3. Railway lengths in Europe

Besides the development of the Hungarian railway network in the 1890s, Approxi Mate Lee is also interested in the state of development of the European railway network. He has found contemporary data about the density of railways in the different countries, the area and the population of these countries. File `vasuteu.txt` with UTF-8 encoding, which can be found in directory 3_Vasuthossz_EU-ban, contains these data separated by semicolons.

Using a worksheet processing program, analyse the data according to the following exercises.

During the solution take the followings into consideration.

- *Whenever possible, use a formula, function in the solution.*
- *The results should be correct even if the source data are modified – for example adjusted.*
- *There are parts in the exercise that use the results from a previous question. If you could not solve the previous part completely, use its solution as it is, or instead of a formula resulting in a number use a number of correct magnitude and work on with it. This way you can receive marks for these exercise parts as well.*

1. Open file *vasuteu.txt* in the worksheet processor so that the first data appears in cell *A1* and save it in the default format of the worksheet processor with the same name. The name of the worksheet should be Data.

2. Insert a row according to the following example and add headings to your work.

	A	B	C	D	E	F	G	H	I
1	Railway network in Europe (1894-1895)								
2	Countries	Railway length per 1000 km^2 (km/1000 km^2)	Railway length per 100000 capita (km/100000 cap.)	Area (km^2)	Population (million capita)	*Railway length I.*	*Railway length II.*	*Railway length*	*Error*
3	England	107	85,7	244820	33	*26 196 km*	*28 281 km*	*27 238 km*	*4%*
4	France	77	107,5	527000	39	*40 579 km*	*41 925 km*	*41 252 km*	*2%*
5	Belgium	188	87,4	30500	6,7	*5 734 km*	*5 856 km*	*5 795 km*	*1%*
6	Germany	87	89,8	533000	55,4			*48 060 km*	*4%*
7	Switzerland								

3. Determine the length of the railway network of the individual countries in the corresponding cells of column *F*. Use data railway length per 1000 km^2 and the area of the country for the calculation, pay attention to the factor of 1000.

4. Using a similar train of thought, determine the length of the railways from the railway length per 100 000 capita and the population of the countries in column *G*. During calculation pay attention to the fact that one data is given for 100 000 capita and the other is given in millions.

5. The results in columns *F* and *G* are different due to estimations and roundings. In the corresponding cells of column *H*, calculate the average of the two values acquired for the same country.

6. In order to characterise the accuracy of the estimation, in column *I* calculate the percentage of the half of the difference of the two values received for the same country in terms of the average. The result should be positive and it should appear in percent format without decimal digits.

7. Create a three-dimensional column chart on a new sheet named Chart where you show the railway density per 1000 km^2 and also per 100 000 capita. The chart should not have a title but the legend should be displayed at the bottom. Pay attention to the name of each country being readable.

8. Based on the average values, determine the total railway length in cell *B22* of worksheet Data.
9. Using a function, in cell *B24* determine which country has the most dense railway system based on the length of the railway network per 1000 km^2.
10. In cell *B25*, determine the rank of Hungary if the length of the railway network per 1000 km^2 is arranged in a descending order. You can use functions SORSZÁM() or RANK() for the solution.
11. Below cell *H22*, collect the names of the countries where the error of the estimation of the railway length is greater than 5%.
12. Format the table based on the above example and the following description.
    - Insert headings for the calculated results: Insert "Total length:" into *A22*; "Highest density:" into *A24* and "Rank of Hungary:" into *A25*.
    - The font type is Arial or Nimbus Sans of size 10 points. The title is an exception, its size is 12 points and it is bold.
    - Every calculated data and their headings are in italics.
    - The grid inside the table is drawn in thin lines, the headings are separated from the data by double line, the outer border is thicker.
    - The railway length data are displayed using thousands separators, as integral numbers, with their unit km.
    - Columns *B*; *C*; *F*; *G* and *H* and columns *D*; *E* and *I* are of equal width, each data in the table fits according to the example and the table fits on a landscape-oriented A4 sheet with margins 2 cm, that is, its width is less than 25.7 cm.

30 marks