**11204. Proposed by Christopher Hillar, Texas A&I University, College Station, TX.** For integers $m$ and $j$ with $m \geq j \geq 0$, and square matrices $X$ and $Y$ of the same size, let $H_{m,j}(X, Y)$ denote the sum of all products of the form $A_1 \cdots A_m$ such that each $A_i$ is either $X$ or $Y$, and is $Y$ in exactly $j$ cases (by convention, we set $H_{0,0}$ to be the identity matrix). Let $\text{tr}(A)$ denote the trace of $A$. Prove that for all $(m, j)$ with $m > j \geq 0$ there exists a constant $c(m, j)$ such that for all complex square matrices $X$ and $Y$ of the same size,

$$\text{tr}[H_{m,j}(X, Y)] = c(m, j)\text{tr}[XH_{m-1,j}].$$