Pre-Reading for Quiz 2

September 22, 2017

1 O'd to a Pair of Runtimes

We're thinking about asking a question like this on at least one of the quizzes.

The pairs of functions below represent algorithm runtimes on /SOME DATA STRUCTURE THAT WE'LL DEFINE WITH TWO PARAMETERS n and \$m\$/. **ASSUME $m > 0$.** For each pair, fill in the circle next to the best choice of:

LEFT: the left function is big-O of the right, i.e., left $\in$ O(right)

RIGHT: the right function is big-O of the left, i.e., right $\in$ O(left)

SAME: the two functions are Θ of each other, i.e., left $\in \Theta$(right)

INCOMPARABLE: none of the previous relationships holds for all allowed values of n and m.

Do not choose **LEFT** or **RIGHT** if **SAME** is true. The first one is filled in for you.

Left Function	Right Function	Answer
n	n^2	**LEFT**
$m \lg m$	$2m \log m + 3$	◯ LEFT ◯ RIGHT ◯ SAME ◯ INCOMPARABLE

2 Disaster Planning

We're thinking about asking at least one quiz question that references this problem.

The Emergency Distribution Problem (EDP) is defined as follows: A group of coastal locations is connected by various roads, each of which connects exactly two locations. At most one "emergency-hardened" road connects each pair of locations. In case of emergency, a set of these locations that are reachable by outside aid will be designated "distribution points". In this problem, we want to determine how many distinct (non-overlapping) paths lead to deliver aid to a particular location.

Formally, EDP's input is an undirected, unweighted graph $G = (V, E)$ plus a set of distribution points $D = \{d_1, d_2, \ldots, d_k\}$ each a vertex in V and a single aid location $a \in V$ that is not in D. The output is the number of non-overlapping paths leading from some d_i to a. (Paths may lead from different distribution points.)