Practical worksheet nr. 1 – C++/C programming language introduction

Subjects

- Introduction to the C++ programming language
  - Values and types
  - Variables
  - Reserved words
  - Operators and expressions
  - Data input/output
- Editing, compiling and execution of C++ programs

Exercises

1. Consider the following program which calculates the final grade of a student attending the course "Programação". Test the program on your computer and interpret its content. Try to compile and execute the program using a command line and also using your IDE.

```
#include <iostream>

using namespace std;

int main(void)
{
    int p = 18;
    int tp = 14;

    double final = 0.75 * p + 0.25 * tp;

    cout << "Final grade: " << final << endl;

    return 0;
}
```

2. Develop a new program, based on the previous one, in which the grades of the two evaluations can be introduced by the user through the keyboard. You can take advantage of the fact that the extraction operator (>>) can be chained to read in more than one quantity at once: `cin >> firstValue >> secondValue;`

3. Also, define constants for the weights of the TP and P components and use them for the final grade calculation.

4. Consider a third version of the program where the weight of the TP and P component is no longer a constant and is also an input from the user, inserted through the keyboard.

5. By default, output is right-justified in its field. You can left-justify text output using the manipulator `ios::left`. Example:

   ```
   std::cout << "Left :\n" << std::right << "Right " << std::endl;
   ```

   Use this manipulator, along with the method `setw()`, to help generate the following output:

   ```
   Last name   First name   Town       Country
   ------------------------------------------------------
   -
   Silva       Joao         Aveiro     Portugal
   Almeida     Maria        Madrid     Spain
   Santos      Miguel       Moscow     Russia
   ```

6. Write a program which reads a temperature value[1] in Celsius, converts it to Fahrenheit and prints the result in the following manner: "`X °C = Y °F`". The conversion formula between Celsius (C) and Fahrenheit (F) is the following: F = 1.8 C + 32.

7. A way to know the average transport speed from point A towards point B is needed, considering that the trip is done in two stages of equal length. Develop a program which requests the input of two values: *v1* – average speed of the first stage and *v2* – average speed of the second stage. Based on these values calculate and print the final average speed. *Suggestion: analyse and calculate one or two examples on paper before starting with the program development.*

8. Write a program which, considering a time in seconds read from the keyboard, shows that time in the console with the format `hh:mm:ss`. *Suggestion: in C++, the % operator allows the calculation of the remainder of the integer division.*

9. Write a program which models a point (defined by its real *x* and *y* coordinates). Create two points, *p1* and *p2*, requesting their coordinates to the user. Calculate and print the distance between those points.

10. Given a right-angled triangle with catheti A and B and hypotenuse C, develop a program which reads the catheti values and determines the hypotenuse, as well as the value of the angle (in degrees) between the A side and the hypotenuse.

[1] When we consider that the program "*reads*" or "*asks*" for a value, it means that it needs to read the values from the keyboard (`cin`) and the user will need to introduce them whenever the program is executed.