Given non-negative integers $v, m, n, \alpha, \beta$, the Hamilton-Waterloo problem, asks for a factorization of the complete graph, $K_v$, into $\alpha m$-cycle factors and $\beta n$-cycle factors. Clearly, $n, m \geq 3$ must be odd, and $m \mid v, n \mid v$ and $\alpha + \beta = (v - 1)/2$ are necessary conditions. Without loss of generality, we may assume that $n \geq m \geq 3$.

We show that these necessary conditions are sufficient when $v$ is a multiple of $nm$ and $v > mn$, except possibly when $\beta = 1$ or $3$, or $(m, n, \beta) = (3, 11, 5)$ or $(3, 13, 5)$. For the case where $v = mn$ we show sufficiency when $\beta > (n + 5)/2$, except possibly when $\alpha = 2, 4$, or $(m, n, \alpha, \beta) = (3, 11, 6, 10), (3, 13, 8, 10), (3, 17, 10, 15)$ or $(3, 21, 10, 21)$.

We also show that when $n \geq m \geq 3$ are odd integers, the lexicographic product of $C_m$ with the empty graph of order $n$ has a factorization into $\alpha C_m$ factors and $\beta C_n$ factors for every $0 \leq \alpha \leq n$, $\beta = n - \alpha$, except possibly when $\alpha = 2, 4, \beta = 1, 3$, or $(m, n, \alpha) = (3, 11, 6), (3, 13, 8), (3, 15, 8), (3, 15, 10), (3, 17, 10), (3, 21, 10)$.

This is joint work with Andrea Burgess and Tommaso Traetta. (Received September 15, 2015)