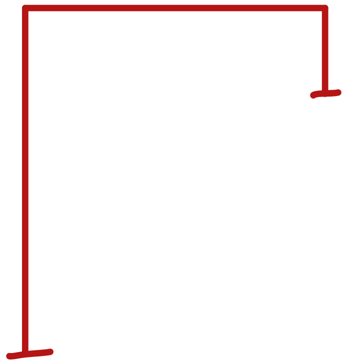
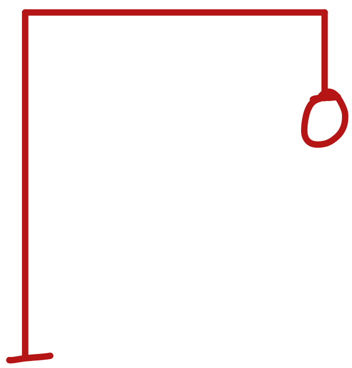
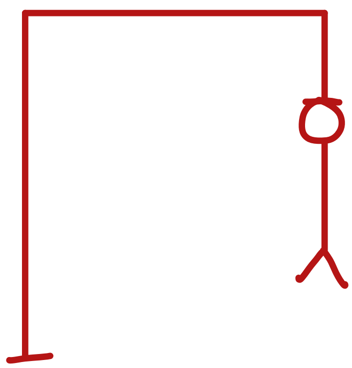


c o m p u t e r



u n i v e r s i t y

b



r u g b y

e x z s

$$|\psi_1 \psi_2\rangle = \frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|11\rangle$$

2 qubit state

$$|\psi_1\rangle|\psi_2\rangle = (\alpha_1|0\rangle + \beta_1|1\rangle)(\alpha_2|0\rangle + \beta_2|1\rangle)$$

$$= \alpha_1\alpha_2|00\rangle + \alpha_1\beta_2|01\rangle + \beta_1\alpha_2|10\rangle + \beta_1\beta_2|11\rangle$$

$\frac{1}{\sqrt{2}}$ 0 $\frac{1}{\sqrt{2}}$

$$\alpha_1\alpha_2 = \frac{1}{\sqrt{2}}$$

$$\beta_1\beta_2 = \frac{1}{\sqrt{2}}$$

$$\boxed{\begin{array}{l}\alpha_1\beta_2 = 0 \\ \beta_1\alpha_2 = 0\end{array}}$$

$$\frac{1}{\sqrt{6}}|00\rangle + \frac{1}{\sqrt{6}}|01\rangle + \sqrt{\frac{2}{3}}|10\rangle$$

a) measure 2nd qubit → probability of obtaining $|0\rangle$?

$$\left|\frac{1}{\sqrt{6}}\right|^2 + \left|\sqrt{\frac{2}{3}}\right|^2 = \frac{1}{6} + \frac{2}{3} = \boxed{\frac{5}{6}}$$

b) what is the post-measurement state of the system?

$$|\psi'\rangle = \frac{1}{\sqrt{6}}|00\rangle + \sqrt{\frac{2}{3}}|10\rangle$$

normalize (magnitude $\to$ 1)

$$|\psi'\rangle = \frac{\frac{1}{\sqrt{6}}|00\rangle + \sqrt{\frac{2}{3}}|10\rangle}{\sqrt{\left(\frac{1}{\sqrt{6}}\right)^2 + \left(\sqrt{\frac{2}{3}}\right)^2}}$$

$$= \frac{\frac{1}{\sqrt{6}}|00\rangle + \sqrt{\frac{2}{3}}|10\rangle}{\sqrt{\frac{5}{6}}}$$

$$= \sqrt{\frac{\cancel{6}}{5}}\left(\frac{1}{\sqrt{\cancel{6}}}\right)|00\rangle + \sqrt{\frac{6}{5}}\sqrt{\frac{2}{3}}|10\rangle$$

$$= \sqrt{\frac{1}{5}}|00\rangle + \sqrt{\frac{4}{5}}|10\rangle$$