

Statistics 506
Final Exam

1. A researcher wants to study 5 factors in 16 runs using two blocks.
 - (a) One idea would be to use the design generator $I=ABCDE$. What is the resolution of this design? What is the alias structure of this design? Which pairs of confounded effects would be reasonable to confound with block?
 - (b) Another idea would be to use the design generator $I=ABCD$. Write down the alias structure for this design. What is the resolution of this design? Which pairs of confounded effects would be reasonable to confound with blocks?
 - (c) What advantage does the first design have over the second design? What advantage does the second design have over the first design? Which approach would you recommend? For whichever approach you recommend, write down the runs that would appear in each of your two blocks.

2. Three factors were analyzed in a replicated full factorial design. Results appear below.

Factor settings	Response
(-1,-1,-1)	30.82,26.79,23.98,30.92
(-1,1,-1)	28.89,28.71,27.77,33.91
(-1,-1,1)	8.22,39.58,16.96,33.09
(-1,1,1)	38.08,38.21,23.92,31.13
(1,-1,-1)	23.95,31.06,27.83,33.20
(1,1,-1)	29.06,24.23,30.38,30.36
(1,-1,1)	17.12,23.74,30.70,14.20
(1,1,1)	34.29,35.88,39.65,24.21

- (a) Analyze the mean in a replicated design. Which factors affect the mean? Using only significant effects, what would be the estimated mean response if we wanted to make the mean as large as possible?
- (b) Compute the standard deviation and mean for each run. Compute \bar{y}/s for each run (the signal-to-noise ratio). Analyze the signal-to-noise ratio in an unreplicated design. Which factors affect the signal-to-noise ratio?
- (c) Explain any differences in results you observe in the two analyses.