**One Way ANOVA**

Suppose in an industrial experiment that an engineer is interested in how the mean absorption of moisture in concrete varies among 5 different concrete aggregates. The samples are exposed to moisture for 48 hours. It is decided that 6 samples are to be tested for each aggregate, requiring a total of 30 samples to be tested. The data are recorded in Table 13.1.

The model for this situation may be set up as follows. There are 6 observations taken from each of 5 populations with means *μ*1*, μ*2*, . . . , μ*5, respectively. We may wish to test

*H*0: *μ*1 = *μ*2 = *· · ·* = *μ*5*,*

*H*1: At least two of the means are not equal*.*

Table 13.1: Absorption of Moisture in Concrete Aggregates

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Aggregate | 1 | 2 | 3 | 4 | 5 |
|  | 551 | 595 | 639 | 417 | 563 |
|  | 457 | 580 | 615 | 449 | 631 |
|  | 450 | 508 | 511 | 517 | 522 |
|  | 731 | 583 | 573 | 438 | 613 |
|  | 499 | 633 | 648 | 415 | 656 |
|  | 632 | 517 | 677 | 555 | 679 |

**Two-Factor Analysis of Variance**

In an experiment conducted to determine which of 3 different missile systems is preferable, the propellant burning rate for 24 static firings was measured. Four different propellant types were used. The experiment yielded duplicate observations of burning rates at each combination of the treatments.

The data, after coding, are given in Table 14.3. Test the following hypotheses:

(a) $H\_{0}^{'}: $there is no difference in the mean propellant burning rates when different missile systems are used,

(b) $H\_{0}^{''}: $ there is no difference in the mean propellant burning rates of the 4 propellant types,

(c) $H\_{0}^{'''}:$ there is no interaction between the different missile systems and the different propellant types.

|  |  |
| --- | --- |
| Missile System | Propellant Type |
| b1 | b2 | b3 | b4 |
| a1 | 34.0 | 30.1 | 29.8 | 29.0 |
|  | 32.7 | 32.8 | 26.7 | 28.9 |
| a2 | 32.0 | 30.2 | 28.7 | 27.6 |
|  | 33.2 | 29.8 | 28.1 | 27.8 |
| a3 | 28.4 | 27.3 | 29.7 | 28.8 |
|  | 29.3 | 28.9 | 27.3 | 29.1 |