1.2 Introduction to Dirac Notation

1. Convert the following qubit states from matrix to Dirac Notation

(a) $|\psi\rangle = \begin{bmatrix} \alpha \\ \beta \end{bmatrix}$ (b) $|\psi\rangle = \begin{bmatrix} \sqrt{3}/2 \\ 1/2 \end{bmatrix}$ (c) $|\psi\rangle = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$

2. If we measure a qubit in the state $|\psi\rangle = \begin{bmatrix} \alpha \\ \beta \end{bmatrix}$ as 0, what would we measure if we were to measure the qubit again? Why?

Answers

1.

(a) $|\psi\rangle = \begin{bmatrix} \alpha \\ \beta \end{bmatrix} = \alpha|0\rangle + \beta|1\rangle$

(b) $|\psi\rangle = \begin{bmatrix} \sqrt{3}/2 \\ 1/2 \end{bmatrix} = \frac{\sqrt{3}}{2}|0\rangle + \frac{1}{2}|1\rangle$

(c) $|\psi\rangle = \begin{bmatrix} 1 \\ 0 \end{bmatrix} = 1|0\rangle + 0|1\rangle = |0\rangle$

2. We would measure 0 since when we measured $|\psi\rangle$ the first time as 0 it's superposition collapsed and it became the state 0.