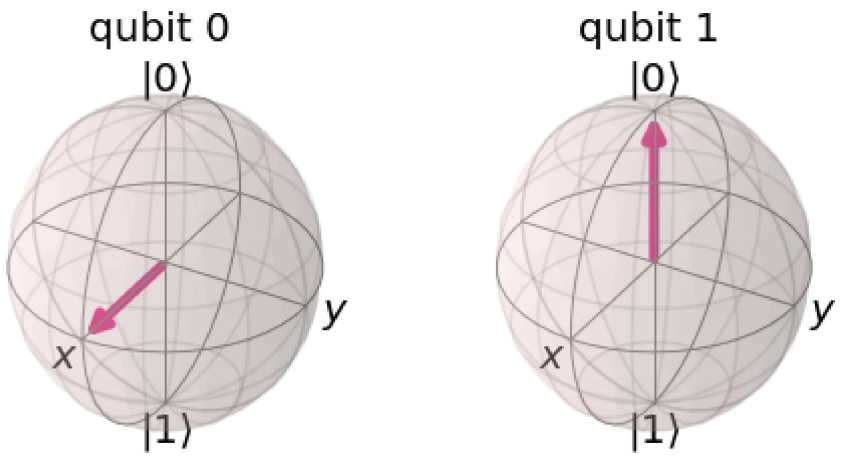
In [14]:
```
from qiskit import QuantumCircuit, Aer, assemble, execute
from math import pi, sqrt
from qiskit.visualization import plot_bloch_multivector, plot_histogram
import numpy as np
from qiskit_textbook.tools import array_to_latex
```

In [23]:
```
# 2.3(1) What would be the resulting state of the control qubit (q0) if the ta
rget qubit (q1) was in the state |0⟩?
```

In [24]:
```
qc = QuantumCircuit(2)
qc.h(0)
qc.cp(pi/4, 0, 1)
display(qc.draw())
backend = Aer.get_backend('statevector_simulator')
result = execute(qc,backend).result()
plot_bloch_multivector(result.get_statevector())
```

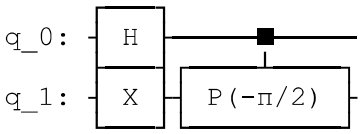
```
q_0: ─ H ──■──
           │
q_1: ──────P(π/4)─
```

Out[24]:

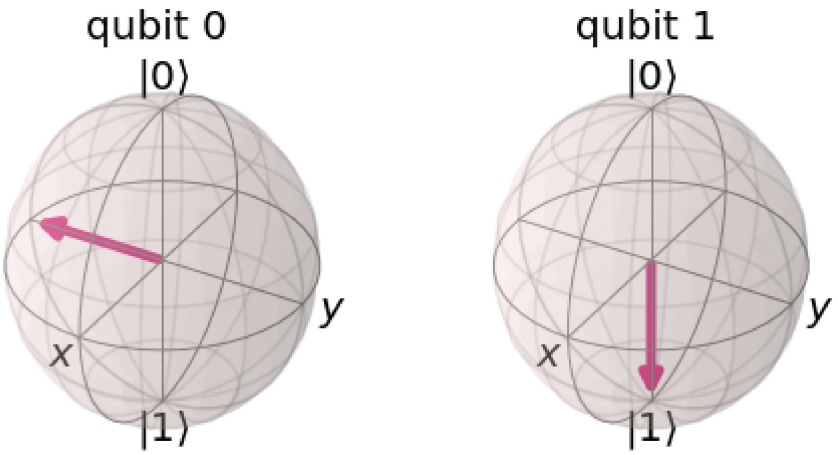


In [25]:
```
#2.3(2) What would happen to the control qubit (q0) if the target qubit (q1) w
as in the state |1⟩, and the circuit used a controlled-Sdg gate instead of the
controlled-T?
```

In [26]:
```
qc = QuantumCircuit(2)
qc.h(0)
qc.x(1)
qc.cp(-pi/2, 0, 1)
display(qc.draw())
backend = Aer.get_backend('statevector_simulator')
result = execute(qc,backend).result()
plot_bloch_multivector(result.get_statevector())
```

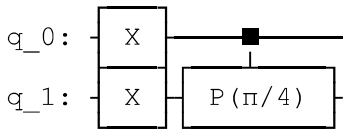


Out[26]:

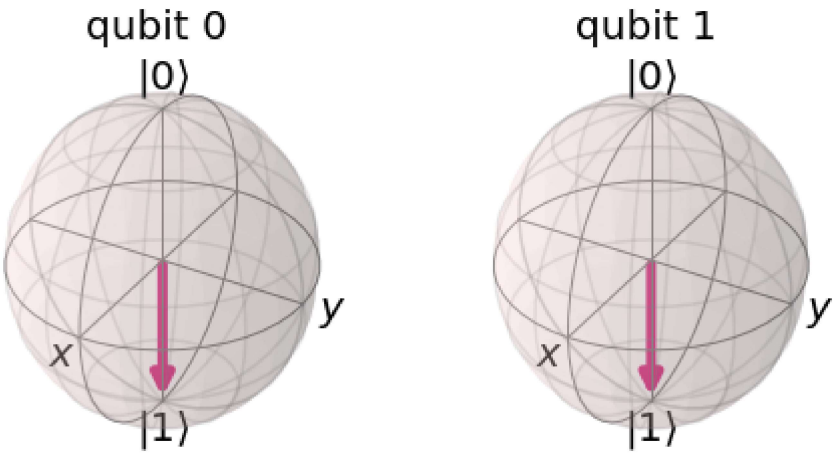


In [27]:
```
#2.3(3) What would happen to the control qubit (q0) if it was in the state |1⟩
instead of the state |+⟩ before application of the controlled-T?
```

In [28]:
```
qc = QuantumCircuit(2)
qc.x(0)
qc.x(1)
qc.cp(pi/4, 0, 1)
display(qc.draw())
backend = Aer.get_backend('statevector_simulator')
result = execute(qc,backend).result()
plot_bloch_multivector(result.get_statevector())
```



Out[28]:



In [ ]: