

Quantum Computing – Laboratory 1

1. Resources for learning Qiskit:

```
https://learning.quantum.ibm.com/\\  
https://www.ibm.com/quantum/qiskit\\
```

```
set-up: https://docs.quantum.ibm.com/start/install\\
```

2. Virtual Environments in Python

```
> python3 -m venv tutorial-env  
> source tutorial-env/bin/activate  
For installation of a specific version of a package:  
> python3 -m pip install requests==2.6.0  
> deactivate
```

3. Jupyter notebook installation

```
> pip install jupyter  
> jupyter notebook
```

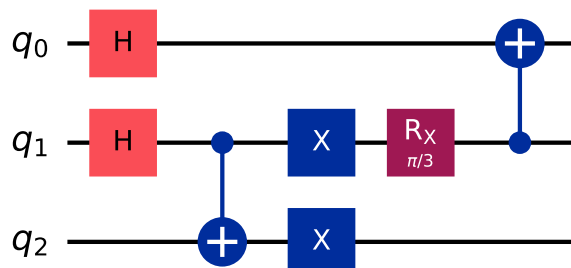
4. Qiskit installation

```
python3 -m venv /path/to/virtual/environment  
source /path/to/virtual/environment/bin/activate  
  
> pip install qiskit  
> pip install qiskit-ibm-runtime  
> pip install qiskit[visualization]  
> pip list
```

5. Installation of the local emulator

```
> pip install qiskit_aer
```

6. Calculate by hand the output of the following circuit for the initial state $|000\rangle$



7. Evaluate the circuit above using the Statevector package.
8. Visualize the state on the Bloch sphere, citystate diagrams and hinton diagram.
9. add measurements of the qubits to the circuit.
10. Simulate the experiment with $N = 1000$ shots using Aer simulator.
11. Visualize the results on a histogram.