BIL 105E – Introduction to Scientific and Engineering Computing (C)
Spring 2015-2016
Homework 4
Assignment Date: 02.05.2016
Due Date: 12.05.2016, 23:00

IMPORTANT:

- Don't use or get inspired by any lines of code from any other sources (friends, Internet, etc). **Any similarity, which is beyond reasonable, will be accepted as cheating!**
- Name your program as **student_id.c** and don't forget to test it on your ITU account before submission by using ssh client. Any code that can't be compiled will not be evaluated.
- Please just use the subjects **shown in the class**. Don't use any other statements or data structures (e.g., goto).
- You must submit a report based on the format given on Ninova course page.

Problem: In this project, you are expected to find the set of M people among a set of N people, whose Body Mass Index BMI values are the farthest from a given threshold.

In a region of city A, public health officials try to reveal if the people of this region have excessive fatness (obesity) or excessive weakness. For this purpose body mass index information of these people will be used and people who are the farthest away from a certain BMI threshold will be examined. In this region, there is only one hospital and its public health clinic is able to give service to M patients at the same time (the rest of the patients will be send to another hospitals). Hence the first M people among N people whose BMI value are farthest from the threshold are chosen. So you will **sort** the absolute differences between BMI values of the people and threshold. And you will choose M highest difference valued records.

BMI is one of the determinative issues for the people who have weight problems. This index is calculated by dividing weight in **kilograms** to square of the height in **meters:**

$$BMI = \frac{mass(kg)}{(height(m))^2} \qquad (1)$$

Firstly you will calculate BMI value for each person according to Equation1. Then, you will take the absolute value of the difference between the calculated BMI value and threshold value for each person. This difference represents how close the BMI value is to the threshold value. The people whose BMI values are much higher (excessive fatness) or much lower (excessive weakness) than the threshold will be examined.

For this homework, you will read data from height_weight.txt as an **input.** The height_weight.txt file includes person_id, weight and height data of people. You will read data from this file by using file reading commands in C.

In this homework you will use person struct as in the given format:

```
struct person{
   int personId;
   double height;
   double weight;
   double BMI;
}
```

Your program will take 3 input parameters from the command line: N, M and threshold. Your program should be run from the command line with the following format.

./studentID_AoA1_P1 N M threshold

N: Total number of people. This value is **variable**, so you have to allocate enough space at run time.

M: Number of people whose BMI values are the farthest from the threshold.

threshold: Normal value of the BMI value.

After execution of your program; M people with their ids, height, weight and calculated BMI values have to be written to the output.txt file. Also results have to be **sorted in decreasing order according to |BMI-Threshold| value.**

Output.txt file format (threshold=35):

Person_id	Height(cm)	Weight(kg)	BMI	|BMI-Threshold|
6	129	98	58,89	23,89
5	188	77	21,79	13,21
3	123	71	46,93	11,93
2	133	56	31,66	3,34
1	123	57	37,68	2,68
4	164	89	33,09	1,91