Consider the following problem: A searcher S and a set of targets T_i, $i = 1,---,k$ move at random on a graph G according to the following tempi: at each epoch, S moves n steps and target T_i moves m_i steps respectively. What is the probability that S encounters a target after p epochs? In the reference, this problem was solved for the case in which G is an N-dimensional rectangular grid, $k = 1$, $n = m = 1$ and $p =$. The definition of "encounter" was suitably adjusted for a parity-preserving phenomenon in these movements.

The proposed problem is to seek various extensions of the result in the reference. In particular, interesting investigations would include some combination of:

1. G is a finite graph, with the density of links per node specified in some way (Average? Statistical distribution?) and the probability of encounter determined as a function of this density.
2. p finite, and the probability of encounter as a function thereof.
3. Probability of encounter as a function of k, m, n.
4. The effects of some structural aspects of G, such as its consisting of a number of densely connected sub-graphs with comparatively light interconnections between them.

The background arose from considerations of mobile software objects in very large computer networks, such as the InterNet. If one object is searching for another, or for any one of several others, and the search is random, the results sought in this problem would be highly relevant.

Reference: Über eine Aufgabe der Wahrscheinlichkeitsrechnung betreffend die Irrfahrt im Strassennetz, by Georg Pólya; Mathematische Annalen, vol. 84 (1921), pp. 149-160.