Conditions and Loops

COMP1400 – Week 3

Relational Operators

==	**Equal to**
!=	**Not equal to**
>	**Greater than**
<	**Less than**
>=	**Greater than or equal to**
<=	**Less than or equal to**

Examples

```
7 == 5      // evaluates to false.
5 > 4       // evaluates to true.
3 != 2      // evaluates to true.
6 >= 6      // evaluates to true.
5 < 5       // evaluates to false.
```

Expressions in Relations

```
int a = 2;
int b = 3;
int c = 6;

a == 5      // evaluates to false since a is not equal to 5.
a*b >= c    // evaluates to true since (2*3 >= 6) is true.
b+4 > a*c   // evaluates to false since (3+4 > 2*6) is false.
(b=2) == a // evaluates to true.
```

Logical Operators

- `!` performs the Boolean operation NOT
- It has only one operand, on the right, and the only thing that it does is invert the value, producing false if its operand is true and true if its operand is false.

```
!(5 == 5)     // false because (5 == 5) is true.
!(6 <= 4)     // true because (6 <= 4) is false.
!true         // false
!false        // true.
```

Logical Operators

The operator `&&` corresponds to Boolean logical operation AND. This operation results true if both its two operands are true and false otherwise.

&& OPERATOR

a	**b**	**a && b**
true	true	true
true	false	false
false	true	false
false	false	false

The operator `||` corresponds to Boolean logical operation OR. This operation results true if either one of its two operands is true, false only when both operands are false.

|| OPERATOR

a	**b**	**a || b**
true	true	true
true	false	true
false	true	true
false	false	false

Examples

```
((5 == 5) && (3 > 6))  // evaluates to false ( true && false ).
((5 == 5) || (3 > 6))  // evaluates to true ( true || false ).

boolean test = ((5 == 5) || (3 > 6));  // assigns value.
```

if-then statement

```
boolean isMoving;
int currentSpeed;
```

```
void applyBrakes()
{
    // the "if" clause: bicycle must be moving
    if (isMoving)
    {
        // the "then" clause: decrease current speed
        currentSpeed--;
    }
}
```

```
void applyBrakes()
{
    // same as above but don't need braces for one statement
    if (isMoving)
        currentSpeed--;
}
```

if-then-else statement

```
void applyBrakes()
{
    if (isMoving)
    {
        currentSpeed--;
    }
    else
    {
       System.out.println("The bicycle has already stopped");
    }
}
```

Nested if-statements

```
int testScore = 76;
char grade;

if (testScore >= 90)
{
    grade = 'A';
}
else
{
    if (testScore >= 80)
    {
        grade = 'B';
    }
    else
    {
        if (testScore >= 70)
        {
            grade = 'C';
        }
        else
        {
            if (testScore >= 60)
            {
                grade = 'D';
            }
            else
            {
                grade = 'F';
            }
        }
    }
}

System.out.println("Grade = " + grade);
```

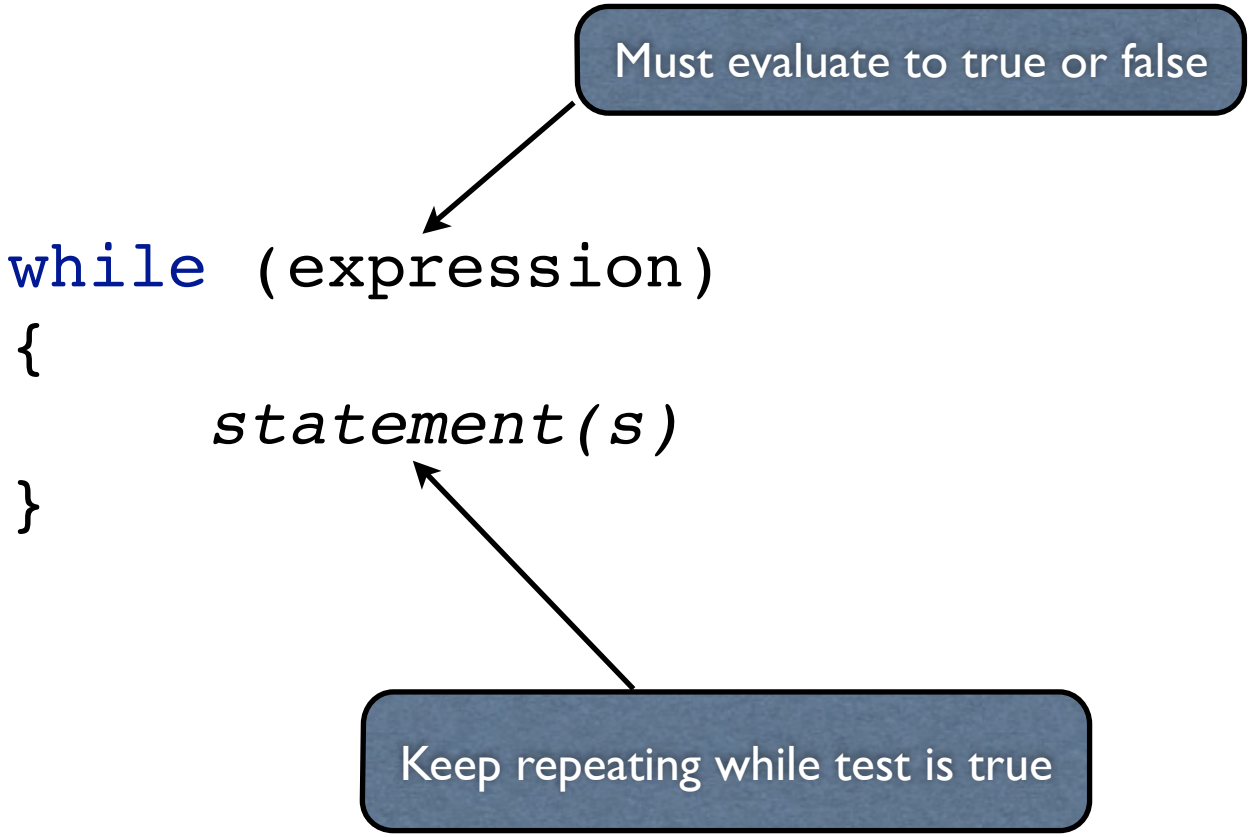
Same statement, different format

```
int testScore = 76;
char grade;

if (testScore >= 90)
    grade = 'A';
else if (testScore >= 80)
    grade = 'B';
else if (testScore >= 70)
    grade = 'C';
else if (testScore >= 60)
    grade = 'D';
else
    grade = 'F';

System.out.println("Grade = " + grade);
```

while statement



while statement

```
int count = 1;

while (count < 11)
{
    System.out.println("Count is: " + count);
    count++;
}
```

do-while

- In while statement, test is performed *before* each loop
- In the do-while, the test is performed *after*
  - statements will be performed at least once

```
do
{
      statement(s)
} while (expression)
```

The for loop

```
for (initialisation; termination; increment)
{
    statement(s)
}
```

initialisation expression initialises the loop.

- Executed once, as the loop begins.

When *termination* expression is *false*, loop terminates.

increment expression invoked after each iteration through the loop.

- It may increment *or* decrement a value.

Example

```
void count()
{
    for (int i = 1; i < 11; i++)
    {
        System.out.println("Count is: " + i);
    }
}
```

The output of this program is:

```
Count is: 1
Count is: 2
Count is: 3
Count is: 4
Count is: 5
Count is: 6
Count is: 7
Count is: 8
Count is: 9
Count is: 10
```

for loop is a shortcut

- the *for* loop is exactly the same as:

```
initialisation;
while (termination)
{
    statement(s);
    increment;
}
```