B4 - Mathematics

B-MAT-400

207demography

Population and regression

{EPITECH.}

207demography

binary name:	207demography
repository name:	207demography_$ACADEMIC_YEAR
repository rights:	ramassage-tek
language:	everything working on "the dump"
compilation:	when necessary, via Makefile, including re, clean and fclean rules

- Your repository must contain the totality of your source files, but no useless files (binary, temp files, obj files,...).

- All the bonus files (including a potential specific Makefile) should be in a directory named *bonus*.

- Error messages have to be written on the error output, and the program should then exit with the 84 error code (0 if there is no error).

The world population growth is a cause for concern for most people: 1 billion people in 1800, 2 billion people in 1927, 6 billion people in 2000 and more than 7.5 billion people today… Predicting future population using past censuses is therefore a key concept.

Along with this subject, you will find a file named `207demography_data.csv`, which gives an estimation of every country's population from 1960 onwards. If world population growth seems exponential in the long-term, in a shorter term it seems linear: using this data, you must establish the linear least squares regression that will allow you to predict population depending on the year.

In the following, Y is the population (in million people) and X the year. With one or several country codes as inputs, your program will print:

1. the a_X and b_X coefficients of the linear fit $Y = a_X X + b_X$,
2. the root-mean-square deviation of this fit,
3. the population prediction in 2050 according to this fit,
4. the a_Y and b_Y coefficients of the linear fit $X = a_Y Y + b_Y$,
5. the root-mean-square deviation of this fit,
6. the population prediction in 2050, according to this fit,
7. the correlation coefficient between X and Y.

> Plot the regression lines and the data on the same graph to see if your coefficients make sense!

> Ask yourself what information gives you the root-mean-square deviations and the correlation coefficient!

{ EPITECH. }

Usage

```
~/B-MAT-400> ./207demography -h
USAGE
    ./207demography code [...]

DESCRIPTION
    code    country code
```

Examples

```
~/B-MAT-400> ./207demography EUU
Country: European Union
Fit1
    Y = 1.62 X - 2749.67
    Root-mean-square deviation: 5.22
    Population in 2050: 570.85
Fit2
    X = 0.60 Y + 1707.97
    Root-mean-square deviation: 5.32
    Population in 2050: 574.54
Correlation: 0.9820
```

```
~/B-MAT-400> ./207demography BRA BOL PER
Country: Bolivia, Brazil, Peru
Fit1
    Y = 3.06 X - 5906.34
    Root-mean-square deviation: 2.22
    Population in 2050: 359.35
Fit2
    X = 0.33 Y + 1932.53
    Root-mean-square deviation: 2.22
    Population in 2050: 359.70
Correlation: 0.9991
```