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Bash course - Tutorial 1

Getting familiar with the bash syntax

The following tasks are very simple and basic and should be used to get familiar with using the bash and its control structures. If you've never written a shell script, please don't copy and paste the solutions from somewhere but type them yourself.

a) Create a directory and within the directory create a file with suffix .sh and executable permissions.

b) Write and execute a bash script which accepts one parameter and just outputs this parameter.

c) Interpret the parameter for the last script as integer n. Write a for loop which runs from one to n and which outputs the square of the current loop step (1, 4, 9, 16, ...).

d) Instead of the for loop, write a loop which calculates and outputs all squares which are smaller than the given parameter n. E.g. for n=30 output 1,4,9,16,25.

e) Remove the output command from the last program and output **success** if n is a square number and **failure** otherwise.

Galton Board

The following picture shows a galton board, which can be used to explain binomial distributions. Marbles start at the top and successively fall on obstacles which cause the marbles to pass on each of the sides with an equal chance. The number of layers, i.e. the number of obstacles which are hit by each marble, is called the height, so the galton board in the given picture has a height of six. There are always height+1 slots in which the marbles will fall in the end. The goal of this tutorial is to simulate such a galton board.
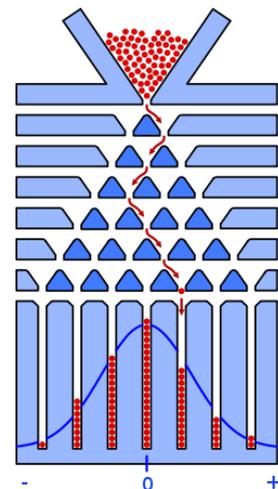
a) If this was a software engineering course, you would first have to think in detail about the specification, e.g. how the user can interact with the program, which data structures to use, which functions to specify, ... But for the moment, we do not care too much about these issues and just want to get a running prototype. So try to implement a simulation of the galton board shown in the picture. Your programm should output the number of marbles in each of the seven slots.
Hints: Use $RANDOM, Modulo-Operator (%), Arrays

b) Now you've implemented a galton board with height six. The next step is to generalise this to an arbitrary number of layers. You should also allow an arbitrary number of marbles.

c) If you didn't think about the structure of your program yet, you probably did not use any functions yet. You should do that now. E.g. use a function which is responsible for running a single marble through the board, which is then invoked for each of the marbles. You can even use a function for each step of a single marble.

d) Improve the user-friendliness of your program. Allow the user of the program to specify height and number of marbles. You can use `read` or program parameters for that. You should also print some help messages to show the user how to use the program.

e) The last task also deals with user-friendliness. Present the results of the simulation in an intuitively readable way, e.g. like that:

```
  0  1  3 18 19 20 20 15  4  0  0
|__|__|__|__|__|__|__|__|__|__|__|
```

Website

The website with slides and tutorials can be found at
`https://www5.in.tum.de/wiki/index.php/Python_/_Git_/_Bash_Course`.