# EFM Fall 2014, Week 2 Python Diagnostic Test

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# 1   Instructions

Complete as many of the following questions as possible. You should not spend more than an hour total on this test, regardless of your skill level. This test is merely for us to gauge the distribution of programming skill and familiarity with Python across members.

Feel free to work in groups or refer to online sources such as Stack Overflow, but refrain for looking for specific solutions to the questions.

Email your solutions to efm.uchicago@gmail.com in a single python file, named `LASTNAME_FIRSTNAME.py`

# 2   Questions

**Question 1**

Print "Hi" 5 times, without a loop.

**Question 2**

Print "Hi" 5 times, with a loop.

**Question 3**

Write a function that returns $True$ is a number is even and $False$ if a number is odd.

**Question 4**

Write a function that executes FizzBuzz. That is, given a number $n$, print numbers from 1 to $n$, except replace numbers divisible by 3 with "Fizz", numbers divisible by 5 with "Buzz", and numbers divisible by both 3 and 5 with FizzBuzz.

**Question 5**

Write a function that takes a number $n$, and returns a list of numbers, where each number is the sum of the numbers from 0 to $n$. In other words, each element of your list is:

$$x_i = \sum_{j=0}^{i} j$$

Do so without using Gauss' formula.

## Question 6

Write a function that takes 2 matrices (either in NumPy, or a list of lists), and returns the result of matrix multiplication. Do so **without** using NumPy's built-in matrix multiplication. As a refresher:

$$(AB)_{i,j} = \sum_{k=1}^{m} A_{ik} B_{kj}$$

## Question 7

Write a function that takes a number $n$ and generates a list (order is unimportant) of all well-formed parentheses. E.g. from $n = 3$, the output should be $[\text{"}((()))\text{"}, \text{"}(()())\text{"}, \text{"}(())()\text{"}, \text{"}()(())\text{"}, \text{"}()()()\text{"}]$, with allowance for rearrangement. If possible, do so without using *set*s.

## Question 8

(You may use libraries for this question.)

Write a function that scrapes the reddit homepage (http://www.reddit.com/) and returns a list of the titles of the top 10 links. If you're ambitious, write a class that contains information such as title, poster, current score, and subreddit, and return a list of instances of that class instead.

## Question 9

(You may use libraries for this question.)

Let $n = 100$, $m = 1000$. Draw $n \times m$ observations from the uniform distribution form 0 to 1, i.e.

$$x_{i,j} \sim Unif(0, 1)$$

for $0 \leq i \leq n$ and $0 \leq j \leq m$. For each j, compute $\bar{x}_j = \frac{1}{n} \sum_{i=1}^{n} x_{i,j}$. Plot the distribution of $\bar{x}_j$ and comment on how this relates to the central limit theorem.

## Question 10

(You may use libraries for this question.)

Write a function that prints out a text-tree of the files and folders within the current working directory. For example, running this in your folders for classes should give output looking like the following:

```
+ Work
|--+ MATH-16100
|  |--+ Pset1
|  |  |-- pset1.pdf
|  |--+ Pset2
|     |-- pset2.pdf
|--+ ECON-19800
   |--+ Readings
      |-- Free_to_choose.pdf
      |-- Microeconomic Theory by Mas-Colell.zip
```