

# Example

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## 1 Exercise

$$\begin{aligned} & H_{0,1} X_2^1 X_2^0 H_{0,-2} X_2 |000\rangle \\ &= H_{0,1} X_2^1 X_2^0 H_{0,-2} [|100\rangle] \\ &= H_{0,1} X_2^1 X_2^0 [0.25\sqrt{2}|000\rangle + 0.25\sqrt{2}|001\rangle + 0.25\sqrt{2}|010\rangle + 0.25\sqrt{2}|011\rangle - 0.25\sqrt{2}|100\rangle - \\ &\quad 0.25\sqrt{2}|101\rangle - 0.25\sqrt{2}|110\rangle - 0.25\sqrt{2}|111\rangle] \\ &= H_{0,1} X_2^1 [0.25\sqrt{2}|000\rangle - 0.25\sqrt{2}|001\rangle + 0.25\sqrt{2}|010\rangle - 0.25\sqrt{2}|011\rangle - 0.25\sqrt{2}|100\rangle + \\ &\quad 0.25\sqrt{2}|101\rangle - 0.25\sqrt{2}|110\rangle + 0.25\sqrt{2}|111\rangle] \\ &= H_{0,1} [0.25\sqrt{2}|000\rangle - 0.25\sqrt{2}|001\rangle - 0.25\sqrt{2}|010\rangle + 0.25\sqrt{2}|011\rangle - 0.25\sqrt{2}|100\rangle + \\ &\quad 0.25\sqrt{2}|101\rangle + 0.25\sqrt{2}|110\rangle - 0.25\sqrt{2}|111\rangle] \\ &= [0.5\sqrt{2}|011\rangle - 0.5\sqrt{2}|111\rangle] \end{aligned}$$