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For Loop

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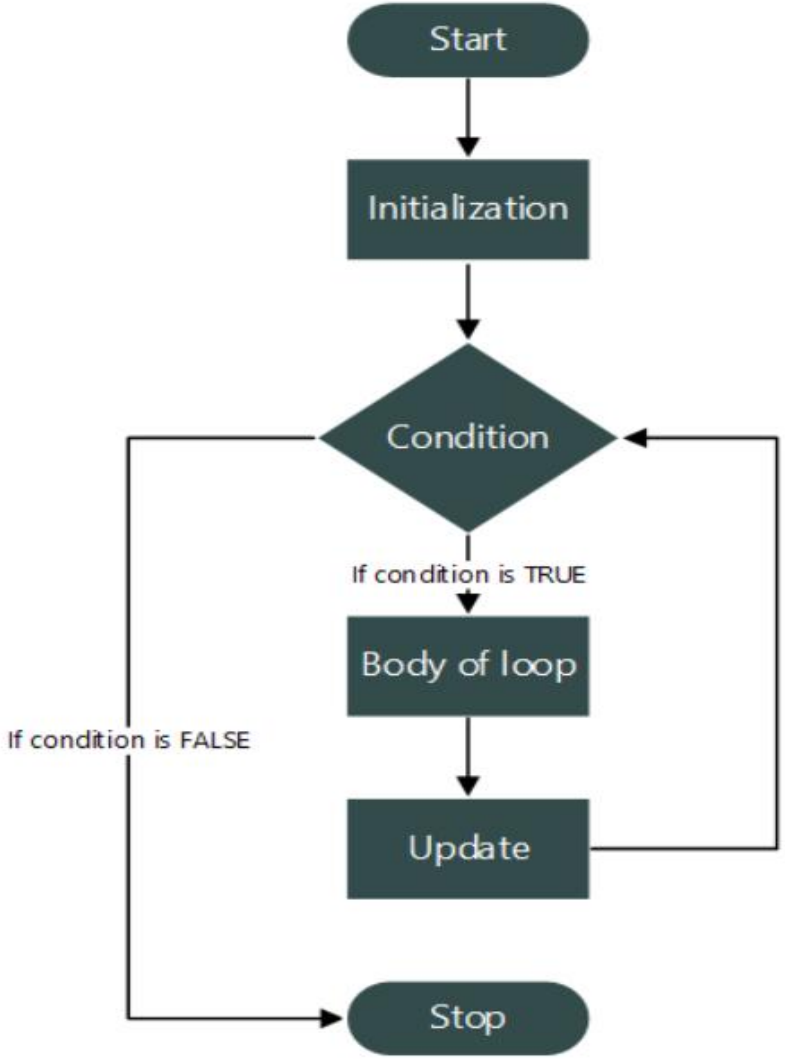
for loop Syntax

```
for (initialization; condition test; increment or
decrement)
{
//statements to be executed repeatedly
}
```



for loop Flow chart

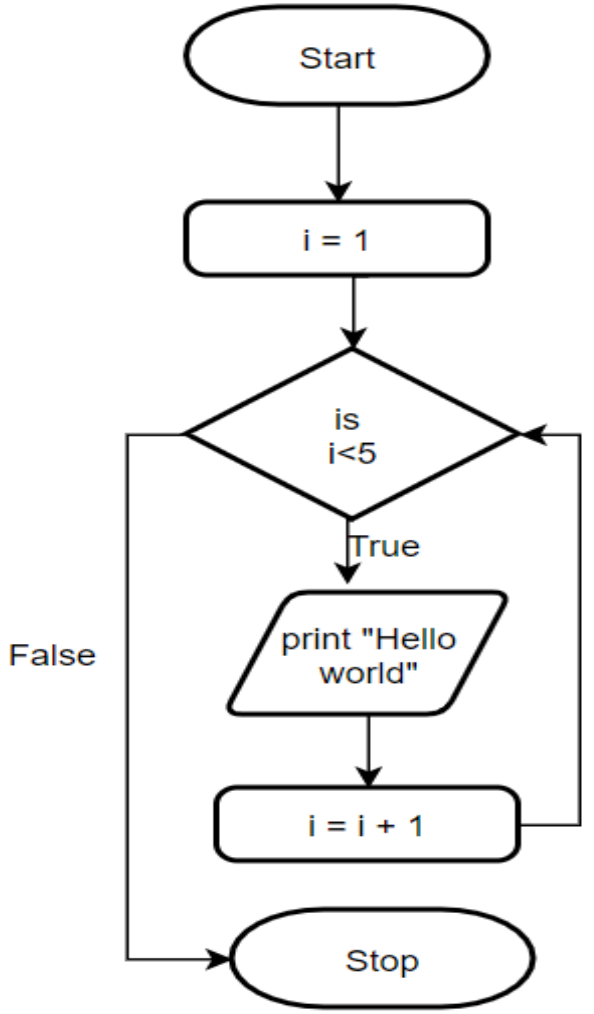
Program: for loop

Write a program to print "Hello World" 4 times using

for (int i =1; i < 5; i ++)

Algorithm:

Step 1: Start
Step 2: i = 1
Step 3: if(i > 5)
THEN GOTO Step 7
ENDIF
Step 4: print "Hello World"
Step 5: i = i +1
Step 6: Go to Step 3
Step 7: Stop



Program: for loop

```
int main()
{
    int i;
    for(i=1;i<5;i++)
    {
    cout<<"Hello, World!\n";
    }
    return 0;
}
```

Output

```
Hello, World!
Hello, World!
Hello, World!
Hello, World!
```

Algorithm & Flowchart to print multiplication Table of a number

Algorithm

Step-1 Start

Step-2 Input Value of NUM

Step-3 I = 1

Step-4 IF (I >10) THEN
GO TO Step 9
ENDIF

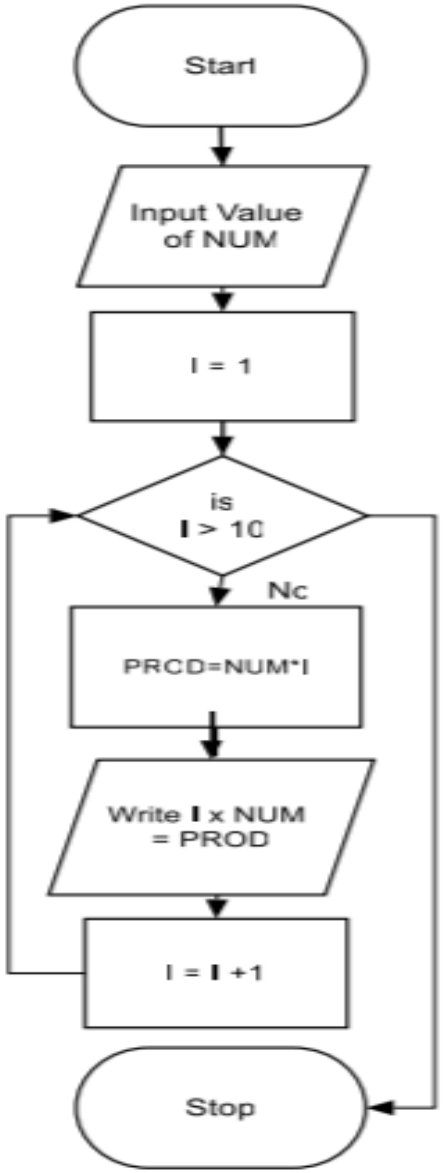
Step-5 PROD = NUM * I

Step-6 WRITE I "x" NUM "=" PROD

Step-7 I = I + 1

Step-8 Go to step-4

Step-9 Stop



Various forms of for loop in C

- 1) Here instead of num++, I'm using num=num+1 which is same as num++.
- `for (num=10; num<20; num=num+1)`

- 2) Initialization part can be skipped from loop as shown below, the counter variable is declared before the loop.
- `int num=10;`
- `for (;num<20;num++)`

Various forms of for loop in C

3) Like initialization, you can also skip the increment part as we did below. In this case semicolon (;) is must after condition logic. In this case the increment or decrement part is done inside the loop.

```
for (num=10; num<20; )
{
    //Statements
    num++;
}
```

4) This is also possible. The counter variable is initialized before the loop and incremented inside the loop.

```
int num=10;
for (;num<20;)
{
    //Statements
    num++;
}
```

Various forms of for loop in C

- 5) As mentioned above, the counter variable can be decremented as well. In the below example the variable gets decremented each time the loop runs until the condition num>10 returns false.
- `for(num=20; num>10; num--)`

Example of for loop with multiple test conditions

```
int main()
{
    int i,j;
    for (i=1,j=1 ; i<3 || j<5; i++,j++)
    {
      cout<<i<<j;
    }
    return 0;
}
```

Programs on for loop

1. Write a program to print numbers from 1 to 10
2. Write a program to calculate sum of first n natural numbers
3. Write a program in C to read 10 numbers from keyboard and find their sum an average
4. WAP to print N Fibonacci number up to N using for loop.
5. Write a program in C to display the cube of the number upto a given integer.
6. Write a program in C to display the multiplication table of a given integer

```
int main()
 {
    int a=0, b=1, num, c, sum=0;

    cout<<“Enter the number of terms:”;
    cin>>num;

    cout<<"The fibonacci series is: \t”;

    for(i=1; i<=num; i++) /* prints series for n number of terms */
    {
       cout<<a;
       sum = sum + a;
       c = a + b;
       a = b;
       b = c;
    }
}
```

output for num =9?

0 1 1 2 3 5 8 13 21

Nested Loops

- How many times will the string "Here" be printed?

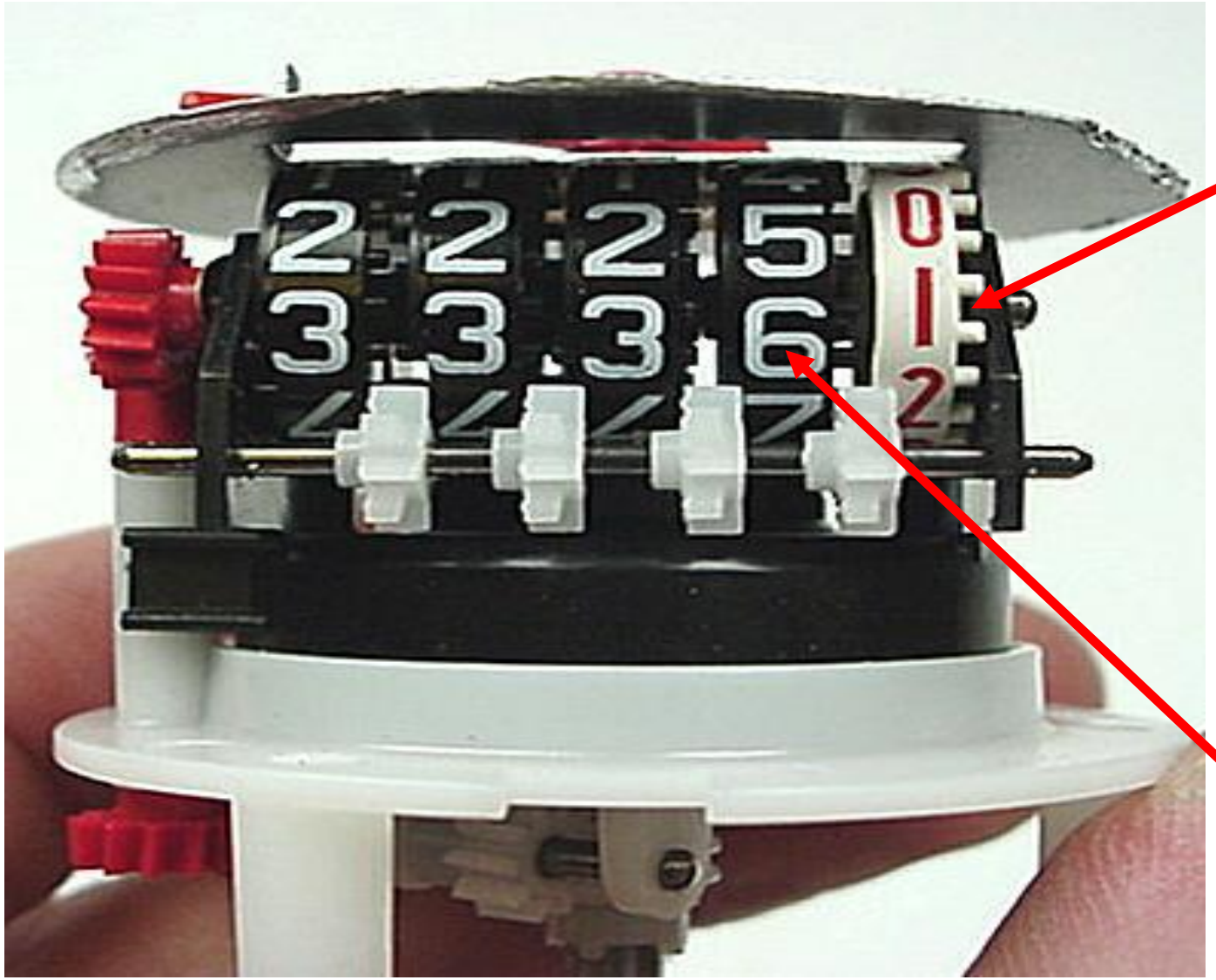
```
count1 = 1;
while (count1 <= 10)
{
    count2 = 1;
    while (count2 <= 20)
    {
        cout<<"Here";
        count2++;
    }
    count1++;
}
```

10 * 20 = 200

Analogy for Nested Loops

http://www.brandondufau.com/archives/odometer%201.jpg

Analogy for Nested Loops



http://static.howstuffworks.com/gif/odometer2.jpg

Nested For Loop in C

- **Its Show time**

Nested For Loop

write logic for sorting elements in the array

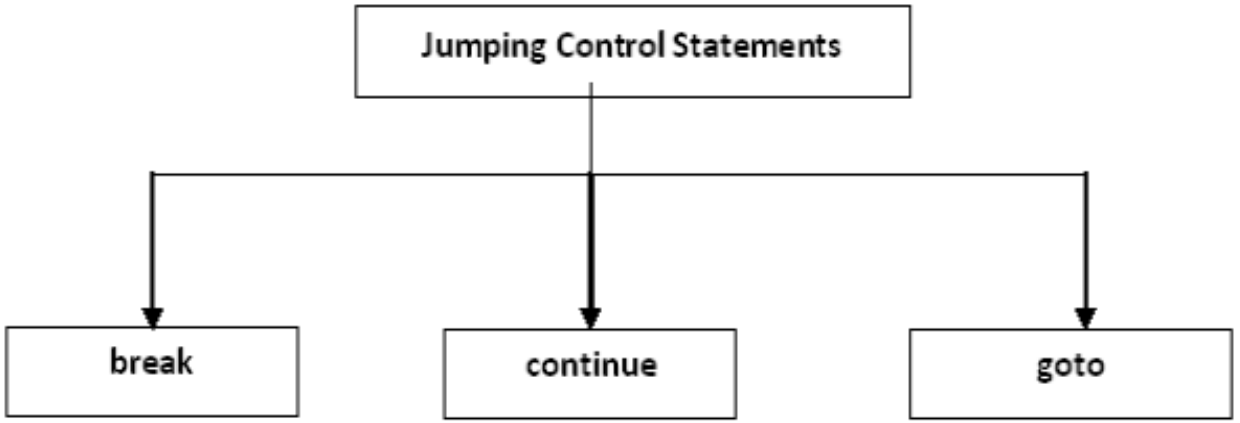
```
for(i=0;i<n-1;i++)
    {
       for(j=0;j<n-1-i;j++)
       {
          if(arr[j]>arr[j+1])
          {
             temp=arr[j];
             arr[j]=arr[j+1];
             arr[j+1]=temp;
          }
       }
    }
```

What's the output for following code

```
for (i=0;i<2;i++)
{
for(j=0;j<4;j++)
{
cout<<i<<j;
}
}
```

Jumping control-flow statements.

Jumping control-flow statements are the control-flow statements that transfer the control to the specified location or out of the loop or to the beginning of the loop. There are 3 jumping control statements:



Jumping control-flow statements.

The "break" statement is used with in the looping control statements, switch statement and nested loops. When it is used with the for, while or do-while statements, the control comes out of the corresponding loop and continues with the next statement.

```
Any loop
{
    statement_1;
    statement_2;
        :
    break;
        :
}
next_statement
```

```
#include <iostream>

int main() {
   for (int i = 1; i <= 10; ++i) {
      if (i == 6) {
         break; // Exit the loop
      }
      std::cout << i << " ";
   }
   return 0;
}
```

Jumping control-flow statements.

A continue statement is used within loops to end the execution of the current iteration and proceed to the next iteration. It provides a way of skipping the remaining statements in that iteration after the continue statement.

```
Any loop
{
    statement_1;
    statement_2;
        :
    continue;
        :
}
next_statement
```

```
#include <iostream>
int main() {
   int n;
   int sum = 0;

   // This loop will run 10 times
   for (int i = 1; i <= 10; ++i) {
      std::cout << "Enter a number: ";
      std::cin >> n;

      // If the number is negative, skip the addition
      if (n < 0) {
         std::cout << "Negative number skipped." << std::endl;
         continue; // Go to the next loop iteration
      } else {
         // Add the non-negative number to the sum
         sum = sum + n; // Or use the shorthand: sum += n;
      }

      // The original code prints the sum on every iteration
      std::cout << "Running total: " << sum << std::endl;
   }
   return 0;
}
```

Jumping control-flow statements.

```
#include <iostream>
int main() {
   for (int i = 0; i < 10; ++i) {
      // If i is 5, skip the rest of this iteration
      // and go to the next one (i=6).
      if (i == 5) {
         continue;
      }

      // Print the current value of i.
      // I've added a space for readability.
      std::cout << i << " ";

      // If i is 8, print it and then
      // terminate the loop immediately.
      if (i == 8) {
         break;
      }
   }
   std::cout << std::endl; // For a clean newline at the end.
   return 0;
}
```

Jumping control-flow statements.

```
#include <iostream>

int main() {
   for (int i = 0; i < 10; ++i) {
      // If i is 5, skip the rest of this iteration
      // and jump to the next one (where i becomes 6).
      if (i == 5) {
         continue;
      }

      // Print the current value of i.
      // I've added a space for better readability.
      std::cout << i << " ";

      // If i is 8, print it first, and then
      // terminate the loop immediately.
      if (i == 8) {
         break;
      }
   }
   std::cout << std::endl; // For a clean newline at the end.
   return 0;
}
```

Jumping control-flow statements.

Difference Between break and continue:

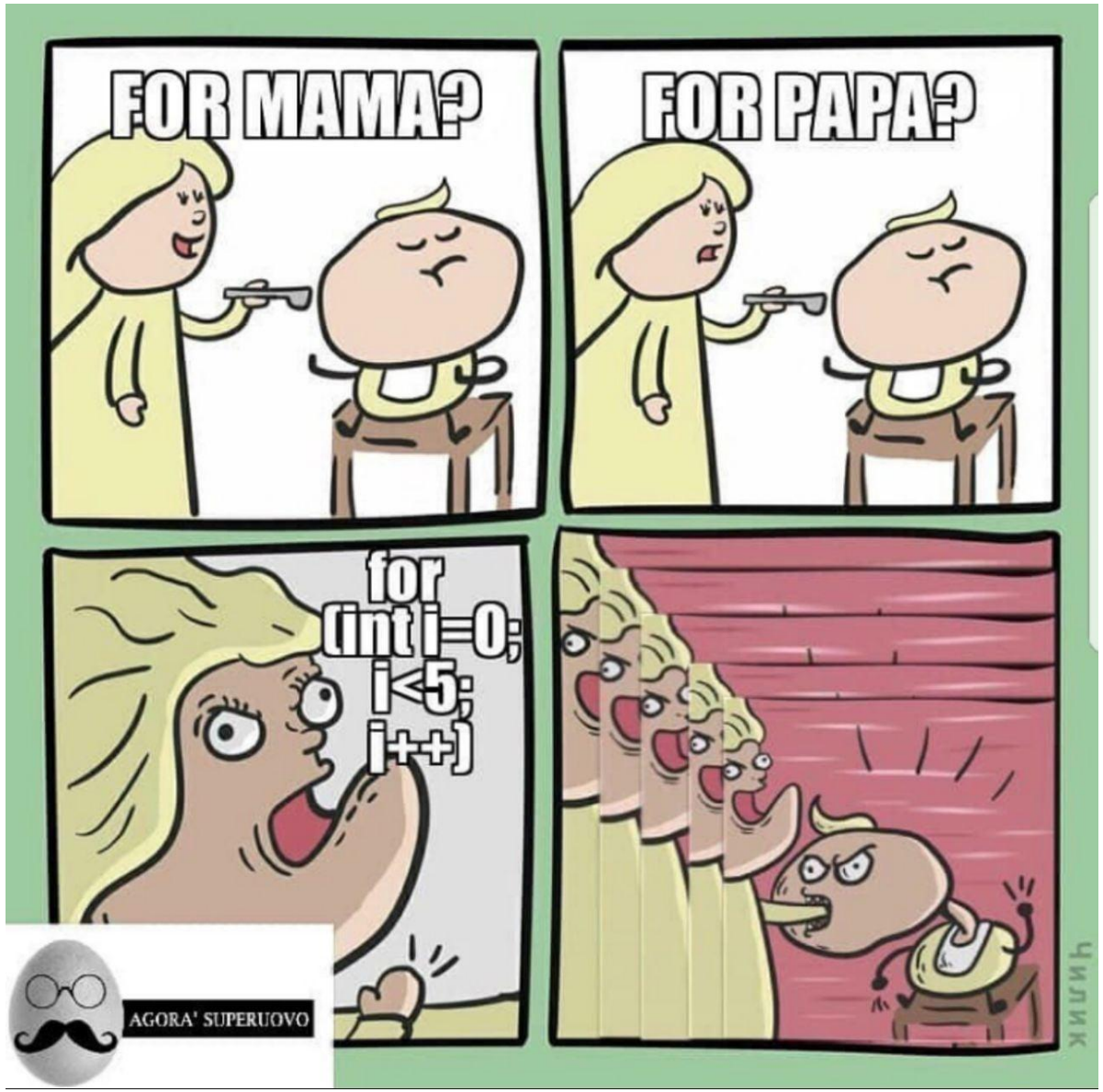
break	continue
A `break` can appear in both `switch` and loop (`for`, `while`, `do`) statements.	A `continue` can appear only in loop (`for`, `while`, `do`) statements.
A `break` causes the `switch` or loop statements to terminate the moment it is executed. Loop or `switch` ends abruptly when break is encountered.	A `continue` doesn't terminate the loop, it causes the loop to go to the next iteration. All iterations of the loop are executed even if `continue` is encountered. The `continue` statement is used to skip statements in the loop that appear after the `continue`.
When a `break` statement is encountered, it terminates the block and gets the control out of the `switch` or loop.	When a `continue` statement is encountered, it gets the control to the next iteration of the loop.
A `break` causes the innermost enclosing loop or `switch` to be exited immediately.	A `continue` inside a loop nested within a `switch` causes the next loop iteration.

Jumping control-flow statements.

The goto statement transfers the control to the specified location unconditionally. There are certain situations where goto statement makes the program simpler. For example, if a deeply nested loop is to be exited earlier, goto may be used for breaking more than one loop at a time. In this case, a break statement will not serve the purpose because it only exits a single loop.

```
label:
        {
        statement_1;
        statement_2;
                :
        }
        :
    goto label;
```

- In this syntax, goto is the keyword and label is any valid identifier and should be ended with a colon (:).
- The identifier following goto is a statement label and need not be declared. The name of the statement or label can also be used as a variable name in the same program if it is declared appropriately.


FOR MAMA?
FOR PAPA?
for (int i=0; i<5; i++)
AGORA' SUPERUOVO
Чилик

Thank you