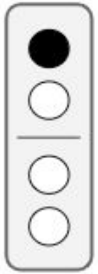
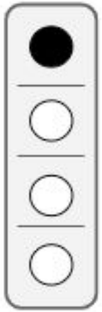
Which represents 25% chance of measuring black and 75% chance of measuring white, with a positive phase?

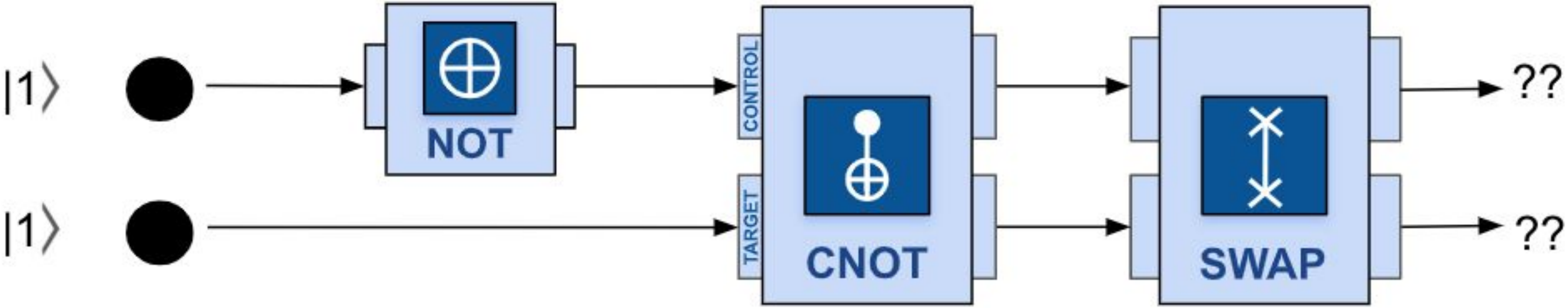
a. 

b. 

c. 

d. 

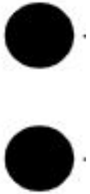
What is the outcome?



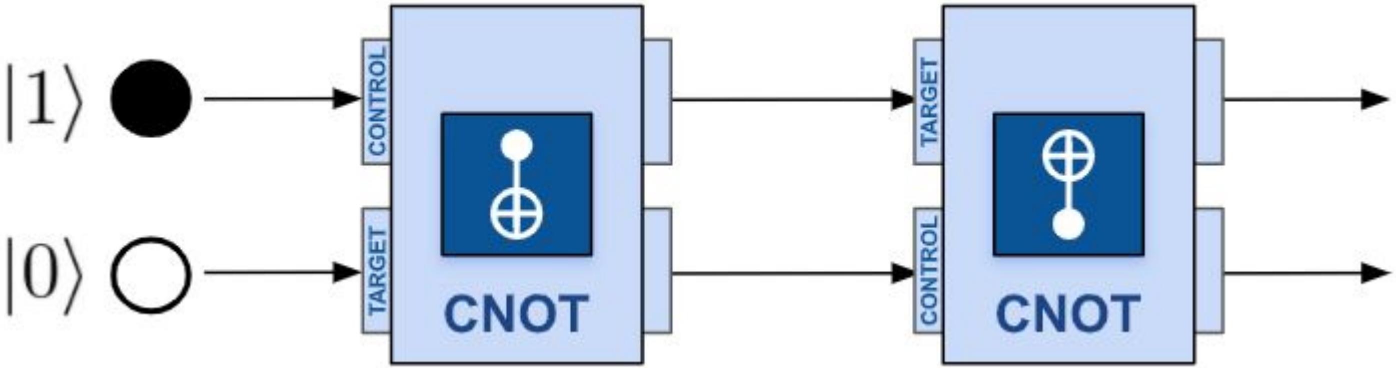
a. 

b. 

c. 

d. 

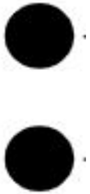
What is the outcome? Note the orientations of the CNOT gates.



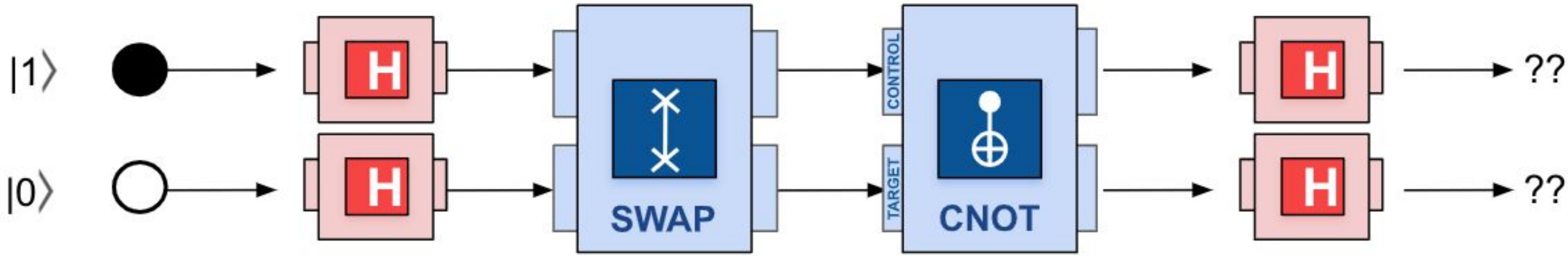
a. 

b. 

c. 

d. 

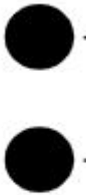
What is the outcome?



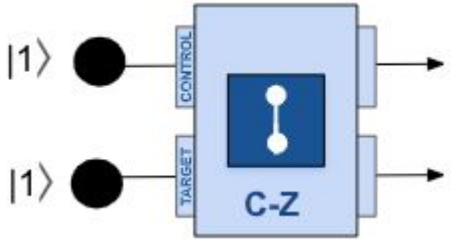
a. 

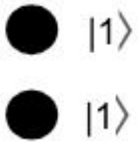
b. 

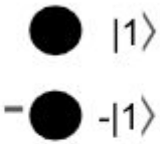
c. 

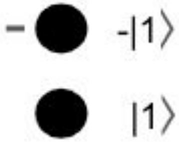
d. 

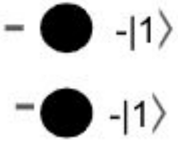
Choose all of the possible outcomes from this C-Z gate.



a.


b.


c.


d.


Choose all valid bra-ket notation representations for a state that has a 64% chance of measuring a 1

1. 0.64 | 0 > + 0.36 | 1 >
2. 0.36 | 0 > + 0.64 | 1 >
3. 0.64 | 0 > - 0.36 | 1 >
4. 0.36 | 0 > - 0.64 | 1 >
5. 0.8 | 0 > + 0.6 | 1 >
6. 0.6 | 0 > + 0.8 | 1 >
7. 0.8 | 0 > - 0.6 | 1 >
8. 0.6 | 0 > - 0.8 | 1 >

Which of the following is/are valid quantum states?

A. $0.5 |0\rangle + 0.5 |1\rangle$
B. $0.6 |0\rangle - 0.8 |1\rangle$
C. $1/3 |0\rangle - 2/3 |1\rangle$

Choose which of the properties each quantum state has - is it valid, and is it entangled? If it is not valid, then we assume it cannot be entangled, so do not say entangled unless you say valid.

A. 0.5 |00> + 0.5 |01> + 0.5 |10> + 0.5 |11>
B. 0.5 |00> - 0.5 |01> + 0.5 |10> + 0.5 |11>
C. -0.6 |00> + 0.8 |11>
D. 0.8 |10> + 0.6 |11>

What is the two-bit representation of these two individual qubits?

qubit 1:

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

qubit 2:

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

a. $\frac{1}{2}|00\rangle + \frac{1}{2}|01\rangle + \frac{1}{4}|10\rangle + \frac{3}{4}|11\rangle$

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

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

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

Perform the following matrix multiplication. What is the result?

$$\begin{bmatrix} 2 & 4 \\ 3 & 7 \end{bmatrix} \begin{bmatrix} 5 \\ 1 \end{bmatrix}$$

$$a. \begin{bmatrix} 12 \\ 16 \end{bmatrix} \quad b. \begin{bmatrix} 14 \\ 22 \end{bmatrix} \quad c. \begin{bmatrix} 30 \\ 10 \end{bmatrix} \quad d. \begin{bmatrix} 11 \\ 11 \end{bmatrix}$$

Start with the following state, a | 0 > + b | 1 >.

What is the result when put through an identity gate?

Identity

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

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

Start with the following state, a | 0 > + b | 1 >.

What is the result when put through a Z gate?

Z Gate

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

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

Start with the following state, a | 0 > + b | 1 >.

What is the result when put through an H gate?

H Gate

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

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

Start with the following state, a | 0 > + b | 1 >.

What is the result when put through a NOT gate?

NOT

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

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

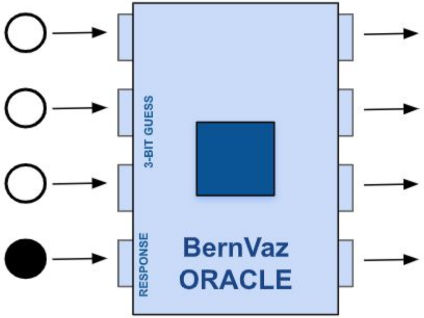
Choose the most accurate description of superposition in quantum computing:

A. In superposition, a qubit is one of two values, but the state is unknown because quantum operations have probabilistic outcomes. A measure reads out the state, telling you how the operation affected it, but not fundamentally changing its state.
B. In superposition, a qubit has two values simultaneously, with some probability of measuring one or the other. The act of measurement reads out one of the values, and if you performed an infinite number of measurements on that qubit, you would read out the values at the distribution equal to that probability.
C. In superposition, a qubit has two values simultaneously, with some probability of measuring one or the other. The act of measurement reads out one of the values, leaving it no longer in superposition but in the measured state.

Which of the following are true about entanglement?

A. Entanglement is present when reporting the probability of independent measurements cannot capture the probability of measuring different combinations of groups of qubits.
B. Once entangled, you can no longer perform quantum operations on the entangled qubits.
C. If qubits are entangled, a measurement of one qubit can affect the state of other qubits entangled with it.
D. Entanglement is required if you want to store the superposition of 8 numbers in a group of 3 qubits with equal probability of measuring each number.

What is the output of this Bernstein-Vazirani Oracle, given a secret code of 110 where 1 is the top bit?



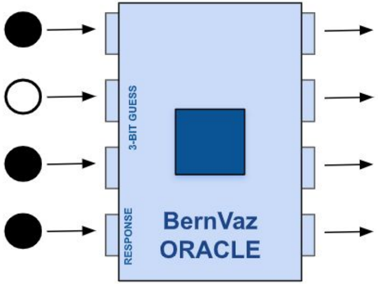
a. 

b. 

c. 

d. 

What is the output of this Bernstein-Vazirani Oracle, given a secret code of 110 (where 1 is the top bit)?



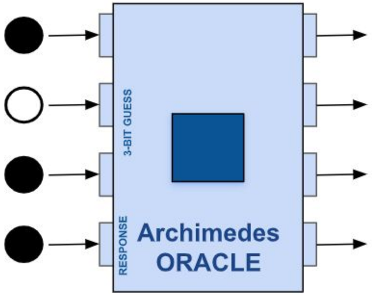
a.

b.

c.

d.

What is the output of the Archimedes Oracle, given a secret code of 110 (where 1 is the top bit)?



a. 

b. 

c. 

d.