Assignment 1

Problem Statement:
Implementations of 16 Qubit Random Number Generator.

Objective:
1. Understand creation of Qubit circuit
2. Create 16 Qubit Random Number Generator

Outcome:
Displays 16 Qubit Random Number

Theory:
To create a Random Number Generator in qiskit for IBMs quantum computers using 16 qubits.

Requirements:

Python 3.x or above (available here: https://www.python.org/)

Pip: A package management system for Python (included with Python 3.x)

IBM Q Account: This is so you can run your programs on IBM quantum devices. You can sign up for one here: https://quantum-computing.ibm.com

Installation :

Install Python 3.x (Make sure Python is added to Path and Pip is checked)

Open Command Prompt and type in: pip install qiskit

Steps to perform:

STEP 1 : INITIALISE THE QUANTUM AND CLASSICAL REGISTERS

The first step is to initialise a 16 qubit register . This is done by the following code:

```
q = QuantumRegister(16,'q')
```

Next we initialise the 16 bit classical register with the following code:

```
c = ClassicalRegister(16,'c')
```

STEP 2 : CREATE THE CIRCUIT

Next we create a quantum circuit using the following code:

circuit = QuantumCircuit(q,c)

STEP 3 : APPLY A HADAMARD GATE TO ALL QUBITS

Then we need to apply a Hadamard gate. This gate is used to put a qubit in to a superposition of 1 and 0 such that when we measure the qubit it will be 1 or a 0 with equal probability.

This is done with the following code:

circuit.h(q)

STEP 4 : MEASURE THE QUBITS

After this we measure the qubits. This measurement will collapse the qubits superposition in to either a 1 or a 0.

This is done with the following code:

circuit.measure(q,c)

ALGORITHM :

1. Start
2. pip install qiskit
3. Initialise the quantum and classical registers
4. Create the circuit
5. Apply a hadamard gate to all qubits
6. Measure the qubits
7. Stop

How to run the program :

Write the code in to a python file.
Enter your API token in the IBMQ.enable_account('Insert API token here') part
Save and run.

Conclusion:

By this way, we can generate 16 Qubit Random Number.