**Study the Properties of "Small World" and Compare Different Data Structures**

**Due: 1/17 23:59:59**

1. Generate a cycle of 1000 nodes. Each edge has length 1.
2. Add 𝑥 random edges. Each random edge has the same length 𝑦.
3. Sample 𝑧 pairs of source and destination, and compute the average shortest distance (𝑑) of these 𝑧 source-destination pairs.

You need to use 2 different structures of heaps. **(In the report, give the name of the data structures that you use, e.g., array and binomial heap).**

**Your report should contain:**

1. A picture of the graph with 𝑥 = 100.
2. Responses to the following questions:
   1. What is the relationship between 𝑥 and 𝑑?
   2. What is the relationship between 𝑦 and 𝑑?
   3. How to choose 𝑧 to obtain a reasonable approximation of the true average shortest distance between all pairs of source and destination?
   4. Which implementation of Dijkstra's Algorithm is faster?

**\*\* You need to support your answers with experimental results. \*\***

**\*\* You also need to explain how you obtain the results. \*\***