INFO 102 Lab 5: Graphs, Intractability, and Incomputability

Partner #1: Name: _____ Net ID: _____

Partner #2: Name: _____ Net ID: _____

What is the definition of **intractable**?

What time complexity is always considered intractable?

Draw a graph that represents these 4 cities and the distances between them.
The nodes should represent the cities.
The edges should represent the distance between the cities

	and Bloomington	and Peoria	and Springfield
Between Urbana	54 miles	93 miles	92 miles
Between Bloomington		38 miles	68 miles
Between Peoria			74 miles

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Go to https://www.csfieldguide.org.nz/en/interactives/city-trip/ and run the solver for the Traveling Salesman problem for different numbers of cities.

What is the time required to find the shortest path between

5 cities? 10 cities?

7 cities? 11 cities?

8 cities? 12 cities?

9 cities? 13 cities?

What is the time complexity of the Traveling Salesman problem?

Open the Google Co-Lab notebook for today's lab at: **https://go.illinois.edu/info102-collatz-notebook** Follow the directions in the notebook and execute the code as the notebook describes.
Try at least 5 different values of n. Describe what the first program does in your own words. It begins with a number n. How does it generate the next number in the sequence? When does it stop generating numbers? What is the role of the modulo operator?
Are there common patterns in the output of the first program? What are those patterns? The ending of the sequence in particular always has a very specific pattern. Can you describe it?
Do you see any patterns in the graphs produced by the second program? How would you describe these graphs?
Do you think you could find a number n that causes the first program to go on forever? Do you think the first program always stops? Is there any reason you believe this?
Based on what you've seen in the notebook and read in the background, is the program in the first cell an algorithm that will always halt (aka terminate)? If we let a user pick an arbitrary n to start with, will this program to compute the Collatz Sequence for that number always complete?

When you're done, check out with a TA or CA, and hand over this completed worksheet.

Bye!