Question 1 by Dan Nguyen (z5206032)

Let there be a flow network represented as a directed graph with the following properties:

- the flow is the number of students in a corridor, f_i, where the total number of students is x;
- nodes are rooms where there are n rooms;
- edges are corridors where there are m corridors and $m \geq n - 1$;
- rooms have infinite student capacity;
- corridors have a student capacity, l_i;
- the source is room 1; and
- the sink is room n.

Let the max flow, f, be the max number of students that can move from room 1 to room n at once i.e. f is at most $\sum_{i=1}^{m} l_i$.

To find f, apply the Edmonds-Karp algorithm to the flow network which will have a time complexity of $O(\min(|V\,||E|^2,\ |E|f)) = O(\min(n(n-1)^2,\ (n-1)\sum_{i=1}^{m} l_i))$.

The minimum number of waves can therefore be determined by $\lceil x/f \rceil$.