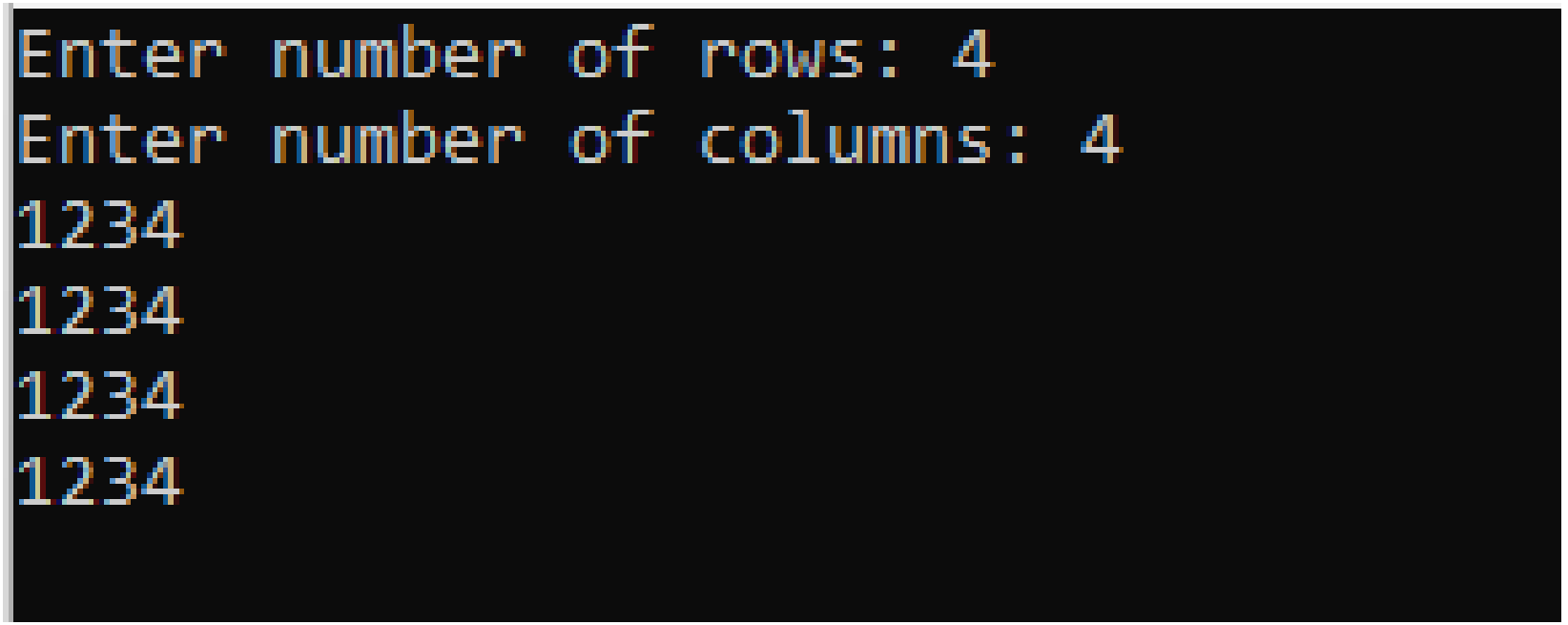
What is the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{

    int rows, columns, i, j;

    cout << "Enter number of rows: ";
    cin >> rows;
    cout << "Enter number of columns: ";
    cin >> columns;
    for(i = 1; i <= rows; ++i)
    {
        for(j = 1; j <= columns; ++j)
        {
            cout << i;
        }
        cout << endl;
    }
    return 0;
}
```


Enter number of rows: 4
Enter number of columns: 4
1111
2222
3333
4444

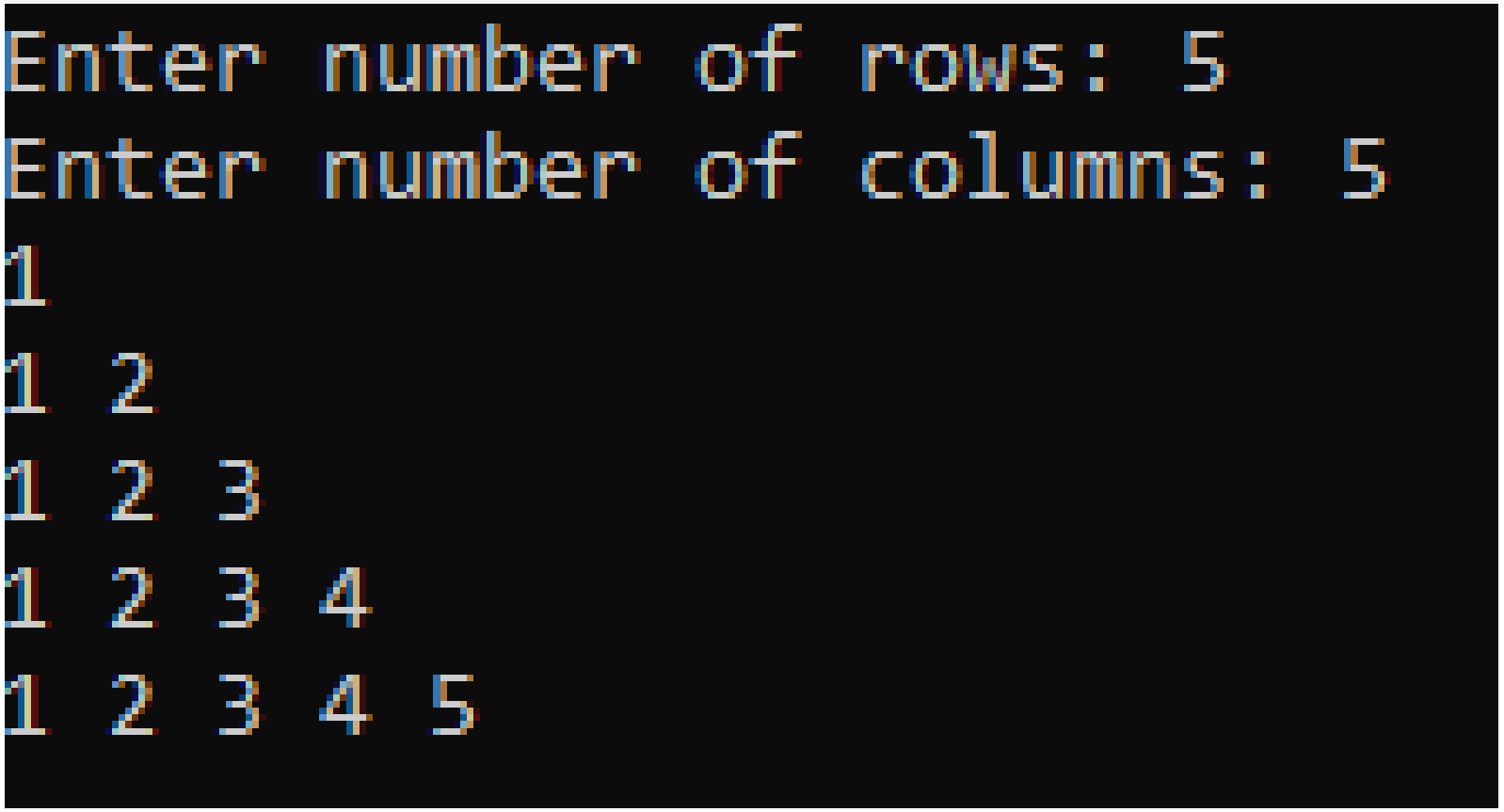
What is the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{

    int rows, columns, i, j;

    cout << "Enter number of rows: ";
    cin >> rows;
    cout << "Enter number of columns: ";
    cin >> columns;
    for(i = 1; i <= rows; ++i)
    {
        for(j = 1; j <= columns; ++j)
        {
            cout << j;
        }
        cout << endl;
    }
    return 0;
}
```


Enter number of rows: 4
Enter number of columns: 4
1234
1234
1234
1234

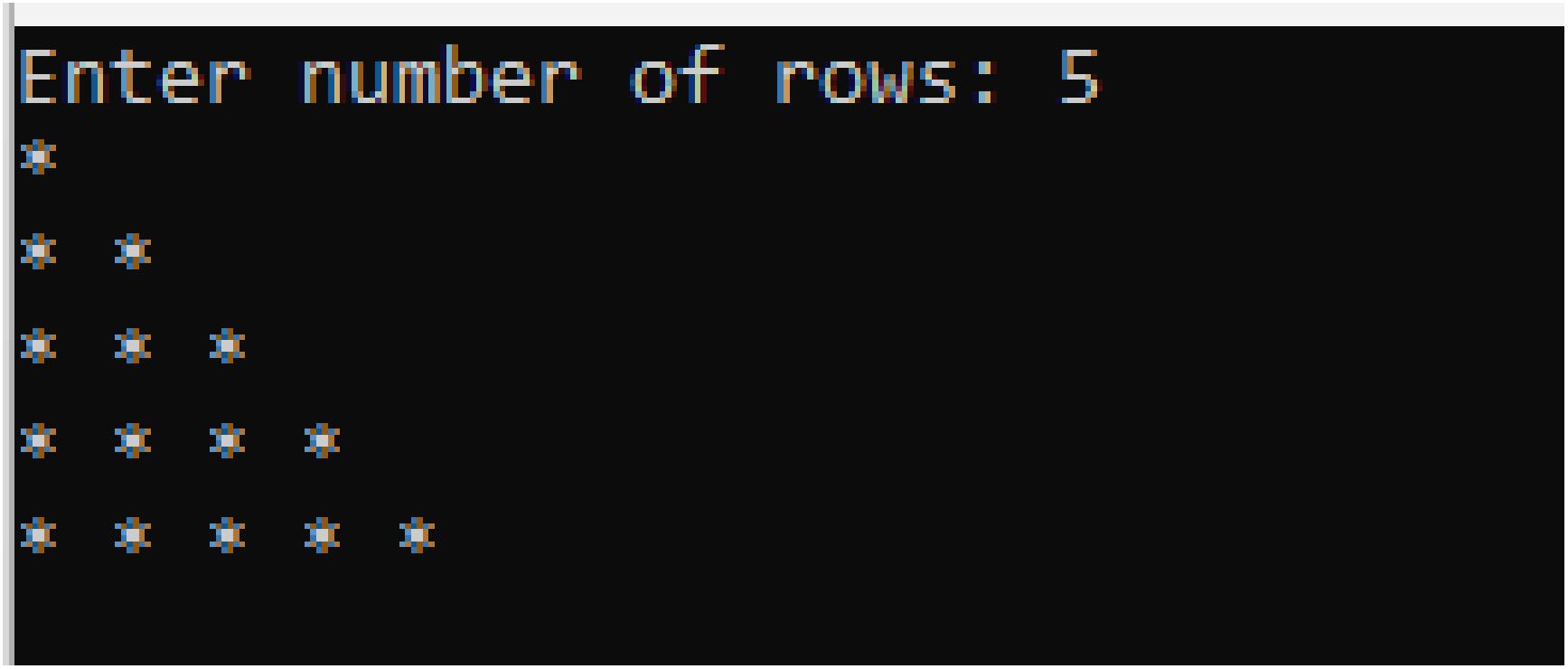
What is the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int rows, columns, i, j;

    cout << "Enter number of rows: ";
    cin >> rows;
    cout << "Enter number of columns: ";
    cin >> columns;
    for(i = 1; i <= rows; ++i)
    {
        for(j = 1; j <= i; ++j)
        {
            cout << j<<" ";
        }
        cout << endl;
    }
    return 0;
}
```


Enter number of rows: 5
Enter number of columns: 5
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5

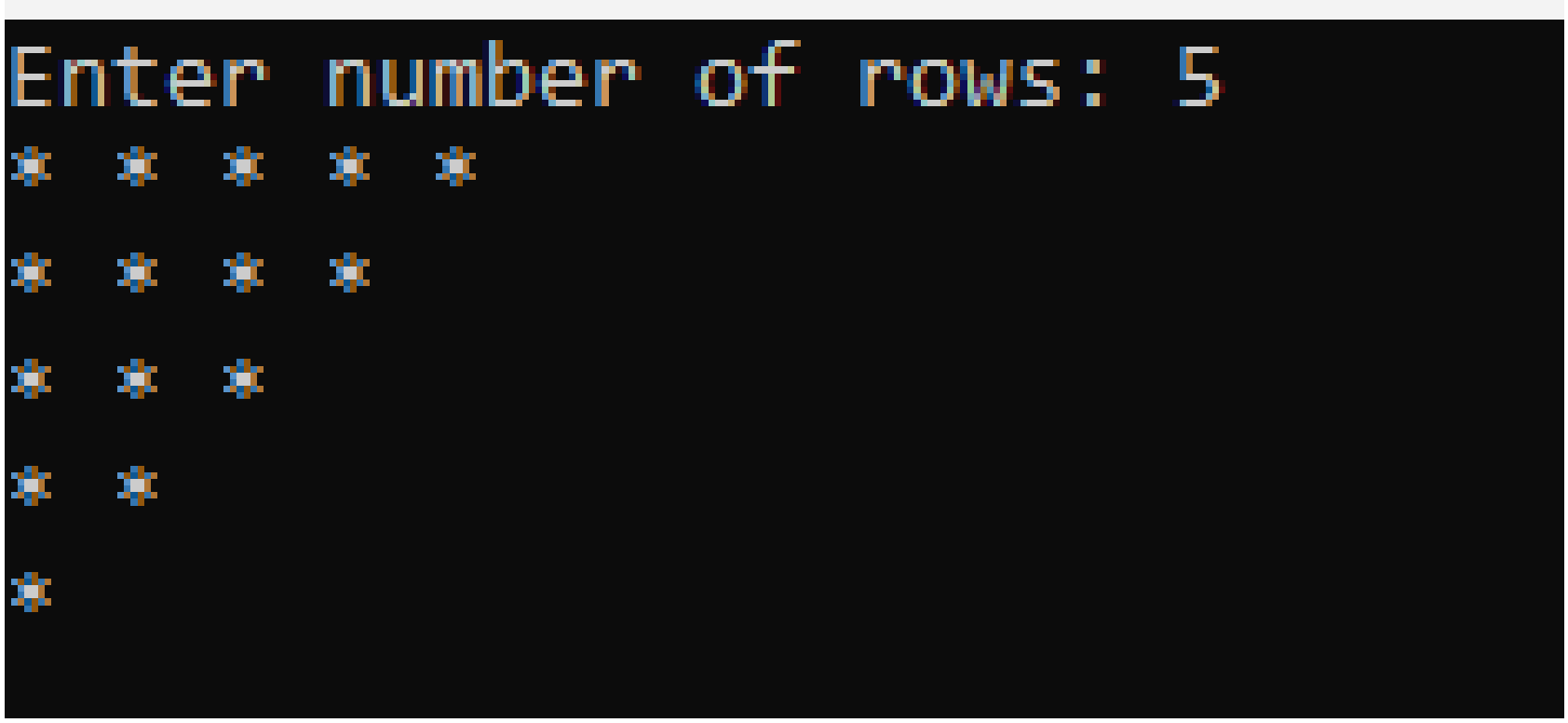
What is the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int rows, i, j;

    cout << "Enter number of rows: ";
    cin >> rows;

    for(i = 1; i <= rows; ++i)
    {
        for(j = 1; j <= i; ++j)
        {
            cout << "*"<<" ";
        }
        cout << endl;
    }
    return 0;
}
```


Enter number of rows: 5
*
* *
* * *
* * * *
* * * * *

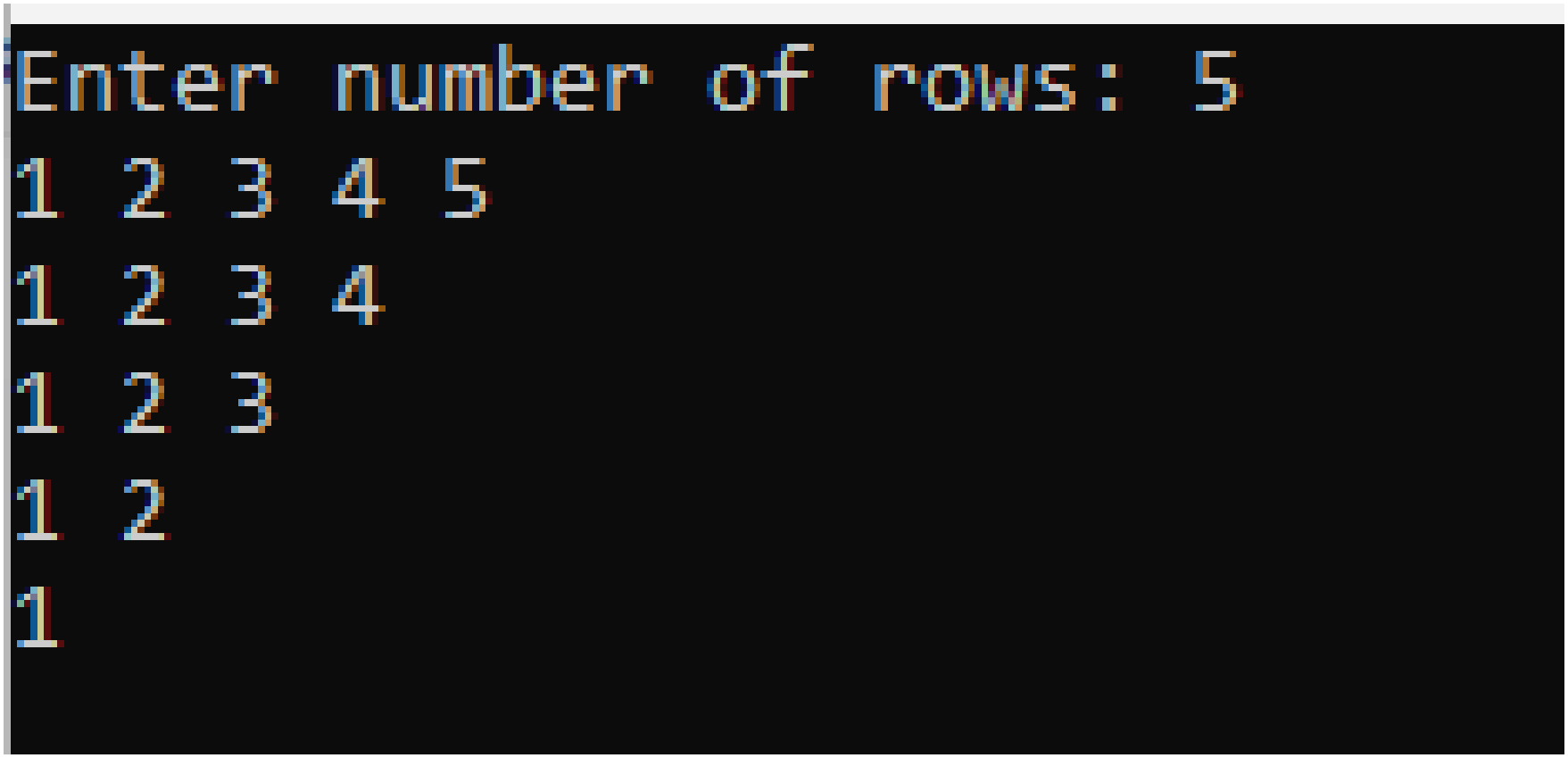
Guess output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int rows, i, j;

    cout << "Enter number of rows: ";
    cin >> rows;

    for(i = rows; i >=1; --i)
    {
        for(j = 1; j <= i; ++j)
        {
            cout << "*"<<" ";
        }
        cout << endl;
    }
    return 0;
}
```


Enter number of rows: 5
* * * * *
* * * *
* * *
* *
*

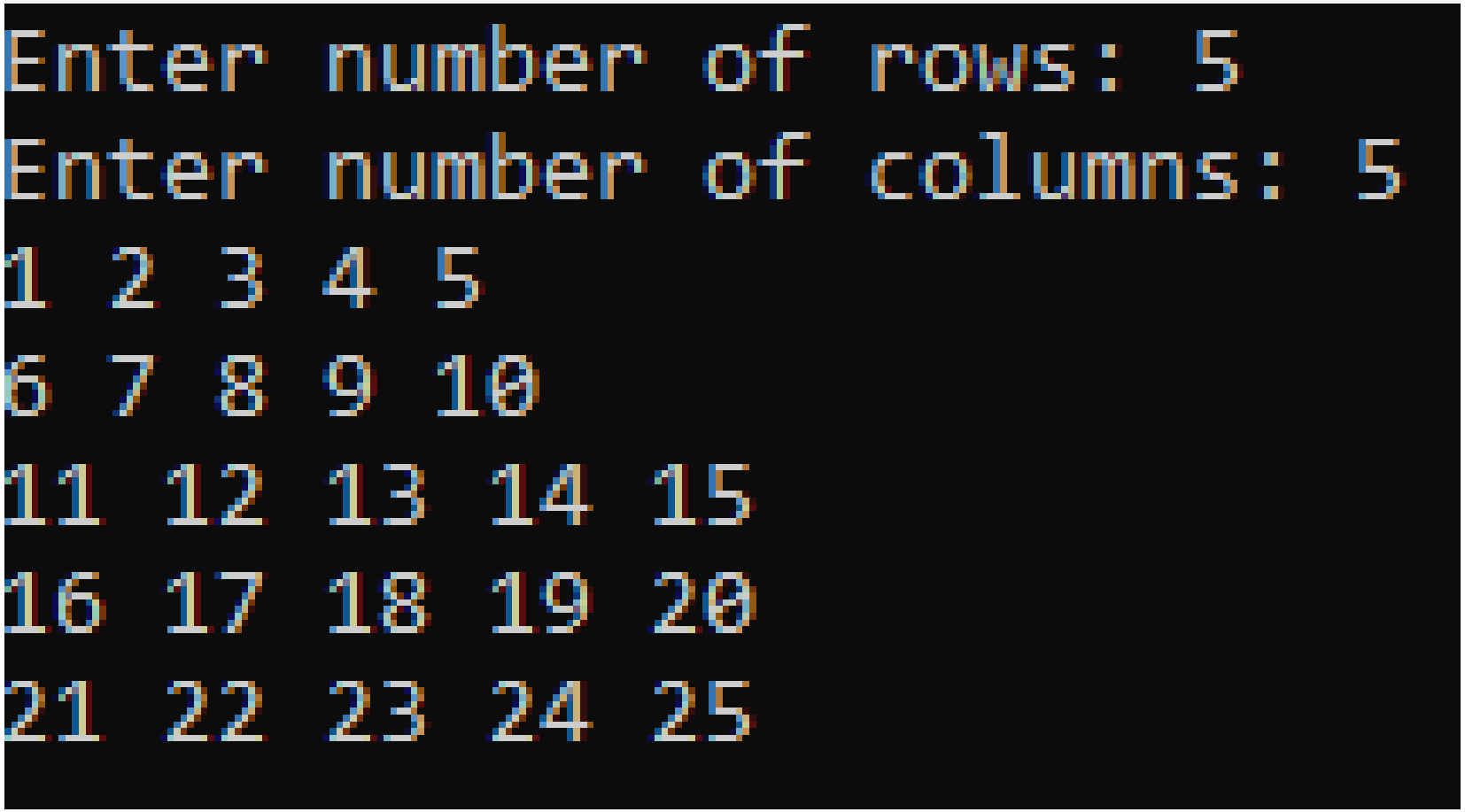
Guess output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int rows, i, j;

    cout << "Enter number of rows: ";
    cin >> rows;

    for(i = rows; i >=1; --i)
    {
        for(j = 1; j <= i; ++j)
        {
            cout << j<<" ";
        }
        cout << endl;
    }
    return 0;
}
```


Enter number of rows: 5
1 2 3 4 5
1 2 3 4
1 2 3
1 2
1

Guess output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int rows,columns,i, j, k;

    cout << "Enter number of rows: ";
    cin >> rows;
    cout << "Enter number of columns: ";
    cin >> columns;
    k=1;
    for(i = 1; i <= rows; i++)
    {
        for(j = 1; j <= columns; ++j)
        {
            cout << k << " ";
            ++k;
        }

        cout << endl;
    }

    return 0;
}
```


Enter number of rows: 5
Enter number of columns: 5
1 2 3 4 5
6 7 8 9 10
11 12 13 14 15
16 17 18 19 20
21 22 23 24 25

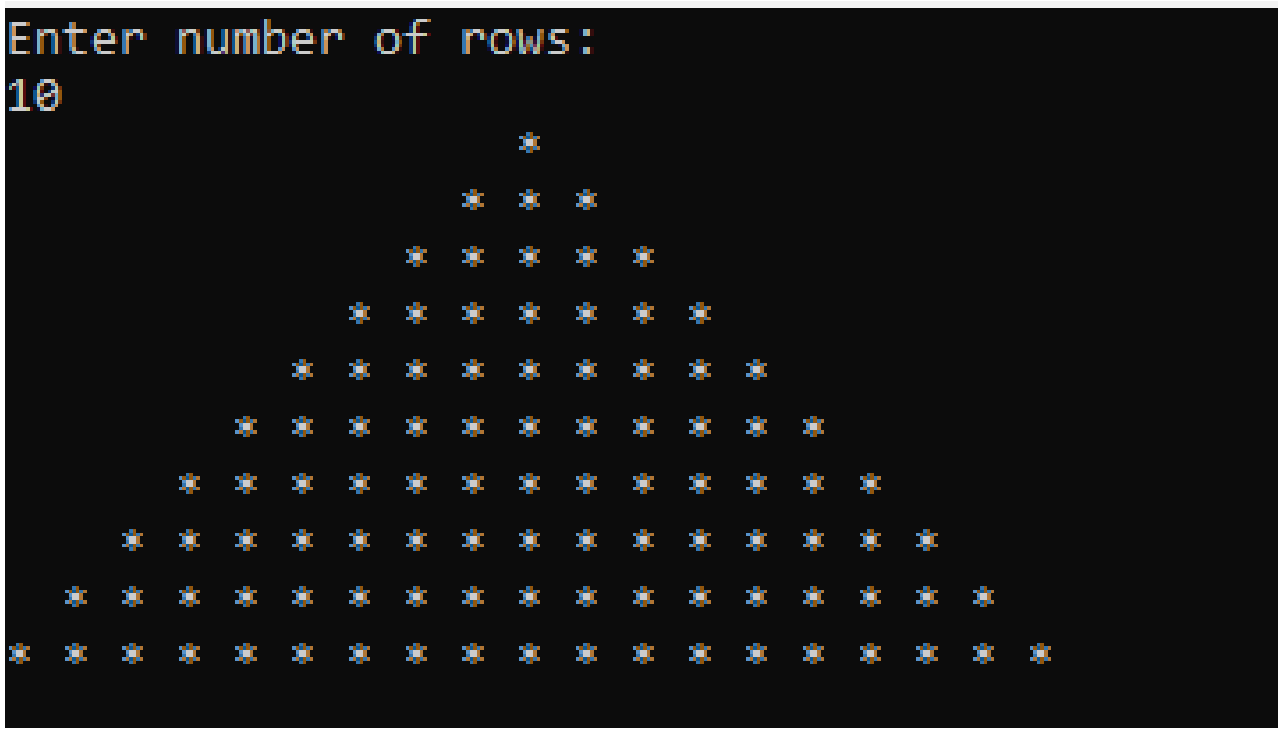
Guess output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    int rows,i, j, k;

    cout << "Enter number of rows: ";
    cin >> rows;
    k=1;
    for(i = 1; i <= rows; i++)
    {
        for(j = 1; j <= i; ++j)
        {
            cout << k << " ";
            ++k;
        }

        cout << endl;
    }

    return 0;
}
```

```
Enter number of rows: 5
1
2 3
4 5 6
7 8 9 10
11 12 13 14 15
```

Three important pyramids

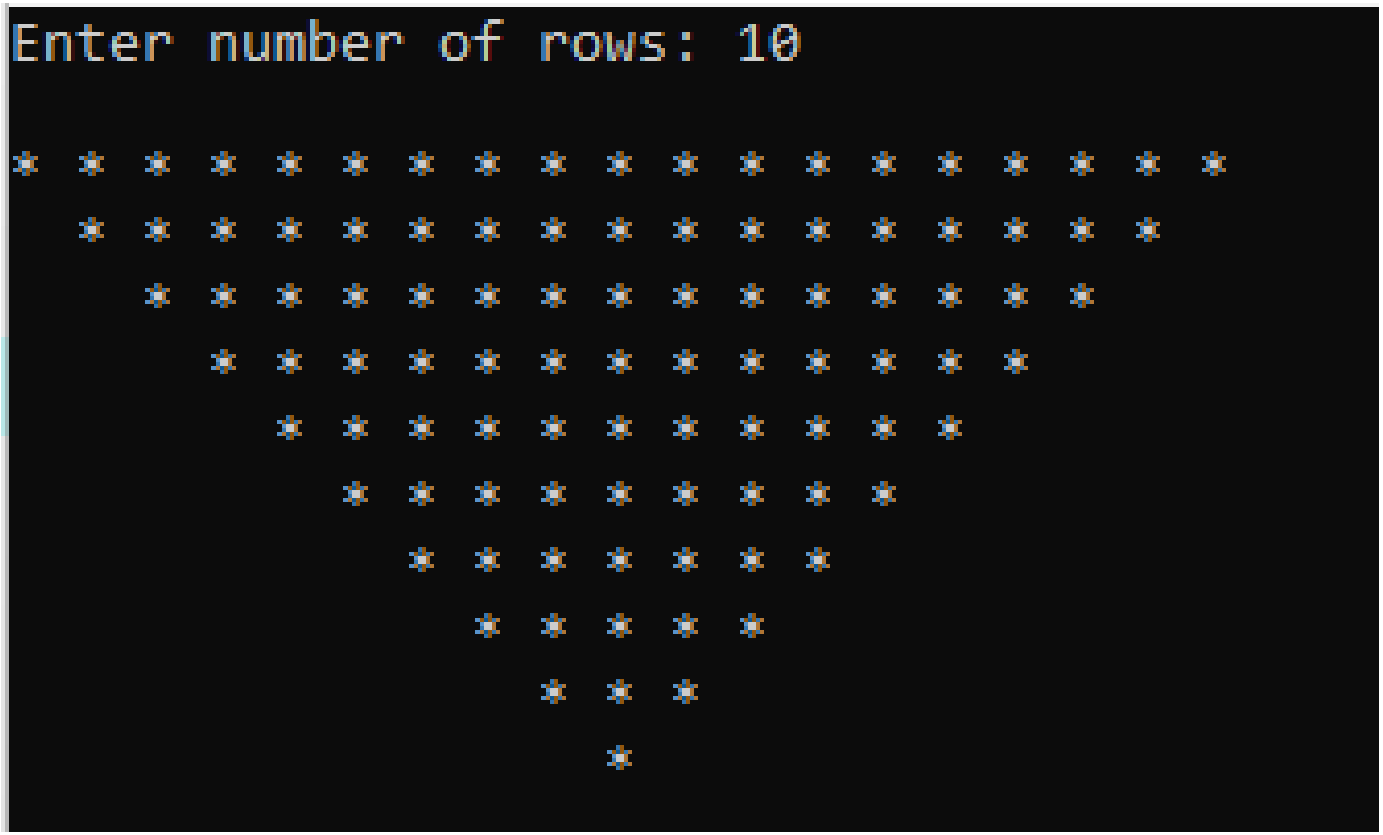
Write a program to print the following pattern.



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

int main()
{   int space, rows, i, j,k;

    cout <<"Enter number of rows: "<<endl;
    cin >> rows;

    for(i = 1; i <= rows; ++i)
    {
        for(space = 1; space <= rows-i; ++space)
        {
            cout <<"  ";
        }
        k=0;
        while(k != 2*i-1)
        {
            cout << "* ";
            ++k;
        }
        cout << endl;
    }
    return 0;
}
```

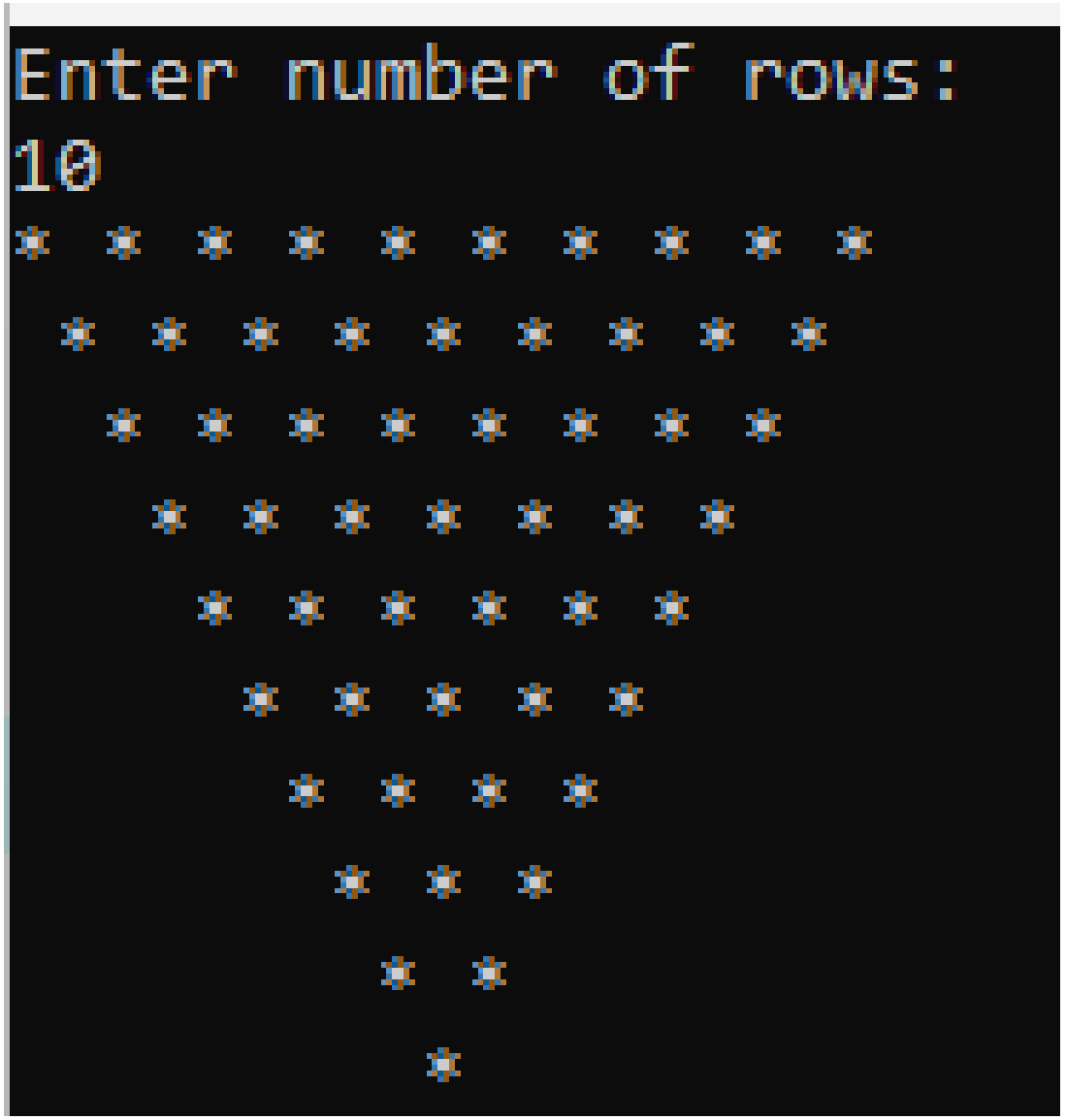
```
#include <iostream>
using namespace std;
int main()
{   int space, rows, i, j,k;

    cout <<"Enter number of rows: "<<endl;
    cin >> rows;
    for(i = 1; i <= rows; ++i)
    {
        for(space = 1; space <= rows-i; ++space)
        {
            cout <<"  ";
        }
        for(k=0;k != 2*i-1;++k)
        {
            cout << "* ";
        }
        cout << endl;
    }
    return 0;
}
```

Write a program to print the following pattern.



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

int main() {

    int rows, i, j, space;

    cout << "Enter number of rows: ";
    cin >> rows;
     cout<<endl;
    for(i = rows; i >= 1; --i)
    {
        for(space = 1; space <= rows-i; ++space)
            cout << "  ";

        for(j = i; j <= 2*i-1; ++j)
            cout << "* ";

        for(j = 0; j < i-1; ++j)
            cout << "* ";

        cout << endl;
    }

    return 0;
}
```

Write a program to print the following pattern.



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

int main()
{   int space, rows, i, j,k;

    cout <<"Enter number of rows: "<<endl;
    cin >> rows;

    for(i = 0; i <=rows-1; ++i)
    {
        for(space = 0; space < i; ++space)
        {
            cout <<" ";
        }
        for(j =space ; j < rows; ++j)
            cout << "* ";


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

Today Class Test-1 at 5 pm