

# IBM Quantum Composer Tutorial

Here is a step-by-step tutorial on using the IBM Quantum Composer. This guide will walk you through the IBM Quantum Learning page, building a circuit, running it, checking its queue time, and obtaining your results.

You can navigate to the IBM Quantum Learning site on your browser through the following link: <https://learning.quantum.ibm.com>.

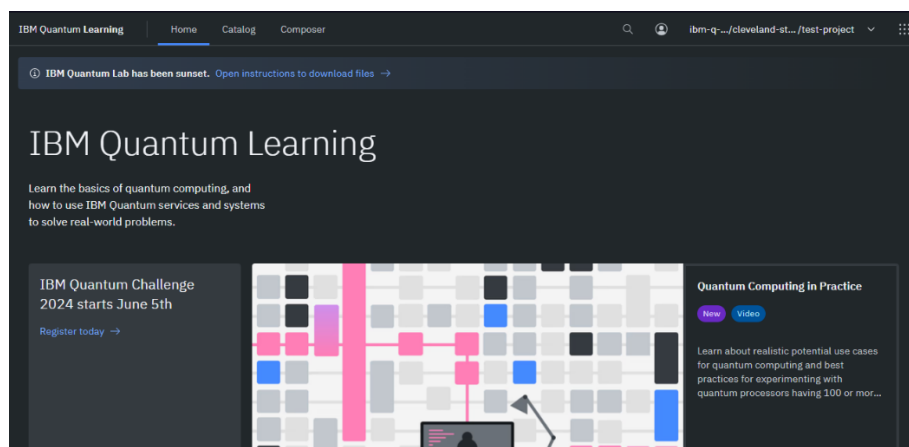


Figure 1: IBM Quantum Learning Webpage

Sign in with your IBMID to access the composer's features. Click on the composer tab on the website where you can manage and create quantum circuits/jobs through a very simple drag-and-drop interface.

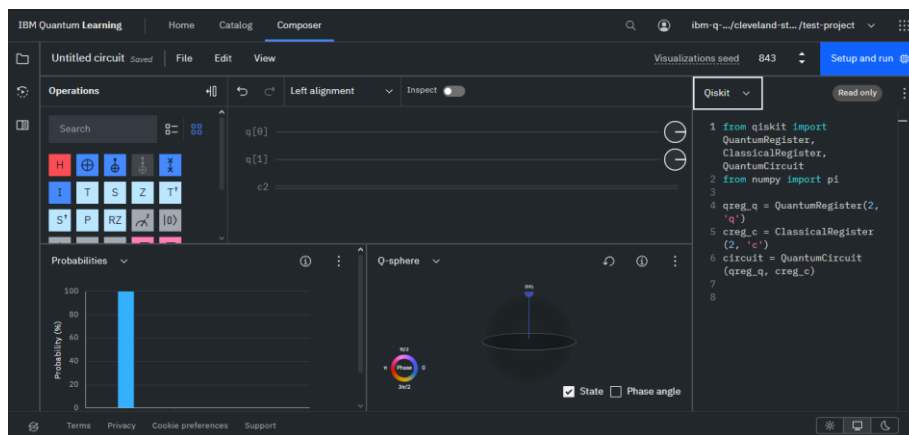


Figure 2: IBM Quantum Composer

From this interface, you can easily drag and drop quantum gates onto the qubits. As you build your circuit visually, the corresponding Qiskit code is automatically generated and displayed in the tab on the right side of the screen. For this tutorial, we are entangling two qubits. We will place a Hadamard gate on the first qubit (H-gate) and a CNOT gate (a controlled-NOT gate) on the first and second qubit.

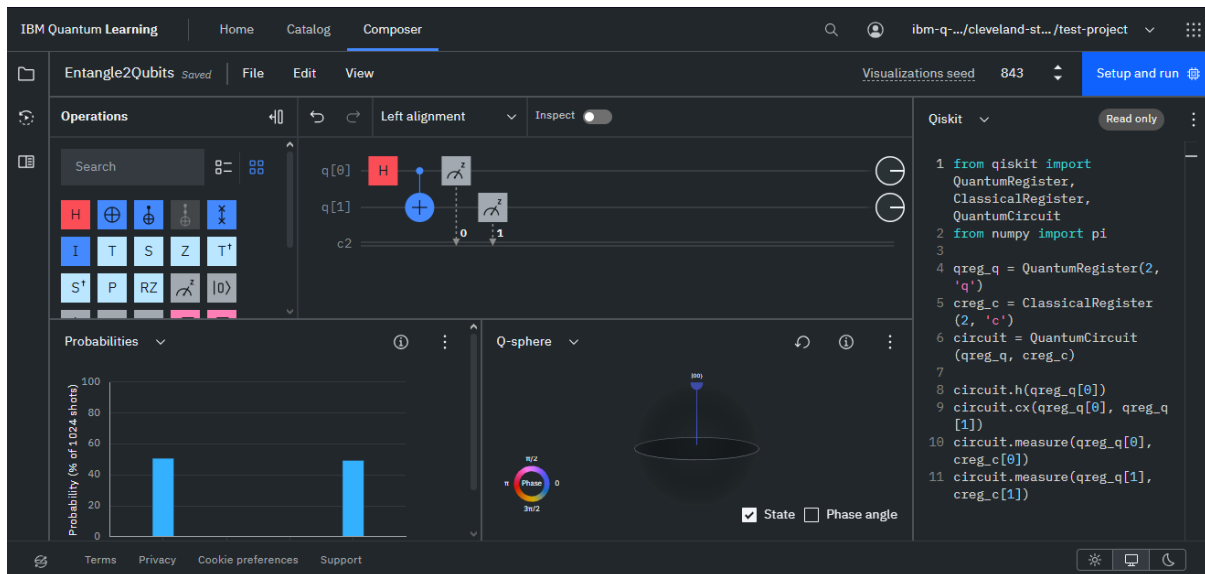


Figure 3: Entangled Circuit

The Composer will automatically generate Qiskit code along with the probabilities of outputs across the computational basis states. It also provides visualization in the form of a Q-Sphere. To run this circuit we click on the setup and run tab in the top right corner.

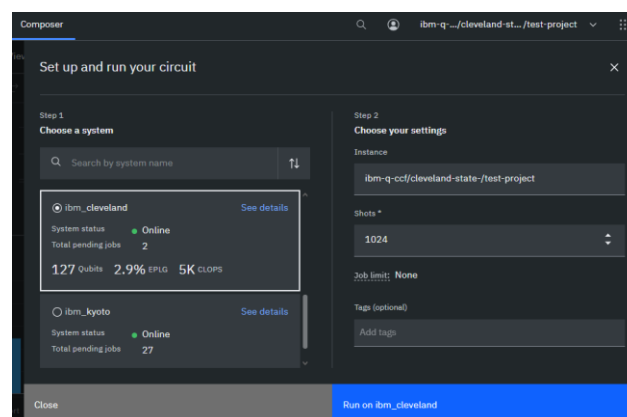


Figure 4: Running the Quantum Circuit

Here you can choose which IBM Quantum Instance to use to run your quantum circuit, along with the number of shots. After the circuit has been sent to be run, you will receive a notification that your job has been queued. You can check Composer jobs on the left sidebar of the page.

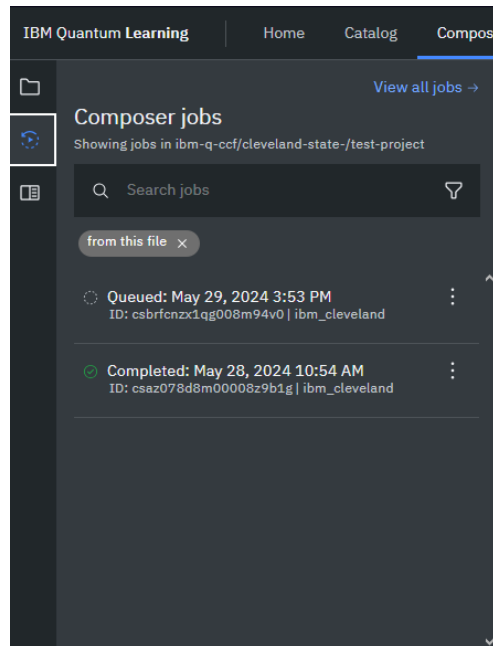


Figure 5: Composer Jobs List

By clicking on your job, you can view more details and get an estimate of when it will execute and finish.

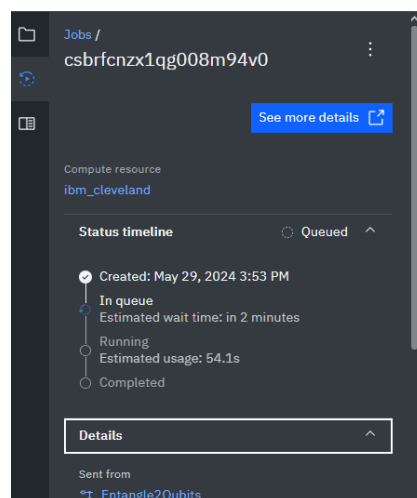
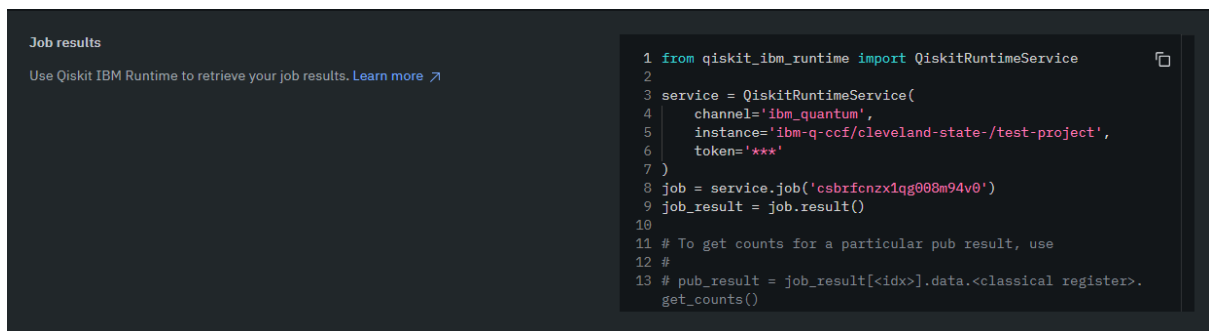


Figure 6: Status Timeline

When the job is complete, you are notified and you can check your results on the Composer.

Alternatively, you can also use the Qiskit IBM Runtime library to retrieve your job results.



The image shows a code editor with a dark background. On the left, there is a sidebar with the text "Job results" and a link "Use Qiskit IBM Runtime to retrieve your job results. Learn more". The main area contains Python code for using the QiskitRuntimeService to retrieve job results.

```
1 from qiskit_ibm_runtime import QiskitRuntimeService
2
3 service = QiskitRuntimeService(
4     channel='ibm_quantum',
5     instance='ibm-q-ccf/cleveland-state-/test-project',
6     token='***'
7 )
8 job = service.job('csbrfcnz1qg008m94v0')
9 job_result = job.result()
10
11 # To get counts for a particular pub result, use
12 #
13 # pub_result = job_result[<idx>].data.<classical register>.
   get_counts()
```

*Figure 7: Retrieving Job results*