

$$\frac{|00\rangle + |11\rangle}{\sqrt{2}}$$

- 00 : Do Nothing. : $\frac{|00\rangle + |11\rangle}{\sqrt{2}}$
- 01 : $\underline{X} \otimes \underline{I}$: $\frac{|10\rangle + |01\rangle}{\sqrt{2}}$
- 10 : $iY \otimes I$:
- 11 :

$$i\sigma_y = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} i\sigma_y |0\rangle = \begin{pmatrix} 0 \\ -1 \end{pmatrix} = -|1\rangle$$

$$\sigma_y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$$

$$i\sigma_y |0\rangle = -|1\rangle$$

$$i\sigma_y |1\rangle = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} = |0\rangle$$

$$|0\rangle : \quad iY \otimes I : \quad \frac{-|10\rangle + |01\rangle}{\sqrt{2}}$$

$$|1\rangle : \quad Z \otimes I : \quad \frac{|00\rangle - |11\rangle}{\sqrt{2}}$$

Effect of Bob's CNOT

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00: $\frac{|00\rangle + |11\rangle}{\sqrt{2}}$: $\frac{|00\rangle + |10\rangle}{\sqrt{2}}$ ✓ : Second Ab 0.

01: $\frac{|110\rangle + |101\rangle}{\sqrt{2}}$: $\frac{|11\rangle + |01\rangle}{\sqrt{2}}$] 1

10: $\frac{-|110\rangle + |101\rangle}{\sqrt{2}}$: $\frac{-|11\rangle + |01\rangle}{\sqrt{2}}$]

11: $\frac{|00\rangle - |11\rangle}{\sqrt{2}}$: $\frac{|00\rangle - |10\rangle}{\sqrt{2}}$ ✓ 0

If the 2nd Qubit is 0

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Alice has sent 00 or 11.

If the 2nd Qubit is 1.

01 or 10

Bob applies H-Gate.