**A 23 factorial design was constructed to test the effect of three different variables on the alertness of students in an early morning class. The variables tested, the design matrix, and the responses are shown in the tables below.**

|  |  |  |
| --- | --- | --- |
| Variable | Low Level | High Level |
| 1 | Hours of sleep | 4 | 8 |
| 2 | Ounces of coffee | 6 | 12 |
| 3 | Number of donuts | 1 | 2 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test | 1 | 2 | 3 | 1\*3 | Alertness (%) |
| 1 | **-** | **-** | **-** |  | 56 |
| 2 | **+** | **-** | **-** |  | 72 |
| 3 | **-** | **+** | **-** |  | 68 |
| 4 | **+** | **+** | **-** |  | 89 |
| 5 | **-** | **-** | **+** |  | 43 |
| 6 | **+** | **-** | **+** |  | 62 |
| 7 | **-** | **+** | **+** |  | 59 |
| 8 | **+** | **+** | **+** |  | 75 |

 **Calculate an estimate of the main effect for factor 2 and the interaction effect for factors 1 and 3. Draw the interaction graph.**