```
# R code single replicate 2^k factorial design Example 6.2p257
# Confounding ABC ACD with blocks
data=read.table("C:/Users/Mihinda/Desktop/formald.txt", header=T) #the
data file
data$A <- as.factor(data$A)
data$B <- as.factor(data$B)
data$C <- as.factor(data$C)
data$D <- as.factor(data$D)
data$blocks <- as.factor(data$blocks)
fit <- lm(y ~ blocks + A + B + C + D + A:B + A:C+A:D + B:C + C:D +
A:B:D + B:C:D + A:B:C:D, data=data)
anova(fit)
fit$effects  # Effects are just sqareroots of SS with appropriate sign
attached
effects <- abs(fit$effects[-1])  # -1 to avoid the effect of (1)
effects
qq <- qqnorm(effects, type="n")  # "n" means no plotting
text(qq$x, qq$y, labels = names(effects))
fit1 <- lm(y ~ A*C*D, data=data)
anova(fit1)
resids <- fit1$residuals
fits <- fit1$fitted.values
plot(fits, resids)
abline(h=0)
qqnorm(resids)
qqline(resids)
```

R output

```
> # R code single replicate 2^k factorial design Example 6.2p257
> # Confounding ABC ACD with blocks
> data=read.table("C:/Users/Mihinda/Desktop/formald.txt", header=T)
#the data file
> data$A <- as.factor(data$A)
> data$B <- as.factor(data$B)
> data$C <- as.factor(data$C)
> data$D <- as.factor(data$D)
> data$blocks <- as.factor(data$blocks)
> fit <- lm(y ~ blocks + A + B + C + D + A:B + A:C+A:D + B:C + C:D +
A:B:D + B:C:D + A:B:C:D,
+ data=data)
> anova(fit)
Analysis of Variance Table

Response: y
          Df  Sum Sq Mean Sq F value Pr(>F)
blocks     3   25.19    8.40
A          1 1870.56 1870.56
B          1   39.06   39.06
C          1  390.06  390.06
D          1  855.56  855.56
A:B        1    0.06    0.06
A:C        1 1314.06 1314.06
A:D        1 1105.56 1105.56
B:C        1   22.56   22.56
C:D        1    5.06    5.06
A:B:D      1   68.06   68.06
B:C:D      1   27.56   27.56
A:B:C:D    1    7.56    7.56
Residuals  0    0.00
Warning message:
In anova.lm(fit) :
  ANOVA F-tests on an essentially perfect fit are unreliable
> fit$effects  # Effects are just sqareroots of SS with appropriate
sign attached
  (Intercept)       blocks2       blocks3       blocks4            A1
 -280.2500000     4.4744646    -2.2453656    -0.3535534    43.2500000
           B1            C1            D1         A1:B1         A1:C1
    6.2500000   -19.7500000    29.2500000     0.2500000   -36.2500000
        A1:D1         B1:C1         C1:D1     A-1:B1:D1      B1:C1:D1
   33.2500000     4.7500000     2.2500000     8.2500000     5.2500000
A1:B-1:C1:D-1
   -2.7500000
> effects <- abs(fit$effects[-1])  # -1 to avoid the effect of (1)
> effects
      blocks2       blocks3       blocks4            A1            B1
    4.4744646     2.2453656     0.3535534    43.2500000     6.2500000
           C1            D1         A1:B1         A1:C1         A1:D1
   19.7500000    29.2500000     0.2500000    36.2500000    33.2500000
```

```
        B1:C1          C1:D1      A-1:B1:D1       B1:C1:D1 A1:B-1:C1:D-1
    4.7500000      2.2500000      8.2500000      5.2500000      2.7500000
> qq <- qqnorm(effects, type="n")  # "n" means no plotting
> text(qq$x, qq$y, labels = names(effects))
>
```