 # Simple Linear Regression

 # Example 1:

```
x=(0:5)
y=c(2, 5, 8, 11, 14, 17)
ex1=data.frame(x,y)
plot(x,y, main = "Scatter plot between x and y")
abline(lm(y~x,data = ex1))
```

 # Example 2:

#x=height, y = weight

```
x=c(1.36, 1.47, 1.54, 1.56, 1.59, 1.63, 1.66, 1.67, 1.69, 1.74, 1.81)
y=c(52, 50, 67, 62, 69, 74, 59, 87, 77, 73, 67 )
ex2=data.frame(x,y)
ex2
plot(ex2, main = "Scatter plot between height(x) and weight(y)")
abline(lm(y~x,data=ex2))
n1=round((x-mean(x)),2)
n2=round((y-mean(y)))
d=round(n1^2,4)
```

#Slope for the estimated regression equation

```
b1=sum(n1*n2)/sum(d)
b1
```

#y-intercept for the estimated regression equation

```
b0=mean(y)-b1*mean(x)
b0
```

#Estimated value of y

```
esty=round(b0+b1*x,2)
esty
```

 # Relationship among Error Sum of Squares(SSE), Regression Sum of Squares(SSR) and Total Sum of Squares (SST)

```
errsq=(y-esty)^2 #Residual
regsq=(esty-mean(y))^2
totsq=(y-mean(y))^2
ex2final=data.frame(x,y,n1,n2,d,errsq,regsq,totsq)
ex2final
colnames(ex2final)=c("x","y","(x-xbar)","(y-ybar)","(x-xbar)^2","(y-esty)^2","(esty-ybar)^2","(y-ybar)^2")
ex2final
SSE=sum(errsq) # sum of (y-esty)^2
SSE
SSR=sum(regsq) # sum of (esty-mean(y))^2
SSR
SST=sum(totsq) # sum of (y-mean(y))^2
SST
```

#Coeffieicnt of Determination

```
rsq=SSR/SST
rsq
```

 # Linear model

```
ex2.lm=lm(y~x,data=ex2)
summary(ex2.lm)
```

#anova(ex2.lm)

```
ex2.lm$coefficients
residual=ex2.lm$residuals
residual
fit=ex2.lm$fitted.values
fit
```