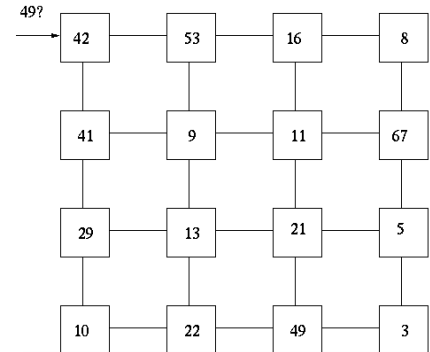


Solve the following problem

Q1: Given a value X, is it stored in one of the processors? The value to search for is entered in at P(0,0) and returned and output also at P(0,0). For example, in the figure below X is 49 and the answer is yes. If X was 2, the answer returned should be no.

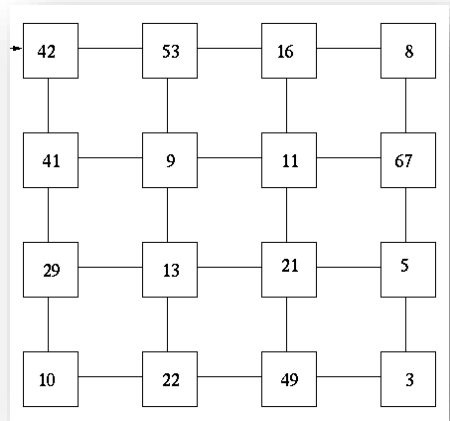
Write an algorithm for an N-mesh (mesh with N processors) to query whether a value X is in the mesh or not. Your algorithm should be as efficient as possible.

How long (number of time steps) does your algorithm take for an N-mesh? Is it optimal?



Q2: Given an n-mesh, with each processor storing a number, write an algorithm to output the min value in the mesh at P(0,0). For example, in the figure in the previous problem, the value 2 should be output from P(0,0). Your algorithm should be as efficient as possible.

How long (number of time steps) does your algorithm take for an N-mesh?



Q3: Given an n-mesh with one value in each processor, compute the prefix sums and store them in the processors. Starting with row 0 and going right to left, the prefix sum for a processor is the sum of all the original values in those processors to the left of it and on all the rows above it.

For example, for the mesh on the left below, the prefix sums have been calculated and are shown in the mesh on the right below. Note that the bottom right processor is the sum of all the elements. The processor P(1,0) is the sum of P(0,0)+P(0,1)+P(0,2)+P(0,3)+P(1,0).

