



```
In [1]: !pip install qiskit qiskit-aer --upgrade
```

```
Collecting qiskit
  Downloading qiskit-2.2.1-cp39-abi3-manylinux2014_x86_64.manylinux_2_17_x86_64.whl.metadata (12 kB)
Collecting qiskit-aer
  Downloading qiskit_aer-0.17.2-cp312-cp312-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (8.3 kB)
Collecting rustworkx>=0.15.0 (from qiskit)
  Downloading rustworkx-0.17.1-cp39-abi3-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (10 kB)
Requirement already satisfied: numpy<3,>=1.17 in /usr/local/lib/python3.12/dist-packages (from qiskit) (2.0.2)
Requirement already satisfied: scipy>=1.5 in /usr/local/lib/python3.12/dist-packages (from qiskit) (1.16.2)
Requirement already satisfied: dill>=0.3 in /usr/local/lib/python3.12/dist-packages (from qiskit) (0.3.8)
Collecting stevedore>=3.0.0 (from qiskit)
  Downloading stevedore-5.5.0-py3-none-any.whl.metadata (2.2 kB)
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.12/dist-packages (from qiskit) (4.15.0)
Requirement already satisfied: psutil>=5 in /usr/local/lib/python3.12/dist-packages (from qiskit-aer) (5.9.5)
Requirement already satisfied: python-dateutil>=2.8.0 in /usr/local/lib/python3.12/dist-packages (from qiskit-aer) (2.9.0.post0)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.12/dist-packages (from python-dateutil>=2.8.0->qiskit-aer) (1.17.0)
Downloading qiskit-2.2.1-cp39-abi3-manylinux2014_x86_64.manylinux_2_17_x86_64.whl (8.0 MB)
_____ 8.0/8.0 MB 47.0 MB/s eta 0:00:00
Downloading qiskit_aer-0.17.2-cp312-cp312-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (12.4 MB)
_____ 12.4/12.4 MB 73.8 MB/s eta 0:00:00
Downloading rustworkx-0.17.1-cp39-abi3-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (2.2 MB)
_____ 2.2/2.2 MB 45.5 MB/s eta 0:00:00
Downloading stevedore-5.5.0-py3-none-any.whl (49 kB)
_____ 49.5/49.5 kB 3.1 MB/s eta 0:00:00
Installing collected packages: stevedore, rustworkx, qiskit, qiskit-aer
Successfully installed qiskit-2.2.1 qiskit-aer-0.17.2 rustworkx-0.17.1 stevedore-5.5.0
```

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In [ ]: #Task 1
```

```
In [8]: sim = AerSimulator()

qc = QuantumCircuit(2, 2)

qc.h(0)
qc.cx(1,0)
qc.cz(1,0)
qc.swap(0, 1)

qc.measure_all()
```

```

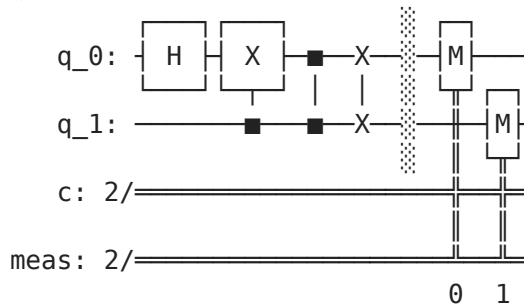
print("Quantum Circuit:")
print(qc.draw())

compiled = transpile(qc, sim)
result = sim.run(compiled, shots=1024).result()

counts = result.get_counts()
print("\nMeasurement Counts:", counts)

```

Quantum Circuit:



Measurement Counts: {'00 00': 527, '10 00': 497}

In [ ]: *#Task 2*

```

In [9]: sim = AerSimulator()

qc = QuantumCircuit(2, 2)

qc.h(0)
qc.cx(0, 1)
qc.cz(0, 1)
qc.measure_all()

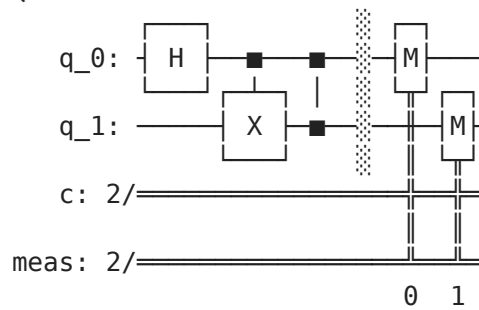
print("Quantum Circuit:")
print(qc.draw())

compiled = transpile(qc, sim)
result = sim.run(compiled, shots=1024).result()

counts = result.get_counts()
print("\nMeasurement Counts:", counts)

```

Quantum Circuit:



Measurement Counts: {'11 00': 541, '00 00': 483}

In [ ]: *#Task 3*

```
In [10]: sim = AerSimulator()

qc = QuantumCircuit(2, 2)

qc.h(0)
qc.h(1)
qc.cx(0, 1)
qc.cz(0, 1)
qc.swap(0, 1)

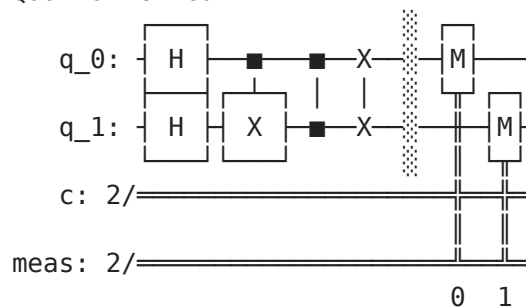
qc.measure_all()

print("Quantum Circuit:")
print(qc.draw())

compiled = transpile(qc, sim)
result = sim.run(compiled, shots=1024).result()

counts = result.get_counts()
print("\nMeasurement Counts:", counts)
```

Quantum Circuit:



Measurement Counts: {'11 00': 258, '10 00': 262, '01 00': 266, '00 00': 238}