

# HW5 STAT512 Fall2014

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1.

```
library(reshape2)
library(xtable)
dat <- matrix(c(1, 360, 67, 73, 83, 89,
                1, 370, 65, 91, 87, 86,
                1, 380, 155, 127, 147, 212,
                2, 380, 108, 100, 90, 153,
                2, 370, 140, 142, 121, 150,
                2, 360, 33, 8, 46, 54),
              byrow = T, nrow = 6)
dat <- as.data.frame(dat)
colnames(dat) <- c("rep", "temp", paste0("coating", 1:4))
dat$temp <- as.factor(dat$temp)
dat$rep <- as.factor(dat$rep)
dat.melt <- melt(dat)
colnames(dat.melt) <- c("rep", "temp", "coating", "y")

lmout <- lm(y~temp*coating , data = dat.melt)
ano <- anova(lmout)

print(xtable(ano, caption = "ANOVA table and F-statistics,
                        degree of freedom,
                        and pvalue for the three tests."))
```

|              | Df | Sum Sq   | Mean Sq  | F value | Pr(>F) |
|--------------|----|----------|----------|---------|--------|
| temp         | 2  | 26519.25 | 13259.62 | 10.23   | 0.0026 |
| coating      | 3  | 4289.12  | 1429.71  | 1.10    | 0.3860 |
| temp:coating | 6  | 3269.75  | 544.96   | 0.42    | 0.8518 |
| Residuals    | 12 | 15560.50 | 1296.71  |         |        |

Table 1: ANOVA table and F-statistics, degree of freedom, and pvalue for the three tests.

## 2.

```
res <- aov(y ~temp * coating + Error(temp:rep), data = dat.melt)
```

### Whole Plot ANOVA

```
print(xtable(summary(res)[[1]], caption = "Whole Plot ANOVA
including F-test, degree of freedom,
and p-value of the test for main
effect of temperature factor."))
```

|           | Df | Sum Sq   | Mean Sq  | F value | Pr(>F) |
|-----------|----|----------|----------|---------|--------|
| temp      | 2  | 26519.25 | 13259.62 | 2.75    | 0.2093 |
| Residuals | 3  | 14439.62 | 4813.21  |         |        |

Table 2: Whole Plot ANOVA including F-test, degree of freedom, and p-value of the test for main effect of temperature factor.

### Split-Plot ANOVA

```
print(xtable(summary(res)[[2]], caption = "Split-Plot ANOVA
including F-test,
degree of freedom,
and p-value of the tests for the
main effect of coating and
interaction of temperature and coating."))
```

|              | Df | Sum Sq  | Mean Sq | F value | Pr(>F) |
|--------------|----|---------|---------|---------|--------|
| coating      | 3  | 4289.12 | 1429.71 | 11.48   | 0.0020 |
| temp:coating | 6  | 3269.75 | 544.96  | 4.38    | 0.0241 |
| Residuals    | 9  | 1120.87 | 124.54  |         |        |

Table 3: Split-Plot ANOVA including F-test, degree of freedom, and p-value of the tests for the main effect of coating and interaction of temperature and coating.