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Grading:
20 marks- Complete submission of worksheet10
40 marks- Problem 4 and 40 marks- Problem 5

Problem:1

```
> #we have to choose x
> set.seed(5)
> x = sample(1:5,1,prob = c(1/5,1/5,1/5,1/5,1/5))
> x
```

```
[1] 3
```

Problem:2

By considering the experiment of rolling a die and an event from this experiment which occurs with probability x/6 = 3/6 =1/2 can be as

Getting an even number on roll of a die.

Problem:3

The number of edges in a graph with 10 vertices having no self-loops is $\binom{10}{2} = 45$

Problem:4

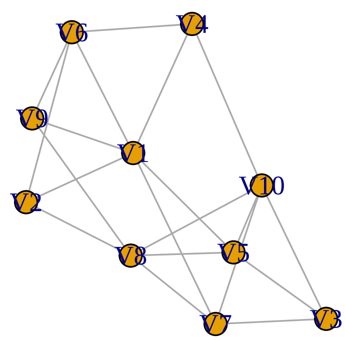
```
> Adj_matrix=read.csv("C:\\Users\\shiva\\Desktop\\Bayesian Inference\\Adjacency matrix.csv",header=FALSE
> Adj_matrix1=data.matrix(Adj_matrix)
> Adj_matrix1
```

```
     V1 V2 V3 V4 V5 V6 V7 V8 V9 V10
 [1,]  0  1  0  1  1  1  1  0  1   0
 [2,]  1  0  0  0  0  1  0  1  0   0
 [3,]  0  0  0  0  1  0  1  0  0   1
 [4,]  1  0  0  0  0  1  0  0  0   1
```

```
 [5,]  1  0  1  0  0  0  0  1  0   1
 [6,]  1  1  0  1  0  0  0  0  1   0
 [7,]  1  0  1  0  0  0  0  1  0   1
 [8,]  0  1  0  0  1  0  1  0  1   1
 [9,]  1  0  0  0  0  1  0  1  0   0
[10,]  0  0  1  1  1  0  1  1  0   0
```

Problem:5

```
> library(igraph)
> ig = graph_from_adjacency_matrix(Adj_matrix1, mode="upper")
> plot(ig)
```




```
> #finding the number of edges for graph
> x1=sum(colSums(Adj_matrix1)/2)
> x1
```

```
[1] 20
```

As

$$a_{ij} \sim Bernoulli(p)$$

; where p denotes the probability of occurrence of event B.
Likelihood will be:

$$L = p^{x_1}(1-p)^{n-x_1}$$

where, $n = 45$ and $x_1 = \sum_{i=1}^{45} x_i$ Now,

$$logL = x_1 logp + (n - x_1) log(1-p)$$

$$\frac{\partial logL}{\partial p} = \frac{x_1}{p} - \frac{n - x_1}{(1-p)} = 0$$

$$\frac{20}{p} - \frac{45-20}{(1-p)} = 0$$

$$20(1-p) - 25p = 0$$

$$20 - 20p - 25p = 0$$

$$45p = 20$$

$$\hat{p} = \frac{20}{45} = 0.44$$

which is MLE of p.