Conditional (if) Statements: Branching Statements

Last week we started a discussion about conditional statements (aka if statements). These statements in Java are the same as the if statements we use in our everyday lives. If something happens then some result will occur.

If (some Boolean express is true) then
    Something happens
Otherwise
    Something else happens
End if

Let’s look at a real example.

```java
int age;
if (age >= 18) {
    System.out.println("You can vote");
}
```

A few things to note:

1. the { is then in Java if statements, and the } is end if
2. We don’t actually need an else statement. If we don’t have one, and the Boolean expression is not true, then nothing will happen (as in the example above).
3. 

We can make something happen if the Boolean expression is false by adding an else.

```java
int age;
if (age >= 18) {
    System.out.println("You can vote");
} else {
    System.out.println("You cannot vote…");
}
```

System.out.println("Yay!");

**Note:** Regardless of the result of the if statement the word “yay” will be printed because it is outside the if statement.

Now, sometimes you may have to deal with other conditions that occur. In that case, it may not be as simple as either one thing happens, or another thing happens. You need to use an if... else if... else. See the example below.
if (x > 0) {
    System.out.println("x is positive");
} else if (x < 0) {
    System.out.println("x is negative");
} else {
    System.out.println("x is 0");
}

In this example, a number is either positive, negative, or equal to zero. So, we have to check to see if the number is > 0, or if the number is < 0. If neither of these if statements are true, we go to the else statement.

Hopefully this clarifies this type of if...else statement. Try the examples below. Write down what is printed out from the execution of each branching statement.

1.

    int x = 20, y = 15, z;
    if (x != y) {
        z = 10;
    } else {
        z = 5;
    }

2.

    int x = 99;
    if (x == 100) {
        System.out.println("x is 100");
    } else {
        System.out.println("x is not 100");
    }

3.

    int x = -3
    if (x == 1) {
        System.out.println("one");
    } else if (x > 1) {
        y = x*2;
        System.out.println("many");
    } else {
        y = -x;
        System.out.println("negative");
    }
4.

```java
int score = 80;
char grade;

if (score == 100) {
    grade = 'A';
    System.out.println( "Superb");
} else if (score >= 90) {
    grade = 'A';
    System.out.println( "Excellent");
} else if (score >= 80) {
    grade = 'B';
    System.out.println( "Very Good");
} else if (score >= 70) {
    grade = 'C';
    System.out.println( "Good");
} else if (score >= 60) {
    grade = 'D';
} else {
    grade = 'F';
}

System.out.println("Your grade is a "+ grade + ".");
```

5.

```java
int i=5, j=1;

if (i > j){
    i = i + 1;
    System.out.println(i);
} else
    j = j + 1;

System.out.println(j);
```

&& (logical and) and || (logical or)

Sometimes we have more than one condition that we want to evaluate at once. For example what if you are an athlete at AHS and you want to play fall soccer. In order to do this you may have to meet two conditions:
1. You made the team
2. You passed a physical

Look at this example.

boolean madeTeam = true;
boolean passedPhysical = false;

if (madeTeam && passedPhysical) {
    System.out.println(“Welcome to the team”);
} else {
    System.out.println(“Sorry, you cannot play.”);
}

Look at the logic above. BOTH conditions need to be met to play. When you examine two
Boolean expressions with a logical and (&&), all conditions need to be true (you can actually
logically and as many expressions together as you want).

When Boolean expressions are examined with a logical or (||), only one of them needs to be
true for the entire expression to be true.

Let’s look at an example. Let’s say you wanted to go to UMASS Amherst for college and they
required that you had either a 3.0 GPA or greater or received a 1000+ on your SATs (out of
1600 – the old system).

double GPA = 2.9;
int SAT = 1100;

if (GPA >= 3.0 || SAT >= 1000) {
    System.out.println(“Admitted”);
} else {
    System.out.println(“Rejected”);
}

Try these examples on your own.
1.

int user = 21;

if (user <= 18) {
    System.out.println(“User is 18 or younger”);
} else if (user > 18 && user < 40) {
    System.out.println(“User is between 19 and 39”);
} else {
    System.out.println(“User is older than 40”);
}
2.

```java
int user = 45;

if (user <= 18) {
    System.out.println("User is 18 or younger");
} else if (user > 18 && user < 40) {
    System.out.println("User is between 19 and 39");
} else if (user == 45 || user == 50) {
    System.out.println("User is either 45 OR 50");
} else {
    System.out.println("User is older than 40");
}

Nested if Statements.

Try these...

1.

    // celsius
    int temperature = 35;
    int humidity = 70;
    if (temperature >= 30) {
        System.out.println("It is hot");
        if (humidity >= 50) {
            System.out.println("It is humid!");
        }
    } else if (temperature < 30 && temperature >= 20) {
        System.out.println("It's getting pretty warm.");
    } else if (temperature < 20 && temperature >= 10) {
        System.out.println("Looks like it's a little chilly.");
    } else {
        System.out.println("It's pretty cold outside.");
    }
```
2.

```java
int y = -7;
int x = 0;
int z = 3;

if (x < y && x < z) { // x comes first
    if (y < z)
        System.out.println(x + " " + y + " " + z);
    else
        System.out.println(x + " " + z + " " + y);
} else if (x > y && x > z) { // x comes last
    if (y < z)
        System.out.println(y + " " + z + " " + x);
    else
        System.out.println(z + " " + y + " " + x);
} else { // x in the middle
    if (y < z)
        System.out.println(y + " " + x + " " + z);
    else
        System.out.println(z + " " + x + " " + y);
}
```

3.

```java
int paygrade = 7;
double salary = 250.50;
int level = 1;

if (paygrade == 7) {
    if (level >= 0 && level <= 8) {
        salary *= 1.05;
    } else {
        salary *= 1.04;
    }
} else {
    salary *= 1.06;
}

System.out.println(salary);
```