CS Basics - Exercises
Functions and Arrays

C. Grothoff and E. Benoist

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1 Arrays

- Write a function for initializing an array with a given value. The parameters of the function are: the array, its length and the new value all the cells will be set to.

  Example of use:

  ```
  int64_t my_array[256];
  init_array(my_array, 256, 42);
  ```

- Write a function that takes as input a `int64_t` value, an array of `int64_t` and the corresponding length of the array. The function should then find the prime factors of the given `int64_t` and write them to the array. The array should be terminated with a 0-byte. The function should return `true` on success and `false` if the array was too short.

  Example of use:

  ```
  // returns true, my_array then contains {5, 29, 0, ...}
  bool success = prime_factors(145, my_array, array_length);
  ```

- Write a function that displays all the elements of an array until finding an element containing a 0-byte. Use the function to display the prime factors for some numbers using the function implemented above.

  Example of use

  ```
  print_array(my_array);
  ```

- In a similar fashion, write a function `average`, which takes an array of `int64_t` and its length, and returns the average of all the values in the array. Then, optionally, write another function `stddev`, which uses `average` to compute the *standard deviation* for all the elements of an array.

2 Creating a Library

Make sure you have `libtool` *installed for this exercise.*

Read about how to build libraries using the GNU Build System:
`https://www.gnu.org/software/automake/manual/automake.html#A-Shared-Library`

Then, write a library "`my_lib.c`" and the corresponding header file "`my_lib.h`". Also write a program called"`my_program.c`", which will use that library.

- The file `my_lib.c` contains the definitions of the functions "`uint64_t logarithm(uint64_t)`" (binary logarithm) and "`double exponential(int64_t)`" (exponential function e^x).
- The file `my_lib.h` declares the corresponding function prototypes.
- The file `my_program.c` uses the functions given above.

Add the required files for the GNU Build System and initialize it. Ensure to add "`LT_INIT`" to your `configure.ac` file. Finally, build and install your program to a location of your choice.