

Homework 3

1. In the following replicated experiment, the amount of inert gas (radon, xenon) adsorbed by activated charcoal was studied as a function of temperature (25°C , 55°C) and humidity (5%, 25%). The variation within cell is small compared to the size of the effects that you will be computing, so you should anticipate differences in the two analyses you are asked to complete.

Factor settings	Adsorption Coefficient
(Xenon,25,5)	530,570,520
(Radon,25,5)	340,330,300
(Xenon,55,5)	320,340,350
(Radon,55,5)	110,130,130
(Xenon,25,25)	440,440,470
(Radon,25,25)	110,100,120
(Xenon,55,25)	120,90,110
(Radon,55,25)	20,10,40

- (a) Construct a normal probability plot of the effects using the average responses stored in a 8-run worksheet in Minitab. Discuss and analyze the results.
 - (b) Now analyze replicated data stored in a 24-run worksheet. Summarize results using the T-tests provided in Minitab output. Compare results to your earlier analysis.
2. Suppose that for the above experiment you are asked to conduct a sample size analysis.
 - (a) Using the negligible effects from 1(a), estimate σ . Now use the negligible effects from 1(b) to estimate σ . Graduate students should re-run the analysis in 1(b) while removing the negligible terms from the model, and look at the square root of MSE (a pooled estimate of pure error and error estimated from negligible effects). Compare these two (or three) error estimates to the square root of MSPE. Are they close? Which method of estimating σ do you prefer?
 - (b) Using all three (or four) estimates of σ from above, how many replicates are needed to detect a factor effect of 30? A factor effect of 10?