ASSIGNMENT 3, Requirement 2 - CSC 361
Student: Theodor Oprea V00888686
Professor: Kui Wu

For this part I will be using trace files from group 2:

1. **Determine the number of probes per "ttl" used in each trace file.**
   Each TTL will have a set of 3 probes, of the format ICMP ECHO followed by a ICMP (1) TTL EXCEEDED.

2. **Determine whether or not the sequence of intermediate routers is the same in different trace files.**
   For group 2, the sequence of intermediate routers is the same across the 5 trace files. However, for group 1, the sequence of intermediate routers has some changes across the trace files. (For this, since I know that my intermRouters values are not 100% reliable, please see README, I'm using the output from a friend that seems to have them displayed in the correct order.)

3. **If the sequence of intermediate routers is different in the five trace files. List the difference and explain why.**
   For this, I will be using group 1, since group 2 has the same intermediate router in the 5 traces files.
   The differences:
   Trace 1 vs trace 2 - R12 and R13 switched, R14, R15, R16 completely different.
   Trace 2 vs trace 3 - R12 and R13 switched back to how it was in trace 1. R14 and R15 are different, switched back to what trace 1 was and R16 is different.
   Trace 4 vs trace 3 - R14 diff, R15 diff, R16 in trace 4 is the same as R13 of trace 3
   Trace 5 - there are only 15 intermediate routers, R12 diff from trace 4, R12 of trace 5 is the same value as R13 of trace 4, the last r13, r14, r15 in trace 5 are different from the ones in trace 4.

   Why are these different? I believe that the reasoning behind this light but noticeable switcheroo is from the unavailability of the other routers. It's possible that the routers were full, or the router had a queue since it was being heavily used. With this in mind, if the route through different routers is better than the one that it previously took because it would have to wait, then it's evident that it would take the alternate one, the one where we need not wait.

4. **If the sequence of intermediate routers is the same in the five trace files, draw a table to compare the RTTS of different traceroute attempts. From the result, which hop is likely to incur the maximum delay? Explain this conclusion.**

   This data is pulled from group 2, since all of the intermediate routers are in the same order the whole way through the 5 traces.

TTL	**Average RTT in trace 1**	**Average RTT in trace 2**	**Average RTT in trace 3**	**Average RTT in trace 4**	**Average RTT in trace 5**
1	3.32975	2.71066	7.85398	3.41535	1.74562
2	15.81168	17.1183	11.83542	13.24503	16.15357
3	18.86932	20.09662	22.57935	21.67225	21.60168
4	22.84304	19.42007	19.4602	19.75465	18.55834
5	26.50205	21.55534	20.32137	35.77129	20.71706
6	24.2637	19.98234	21.84971	22.67464	43.47205
7	18.4079	51.65799	22.76333	18.33733	26.92127
8	22.97076	108.73763	20.59197	24.57428	25.6234
9	18.09971	21.91106	23.13995	19.9426	21.44194

From the table above, we can see that the hop from TTL1 to TTL2 increases the average RTTs in most of the traces, but these are all, from the data, foreseeable. On the other hand, by calculating the averages by row, so by TTL, we can see that the highest averaging TTL overall, over the 5 traces, is TTL8, with an average of 40.499608, since it could be possible for it to give us a huge wait time, without it being foreseeable. A second in place contender would be the hop from TTL6 to TTL7.