Suppose that we have a communication network with 5 nodes, and each pair of nodes is connected directly.  Each node in the network can both send and receive messages. This network can be represented by a graph with 5 vertices {A,B,C,D,E}, and 10 edges {AB,AC,AD,AE,BC,BD,BE,CD,CE, DE}.

Assume the the network has been hit with a disaster in such a a way that each link has a 50% probability that the link is intact.  Simulate that situation by flipping a coin 10 times, once for each edge.  If the coin is heads, the link has remaind intact.  If the coin is tails, the link has been lost.

1.  Draw the resulting graph

2.  How many edges does the resulting graph have?

3. Is the graph that results connected?  What does this mean for the ability to continue to communicate through the network?

4. Do you think that if a 6th node were added to the network but we were limited to having only 10 edges if the situation would change?  How would you arrange the edges make it as likely as possible that the network would remain connected?

This is actually a discussion related to an interesting topic in graph theory known as random graphs.  This theory can explore the chances that various network configurations remain intact based on various probabilities of failures of links in the network (we might change the probability of a failure from 50% to some other value).