



B-MAT-400

Population and regression



World demography

Population and regression

binary name: 207demography
repository name: 207demography_\$ACADEMICYEAR
repository rights: ramassage-tek
language: C, C++, perl 5, python 3 (≥ 3.5), ruby 2 (≥ 2.2), php 5.6, bash 4
group size: 1-2
compilation: 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 billion people today... predicting future populations by using past censuses is therefore a key concept.

Along with this subject, you will find a file named `207demography_data.csv`, which gives estimations of all the countries' population from 1961 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 least-squares regression line that will allow you to predict population depending on 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 $Y = a_X X + b_X$ where Y is the population and X the year,
2. the standard deviation of this fit,
3. the population prediction in 2050 according to this fit (in million people),
4. the a_Y and b_Y coefficients of the linear fit $X = a_Y Y + b_Y$,
5. the standard deviation of this fit,
6. the population prediction in 2050, according to this fit,
7. the linear 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 standard deviations and the correlation coefficient!



```
Terminal
~/B-MAT-400> ./207demography -h
USAGE
    ./207demography code1 [...]

DESCRIPTION
    code1 country code
```



Your program output has to be strictly identical to the one below.

```
Terminal
~/B-MAT-400> ./207demography EUU
country: European Union
fit 1
    Y = 1.69 X - 2885.26
    standard deviation: 4.41
    population in 2050: 571.57
fit 2
    X = 0.57 Y + 1719.46
    standard deviation: 4.48
    population in 2050: 574.98
correlation: 0.9846
```

```
Terminal
~/B-MAT-400> ./207demography BRA BOL PER
country: Brazil, Bolivia, Peru
fit 1
    Y = 3.08 X - 5951.81
    standard deviation: 1.61
    population in 2050: 360.99
fit 2
    X = 0.32 Y + 1932.84
    standard deviation: 1.61
    population in 2050: 361.24
correlation: 0.9994
```