PROBLEM SET #1

For the problems below, you need to write programs into a single Jupyter notebook document. Use `Markdown` cells and the hash(#) symbol to indicate the problem numbers, explanation, and comments. Name your notebook document using your student `ID` number as `HW1_ID.ipynb`, and email it to your teaching assistant at `hangyeol@snu.ac.kr` before the deadline. No homework will be accepted after the deadline.

1. Write a Python script that takes two integers as keyboard inputs, and outputs the quotient and remainder when the larger is divided by the smaller. It is convenient to use the function `input()` such as `x=input("Input first integer")` to read the keyboard input and save it to the variable `x`. Your outputs should look something like

   ```
   two integers: 78    and 1023
   quotient    : 13
   remainder   : 9
   ```

2. Write a Python script that reads an integer `n` from the keyboard, and prints out a block letter `H` on the screen with sides of size `n`, like the ones shown below for `n = 1, 2,` and `3` from left to right. Make sure to use a `for` loop in your script.

   ```
                                         ★ ★ ★     ★ ★ ★
                                         ★ ★ ★     ★ ★ ★
                                         ★ ★ ★     ★ ★ ★
                      ★ ★     ★ ★        ★ ★ ★ ★ ★ ★ ★ ★ ★
                      ★ ★     ★ ★        ★ ★ ★ ★ ★ ★ ★ ★ ★
                      ★ ★ ★ ★ ★ ★        ★ ★ ★ ★ ★ ★ ★ ★ ★
           ★     ★    ★ ★ ★ ★ ★ ★        ★ ★ ★     ★ ★ ★
           ★ ★ ★      ★ ★     ★ ★        ★ ★ ★     ★ ★ ★
           ★     ★    ★ ★     ★ ★        ★ ★ ★     ★ ★ ★
   ```

3. A prime number is a positive integer (greater than 1) that has no positive integer divisors other than 1 and itself. Write a Python function using the keyword `def` that checks whether an integer `n` is prime or not, and call it to calculate the total number of prime numbers between 2 and a given number `nmax`. How many prime numbers when `namx=100, 1000, 10000` and `100000`?

4. Download the data file `hw1_p4.dat` at `http://mirzam.snu.ac.kr/~wkim/Comp2020/`. It contains 3-column, 10000-row data. Write a Python script to read it, and output every fourth row starting from the first row into another file named `hw1_p4_fourth.dat`. Assign the first, second, and third columns to the variables `x`, `a`, and `b`, respectively, and make a plot that shows `a*x`, `b*x`, and `a*b*x` as functions of `x` using solid, dotted, and dashed lines, respectively. Name the abscissa and ordinate to `time` and `value`, respectively. Do not forget to place a legend at the appropriate place.