Data Structures
Homework #1

Due: October 2, 2023

This assignment is to practice Python programming. There are five problems and please finish each problem right after the problem description in `HW1.ipynb` file that is provided on the **i-school(Plus)** (`https://istudy.ntut.edu.tw/learn/index.php`) platform. More details about each problem are also in the `HW1.ipynb` file.

1. Write a short Python function, `is_bigger(n, m)`, that takes two integer values and returns the bigger one.

2. Write a Python function, `IDvalidation(s)`, that takes a personal ID (Taiwan, ROC) string `s` and returns `Valid`, if `s` is a valid ID, and `Invalid`, otherwise. You need to provide a short script of Python code that repeatedly reads the input ID string and outputs the validation.

3. Implement the simple methods `get_num` and `get_den` that will return the numerator and denominator of a fraction respectively.

4. Instead of calling `sqrt()` from the math module of Python to compute the square root, we could implement our own square root function by using a well-known technique called *Newton's Method*. Newton's Method for approximating square roots performs an iterative computation that converges on the correct value. The equation

$$new\_guess = \frac{1}{2} \times (old\_guess + \frac{n}{old\_guess})$$

   takes a value n and repeatedly guesses the square root of n by making each *new_guess* the *old_guess* in the subsequent iteration. The initial guess used here is $\frac{n}{2}$. Please write a Python function, `square_root(n)` that accepts a value n and returns the square root of n after making 20 guesses.

5. Recall the selection sort we discussed in class. Please provide a Python function, `selection_sort(A)`, that reads a list `A` and outputs the sorted list. In the program file, you need to provide a short script of Python code that reads the original list of numbers and prints out the original and sorted lists respectively.

About submitting this homework

1. Please upload the completed `.ipynb` file with the filename as `HW1_studentID.ipynb` to **i-school(Plus)** (`https://istudy.ntut.edu.tw/learn/index.php`).

2. The **deadline** is the **midnight of October 2**, 2023 and **Late work** is not acceptable.

3. Honest Policy: We encourage students to discuss their work with the peer. However, each student should write the program or the problem solutions on her/his own. Those who copy others work will get 0 on the homework grade.