Practical 3: Variables and Data Types

In this practical you will be introduced, **ahead of the relevant lecture**, to some of the data types that are used in Java. You will be creating and using *variables* of different *data types*.

You will soon find out in your lectures that Java uses six different data types for storing numbers. Four of those are for whole numbers and two are for fractional numbers. The difference between these numeric data types is the range of numbers (minimum to maximum) that each data type can represent. Here is the range of each type:

Data type	Range of values it can represent
`byte`	-128 to 127
`short`	-32768 to 32767
`int`	-2147483648 to 2147483647
`long`	-9233372036854775808 to 9233372036854775807
`float`	1.4E-45 to 3.4E+38 *(positive or negative)*
`double`	4.9E-324 to 1.7E+308 *(positive or negative)*

In addition to the above, Java uses the `char` data type to store *single* characters and the `String` data type to store strings of characters. Here are two example instructions each creating (or *declaring*) and at the same time *initializing* a `char` and a `String` variable respectively:

```
char myInitial = 'T';
String myName = "Theo";
```

All the numeric data types shown above and the `char` data type are called ***primitive*** data types. The `String` data type however is a more complex one: it is a ***class*** data type. So `myName`, in the example above, is in fact an *object* and the second line above is actually short for:

```
String myName = new String("Theo");
```

For now however just use string variables for storing lots of characters. In the near future you will find out about many more interesting things you can do with strings.

Task 1

By looking at the few program examples that you were given so far in the module write simple programs to create and use variables of different data types mentioned above. Here is an example to get you started:

```
public class Program_1
{
    public static void main(String[] args)
    {
        byte thisYear = 2008;
        System.out.println("This is " + thisYear);
    }
}
```

What? Is there a problem in the program? Can you fix it?

Task 2

Study the program below before you copy it and run it:

```
public class Program_2
{
    public static void main(String[] args)
    {
        int a = 1;
        int b = 1;

        System.out.println("a and b united is " + a + b);
        System.out.println("a and b united is " + (a + b));
    }
}
```

You have met something similar in your last practical. Can you explain what is going on?

Clue: In each of the two cases above (last two lines) you are trying to add together data of different data types.

Task 3

Create your own program in which you experiment with adding data of different data types and see what happens in each case. Try all possible pair combinations and some triplets. For example:

`byte` with `int`
`int` with `float`
`double` with `float`

`int` with `char` (yes why not).
`String` with `char`
`char` with `String`
`int` with `char` with `String`
...

So an example program could be:

```
public class Program_3
{
    public static void main(String[] args)
    {
        int a = 1;
        float b = 3.2F;

        System.out.println("Result is " + a + b);
        System.out.println("Result is " + (a + b));
    }
}
```

Notice the necessary suffix `F` when initialising `float`.

In most cases you will get the result you expect and in some others not. **This fact is the only thing you are expected to take home from this practical.** It will soon become clear why in your lectures.