# Problems for Tutorial 11

## 1 Network Routing

Consider a grid of 100x100 nodes, connected without wraparound edges. This is to be viewed as a communications network. Each node sends 1 message per second to a randomly selected destination node. Messages are routed through the row to the correct column and then through the column to the correct destination. It can be assumed that messages are routed instantaneously, provided there is sufficient bandwidth on the edges of the network.

Your job is to figure out how much bandwidth is needed in each edge to be able to handle all the traffic for the next 10 years with probability 99%. Every destination of every message is mutually indepedent of all other destinations. Not every edge will need the same bandwidth. Bandwidth is measured in messages traversing the edge per second. The bandwidth should be sufficient that there is at most a 1% chance of an edge ever being overloaded over a 10 year period.