# LAB ASSIGNMENT – 3

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|---|---|
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| COURSE CODE | MAT2001 |
| COURSE NAME | STATISTICS FOR ENGINEERS |
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## Q.1(A)

Write down the $R$ code to obtain the equation of the regression line of $X$ on $Y$ from the following data:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $X$ : | 4.7 | 8.2 | 12.4 | 15.8 | 20.7 | 24.9 | 31.9 | 35.0 | 39.1 | 38.8 |
| $Y$ : | 4.0 | 8.0 | 12.5 | 16.0 | 20.0 | 25.0 | 31.0 | 36.0 | 40.0 | 40.0 |

## R CODE & OUTPUT:

```
> x=c(4.7,8.2,12.4,15.8,20.7,24.9,31.9,35.0,39.1,38.8)
> y=c(4.0,8.0,12.5,16.0,20.0,25.0,31.0,36.0,40.0,40.0)
> fit=lm(x~y)
> fit

Call:
lm(formula = x ~ y)

Coefficients:
(Intercept)            y
     0.7508       0.9634
```

## ANS:

| | |
|---|---|
| EQUATION OF REGRESSION LINE | X = 0.7508 + 0.9634Y |

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## Q.1(B)

Write down the $R$ code to obtain the equation of the regression plane of $Y$ on $X_1$ and $X_2$ from the following data:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $X_1$ : | 30 | 40 | 20 | 50 | 60 | 40 | 20 | 60 |
| $X_2$ : | 11 | 10 | 7 | 15 | 19 | 12 | 8 | 14 |
| $Y$ : | 110 | 80 | 70 | 120 | 150 | 90 | 70 | 120 |

## R CODE & OUTPUT:

```
> y=c(110,80,70,120,150,90,70,120)
> x1=c(30,40,20,50,60,40,20,60)
> x2=c(11,10,7,15,19,12,8,14)
> input_data=data.frame(y,x1,x2)
> input_data
    y x1 x2
1 110 30 11
2  80 40 10
3  70 20  7
4 120 50 15
5 150 60 19
6  90 40 12
7  70 20  8
8 120 60 14
> RegModel<-lm(y~x1+x2,data=input_data)
> RegModel

Call:
lm(formula = y ~ x1 + x2, data = input_data)

Coefficients:
(Intercept)           x1           x2
    16.8314      -0.2442       7.8488

> summary(RegModel)

Call:
lm(formula = y ~ x1 + x2, data = input_data)

Residuals:
      1       2       3       4       5       6       7       8
 14.157  -5.552   3.110  -2.355  -1.308 -11.250  -4.738   7.936

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  16.8314    11.8290   1.423   0.2140
x1           -0.2442     0.5375  -0.454   0.6687
x2            7.8488     2.1945   3.577   0.0159 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 9.593 on 5 degrees of freedom
Multiple R-squared:  0.9191,    Adjusted R-squared:  0.8867
F-statistic:  28.4 on 2 and 5 DF,  p-value: 0.001862
```

## ANS:

| | |
|---|---|
| EQUATION OF REGRESSION PLANE | $Y = 16.8314 - 0.2442X_1 + 7.8488X_2$ |

## Q.2(A)

Suppose our random variable X is Poisson with lambda = 12.33.

1. What is the probability of 15 or fewer occurrences? P(X <= 15)
2. What is the probability of EXACTLY 6 occurrences? P(X = 6)
3. What is the probability of more than 15 occurrences? P(X > 15)
4. What is the probability of 15 or more occurrences? P(X >= 15)
5. What is the probability of 8, 9, or 10 occurrences? P(8 <= X <= 10)

## R CODE & OUTPUT:

```
> ppois(15,12.33)
[1] 0.8195608
>
> dpois(6,12.33)
[1] 0.02155733
>
> 1-ppois(15,12.33)
[1] 0.1804392
>
> 1-ppois(14,12.33)
[1] 0.2586192
>
> ppois(10,12.33)-ppois(7,12.33)
[1] 0.2375607
```

## ANS:

| | |
|---|---|
| P(X<=15) | 0.8195608 |
| P(X=6) | 0.02155733 |
| P(X>15) | 0.1804392 |
| P(X>=15) | 0.2586192 |
| P(8<=X<=10) | 0.2375607 |

Q.2(B)

For a random variable X with a binomial(20,1/2) distribution, find the following probabilities.

(i). Find Pr(X < 8)

(ii). Find Pr(X > 12)

(iii) Find Pr(8 <= X <= 12)

R CODE & OUTPUT:

```
> pbinom(7,20,0.5)
[1] 0.131588
>
> 1-pbinom(12,20,0.5)
[1] 0.131588
>
> pbinom(12,20,0.5)-pbinom(7,20,0.5)
[1] 0.736824
```

ANS:

| | |
|---|---|
| P(X<8) | 0.131588 |
| P(X>12) | 0.131588 |
| P(8<=X<=12) | 0.736824 |