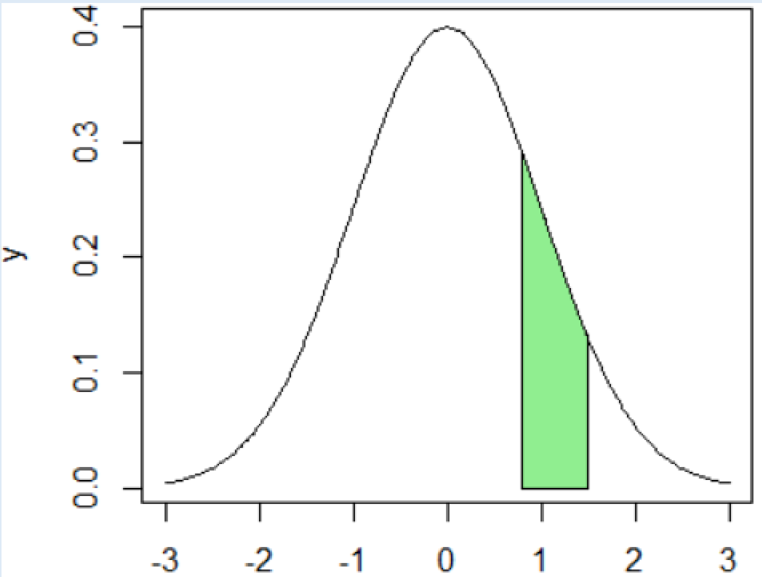
LAB ASSIGNMENT – 4

NAME	PRIYAL BHARDWAJ
REG. NO.	18BIT0272
COURSE CODE	MAT2001
COURSE NAME	STATISTICS FOR ENGINEERS
SLOT	L7+L8
FACULTY	Prof. VENKATA SATYANARAYANA

1. Find (i) $P(0.8 \le Z \le 1.5)$ (ii) $P(Z \le 2)$ (iii) $P(Z \ge 1)$
Find These probability values and Plot the graph .

(i) R CODE & OUTPUT:

```
> pnorm(1.5, mean=0, sd=1)-pnorm(0.8, mean=0, sd=1)
[1] 0.1450482
> x=seq(-3,3,length=200)
> y=dnorm(x)
> plot(x,y,type="l")
> x=seq(0.8,1.5,length=100)
> y=dnorm(x)
> polygon(c(0.8,x,1.5),c(0,y,0),col="lightgreen")
```

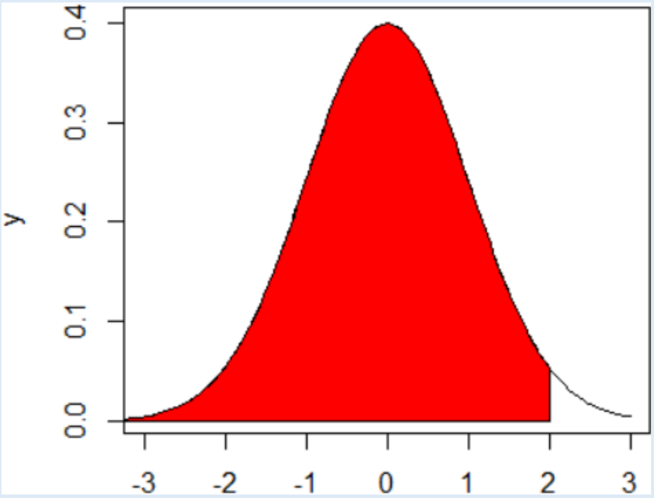


ANS:

P(0.8<=Z<=1.5)	0.1450482

(ii) R CODE & OUTPUT:

```
> pnorm(2, mean=0, sd=1)
[1] 0.9772499
> x=seq(-3,3,length=200)
> y=dnorm(x)
> plot(x,y,type="l")
> x=seq(-4,2,length=100)
> y=dnorm(x)
> polygon(c(-4,x,2),c(0,y,0),col="red")
```

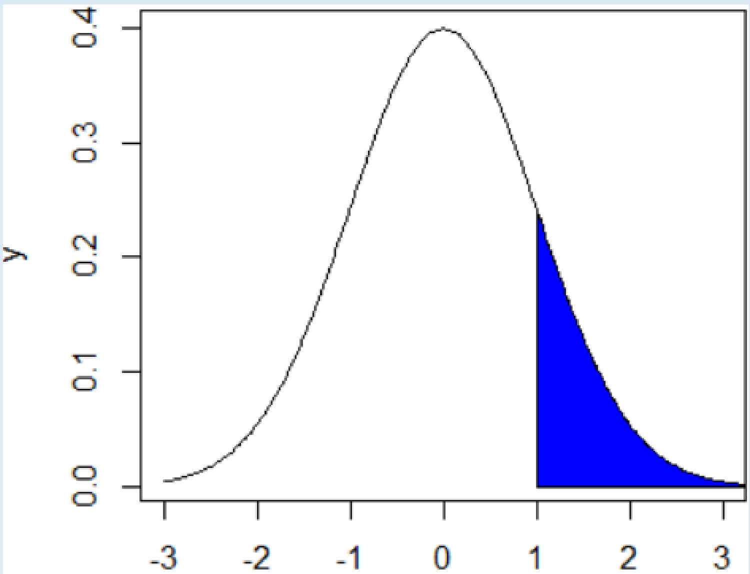


ANS:

P(Z<=2)	0.9772499

(iii) R CODE & OUTPUT:

```
> 1-pnorm(1, mean=0, sd=1)
[1] 0.1586553
> x=seq(-3,3,length=200)
> y=dnorm(x)
> plot(x,y,type="l")
> x=seq(1,4,length=100)
> y=dnorm(x)
> polygon(c(1,x,4),c(0,y,0),col="blue")
```



ANS:

P(Z>=1)	0.1586553

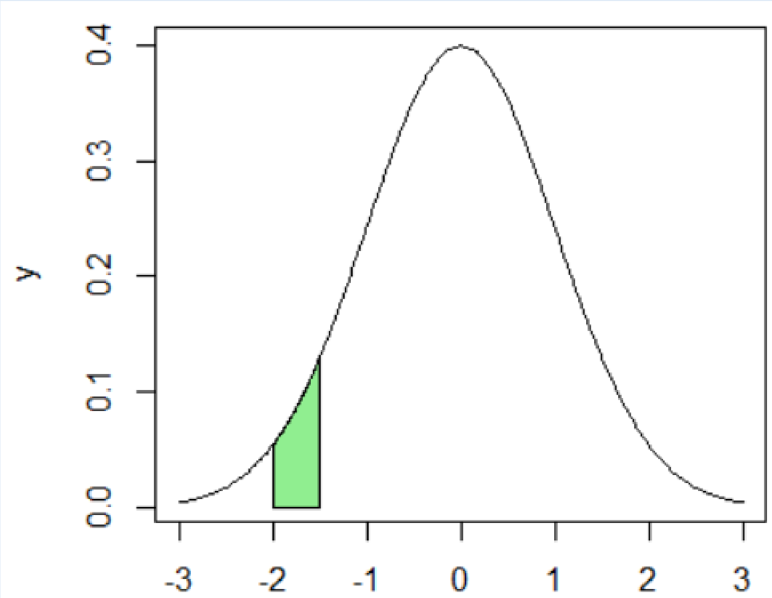
2. *If mean=70 and Standard deviation is 16*

i) $P(38 \le X \le 46)$ *ii)* $P(82 \le X \le 94)$ *iii)* $P(62 \le X \le 86)$

Find the Probability values and Plot the graph with text.

(i) R CODE & OUTPUT:

```
> pnorm(46, mean=70, sd=16)-pnorm(38, mean=70, sd=16)
[1] 0.04405707
> x=seq(-3,3,length=200)
> y=dnorm(x)
> plot(x,y,type="l")
> x=seq(-2,-1.5,length=100)
> y=dnorm(x)
> polygon(c(-2,x,-1.5),c(0,y,0),col="lightgreen")
```

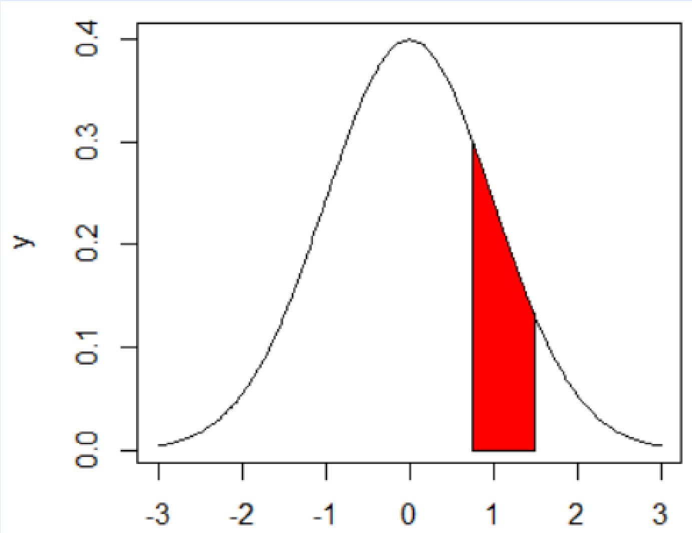


ANS:

P(38<=X<=46)	0.04405707

(ii) R CODE & OUTPUT:

```
> pnorm(94, mean=70, sd=16)-pnorm(82, mean=70, sd=16)
[1] 0.1598202
> x=seq(-3,3,length=200)
> y=dnorm(x)
> plot(x,y,type="l")
> x=seq(0.75,1.5,length=100)
> y=dnorm(x)
> polygon(c(0.75,x,1.5),c(0,y,0),col="red")
```

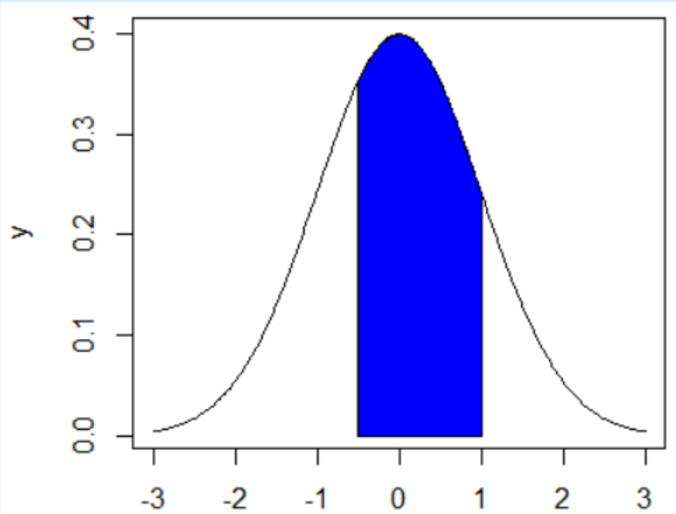


ANS:

P(82<=X<=94)	0.1598202

(iii) R CODE & OUTPUT:

```
> pnorm(86, mean=70, sd=16)-pnorm(62, mean=70, sd=16)
[1] 0.5328072
> x=seq(-3,3,length=200)
> y=dnorm(x)
> plot(x,y,type="l")
> x=seq(-0.5,1,length=100)
> y=dnorm(x)
> polygon(c(-0.5,x,1),c(0,y,0),col="blue")
```



ANS:

P(62<=X<=86)	0.5328072

3. *1000 students had Written an examination the mean of test is 35 and standard deviation is 5.Assumning the to be normal find*
   - i) *How many students Marks Lie between 25 and 40*
   - ii) *How many students get more than 40*
   - iii) *How many students get below 20*
   - iv) *How many students get 50*

R CODE & OUTPUT:

```
> 1000*(pnorm(40, mean=35, sd=5)-pnorm(25, mean=35, sd=5)) #Q3(i)
[1] 818.5946
> 1000*(1-pnorm(40, mean=35, sd=5))                        #Q3(ii)
[1] 158.6553
> 1000*(pnorm(20, mean=35, sd=5))                          #Q3(iii)
[1] 1.349898
```

P(x = a) = 0 for continuous random variables.

ANS:

Number of students with marks(approx.):

1	Between 25 and 50	818
2	More than 40	158
3	Less than 20	1
4	Equal to 50	0

P(X=50)=0 because student marks is a continuous random variable.

Q.4

Experience has shown that 20% of a manufactured product is of top quality. In one day's production of 400 articles, only 50 are of top quality. Write down the *R* programming code to test whether the production of the day chosen is a representative sample at 95% confidence level.

ANS: **Null Hypothesis(H_0): P = 0.2**

Alternative Hypothesis(H_1): P ≠ 0.2

R CODE:

```
> pbar = 50/400         #sample proportion
> p0 = .2               #hypothesized value
> n = 400               #sample size
> z = (pbar-p0)/sqrt(p0*(1-p0)/n)
> z                     #test statistic
[1] -3.75
> c(-z.half.alpha, z.half.alpha)
[1] -1.959964  1.959964
```

Interpretation:

Since test statistic(z) does not fall between -1.959964 and 1.959964, we reject the null hypothesis. Hence, the production of the day chosen is not a representative sample at 95% confidence level.

Q.5

Before an increase in excise duty on tea, 800 people out of a sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 1200 persons. Write down the *R* programming code to test whether the significant decrease in the consumption of tea after the increase in duty at 1 % level of significance.

ANS: **P_1 = Proportion of tea drinkers before excise**

P_2 = Proportion of tea drinkers after excise

Null Hypothesis(H_0): $P_1 = P_2$

Alternative Hypothesis(H_1): $P_1 > P_2$

R CODE:

```
> x<-c(800,800)
> n<-c(1000,1200)
> prop.test(x,n,alternative="greater",correct=FALSE,conf.level=0.99)

        2-sample test for equality of proportions without continuity
        correction

data:  x out of n
X-squared = 48.889, df = 1, p-value = 1.354e-12
alternative hypothesis: greater
99 percent confidence interval:
 0.09011174 1.00000000
sample estimates:
   prop 1    prop 2
0.8000000 0.6666667
```

Interpretation:

Since p value = $1.354*10^{-12}$ is less than significance level i.e. 0.01, we reject the null hypothesis. Hence, there is significant decrease in number of tea drinkers after increase in excise duty at 1% LOS.