

Assembly and Machine Language

Homework 4

Your task is to write a program to read an integer from the input, calculate the number of **trailing zeros of its factorial**, and print the Greatest Common Divisor (GCD) of the input and the counted zeros, that is **GCD(n, trailing_zeros(n!))**.

This must be implemented both in C and Assembly (in files **trailing_zeros.c** and **trailing_zeros_asm.asm** respectively). Furthermore, the part calculating the GCD must be implemented as a C function (in file **gcd.c**) which is called both from the C and Assembly codes. This means that, after calculating the number of trailing zeros, you must call the C function **gcd** (in file **gcd.c**) to calculate the GCD of the two numbers both in your assembly and C codes, and print the return value obtained from the **gcd** function.

The “hw4.zip” file consists of this items:

[trailing_zeros_asm.asm](#)

[trailing_zeros.c](#)

[gcd.c](#)

[main.c](#)

[testcase](#)

The file “testcase” contains some input/output pairs to test your code. Testing your functions takes place in the file “main.c”, which calls the “trailing_zeros” and “trailing_zeros_asm” functions, compares their outputs with those in the “testcase”, and prints the execution time.

You also, need to write your own Makefile to compile/assemble, and link your code and create the finale executable named **test**.

Your program must get compiled and run with the following command:

```
make && ./test
```

To summarize, your task is:

1. Write the function "trailing_zeros" in C inside the file **trailing_zeros.c**. The prototype is `int trailing_zeros (int n);`
2. Write the function "trailing_zeros_asm" in assembly and in the file **trailing_zeros_asm.asm**.
3. Write the "**gcd**" function (in file gcd.c) in C. This function is to be called both from the "trailing_zeros_asm" function and the "trailing_zeros" function.
4. Write a Makefile to compile and link everything and create an executable called test.

Please notice that files and functions' names must not change. Except "trailing_zeros.c", "trailing_zeros_asm.asm", "gcd.c" and "Makefile", other files must remain untouched. Notice that you do not need to compute the factorial of a number to calculate the number of trailing zeros.

Example:

Input:

6

The factorial of 6 is 720. There is one zero at its end. The largest common divisor of 6 and 1 is 1.

Output:

1