Logical operators

Logical Operators

Following table shows all the logical operators supported by C language. Assume variable **A** holds 1 and variable **B** holds 0, then –

Show Examples

Operator	Description	Example
&&	Called Logical AND operator. If both the operands are non-zero, then the condition becomes true.	(A && B) is false.
||	Called Logical OR Operator. If any of the two operands is non-zero, then the condition becomes true.	(A || B) is true.
!	Called Logical NOT Operator. It is used to reverse the logical state of its operand. If a condition is true, then Logical NOT operator will make it false.	!(A && B) is true.

https://www.tutorialspoint.com/cprogramming/c_operators.htm

Logical operators example

logical_op.c:

```c
#include <stdio.h>
int main()
{
    int a = 5, b = 5, c = 10, result = 0;
    result = (a == b) && (c > b);
    printf("(a == b) && (c > b) equals to %d \n", result);
    result = (a == b) && (c < b);
    printf("(a == b) && (c < b) equals to %d \n", result);
    result = (a == b) || (c < b);
    printf("(a == b) || (c < b) equals to %d \n", result);
    result = (a != b) || (c < b);
    printf("(a != b) || (c < b) equals to %d \n", result);
    result = !(a != b);
    printf("!(a != b) equals to %d \n", result);
    result = !(a == b);
    printf("!(a == b) equals to %d \n", result);
}
```

```
$ gcc logical_op.c -std=c99 -pedantic -Wall -Wextra
$ ./a.out
(a == b) && (c > b) equals to 1
(a == b) && (c < b) equals to 0
(a == b) || (c < b) equals to 1
(a != b) || (c < b) equals to 0
!(a != b) equals to 1
!(a == b) equals to 0
```

Decision-statement summary (part 1)

- Suppose a represents some boolean expression (that is, a can be interpreted as having either value true or value false).


```
if (a) {
    printf("a is true\n");
}
```

```
if (a) {
    printf("a is true\n");
}
else {
    printf("a is false\n");
}
```

Decision-statement summary (part 2)

```
switch (integer expr) {

case c1: stmt1;   // execution starting point for c1
case c2: stmt2;
         break;   // exits switch block
case c3:                                  c3 || c4
case c4: stmt3;
         stmt4;   // executes stmt3, stmt4 and
                  // stmtlast for matches of c3 or c4
default: stmtlast;    // if no case matches

}
```

Switch statment example

switch_example.c:

```c
#include <stdio.h>

int main () {
   char grade = 'B';
   switch(grade) {
      case 'A' :
         printf("Excellent!\n");
         break;
      case 'B' :
      case 'C' :
         printf("Well done\n");
         break;
      case 'D' :
         printf("You passed\n");
         break;
      case 'F' :
         printf("Better try again\n");
         break;
      default :
         printf("Invalid grade\n");
   }
   printf("Your grade is  %c\n", grade);
}
```

this works b/c characters are much like integers in C

```
$ gcc switch_example.c -std=c99 -pedantic -Wall -Wextra
$ ./a.out
Well done
Your grade is  B
```

Compound assignments

Assignment operator	Sample expression	Explanation	Assigns
Assume: `int c = 3, d = 5, e = 4, f = 6, g = 12;`			
`+=`	`c += 7`	`c = c + 7`	10 to c
`-=`	`d -= 4`	`d = d - 4`	1 to d
`*=`	`e *= 5`	`e = e * 5`	20 to e
`/=`	`f /= 3`	`f = f / 3`	2 to f
`%=`	`g %= 9`	`g = g % 9`	3 to g

Fig. 3.11 | Arithmetic assignment operators.

Increment and decrement

```
int a = 10;
printf("%d", a++);
```

10

```
int b = 10;
printf ("%d", --b);
```

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Operator	Sample expression	Explanation
++	++a	Increment a by 1, then use the new value of a in the expression in which a resides.
++	a++	Use the current value of a in the expression in which a resides, then increment a by 1.
--	--b	Decrement b by 1, then use the new value of b in the expression in which b resides.
--	b--	Use the current value of b in the expression in which b resides, then decrement b by 1.

Fig. 3.12 | Increment and decrement operators

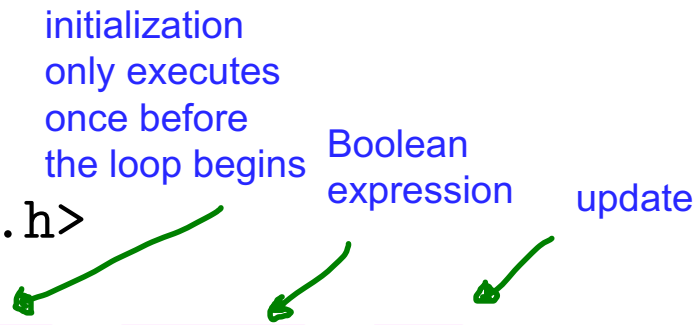
Loop summary

- `while(boolean expression) { statements }`
  - Iterates ≥ 0 times, as long as expression is true
- `do { statements } while(boolean expression)`
  - Iterates ≥ 1 times; always once, then more times as long as expression is true
- `for(initialize; boolean exp; update) { stmts }`
  - `initialize` happens first; usually declares & assigns "index variable"
  - Iterates ≥ 0 times, as long as boolean expression is true
  - Right after `stmts`, `update` is run; often it increments the index variable (`i++`)
- `break` immediately exits loop
- `continue` immediately proceeds to next iteration of loop

An example for loop

for_example.c:

```c
#include <stdio.h>
int main() {
    for(int i = 0; i < 10; i++) {
        printf("%d ", i);
    }
}
```



A loop that reads in values until no more are available

sum.c:

```
#include <stdio.h>
int main() {
    int sum = 0;
    int addend;  //addend's value is undefined to start
    //read as many integers as we can
    while (scanf("%d", &addend) == 1) {
        //accumulate the sum of all numbers
        sum += addend;
    }
    //output the sum
    printf("%d\n", sum);
    return 0;
}
```

keep going as long as another integer value can be read successfully from the standard input

This contnues to scan even when you press enter. To signal end-of-input, press `Ctrl-D` (possibly twice).

Less desirable loop to read in input

sum_less_clean.c:

```c
#include <stdio.h>
int main() {
    int sum = 0;
    while (1) {
        int addend = 0;
        if(scanf("%d", &addend) != 1) {
            break; // immediately exit loop
        }
        sum += addend;
    }
    printf("%d\n", sum);
    return 0;
}
```

bad practice: this is an infinite loop if you don't successfully "break" inside the loop

bad practice

The loop on the previous slide is preferred, since the loop body is cleaner. The code is more easy to follow, and less prone to errors.