Erdös Renyi Graph G(n, p) is constructed in the following manner:

1. Consider n vertices labeled $\{1, 2, \ldots, n\}$.

2. Corresponding to each distinct pair $\{i, j\}$ we perform an independent Bernoulli (p) experiment and insert an edge between i and j with probability p. Note that all edges are *undirected* and hence there are total of $\binom{n}{2}$ possible edges, each occurring with probability p.

3. In this Homework you will simulate an Erdös Renyi Graph and find the M.L.E for the relevant p.

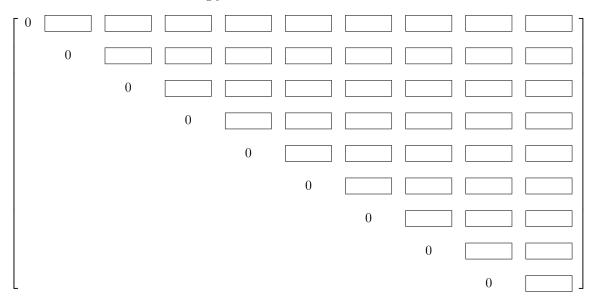
- 1. Choosing x: Write a simple R-code to generate a number uniformly from $\{1, 2, 3, 4, 5\}$. Let x denote the chosen number. Record x in the box:
- 2. Consider the experiment of rolling a die and (choose) specify an event from that experiment which occurs with probability x/6. Let it be called *B*. Write out the description of the event *B* in the box below:
- 3. The set of vertices for the graph you are about to construct are $\{1, 2, ..., 10\}$. The graph has no self-edges (i.e Self-loops). What is the total number of possible edges ?

Record answer in the box:

4. Construct the random adjacency matrix A for the graph as follows. For each pair $1 \le i < j \le 10$: roll the die(using one at home or at http://www.randomservices.org/random/apps/Dice.html) and observe if the event B has occured. Designate

$a_{ij} = \left\{ \right.$	1	if B occured.
	0	if B did not occur

Fill in the matrix entries accordingly:



- 5. Using the igraph package draw the random graph, denote by $G(10, \frac{x}{6})$, corresponding to the above adjacency matrix (i.e draw an edge between *i* and *j* if $a_{ij} = 1$). Send the image of your graph on zoom chat group between 8:15am and 8:30am on May 5th, 2022.
- 6. From the graph $G(10, \frac{x}{6})$ or from A that you constructed in the worksheet:
 - (a) fill in the following table from the data in worksheet:

х	# Edges

- 7. Let *E* denote the number of edges in a realisation of $G(10, \frac{x}{6})$. Find the likelihood L(x; E) that *E* edges occur in the random Graph $G(10, \frac{x}{6})$.
- 8. Find x^* that maximizes L(x; E) with respect to x. You may assume $x \in [1, 5]$.
- 9. Substitute your value of E from Question 1, into the expression for x^* . Is the resulting x^* close to your chosen x?