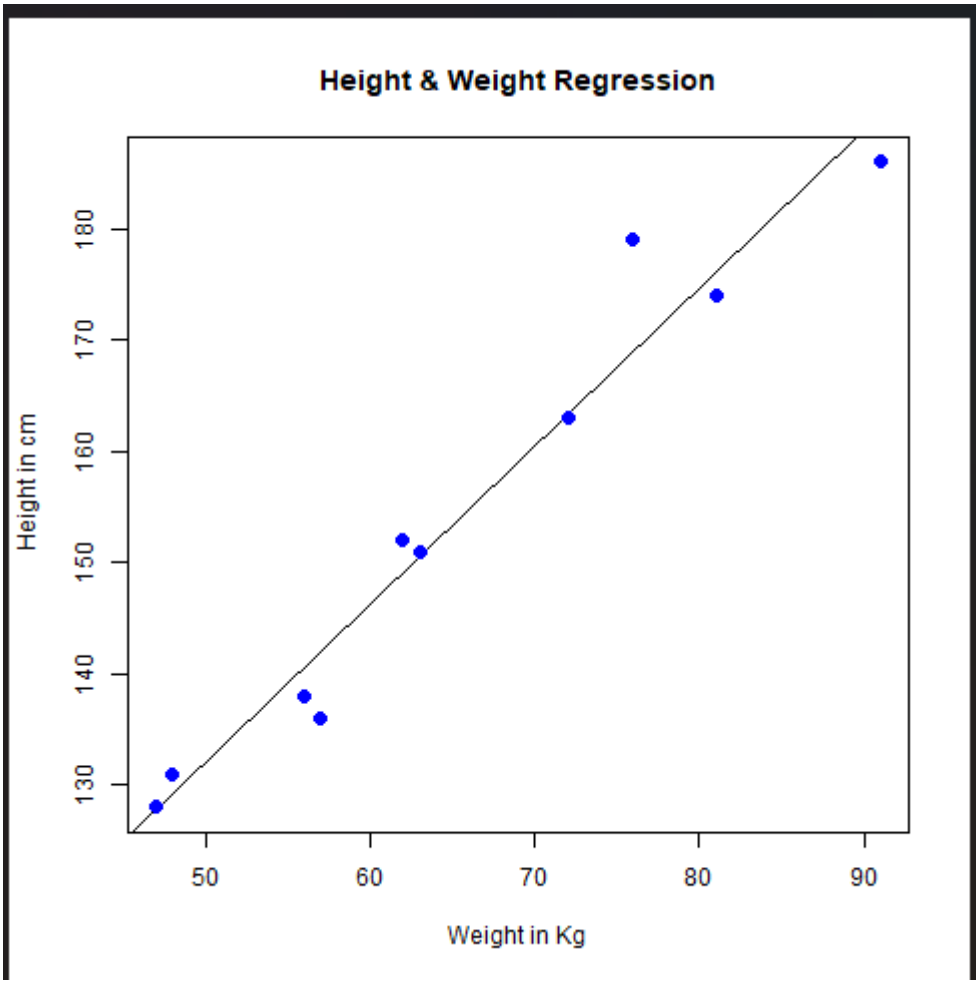
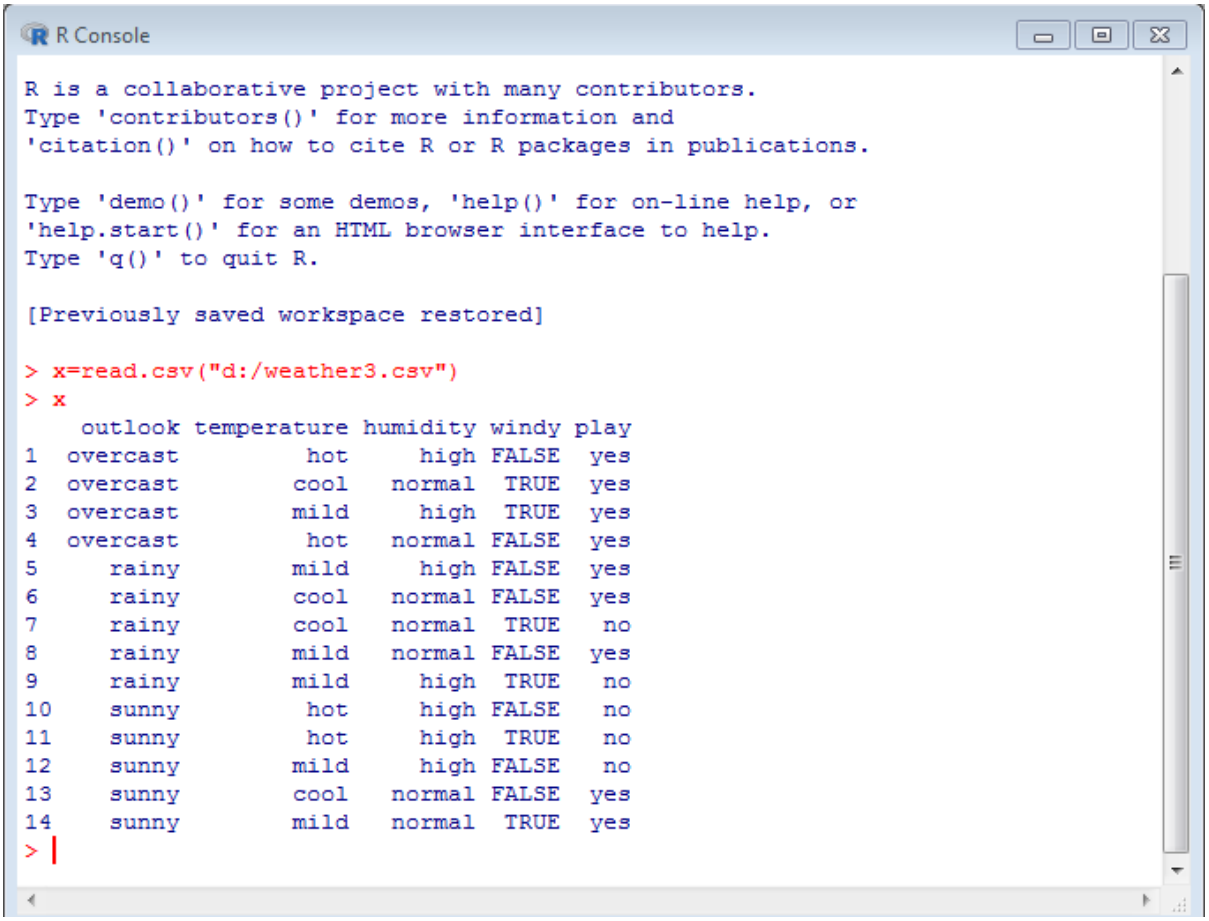
Prac 2
Aim: Demonstration of Linear Regression.
Code:

```
> x <- c(151, 174, 138, 186, 128, 136, 179, 163, 152, 131)
> y <- c(63, 81, 56, 91, 47, 57, 76, 72, 62, 48)
> relation <- lm(y~x)
> print(relation)

Call:
lm(formula = y ~ x)

Coefficients:
(Intercept)            x
   -38.4551       0.6746

> print(summary(relation))

Call:
lm(formula = y ~ x)

Residuals:
    Min      1Q  Median      3Q     Max
-6.3002 -1.6629  0.0412  1.8944  3.9775

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -38.45509    8.04901  -4.778  0.00139 **
x             0.67461    0.05191  12.997 1.16e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.253 on 8 degrees of freedom
Multiple R-squared:  0.9548,    Adjusted R-squared:  0.9491
F-statistic: 168.9 on 1 and 8 DF,  p-value: 1.164e-06

> a <- data.frame(x = 170)
> result <-  predict(relation,a)
> print(result)
       1
76.22869
> png(file = "linearregression.png")
> plot(y,x,col = "blue",main = "Height & Weight Regression", abline(lm(x~y)),cex = 1.3,pch = 16,xlab =
"Weight in Kg",ylab = "Height in cm")
> dev.off()
null device
          1
```


Height & Weight Regression
Height in cm
130
140
150
160
170
180
50
60
70
80
90
Weight in Kg

Prac 3
Aim: Demonstration of Logistics Regression.
Theory: Explain Logistic Regression in detail.
Code:
X<-read.csv("C:/Users/Admin/Documents/SampleStudentData.csv")
> X



PRINTING THE DATASET

>x$humidity=ifelse(test=x$humidity=="high",yes=1,no=0)
>x

```
> x$humidity=ifelse(test=x$humidity=="high",yes=1,no=0)
> x
    outlook temperature humidity windy play
1  overcast         hot        1 FALSE  yes
2  overcast        cool        0  TRUE  yes
3  overcast        mild        1  TRUE  yes
4  overcast         hot        0 FALSE  yes
5     rainy        mild        1 FALSE  yes
6     rainy        cool        0 FALSE  yes
7     rainy        cool        0  TRUE   no
8     rainy        mild        0 FALSE  yes
9     rainy        mild        1  TRUE   no
10    sunny         hot        1 FALSE   no
11    sunny         hot        1  TRUE   no
12    sunny        mild        1 FALSE   no
13    sunny        cool        0 FALSE  yes
14    sunny        mild        0  TRUE  yes
```

>x$play=ifelse(test=x$play=="yes",yes=1,no=0)

>x

```
> x$play=ifelse(test=x$play=="yes",yes=1,no=0)
> x
    outlook temperature humidity windy play
1  overcast         hot        1 FALSE    1
2  overcast        cool        0  TRUE    1
3  overcast        mild        1  TRUE    1
4  overcast         hot        0 FALSE    1
5     rainy        mild        1 FALSE    1
6     rainy        cool        0 FALSE    1
7     rainy        cool        0  TRUE    0
8     rainy        mild        0 FALSE    1
9     rainy        mild        1  TRUE    0
10    sunny         hot        1 FALSE    0
11    sunny         hot        1  TRUE    0
12    sunny        mild        1 FALSE    0
13    sunny        cool        0 FALSE    1
14    sunny        mild        0  TRUE    1
```

>x$windy=ifelse(test=x$windy=="FALSE",yes=0,no=1)

>x

```
> x$windy=ifelse(test=x$windy=="FALSE",yes=0,no=1)
> x
    outlook temperature humidity windy play
1  overcast         hot        1     0    1
2  overcast        cool        0     1    1
3  overcast        mild        1     1    1
4  overcast         hot        0     0    1
5     rainy        mild        1     0    1
6     rainy        cool        0     0    1
7     rainy        cool        0     1    0
8     rainy        mild        0     0    1
9     rainy        mild        1     1    0
10    sunny         hot        1     0    0
11    sunny         hot        1     1    0
12    sunny        mild        1     0    0
13    sunny        cool        0     0    1
14    sunny        mild        0     1    1
> 
```

PARTIONING DATASET

> s=sample(nrow(x),.7*nrow(x))

>x_tr=x[s,]

>x_test=x[-s,]

>nrow(x)

>nrow(x_tr)

>nrow(x_test)

```
> s=sample(nrow(x),.7*nrow(x))
> x_tr=x[s,]
> x_test=x[-s,]
> nrow(x)
[1] 14
> nrow(x_tr)
[1] 9
> nrow(x_test)
[1] 5
> |
```

DATA MODELING

>lmod=glm(play~windy,data=x_tr,family=binomial,control=list(maxit=100))
>lmod

```
> lmod=glm(play~windy,data=x_tr,family=binomial,control=list(maxit=100))
> lmod

Call:  glm(formula = play ~ windy, family = binomial, data = x_tr, control = list(maxit = 100))

Coefficients:
(Intercept)        windy
      20.57       -19.87

Degrees of Freedom: 8 Total (i.e. Null);  7 Residual
Null Deviance:      6.279
Residual Deviance: 3.819        AIC: 7.819
> |
```

```
> summary(lmod)

Call:
glm(formula = play ~ windy, family = binomial, data = x_tr, control = list(maxit = 100))

Deviance Residuals:
     Min        1Q    Median        3Q       Max
-1.48230   0.00005   0.00005   0.00005   0.90052

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)    20.57    7238.39   0.003    0.998
windy         -19.87    7238.39  -0.003    0.998

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 6.2790  on 8  degrees of freedom
Residual deviance: 3.8191  on 7  degrees of freedom
AIC: 7.8191

Number of Fisher Scoring iterations: 19

> |
```

>lmod=glm(play~humidity,data=x_tr,family=binomial,control=list(maxit=100))
>summary(lmod)

```
> lmod=glm(play~humidity,data=x_tr,family=binomial,control=list(maxit=100))
> summary(lmod)

Call:
glm(formula = play ~ humidity, family = binomial, data = x_tr,
    control = list(maxit = 100))

Deviance Residuals:
     Min        1Q    Median        3Q       Max
-1.97277   0.00008   0.55525   0.55525   0.55525

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)    1.792      1.080   1.659   0.0971 .
humidity      17.774   7604.236   0.002   0.9981
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 6.2790  on 8  degrees of freedom
Residual deviance: 5.7416  on 7  degrees of freedom
AIC: 9.7416

Number of Fisher Scoring iterations: 18

>
```

>lmod=glm(play~temperature,data=x_tr,family=binomial,control=list(maxit=100))
>summary(lmod)

```
> lmod=glm(play~temperature,data=x_tr,family=binomial,control=list(maxit=100))
> summary(lmod)

Call:
glm(formula = play ~ temperature, family = binomial, data = x_tr,
    control = list(maxit = 100))

Deviance Residuals:
     Min        1Q    Median        3Q       Max
-1.66511   0.00005   0.00005   0.75853   0.75853

Coefficients:
                Estimate Std. Error z value Pr(>|z|)
(Intercept)        1.099      1.155   0.951    0.341
temperaturehot    19.467  12537.265   0.002    0.999
temperaturemild   19.467  10236.634   0.002    0.998

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 6.2790  on 8  degrees of freedom
Residual deviance: 4.4987  on 6  degrees of freedom
AIC: 10.499

Number of Fisher Scoring iterations: 19

>
```

#PREDICTION:

> p=predict(lmod,x_test,type="response")
>p

```
> p=predict(lmod,x_test,type="response")
> p
           3            9           10           11           12
1.000000e+00 5.800756e-11 1.000000e+00 1.000000e+00 1.000000e+00
>
```

(2) SECOND DATA SET:

#IMPORT THE DATA

>x2=read.csv("D:/grade_logit.csv")

>x2

```
> x2=read.csv("D:/grade_logit.csv")
> x2
   Exam1 Exam2 Exam3 Exam4 Final_score Grade
1     60    10    16   7.0       40.79     1
2     90     0     0   0.0       69.23     1
3    130    20    24   1.0       76.75     1
4    130    10    24   8.5       75.66     1
5     90     5    22   9.5       55.48     1
6    100    30    20   3.0       67.11     1
7    105    20    22   8.0       67.98     1
8    120    40    18  16.0       85.09     1
9    120    20    30  18.0       82.46     1
10   130    45    22  10.5       91.01     1
11    90    40    20   7.0       68.86     1
12   130    30    28  10.5       87.06     1
13   100    30    22   6.5       69.52     1
14     0    30    18   0.0       60.00     1
15     0    30    18   0.0       60.00     1
16    80     0    24   3.0       60.11     1
17   105    40    22   6.5       76.10     1
18    10     0     0   8.0       12.16     0
19   130    35    24   0.0       90.00     1
20     0    15    20   7.0       42.86     1
21    40    10    14   6.0       30.70     0
22    90    15    28   8.5       62.06     1
23   110     0    24   9.5       80.62     1
24    65     5    24   1.0       41.67     1
25    55    15    18   0.0       41.90     1
26   100    50    30  11.5       83.99     1
27    95    40    24   8.0       73.25     1
28     0    10    24   0.0       42.50     1
29     0     0    18   0.0       60.00     1
30    65    20    20   0.0       50.00     1
31   110    25    18   6.0       69.74     1
32   130    45    24   8.0       90.79     1
33   120    40    30   9.0       87.28     1
34    70    20    24   1.0       50.44     1
35   130    45    10  16.5       88.38     1
```

> lmod2=glm(Grade~Exam1,data=x2_train,family=binomial,control=list(maxit=100))

>summary(lmod2)

```
> lmod2=glm(Grade~Exam1,data=x2_train,family=binomial,control=list(maxit=100))
> summary(lmod2)

Call:
glm(formula = Grade ~ Exam1, family = binomial, data = x2_train,
    control = list(maxit = 100))

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.2051   0.1834   0.2442   0.4444   0.9351

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) 0.600860   0.396710   1.515  0.12987
Exam1       0.028971   0.009424   3.074  0.00211 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 68.589  on 82  degrees of freedom
Residual deviance: 54.049  on 81  degrees of freedom
AIC: 58.049

Number of Fisher Scoring iterations: 6
```

Prediction data 1's and 0's form

>prediction=ifelse(p>.5,1,0)

>prediction

```
> prediction=ifelse(p>.5,1,0)
> prediction
 4 10 13 14 23 37 45 50 51 55 64 66 67 76 81 84 89 91 93 96 97
 1  1  1  1  1  1  1  1  0  1  1  1  0  1  1  1  0  1  1  1  1
>
```

PREDICTION MATRIX

>table(x2_test$Grade,prediction)

```
> table(x2_test$Grade,prediction)
   prediction
     0  1
  0  2  1
  1  1 17
```

> x2_test

```
> x2_test
   Exam1 Exam2 Exam3 Exam4 Final_score Grade
4    130    10    24   8.5       75.66     1
10   130    45    22  10.5       91.01     1
13   100    30    22   6.5       69.52     1
14     0    30    18   0.0       60.00     1
23   110     0    24   9.5       80.62     1
37     0    25    24   0.0       61.25     1
45    95    30    30  12.0       73.25     1
50   130    40    28  16.5       94.08     1
51     0     0     0  15.5       86.11     1
55   110    25    20   3.0       69.30     1
64   125    30    30  11.5       86.18     1
66    75    15    16   0.0       50.48     1
67     0     0     0   5.0       27.78     0
76   100    35    24   0.0       75.71     1
81    50    20    20   1.0       39.91     0
84   100    35    24  10.5       74.34     1
89     0     0     0   2.0       11.11     0
91   110    25    24   4.0       71.49     1
93    85    30    20   2.5       60.31     1
96   100    35    20   0.0       73.81     1
97     0     0    26   0.0       86.67     1
> |
```

#actuals predicted

>ac_pr<- data.frame(cbind(actuals=x2_test$Grade, predicteds=prediction))

>ac_pr

```
> ac_pr <- data.frame(cbind(actuals=x2_test$Grade, predicteds=prediction))
> ac_pr
   actuals predicteds
4        1          1
10       1          1
13       1          1
14       1          1
23       1          1
37       1          1
45       1          1
50       1          1
51       1          0
55       1          1
64       1          1
66       1          1
67       0          0
76       1          1
81       0          1
84       1          1
89       0          0
91       1          1
93       1          1
96       1          1
97       1          1
> |
```

>vif(lmod2) // variable influence factor

```
> vif(lmod2)
   Exam1    Exam2    Exam3
1.023350 1.117704 1.122152
> |
```