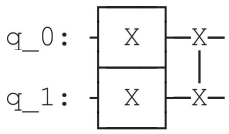
In [1]:
```
from qiskit import *
from qiskit.visualization import *
```

Swap 1 and 1

In [2]:
```
# Using Swap operation

qc = QuantumCircuit(2)
qc.x(0)
qc.x(1)
qc.swap(0,1)
qc.draw()
```

Out[2]:



In [3]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

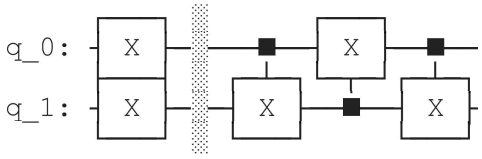
Out[3]:

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

In [4]:
```
# Using Cnot gates

qc = QuantumCircuit(2)
qc.x(0)
qc.x(1)
qc.barrier()
qc.cx(0,1)
qc.cx(1,0)
qc.cx(0,1)
qc.draw()
```

Out[4]:



In [5]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

Out[5]:

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

Swap 0 and 0

In [6]:
```
# Using Swap operation

qc = QuantumCircuit(2)
qc.swap(0,1)
qc.draw()
```

Out[6]:
```
q_0: ─X─
     │
q_1: ─X─
```

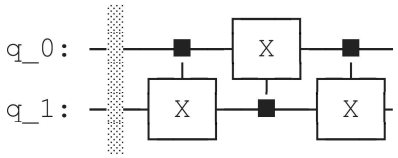
In [7]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

Out[7]:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

In [8]:
```
# Using Cnot gates

qc = QuantumCircuit(2)
qc.barrier()
qc.cx(0,1)
qc.cx(1,0)
qc.cx(0,1)
qc.draw()
```

Out[8]:


In [9]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

Out[9]:

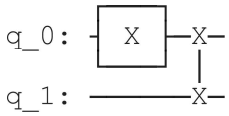
$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Swap 1 and 0

In [10]:
```
# Using Swap operation

qc = QuantumCircuit(2)
qc.x(0)
qc.swap(0,1)
qc.draw()
```

Out[10]:



In [11]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

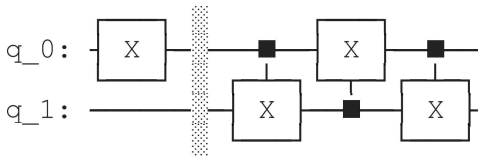
Out[11]:

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

In [12]:
```
# Using Cnot gates

qc = QuantumCircuit(2)
qc.x(0)
qc.barrier()
qc.cx(0,1)
qc.cx(1,0)
qc.cx(0,1)
qc.draw()
```

Out[12]:



In [13]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

Out[13]:

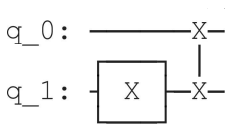
$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

Swap 0 and 1

In [14]:
```
# Using Swap operation

qc = QuantumCircuit(2)
qc.x(1)
qc.swap(0,1)
qc.draw()
```

Out[14]:



In [15]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

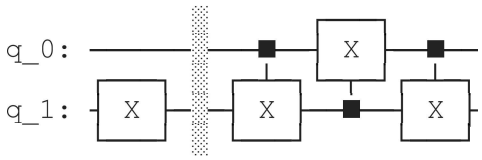
Out[15]:

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

In [16]:
```
# Using Cnot gates

qc = QuantumCircuit(2)
qc.x(1)
qc.barrier()
qc.cx(0,1)
qc.cx(1,0)
qc.cx(0,1)
qc.draw()
```

Out[16]:



In [17]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

Out[17]:

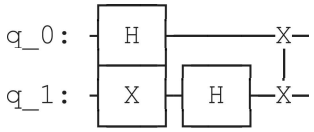
$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

Swap with superposition

In [18]:
```
# Using Swap operation

qc = QuantumCircuit(2)
qc.h(0)
qc.x(1)
qc.h(1)
qc.swap(0,1)
qc.draw()
```

Out[18]:



In [19]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
sv = job.get_unitary()
array_to_latex(sv)
```

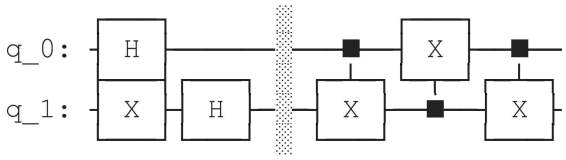
Out[19]:

$$\begin{bmatrix} \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ -\frac{1}{2} & -\frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} \end{bmatrix}$$

In [20]:
```
# Using Cnot gates

qc = QuantumCircuit(2)
qc.h(0)
qc.x(1)
qc.h(1)
qc.barrier()
qc.cx(0,1)
qc.cx(1,0)
qc.cx(0,1)
qc.draw()
```

Out[20]:



In [21]:
```
sim = Aer.get_backend('unitary_simulator')
job = execute(qc, sim).result()
```

```
sv = job.get_unitary()
array_to_latex(sv)
```

Out[21]:

$$\begin{bmatrix} \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ -\frac{1}{2} & -\frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} \end{bmatrix}$$