Exercise 1) 6j-coefficients

Calculate $\begin{bmatrix} 1 & 1 & k_{12} \\ 1 & 1 & k_{23} \end{bmatrix}$ for all possible k_{12} and k_{23} by

a) using

$$\begin{bmatrix} k_1 & k_2 & k_{12} \\ k_3 & k & k_{23} \end{bmatrix} = \sum_{l_1,l_2,l_3,l_{12},l_{23}} \begin{pmatrix} k_1 & k_2 & k_{12} \\ l_1 & l_2 & l_{12} \end{pmatrix} \begin{pmatrix} k_{12} & k_3 & k \\ l_{12} & l_3 & l \end{pmatrix} \begin{pmatrix} k_2 & k_3 & k_{23} \\ l_2 & l_3 & l_{23} \end{pmatrix} \begin{pmatrix} k_1 & k_{23} & k \\ l_1 & l_{23} & l \end{pmatrix}$$

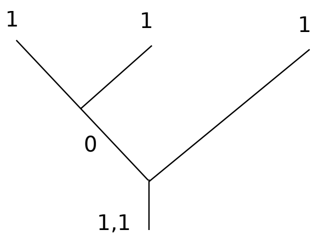
b) using

$$\begin{bmatrix} k_1 & k_2 & k_{12} \\ k_3 & k & k_{23} \end{bmatrix} = \langle k_1, k_2, k_3, k_{12}, k, l|_{\text{left}} |k_1, k_2, k_3, k_{23}, k, l\rangle_{\text{right}}$$

and expressing the occuring states in the computational basis.

Exercise 2) Recoupling moves

Let $|\alpha\rangle \in (\mathbb{C}^2)^{\otimes 3}$ be the vector that corresponds to



Compute how $(\pi_{12} \otimes \text{id}_3)$ and $(\text{id}_1 \otimes \pi_{23}) \in S_3$ act on $|\alpha\rangle$. Do this by

a) using the braiding rules

b) using exercise 2b) of problem set 6.