4 (c) $|+\rangle$, $\left\{\frac{1}{2}|0\rangle + \frac{\sqrt{3}}{2}|1\rangle, \frac{\sqrt{3}}{2}|0\rangle - \frac{1}{2}|1\rangle\right\}$

$$|+\rangle = \frac{1}{\sqrt{2}}\left(|0\rangle + |1\rangle\right)$$

$$\therefore \frac{1}{\sqrt{2}}\left(|0\rangle + |1\rangle\right) = a \cdot \left(\frac{1}{2}|0\rangle + \frac{\sqrt{3}}{2}|1\rangle\right) + b \cdot \left(\frac{\sqrt{3}}{2}|0\rangle - \frac{1}{2}|1\rangle\right)$$

Assumindo $a = \frac{\sqrt{3}+1}{2\sqrt{2}}$ e $b = \frac{\sqrt{3}-1}{2\sqrt{2}}$

$$\frac{\sqrt{3}+1}{2\sqrt{2}}\left(\frac{1}{2}|0\rangle + \frac{\sqrt{3}}{2}|1\rangle\right) + \frac{\sqrt{3}-1}{2\sqrt{2}}\left(\frac{\sqrt{3}}{2}|0\rangle - \frac{1}{2}|1\rangle\right)$$

$$\frac{\sqrt{3}+1}{4\sqrt{2}}|0\rangle + \frac{3+\sqrt{3}}{4\sqrt{2}}|1\rangle + \frac{3-\sqrt{3}}{4\sqrt{2}}|0\rangle - \frac{\sqrt{3}-1}{4\sqrt{2}}|1\rangle$$

$$\therefore \frac{4}{4\sqrt{2}}|0\rangle + \frac{4}{4\sqrt{2}}|1\rangle \Rightarrow \frac{1}{\sqrt{2}}\left(|0\rangle + |1\rangle\right)$$

Logo, as probabilidades:

- $\frac{1}{2}|0\rangle + \frac{\sqrt{3}}{2}|1\rangle \Rightarrow \left|\frac{\sqrt{3}+1}{2\sqrt{2}}\right|^2 \Rightarrow \boxed{\frac{4+2\sqrt{3}}{8}}$

- $\frac{\sqrt{3}}{2}|0\rangle - \frac{1}{2}|1\rangle \Rightarrow \left|\frac{\sqrt{3}-1}{2\sqrt{2}}\right|^2 \Rightarrow \boxed{\frac{4-2\sqrt{3}}{8}}$