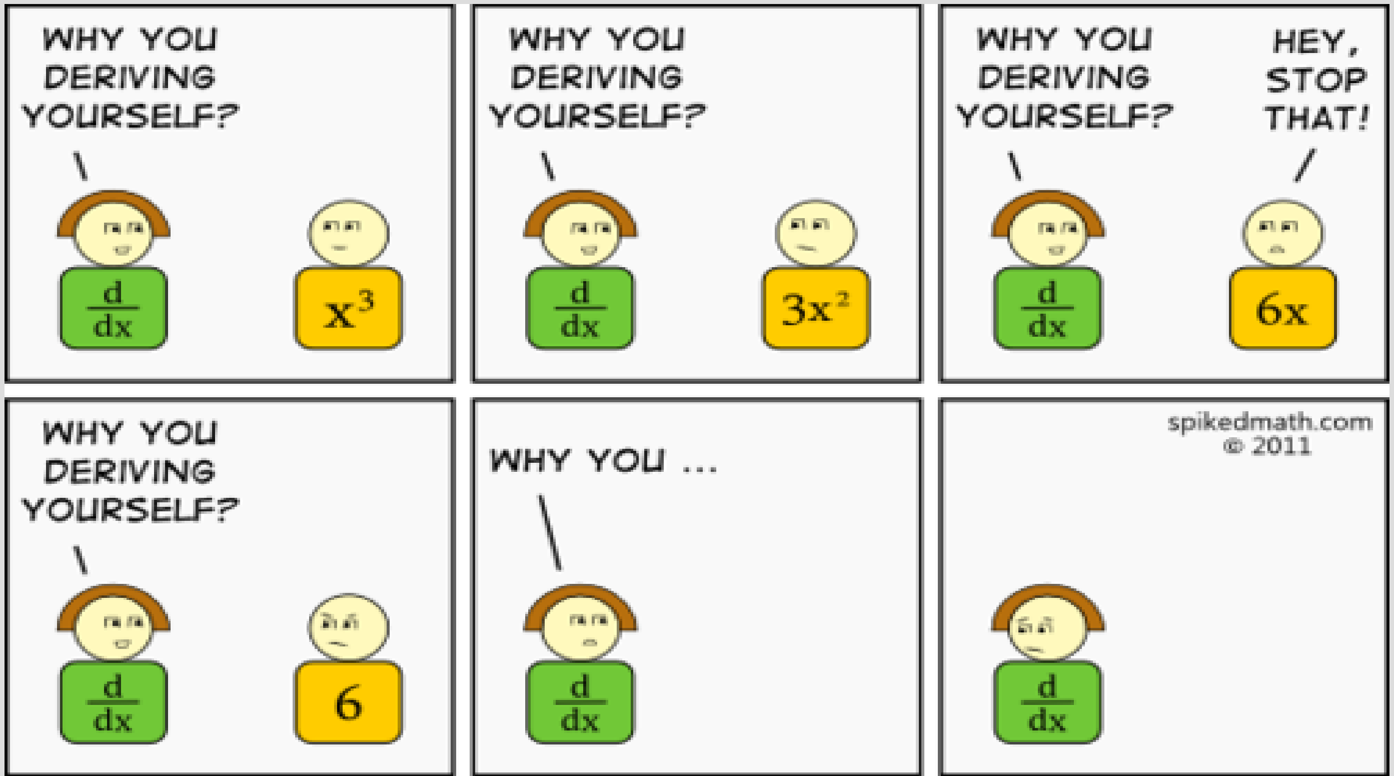
Loops

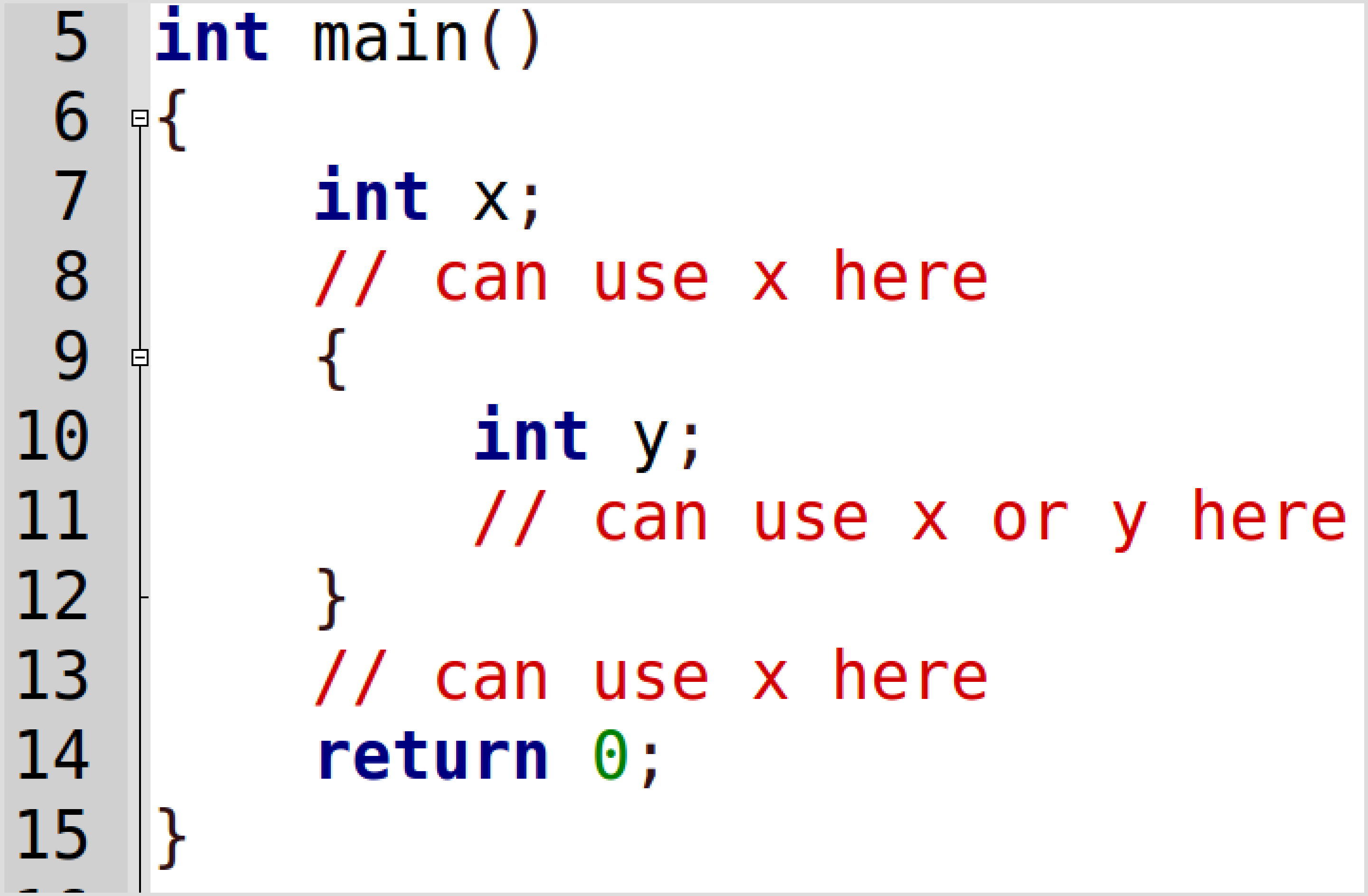
Ch 3.3-3.4



Announcements

HW 0 due tonight
(check that it compiles on CSE labs)
(make sure you submit the code part)

Scope



```
int main()
{
    int x;
    // can use x here
    {
        int y;
        // can use x or y here
    }
    // can use x here
    return 0;
}
```

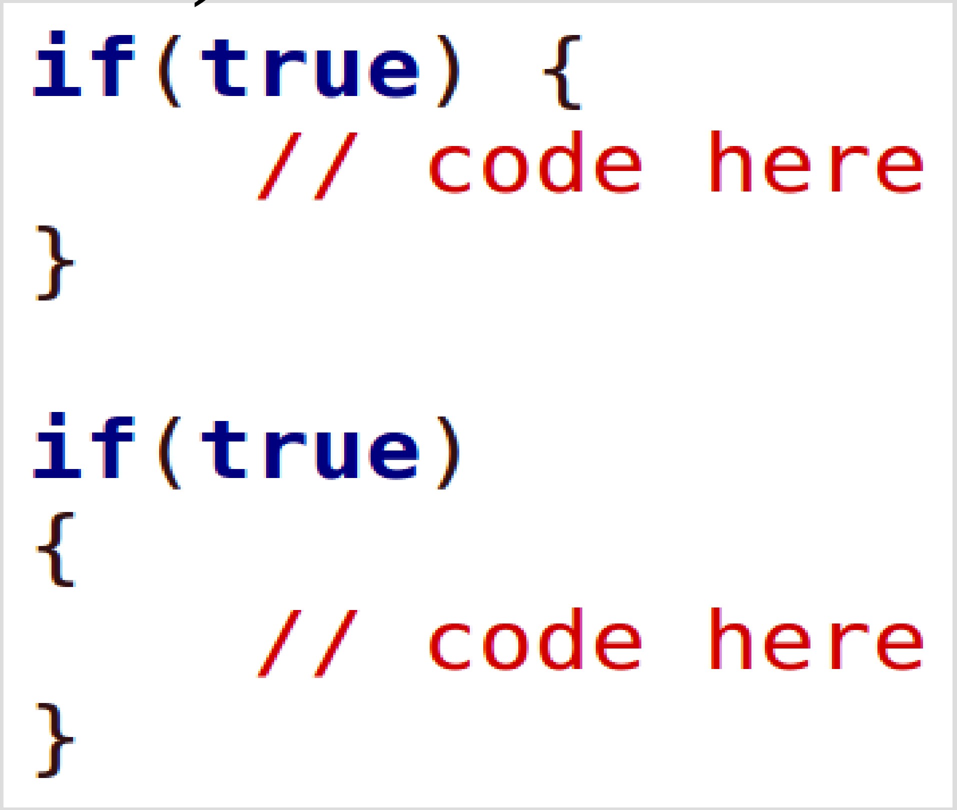
(See last time: scope.cpp)

If... if... else!

When in doubt, use parenthesis and blocks! (Some people like to put the first brace after the if, others on a new line)

What happens if you have an if if else?

(See: ifIfElse.cpp)



```
if(true) {
	// code here
}

if(true)
{
	// code here
}
```

Multiway if/else

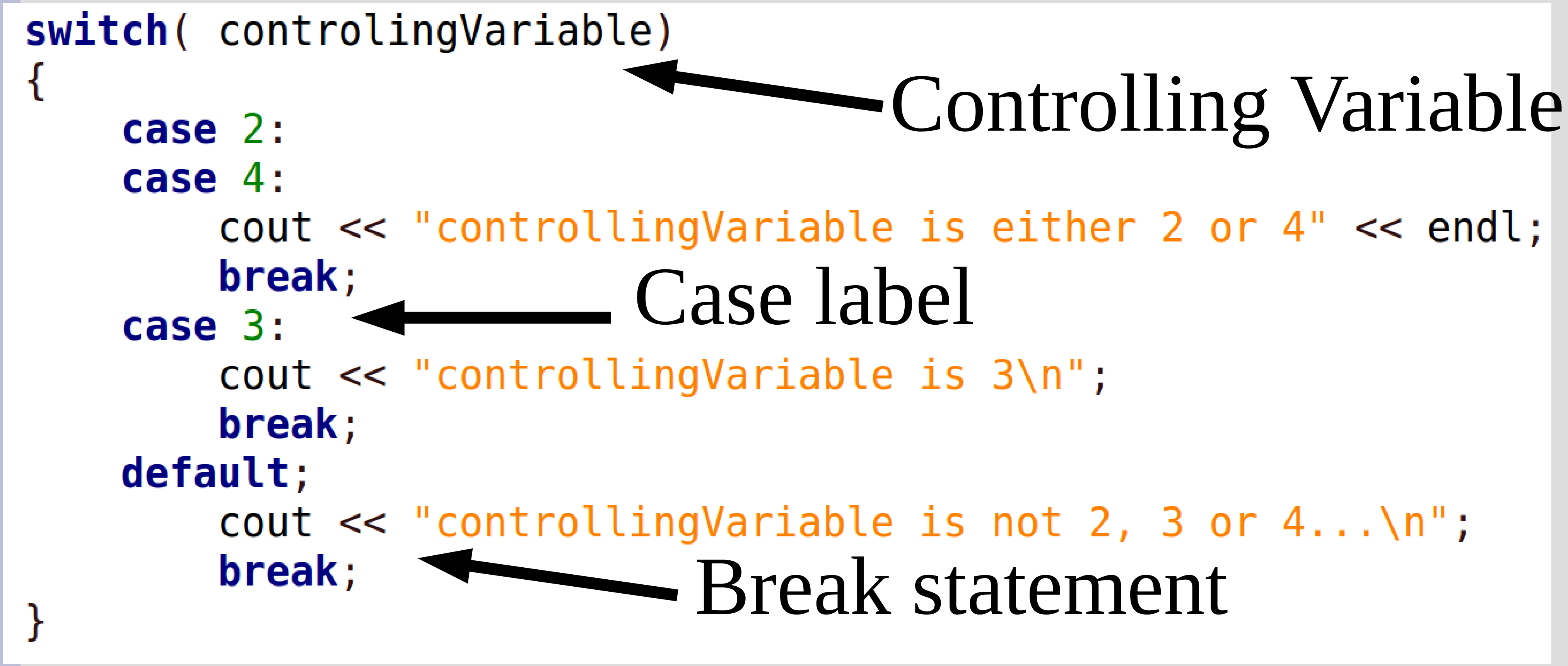
This is a special format if you put an if statement after an else.

This second “if statement” only is tested when the first “if statement” is not true

(See: grades.cpp)

Switch

A <u>switch statement</u> checks to see if a variable has a specific value.



```
switch( controlingVariable)
{
    case 2:
    case 4:
        cout << "controllingVariable is either 2 or 4" << endl;
        break;
    case 3:
        cout << "controllingVariable is 3\n";
        break;
    default;
        cout << "controllingVariable is not 2, 3 or 4...\n";
        break;
}
```

Switch

If the value of the controlling variable
is found in a case label, all code until
a break statement is ran (or the switch ends)

Switch statements only test equality
with case labels (not greater or less than)

(See: switch.cpp)

Switch

Switch statements can be written as multiway if/else statements.

Could use just “if statements” but “else if” shows only one of these will run

(See: switchToIf.cpp)

Conditional operator

We will not use in this class, but if you use other people's code you will encounter

Shorthand for an if-else statement

(boolean) ? [if true] : [if false]

Example:

```
max = (x>y) ? x : y;
```

(See: max.cpp)

if/else vs loops

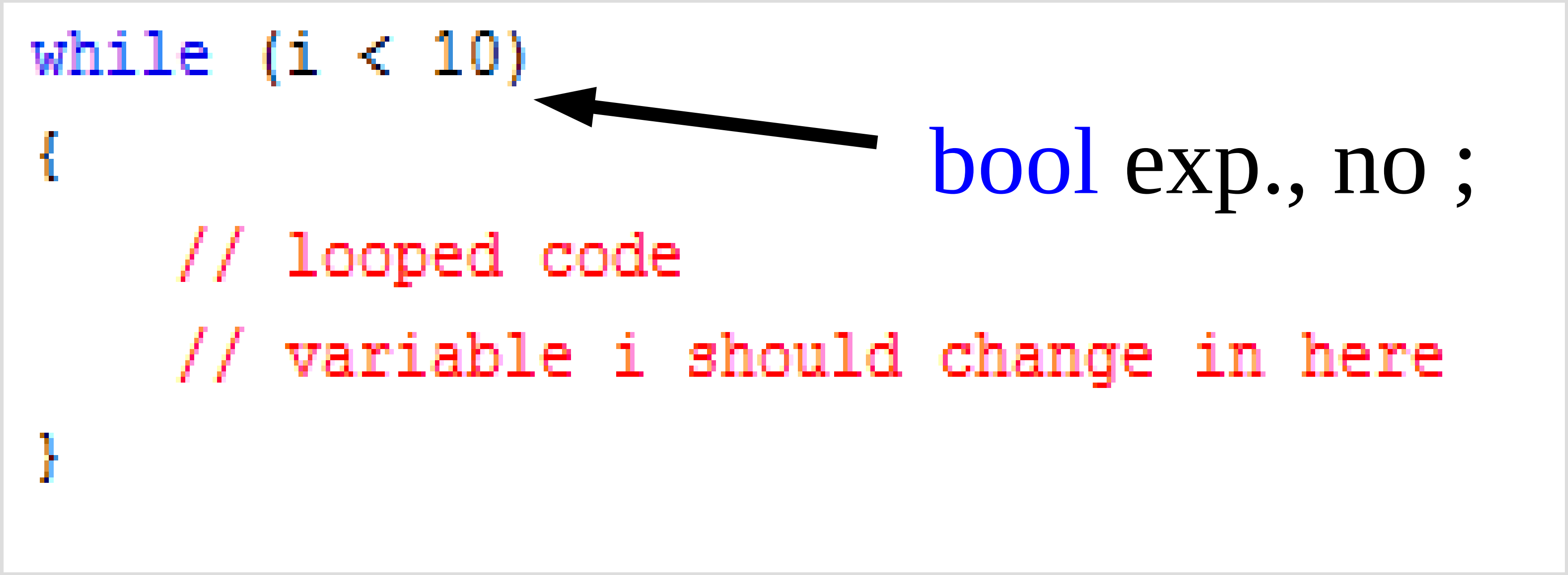
if/else statements makes code inside only sometimes run

Loops make code inside run more than once

Both use boolean expressions to determine if the code inside is run

while loop

A while loop tests a bool expression and will run until that expression is false



```
while (i < 10)
{
    // looped code
    // variable i should change in here
}
```

bool exp., no ;

(See: whileLoop.cpp)

while loop

The bool expression is tested when first entering the while loop

And!

When the end of the loop code is reached (the } to close the loop)

```
int i = 0;
while (i < 5) {
    cout << "Looping, i = " << i << "\n";
    i++;
}
cout << "Outside the loop, i = " << i << "\n";
```

while loop

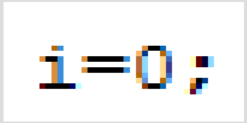
It can be helpful to manually work out what loops are doing and how variables change in each loop iteration

This will build an insight into how loops work and will be beneficial when working with more complicated loops

while loop

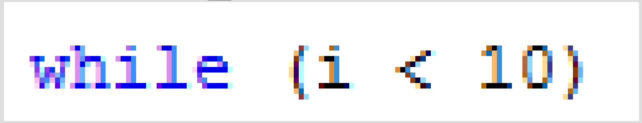
3 parts to any (good) loop:

- Test variable initialized



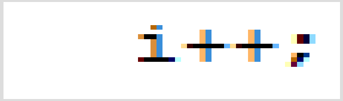
```
i=0;
```

- bool expression



```
while (i < 10)
```

- Test variable updated inside loop

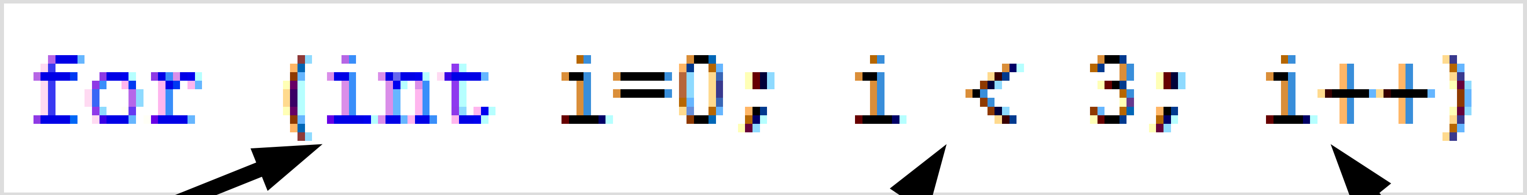


```
    i++;
```

for loop

A for loop is a compacted version of the while loop (the 3 important parts are together)

for loops are used normally when iterating over a sequence of numbers (i.e. 1, 2, 3, 4)



```
for (int i=0; i < 3; i++)
```

Initialization

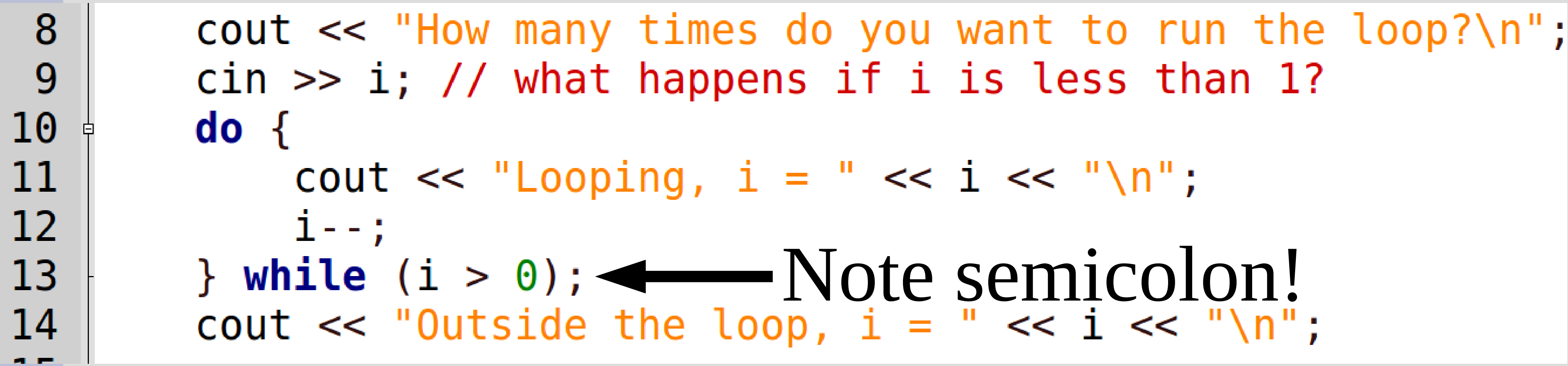
boolean expression

Update

(See: forLoop.cpp)

do-while loop

A do-while loop is similar to a normal while loop, **except** the bool expression is only tested at the end of the loop (not at the start)



```
    cout << "How many times do you want to run the loop?\n";
    cin >> i; // what happens if i is less than 1?
    do {
        cout << "Looping, i = " << i << "\n";
        i--;
    } while (i > 0);
    cout << "Outside the loop, i = " << i << "\n";
```

Note semicolon!

(See: doWhile.cpp)

do-while loop

Q: Why would I ever want a do-while loop?

A: When the first time the variable is set is inside the loop.

You can initialize the variable correctly and use a normal while loop, but this makes the logic harder

Loops

99 bottles of beer on the wall, 99 bottles of beer!
Take one down, pass it around, 98 bottles of beer on the wall!

98 bottles of beer on the wall, 98 bottles of beer!
Take one down, pass it around, 97 bottles of beer on the wall!

97 bottles of beer on the wall, 97 bottles of beer!
Take one down, pass it around, 96 bottles of beer on the wall!
...

Write a program to output the above song
(See 99beer.cpp)

continue

There are two commands that help control loops:

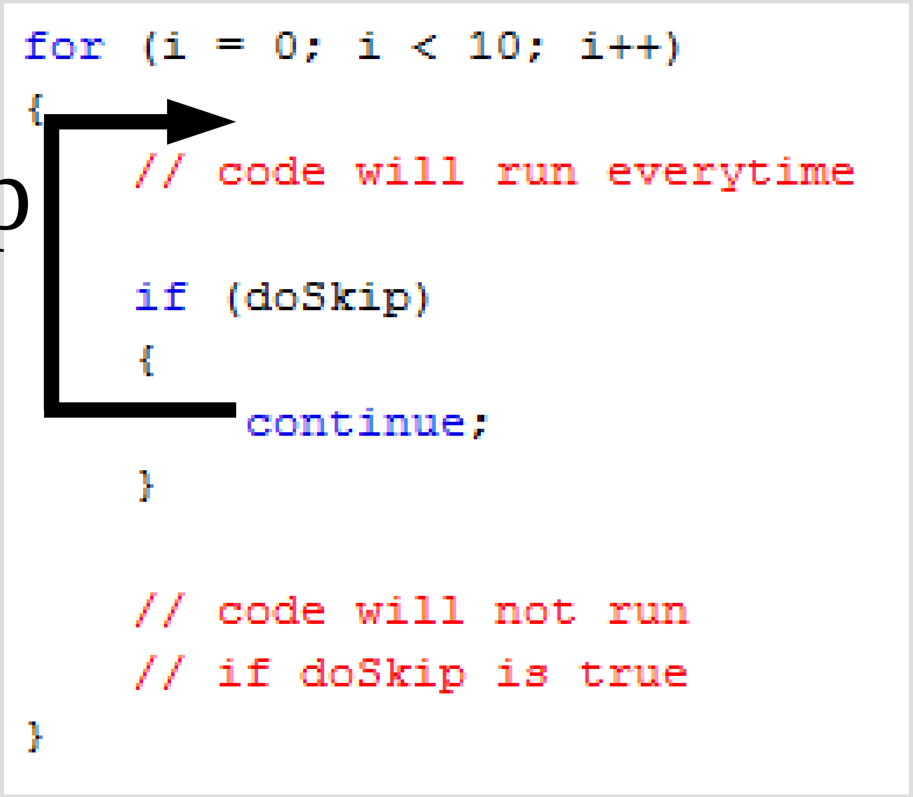
<u>continue</u> tells the loop to start over again

<u>break</u> stops the loop

continue

continue command can be issued to start at the next iteration of a loop

doSkip
true

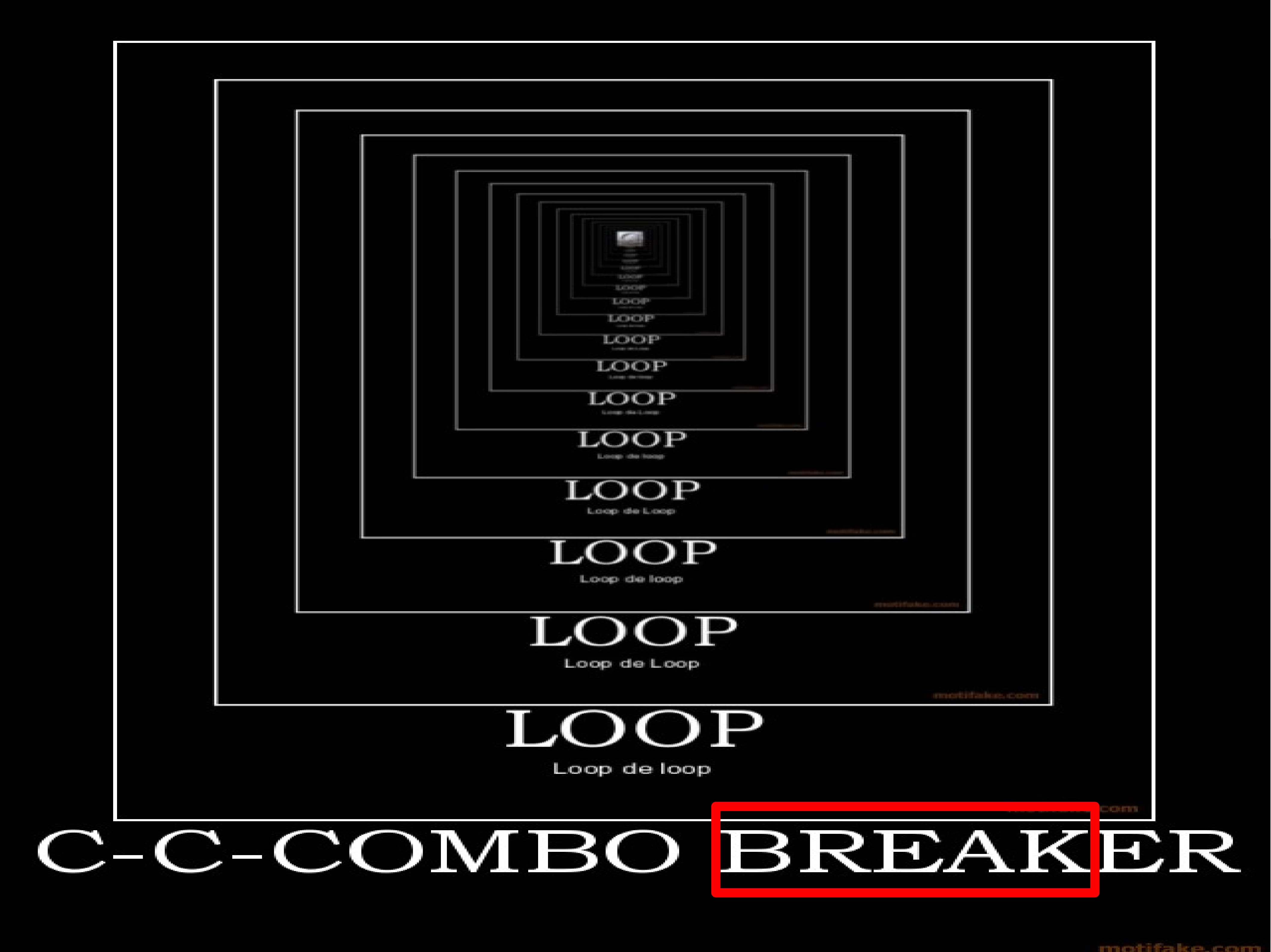


```
for (i = 0; i < 10; i++)
{
    // code will run everytime

    if (doSkip)
    {
        continue;
    }

    // code will not run
    // if doSkip is true
}
```

(See: continue.cpp)


LOOP
Loop de Loop
LOOP
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LOOP
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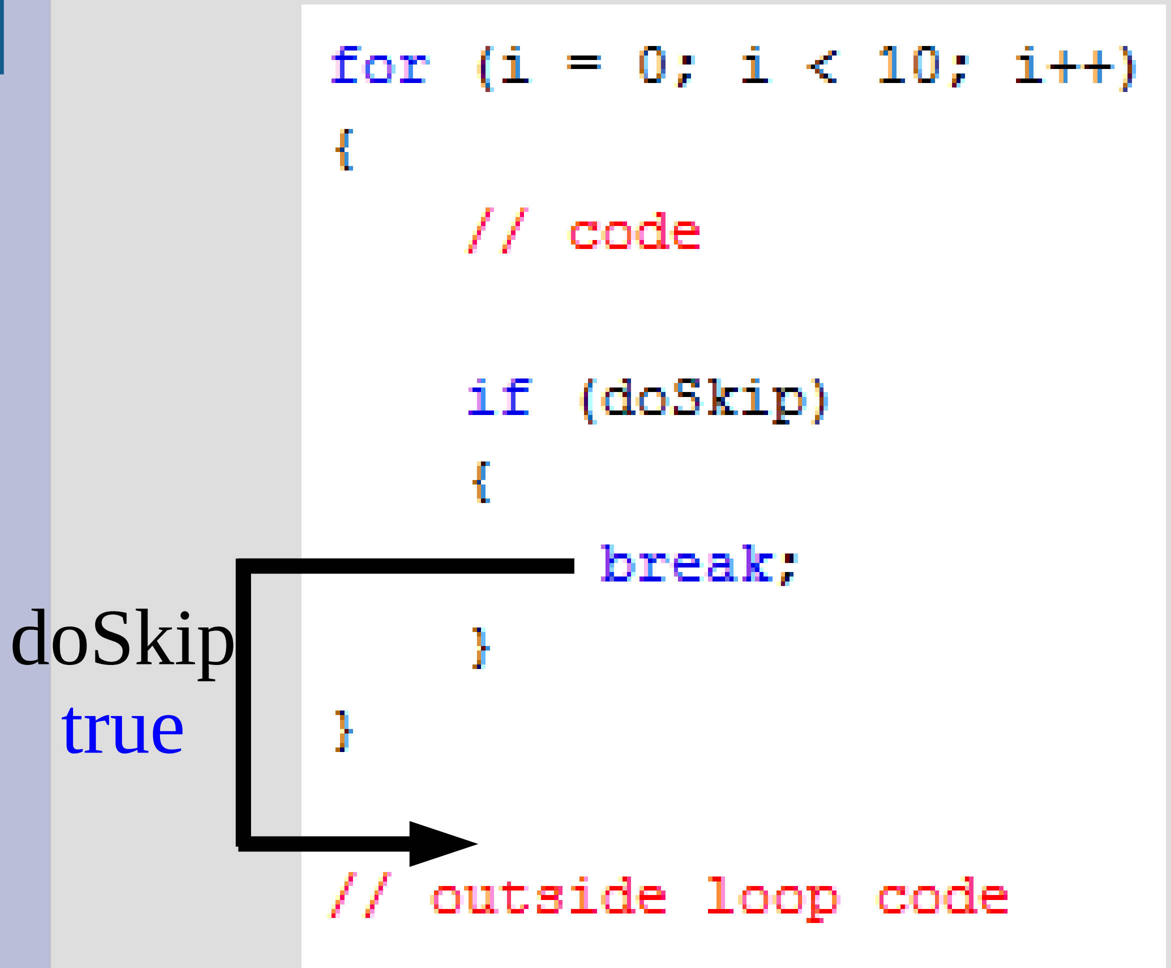
Loop de loop
LOOP
Loop de loop
C-C-COMBO BREAKER
motifake.com

break

- <u>break</u> will exit the current loop

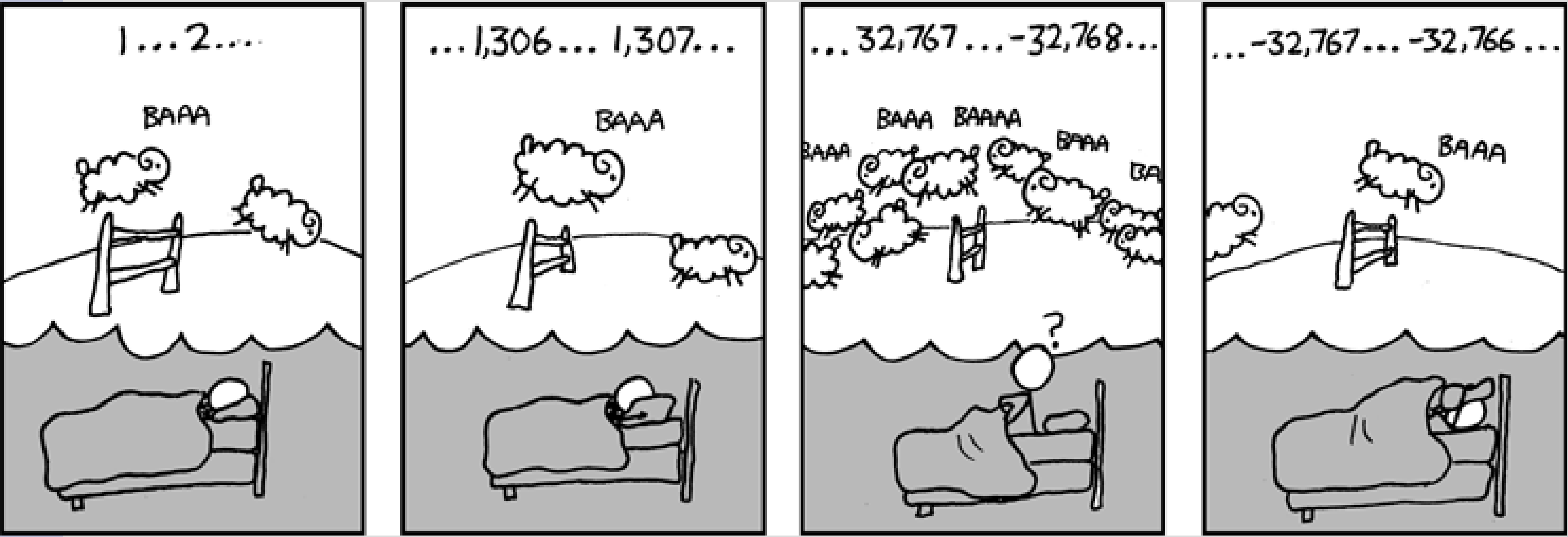


```
for (i = 0; i < 10; i++)
{
    // code

    if (doSkip)
    {
        break;
    }
}

// outside loop code
```

(See: break.cpp)

Infinite loops

(See: countingSheep.cpp)



while loop

https://www.youtube.com/watch?v=7-Nl4JFDLOU

Loops to sum

Loops allow you to decide how many times a piece of code should run on the fly (i.e. at run time, not compile time)

You can either directly prompt the user how many times or make a special value to "exit" on

(See: sumLoop.cpp)

Debugging

When your program is not working, it is often helpful to add cout commands
to find out what is going on

Normally displaying the value of your variables will help you solve the issue

Find up until the point where it works, then show all the values and see what is different than you expected