

(TRUE / FALSE)

Entanglement allows relationships to exist between qubits.

We know how entanglement works.

You can only entangle qubits to have the same value.

In entanglement, probability outcomes do not follow independent probabilities.

Qubits can work together without entanglement.

Which of the following is a true statement about the C-NOT gate?

a. C-NOT toggles the control qubit if and only if the target qubit is $|0\rangle$

b. C-NOT toggles the control qubit if and only if the target qubit is $|1\rangle$

c. C-NOT toggles the target qubit if and only if the control qubit is $|0\rangle$

d. C-NOT toggles the target qubit if and only if the control qubit is $|1\rangle$

Convert the two independent qubits shown below into 2-qubit bra-ket notation.

QUBIT 1 $\frac{\sqrt{3}}{2}|0\rangle + \frac{1}{2}|1\rangle$

QUBIT 2 $1|0\rangle + 0|1\rangle$

$a.$ $\frac{1}{\sqrt{2}}|00\rangle + 0\ |01\rangle + \frac{\sqrt{3}}{2}|10\rangle + 1|11\rangle$

$b.$ $\frac{1}{2}\ |00\rangle + \frac{\sqrt{3}}{2}|01\rangle + 0\ |10\rangle + 0|11\rangle$

$c.$ $\frac{\sqrt{3}}{2}|00\rangle + 0\ |01\rangle + \frac{1}{2}\ |10\rangle + 0|11\rangle$

$d.$ $\frac{1}{2}\ |00\rangle + 0\ |01\rangle + \frac{\sqrt{3}}{2}|10\rangle + 0|11\rangle$

Convert the two independent qubits shown below into 2-qubit bra-ket notation.

QUBIT 1

$$\frac{1}{\sqrt{2}}\,|0\rangle + \frac{1}{\sqrt{2}}\,|1\rangle$$

QUBIT 2

$$|0\rangle$$

a. $\frac{1}{\sqrt{2}}|00\rangle + 0|01\rangle + \frac{1}{\sqrt{2}}|10\rangle + 0|11\rangle$

b. $0|00\rangle + \frac{1}{\sqrt{2}}|01\rangle + \frac{1}{\sqrt{2}}|10\rangle + 0|11\rangle$

c. $0|00\rangle + \frac{1}{\sqrt{2}}|01\rangle + 0|10\rangle + \frac{1}{\sqrt{2}}|11\rangle$

d. $\frac{1}{\sqrt{2}}|00\rangle + 0|01\rangle + 0|10\rangle + \frac{1}{\sqrt{2}}|11\rangle$

Convert the 2-qubit bra-ket notation into vector notation.

BRA-KET NOTATION

$$\frac{\sqrt{3}}{2}|00\rangle + 0\,|01\rangle + \frac{1}{2}|10\rangle + 0|11\rangle$$

$a.$ $\begin{bmatrix} \frac{3}{4} \\ 0 \\ \frac{1}{4} \\ 0 \end{bmatrix}$ $b.$ $\begin{bmatrix} \frac{\sqrt{3}}{2} \\ 0 \\ \frac{1}{2} \\ 0 \end{bmatrix}$ $c.$ $\begin{bmatrix} \frac{1}{2} \\ 0 \\ \frac{\sqrt{3}}{2} \\ 0 \end{bmatrix}$ $d.$ $\begin{bmatrix} 0 \\ \frac{1}{2} \\ 0 \\ \frac{\sqrt{3}}{2} \end{bmatrix}$

Convert the 2-qubit bra-ket notation into vector notation.

BRA-KET NOTATION

$$0|00\rangle+\frac{\sqrt{3}}{2}|01\rangle+0\,|10\rangle+\frac{1}{2}\,|11\rangle$$

$a.$ $\begin{bmatrix} 0 \\ \frac{\sqrt{3}}{2} \\ 0 \\ \frac{1}{2} \end{bmatrix}$ $b.$ $\begin{bmatrix} \frac{\sqrt{3}}{2} \\ 0 \\ \frac{1}{2} \\ 0 \end{bmatrix}$ $c.$ $\begin{bmatrix} \frac{1}{2} \\ 0 \\ \frac{\sqrt{3}}{2} \\ 0 \end{bmatrix}$ $d.$ $\begin{bmatrix} 0 \\ \frac{1}{2} \\ 0 \\ \frac{\sqrt{3}}{2} \end{bmatrix}$

Convert the 2-qubit bra-ket notation into vector notation.

BRA-KET NOTATION

$$\frac{1}{\sqrt{2}}|00\rangle + 0|01\rangle + \frac{1}{\sqrt{2}}|10\rangle + 0|11\rangle$$

$a.$ $\begin{bmatrix} 0 \\ \frac{1}{\sqrt{2}} \\ 0 \\ \frac{1}{\sqrt{2}} \end{bmatrix}$ $b.$ $\begin{bmatrix} 0 \\ \frac{1}{2} \\ 0 \\ \frac{1}{2} \end{bmatrix}$ $c.$ $\begin{bmatrix} \frac{1}{2} \\ 0 \\ \frac{1}{2} \\ 0 \end{bmatrix}$ $d.$ $\begin{bmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ \frac{1}{\sqrt{2}} \\ 0 \end{bmatrix}$

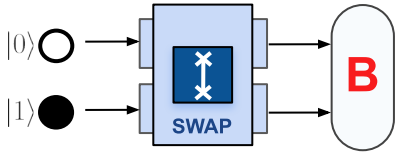
Convert the 2-qubit bra-ket notation into vector notation.

BRA-KET NOTATION

$$\tfrac{1}{\sqrt{2}}\,|00\rangle + \;0\,|01\rangle + \;0|10\rangle + \tfrac{1}{\sqrt{2}}|11\rangle$$

$a.$ $\begin{bmatrix} 0 \\ \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \\ 0 \end{bmatrix}$ $b.$ $\begin{bmatrix} \frac{1}{2} \\ 0 \\ 0 \\ \frac{1}{2} \end{bmatrix}$ $c.$ $\begin{bmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ 0 \\ \frac{1}{\sqrt{2}} \end{bmatrix}$ $d.$ $\begin{bmatrix} 0 \\ \frac{1}{2} \\ \frac{1}{2} \\ 0 \end{bmatrix}$

Select the option below that describes the combined 2-qubit state at **B**.



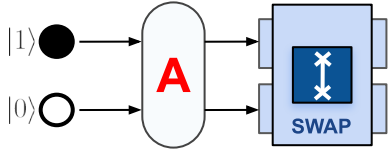
$a.\ \ 1|00\rangle + 0|01\rangle + 1|10\rangle + 0|11\rangle$

$b.\ \ 0|00\rangle + 1|01\rangle + 0|10\rangle + 0|11\rangle$

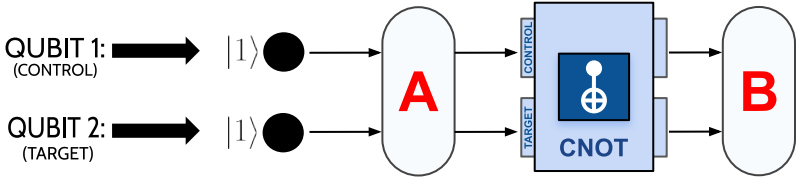
$c.\ \ 0|00\rangle + 0|01\rangle + 1|10\rangle + 0|11\rangle$

$d.\ \ 0|00\rangle + 0|01\rangle + 0|10\rangle + 1|11\rangle$

Select the option below that describes the combined 2-qubit state at **A**.



$a.\begin{bmatrix}0\\1\\0\\0\end{bmatrix}$ $b.\begin{bmatrix}0\\0\\1\\0\end{bmatrix}$ $c.\begin{bmatrix}1\\0\\0\\0\end{bmatrix}$ $d.\begin{bmatrix}0\\0\\0\\1\end{bmatrix}$



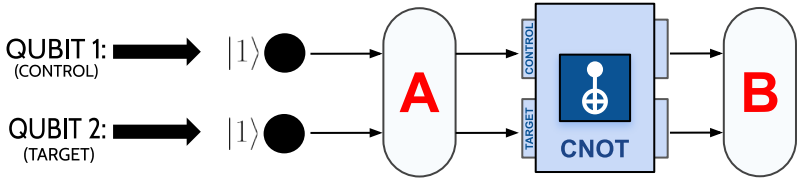
$a.\ \ 1|00\rangle + 0|01\rangle + 1|10\rangle + 0|11\rangle$

$b.\ \ 0|00\rangle + 1|01\rangle + 0|10\rangle + 0|11\rangle$

$c.\ \ 0|00\rangle + 0|01\rangle + 1|10\rangle + 0|11\rangle$

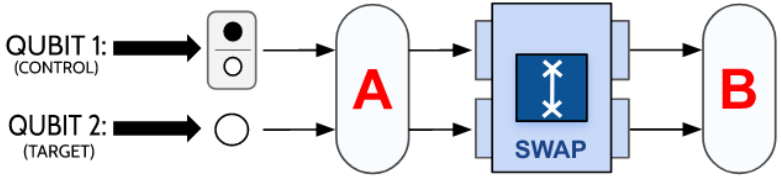
$d.\ \ 0|00\rangle + 0|01\rangle + 0|10\rangle + 1|11\rangle$

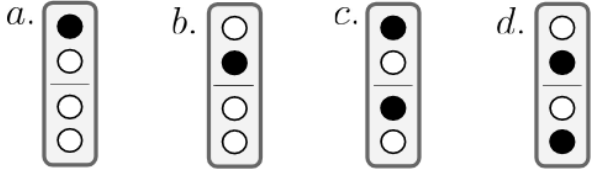
Select the option that describes the combined 2-qubit state at **A**.



$a.\ \begin{bmatrix}1\\0\\0\\0\end{bmatrix}$ $b.\ \begin{bmatrix}0\\1\\0\\0\end{bmatrix}$ $c.\ \begin{bmatrix}0\\0\\1\\0\end{bmatrix}$ $d.\ \begin{bmatrix}0\\0\\0\\1\end{bmatrix}$

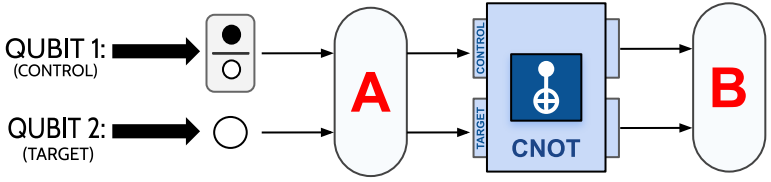
Select the option that describes the combined 2-qubit state at **B**.

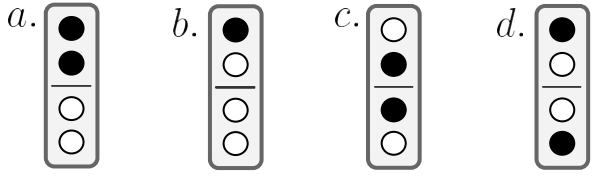




Select the option that describes the combined 2-qubit state at **A**.

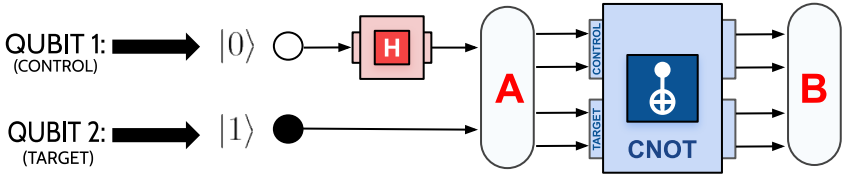
Select the option that describes the combined 2-qubit state at **B**.

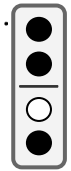


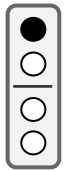


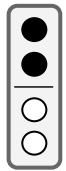
Select the option that describes the combined 2-qubit state at **A**.

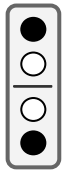
Select the option that describes the combined 2-qubit state at **B**.



$a.$ 

$b.$ 

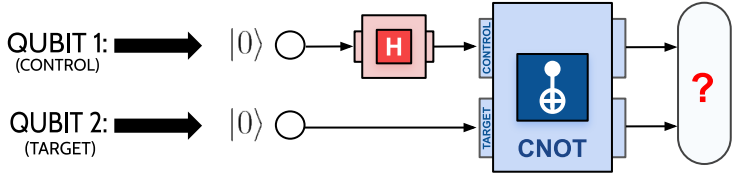
$c.$ 

$d.$ 

$e.$ cannot be determined

Select the option that describes the combined 2-qubit state at **A**.

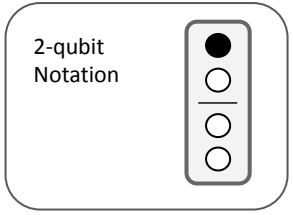
Select the option that describes the combined 2-qubit state at **B**.



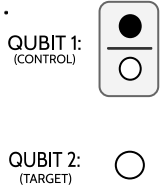
Select the option that describes the result vector at ?.

$a.\begin{bmatrix} 0 \\ \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \\ 0 \end{bmatrix}$ $b.\begin{bmatrix} 0 \\ \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \\ 0 \end{bmatrix}$ $c.\begin{bmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ 0 \\ \frac{1}{\sqrt{2}} \end{bmatrix}$ $d.\begin{bmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ 0 \\ -\frac{1}{\sqrt{2}} \end{bmatrix}$ $e.$ cannot be determined

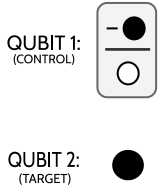
Select the option that describes the input values that can be described by the combined, 2-qubit notation:



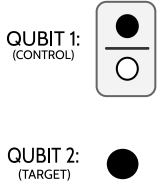
a.



b.



c.



d.