# 2k Factorial Designs by Hand

An engineer is interested in the effects of cutting speed A, tool geometry B, and cutting angle C on the life (in hours) of a machine tool. Two levels of each factor are chosen, and three replicates of a 23 factorial design are run. The results are as follows:

|  |  |  | **Treatment Combination** | **Replicate** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***A*** | ***B*** | ***C*** | **I** | **II** | **III** |  |  |  |  |
| − | − | − | (1) | 22 | 31 | 25 |  |  |  |  |
| + | − | − | *a* | 32 | 43 | 29 |  |  |  |  |
| − | + | − | *b* | 35 | 34 | 50 |  |  |  |  |
| + | + | − | *ab* | 55 | 47 | 46 |  |  |  |  |
| − | − | + | *c* | 44 | 45 | 38 |  |  |  |  |
| + | − | + | *ac* | 40 | 37 | 36 |  |  |  |  |
| − | + | + | *bc* | 60 | 50 | 54 |  |  |  |  |
| + | + | + | *abc* | 39 | 41 | 47 |  |  |  |  |

*Upload a pdf/scan of your handwritten work into Blackboard. Must show all work.*

1. Construct the full table of plus (+) and minus (-) using Yates method
2. Write the model equation for this a 23 factorial design
3. Draw a cube labeling the corner points with the treatment combinations
4. Estimate the effect of the AB interaction
5. Calculate the sums of square for the AB interaction (i.e. SSAB)
6. Calculate the mean square for the AB interaction (i.e. MSAB)
7. How many degrees of freedom are there in error?
8. Test whether the AB interaction term is significant at α=0.05 (SSE = 482.67)