

## $2^{k-1}$ Fractional Factorial Design Exercise

Respond to the following questions individually then discuss your answers in your group. You should hand in your individual response. We will discuss your group responses and then I will lecture on advanced topics.

1. For the following  $2^{4-1}$  table:

Run
(1)
a
bc
abc
bd
abd
cd
acd

- (a) Verify that  $I=BCD$  is the design generator (i.e., that all the runs correspond to the low level of the effect BCD). What is the alias structure (you should be able to list 7 unique alias pairs)?
  - (b) What is the resolution of the design? Is a higher resolution  $2^{4-1}$  design possible?
  - (c) Suppose the effects B-CD, C-BD and D-BC are significant. What possible conclusions can you reach about which effects are active?
2. Suppose the following  $2^{4-1}$  design (with generator  $I=ABCD$ ) has to be run in two blocks:

Run
(1)
ab
ac
ad
bc
bd
cd
abcd

- (a) Write the alias structure for the fractional factorial (there should be 7 unique alias pairs again). Suppose the experiment has to be run in two blocks—what would be some reasonable choices for aliased pairs of effects to confound with block? Write out the runs for each block.