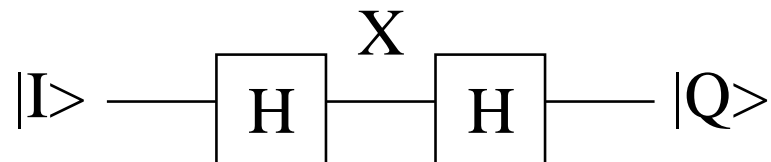


Quiz 8

1. Compute the transformation performed by the circuit below, given

$$H = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}.$$



2. If $|I\rangle = |0\rangle$ what are $P(Q = 0)$ and $P(Q = 1)$?
3. Now imagine a measurement is made at point X . How does this affect $P(Q = 0)$ and $P(Q = 1)$?

Solutions

1. The transformation is $H^2 = \frac{1}{2} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
2. Since $H^2 = I$, if $|I\rangle = |0\rangle$ then $P(Q = 0) = 1$ and $P(Q = 1) = 0$
3. After the measurement is made at X, the state there must be either $|0\rangle$ or $|1\rangle$. This means that $|Q\rangle = \frac{1}{\sqrt{2}} (|0\rangle \pm |1\rangle)$ and so $P(Q = 0) = P(Q = 1) = 1/2$