

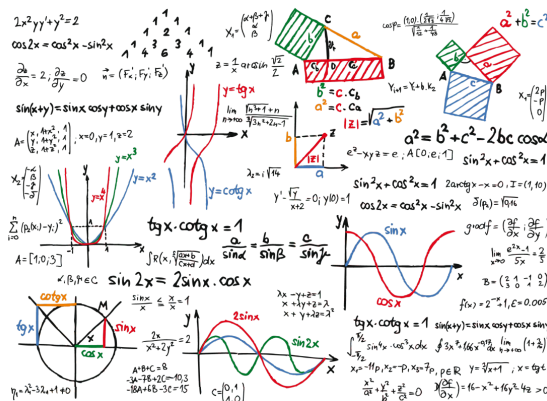


# B4 - Mathematics

B-MAT-400

## 204ducks

Decamping Disturbed Ducks





# 204ducks

binary name: 204ducks  
repository name: 204ducks\_\$ACADEMIC\_YEAR  
repository rights: ramassage-tek  
language: C, C++, python3, perl, ruby, php or bash  
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).

When ducks are disturbed by a sudden noise, they fly away almost simultaneously, and everything is deserted. Chances that a duck will then come back after  $t$  minutes are given by the following probability density function:

$$f : [0, +\infty[ \longrightarrow \mathbb{R}$$
$$t \longmapsto ae^{-t} + (4 - 3a)e^{-2t} + (2a - 4)e^{-4t}$$

where  $a$  is a real constant between 0 and 2.5, which depends on external factors (such as temperature, day time, duck's health etc. ).

A study is being conducted about these ducks, and you are asked to compute and display the following, given the value of  $a$ :

1. The average time after which ducks come back,
2. The standard deviation of the ducks' return time,
3. The time after which 50% of all of the ducks are back,
4. The time after which 99% of all of the ducks are back,
5. The percentage of ducks that come back after 1 minute,
6. The percentage of ducks that come back after 2 minutes.



## USAGE

```
Terminal
~/B-MAT-400> ./204ducks -h
USAGE
    ./204ducks a

DESCRIPTION
    a          constant
```

## EXAMPLES

```
Terminal
~/B-MAT-400> ./204ducks 1.6
Average return time: 1m 21s
Standard deviation: 1.074
Time after which 50% of the ducks are back: 1m 04s
Time after which 99% of the ducks are back: 5m 04s
Percentage of ducks back after 1 minute: 46.9%
Percentage of ducks back after 2 minutes: 79.1%
```

```
Terminal
~/B-MAT-400> ./204ducks 0.2
Average return time: 0m 50s
Standard deviation: 0.676
Time after which 50% of the ducks are back: 0m 39s
Time after which 99% of the ducks are back: 3m 16s
Percentage of ducks back after 1 minute: 71.3%
Percentage of ducks back after 2 minutes: 94.2%
```