

$$\chi_1^1 = \uparrow_1 \uparrow_2$$

$$\chi_0^1 = \sqrt{\frac{1}{2}} (\uparrow_1 \downarrow_2 + \downarrow_1 \uparrow_2)$$

$$\chi_{-1}^1 = \downarrow_1 \downarrow_2$$

$$\begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

[2]

$$\begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

[1]

$$\chi_0^0 = \sqrt{\frac{1}{2}} (\uparrow_1 \downarrow_2 - \downarrow_1 \uparrow_2)$$

$$[3] = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$$

$$|s = \frac{3}{2}, S\rangle,$$

$$\begin{aligned} |\frac{3}{2}, +\frac{3}{2}\rangle &\rightarrow \uparrow\uparrow\uparrow \\ |\frac{3}{2}, +\frac{1}{2}\rangle &\rightarrow \frac{1}{\sqrt{3}} (\uparrow\uparrow\downarrow + \uparrow\downarrow\uparrow + \downarrow\uparrow\uparrow) \\ |\frac{3}{2}, -\frac{1}{2}\rangle &\rightarrow \frac{1}{\sqrt{3}} (\uparrow\downarrow\downarrow + \downarrow\uparrow\downarrow + \downarrow\downarrow\uparrow) \\ |\frac{3}{2}, -\frac{3}{2}\rangle &\rightarrow \downarrow\downarrow\downarrow \end{aligned}$$

* also for N=4

$$[21] = \begin{bmatrix} 1 & 2 \\ 3 \end{bmatrix}$$

$$|s = \frac{1}{2}, MS\rangle :$$

$$\begin{aligned} |\frac{1}{2}, +\frac{1}{2}\rangle &\rightarrow \sqrt{\frac{2}{3}} \uparrow\uparrow\downarrow - \frac{1}{\sqrt{3}} \frac{1}{\sqrt{2}} (\uparrow\downarrow + \downarrow\uparrow) \uparrow \\ |\frac{1}{2}, -\frac{1}{2}\rangle &\rightarrow \sqrt{\frac{2}{3}} \downarrow\downarrow\uparrow + \frac{1}{\sqrt{3}} \frac{1}{\sqrt{2}} (\uparrow\downarrow + \downarrow\uparrow) \downarrow \end{aligned}$$

$$\begin{bmatrix} 1 & 3 \\ 2 \end{bmatrix}$$

$$|s = \frac{1}{2}, MA\rangle :$$

$$|\frac{1}{2}, +\frac{1}{2}\rangle \rightarrow \frac{1}{\sqrt{2}} (\uparrow\downarrow - \downarrow\uparrow) \uparrow$$