DISCUSSION 9

-Review on some terms/notation:

1. compounding, alias Columns that have identical entries correspond to e?ects that are **confounded** or **aliased**. In order to construct a fractional factorial that deliberately confounds pre-selected important factors, one needs to use a generator (=**word**). The generator uses the fact that squaring the entries in any given column gives a column of ones, which can be thought of as an identity element I.
2. defining relation, generators, resolution, e.g. 2^{7-4}_{IV} design:
3. higher-order interaction negligible:

   Large factorial designs allow for estimation of many higher order effects. If we can make assumptions that three-factor or higher-order interactions are negligible. Fractional factorial designs employ such redundancy by arranging that lower order effects are compounded with those of higher order.
4. parsimony, projectivity = R -1

   the vital few factors and trivial many – Pareto Principle / Occam's Razor
5. sign switching, fold over, and sequential assembly

   Further runs may be needed when fractional designs yield ambiguities. One strategy in this sequential assembly of designs is called "**foldover**". It is achieved by signswitching. Increase design with 8 runs to a design with 16 runs.

   (a) single-column fold over

   (b) multiple-column fold over

   (c) increase design resolution from III to IV by fold over

-Exercies:

1. Question 10 from page 277

   (a) Write a design of reso]ution III in seven fators and eight runs

   (b) From (a) obtain a design in eight factors in 16 runs of resolution IV arranged in two bJocks of 8.

   (c) How could this design be used to eliminate time trends?

   (d) What are the generators of the 16-run design?

   (e) If no blocking is used, how can this design be employed to study three principal factors, the main effects of eight minor factors not expected to interact with the major factors or with each other?
2. Question 16 from page 278.

   An experimenter performs a 2^{5-2} fractional factorial design with generators 1 = 1234 and 1 = 135. After analyzing the results from this design he decides to perform a second 2^{5-2} design exactly the same as the first but with signs changed in column 3 of the design matrix.

   (a) How many runs does the first design contain?

   (b) Give a set of generators for the second design

(c) What is the resolution of the second design?

(d) What is the defining relation of the combined design?

(e) What is the resolution of the combined design?

(f) Give a good reason for the unique choice of the second design.