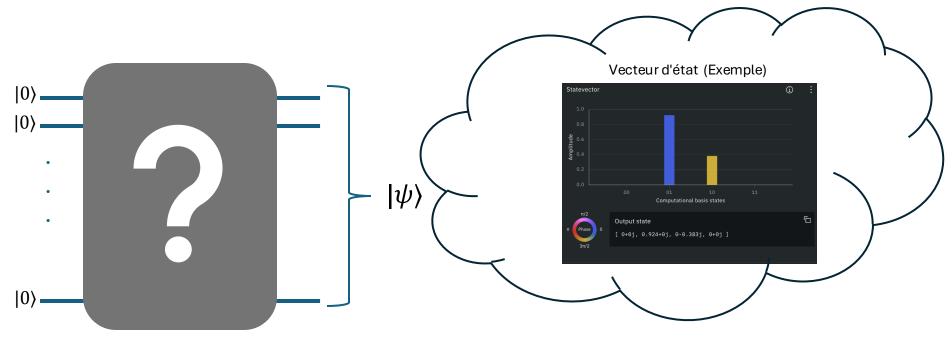


## Presentation

Explanation of the challenge and how to complete it.

#### Your mission:

Starting from a quantum state  $|\psi\rangle$  (represented by a diagram of its state vector), your goal is to find the quantum circuit that produces this specific state.



Find the quantum circuit

A quantum state is represented by a diagram of its state vector.

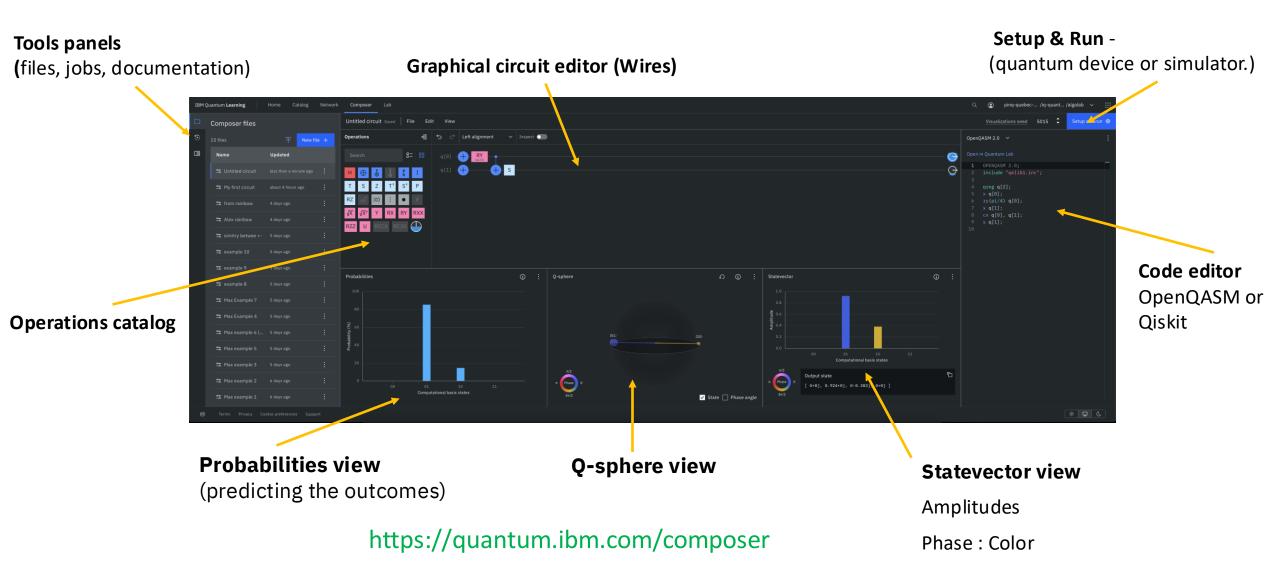
#### Challenge overview

- 1. You have 11 + 8 katas to solve.
- 2. You may use one of the following tools to solve them:
  - IBM Quantum Composer (to be used only as a tool to help you design your solution)

#### Or

- Source code (Jupyter notebook)
- 3. Provide your solutions in the notebook associated with this challenge, in the form of source code.

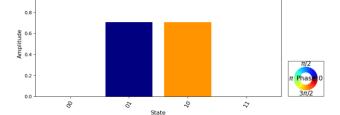
# IBM Quantum Composer Create your circuit using drag and drop.



#### Code: Jupyter Notebook

```
statevector_visualizer.py
     # This part of code is by : Maxime Dion
     import os
     import matplotlib.pyplot as plt
     import numpy as np
     from matplotlib.patches import Circle, Rectangle
     from qiskit import QuantumCircuit
     from qiskit.quantum_info import Statevector
     def plot_statevector(circuit):
         statevector = Statevector(circuit)
         state_indices = np.arange(len(statevector))
         n_qubits = int(np.log2(len(state_indices)))
         color_map = plt.get_cmap("jet")
         fig, ax histo = plt.subplots(1, 1, figsize=(8, 4))
         ax_histo.bar(
     color=color map(np.remainder(np.angle(statevector) / (2 * np.pi), 1))
         plt.show()
```

```
Defi_notebook.ipynb
from tools.statevector_visualizer import plot_statevector
 from giskit import QuantumCircuit
 import numpy as np
def circuit_test(): # your circuit
    circuit = QuantumCircuit(2)
    circuit.x(range(2))
    circuit.ry(np.pi/2,0)
    circuit.cx(0,1)
    circuit.s(1)
    return circuit
qc = circuit_test()
 plot_statevector(qc)
```

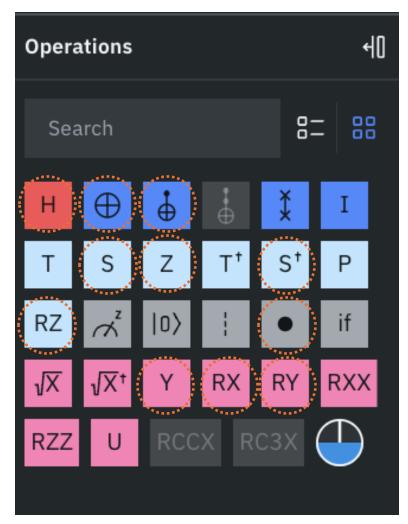


#### Use the source code to:

- •Optional: Find the solution to the required circuit (you may also use IBM Composer for this).
- •Mandatory: Submit your solutions.

## Quantum gate options for the challenge

- H Hadamard
- Pauli: X (NOT), Y, Z
- S, S<sup>†</sup>
- Controlled-gate
- Rotation Gate: RX, RY, RZ



#### Quantum Dojo - Easy



Kata (partie 1): 11 Kata

## Quantum Dojo - Medium



Kata (partie 2): 8 Kata