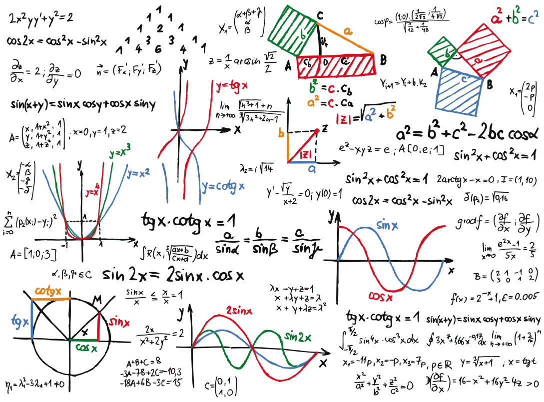

B2- Mathematics

B-MAT-150

106bombyx

Bombyx booming bylaw

EPITECH.
L'ECOLE DE L'INNOVATION ET DE L'EXPERTISE INFORMATIQUE

Bombyx

Bombyx booming bylaw

binary name:	: 106bombyx
repository name:	: 106bombyx
repository rights:	: ramassage-tek
language:	: C, C++, perl 5, python 3.4, ruby 2.1, php 5.6, bash 4
group size:	: 1-2
compilation *(when necessary)*:	: via Makefile, includig re, clean and fclean rules

- Your repository shall contain the totality of your source files, but no useless file (binary, test files, obj files,...).
- All the bonus files (including a specific Makefile) shall 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).

In the 70's, chaos theory opened the way for a better understanding of some animal species.
Butterflys for instance. Let's say... bombyx.

If a generation is crowded, chances are that the next generation will be crowded too, regarding the natural rules of reproduction. But resources may lack for this new generation, so it may not be able to develop.
Therefore, the evolution of the number of bombyx from a generation to the next one is not trivial.

Let's call x_i the number of the i^{th} generation of butterflys. Here is a model for the evolution of x_i :

$$\begin{cases} x_1 = n & \text{where } n \text{ is the number of first generation individuals} \\ x_{i+1} = k.x_i.\frac{1000-x_i}{1000}, & \text{for } i \geq 1,\ k \text{ being the } \textit{growth rate}\text{, from 1 to 4.} \end{cases}$$

In order to study this evolution, you are asked to plot two things :

- the curve representing the number of individuals in relation to the generation (varying from 1 to 100)
- a synthetic scheme summing all the results for a given n ; it consists in plotting every value of x_i (between two given bounds), in relation to k (k varying from 1 to 4 by 0.01 steps).

In both cases, your program shall print on the standard outuput the values to be entered into *gnuplot* to draw the graphes.

Terminal

```
∼/B-MAT-150> ./106bombyx -h
USAGE
            ./106bombyx n [k | i0 i1]

DESCRIPTION
            n       number of first generation individuals
            k       growth rate from 1 to 4
            i0      initial generation (included)
            i1      final generation (included)
```

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

Terminal

```
~/B-MAT-150> cat drawer.gnu
set terminal dumb
set nokey
plot "data"
```

Terminal

```
~/B-MAT-150> ./106bombyx 10 10000 10010 > data
~/B-MAT-150> head -n 30 data
1.00 0.10
1.00 0.10
1.00 0.10
1.00 0.10
1.00 0.10
1.00 0.10
1.00 0.10
1.00 0.10
1.00 0.10
1.00 0.10
1.00 0.10
1.01 9.90
1.01 9.90
1.01 9.90
1.01 9.90
1.01 9.90
1.01 9.90
1.01 9.90
1.01 9.90
1.01 9.90
1.01 9.90
1.01 9.90
1.02 19.61
1.02 19.61
1.02 19.61
1.02 19.61
1.02 19.61
1.02 19.61
1.02 19.61
1.02 19.61
~/B-MAT-150> cat drawer.gnu | gnuplot


1000 ++---------+-----------+----------+----------+-----------+--------AAA
     +          +           +          +          +           +   AAAAAAAA
     |                                                       AAAAAAAAA AAA
     |                                                  AAAAAAAAAAAAAAAAAA
800  ++                                              AAAA      AAAAAAAAAAA
     |                                             AA            AAAA AAAA
     |                                           AAA             AAAA A AA
     |                                  AAAAAAAAAA A             AAAAA AAA
600  ++                          AAAAAAAA          AAA         AAAA AAAAAA
     |                      AAAAAA                   AAAA     AAAAAAAAAAAA
     |                 AAAAA                            AAAAAA AAAAAAAAAAA
400  ++             AAAA                                    AA  A AAA AAAA
     |           AAAA                                        AAAAA  AA A A
     |        AAAA                                              AAA AA AAA
     |      AAA                                                  AAAA AAAA
200  ++   AAA                                                      AAAAAA+
     |   AA                                                         AAAAAA
     | AA                                                             AAAA
     +AA        +           +          +          +           +        AAA
0    A+---------+-----------+----------+----------+-----------+---------+A
     1         1.5          2         2.5         3          3.5        4
```

Terminal

```
~/B-MAT-150> ./106bombyx 10 3.3 > data
~/B-MAT-150> head data
1 10.00
2 32.67
3 104.29
4 308.26
5 703.68
6 688.10
7 708.24
8 681.89
9 715.82
10 671.29
~/B-MAT-150> tail data
91 823.60
92 479.43
93 823.60
94 479.43
95 823.60
96 479.43
97 823.60
98 479.43
99 823.60
100 479.43
```