

Prashant Sharma

Problem:1(a)

```
> x=c(1,2,3)
> MYMEAN=function(x){sum(x)/length(x)}
> #To calculate the average of vector x
> MYMEAN(x)
```

```
[1] 2
```

Problem:1(b)

```
> x=1:100
> y=x[x<50 & x>2]
> #To store value of x which lie between 2 to 50(i.e., 3, 4, ...,49) in y.
> MYMEAN(y)
```

```
[1] 26
```

Problem:2

2(i) Range of $Y(=X_1+X_2)=[2,12]$

2(ii) $P(Y=y) = (y-1)/36$; for $2 \leq y \leq 7$

$P(Y=y) = (13-y)/36$; for $8 \leq y \leq 12$

$P(Y=y) = 0$; Otherwise

2(iii)

```
> X1=1:6 #outcome of the first die
> X2=1:6 #outcome of the first die
> Y = (min(X1)+min(X2)):(max(X1)+max(X2))
> #calculate the range of y
> print(Y)
```

```
[1] 2 3 4 5 6 7 8 9 10 11 12
```

```
> func1=function(y){
+ if(y>=2 & y<= 7){
+   return((y-1)/36)
+ }
+ else if(y>=8 & y<= 12){
+   return((13-y)/36)
+ }
+ else{
+   return(0)
+ }
+ }
> #Function to calculate the required probabilities for different values of y.
> #For example:
> func1(13)
```

```
[1] 0
```

```
> func1(2)
```

```
[1] 0.02777778
```

```
> func1(8)
```

```
[1] 0.1388889
```

Problem:3

3(i) Range(y)=[0,6]

As X is outcome of a fair die i.e., 1, 2, 3, 4, 5, 6 and Y is the number of Heads in X tosses.

3(ii) Here the distribution of Y is obtained by adding all the possible values of x

(a) For y=0

$$P(Y=y) = \sum_{x=1}^6 P(Y = y, X = x) = \sum_{x=1}^6 P(Y = y|X = x)P(X = x)$$
$$= \sum_{x=1}^6 ({}^x C_y) p^y (1-p)^{x-y}$$

(b) For $y=1, 2, 3, 4, 5, 6$

$$\begin{aligned} P(Y=y) &= \sum_{x=y}^6 P(Y=y, X=x) \\ &= \sum_{x=y}^6 P(Y=y|X=x)P(X=x) \\ &= \sum_{x=y}^6 \binom{x}{y} p^y (1-p)^{x-y} \end{aligned}$$

3(iii)

```
> func2 = function(y,p) {
+ if(y==0){
+ sum(dbinom(y,1:6,p)/6)}
+ #To calculate binomial distribution dbinom() is used and divide by 6 to find the
+ #required probability at 0.
+ else if(y<7){
+ sum(dbinom(y,y:6,p)/6)
+ #To calculate the probability at y=1, 2, 3, 4, 5, 6.
+ }
+ else{
+   print(0)
+ }
+ }
> func2(3,0.5)
```

```
[1] 0.1666667
```

```
> func2(0,0.4)
```

```
[1] 0.238336
```

```
> func2(7,0.5)
```

```
[1] 0
```