Regression Example

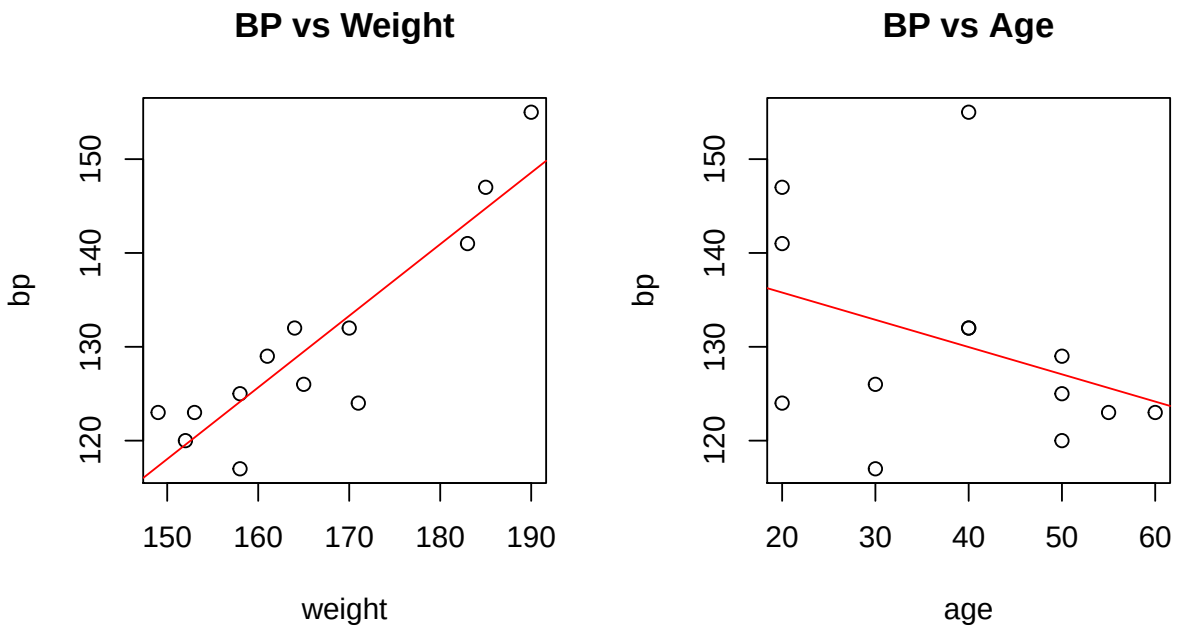
Blood pressure on weight and age

Input the data as in the below

```
bp = c(120, 141, 124, 126, 117, 129, 123, 125, 132, 123, 132, 155, 147)
weight = c(152, 183, 171, 165, 158, 161, 149, 158, 170, 153, 164, 190, 185)
age = c(50, 20, 20, 30, 30, 50, 60, 50, 40, 55, 40, 40, 20)
```

We first draw the plot of the data and identify LINEAR relationship between independent variables(xs) and response variable (y).

```
par(mfrow=c(1,2))
plot(weight, bp);
title("BP vs Weight")
abline(lm(bp~weight), col="red")
plot(age, bp);
title("BP vs Age")
abline(lm(bp~age), col="red")
```



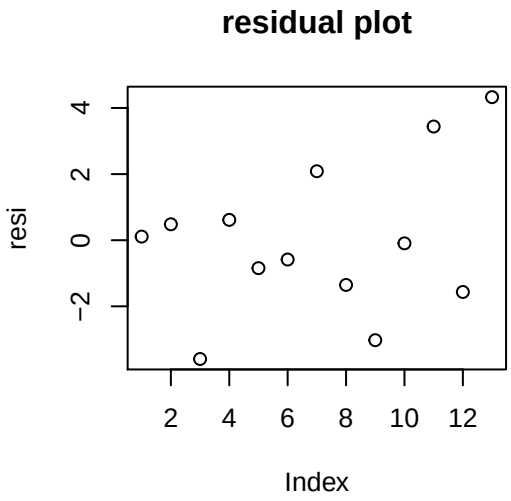
Now, we fit linear regression

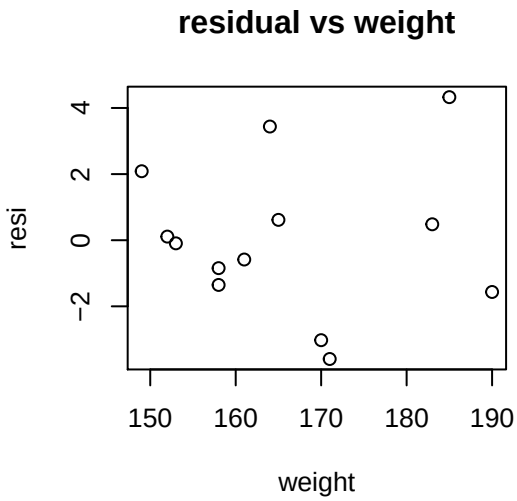
```
fit = lm(bp ~ weight + age)
summary(fit)
```

```
##
## Call:
## lm(formula = bp ~ weight + age)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.5929 -1.3530 -0.0946  0.6155  4.3276
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -65.09968   14.94458  -4.356 0.001430 **
## weight        1.07710    0.07707  13.975 6.89e-08 ***
## age           0.42541    0.07315   5.815 0.000169 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.509 on 10 degrees of freedom
## Multiple R-squared:  0.9577, Adjusted R-squared:  0.9492
## F-statistic: 113.1 on 2 and 10 DF,  p-value: 1.359e-07
```

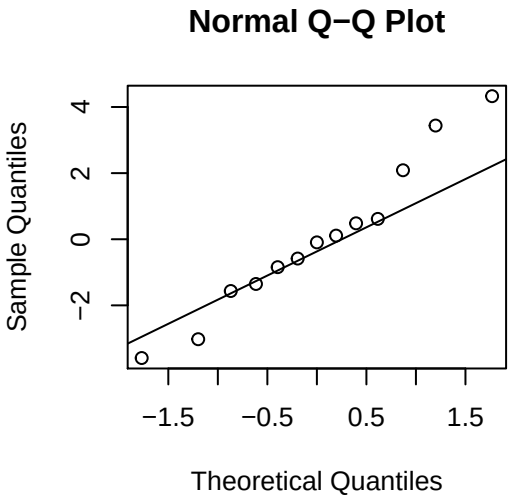
Diagnostics of linear regression becomes

```
resi = residuals(fit)
par(mfrow=c(2,2))
plot(resi);
title("residual plot")
plot(weight, resi);
title("residual vs weight")
plot(age, resi);
title("residual vs age")
qqnorm(resi);
qqline(resi)
```


residual plot
resi
Index
−2
0
2
4
2
4
6
8
10
12


residual vs weight
resi
weight
−2
0
2
4
150
160
170
180
190


residual vs age
resi
age
−2
0
2
4
20
30
40
50
60


Normal Q−Q Plot
Sample Quantiles
Theoretical Quantiles
−2
0
2
4
−1.5
−0.5
0.5
1.5