```
/* Montgomery 5.21 */
proc import datafile="/home/u63048916/STAT571B/Homework/Homework 4/Q5-21.xlsx"
    dbms=xlsx
    out=mont5_21
    replace;
    getnames=yes;
run;

proc print data=mont5_21;
run;

proc glm data=mont5_21;
class Pressure Temperature Day;
model Yield= Day Temperature|Pressure;
means Day Pressure Temperature Pressure*Temperature;
output out=mont5_21new r=res p=pred;
run;

PROC univariate data=mont5_21new normal;
var res;
qqplot res /normal(MU=0 SIGMA=EST);
run;

proc sgplot;
scatter x=pred y=res;
refline 0;
run;

/* multiple comparison */

proc glm data=mont5_21;
class Pressure Temperature Day;
model Yield= Day Temperature|Pressure;
means Temperature|Pressure /tukey lines;
output out=mont5_21new1 r=res p=pred;
run;

proc glm data=mont5_21;
class Pressure Temperature Day;
model Yield= Day Temperature|Pressure;
lsmeans Temperature|Pressure/tdiff adjust=tukey;
output out=mont5_21new2 r=res p=pred;
run;
```

5.21. The yield of a chemical process is being studied. The two factors of interest are temperature and pressure. Three levels of each factor are selected; however, only nine runs can be made in one day. The experimenter runs a complete replicate of the design on each day. The data are shown in the following table. Analyze the data, assuming that the days are blocks.

	Day 1 Pressure			Day 2 Pressure		
Temperature	**250**	**260**	**270**	**250**	**260**	**270**
Low	86.3	84.0	85.8	86.1	85.2	87.3
Medium	88.5	87.3	89.0	89.4	89.9	90.3
High	89.1	90.2	91.3	91.7	93.2	93.7

4. **Montgomery 5.21**

This is a general two factor blocked factorial design (factors are Pressure and Temperature, blocks are Days). The Statistical model is

$$y_{ijk} = \mu + \tau_i + \beta_j + (\tau\beta)_{ij} + \delta_k + \epsilon_{ijk} \begin{cases} i = 1, 2, 3 \\ j = 1, 2, 3 \\ k = 1, 2, ..., 18 \end{cases}$$