STAT 8020 R Lab 19

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Contents

RCBD

Create the data set

```
x <- c(52, 47, 44, 51, 42, 60, 55, 49, 52, 43, 56, 48, 45, 44, 38)
trt <- rep(c("A", "B", "C"), each = 5)
blk <- rep(1:5, 3)
dat <- data.frame(x = x, trt = trt, blk = as.factor(blk))
```

Two-way ANOVA

```
aov <- aov(x ~ trt + blk, data = dat)
lm <- lm(x ~ trt + blk, data = dat)
anova(lm)
```

```
## Analysis of Variance Table
##
## Response: x
##           Df Sum Sq Mean Sq F value    Pr(>F)
## trt        2   89.2   44.60  7.6239 0.0140226 *
## blk        4  363.6   90.90 15.5385 0.0007684 ***
## Residuals  8   46.8    5.85
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

One-way ANOVA

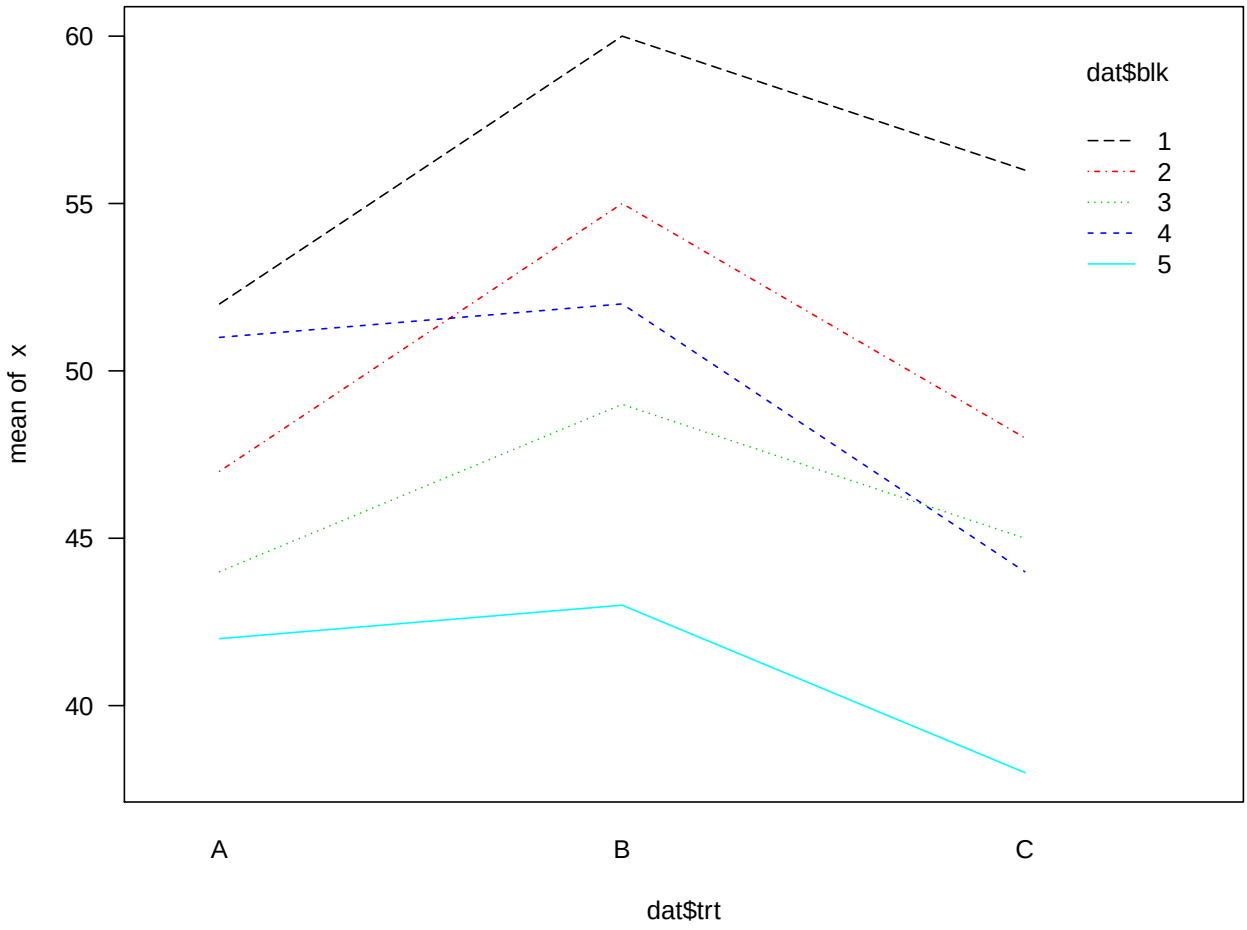
```
lm2 <- lm(x ~ trt, data = dat)
anova(lm2)
```

```
## Analysis of Variance Table
##
## Response: x
##           Df Sum Sq Mean Sq F value Pr(>F)
## trt        2   89.2    44.6  1.3041 0.3073
```

```
## Residuals 12  410.4    34.2
```

Interaction plot: assessing the additivity assumption

```
interaction.plot(dat$trt, dat$blk, x, las = 1, col = 1:5)
```



Factorial Design

Create the data set

```
y <- c(130, 74, 150, 159, 138, 168, 155, 180, 188, 126, 110, 160,
       34, 80, 136, 106, 174, 150, 40, 75, 122, 115, 120, 139,
       20, 82, 25, 58, 96, 82, 70, 58, 70, 45, 104, 60)
temp <- c(rep(15, 12), rep(70, 12), rep(125, 12))
material <- rep(c(1, 1, 2, 2, 3, 3), 6)
dat <- data.frame(cbind(y, temp, material))
dat$temp <- as.factor(dat$temp); dat$material <- as.factor(dat$material)

meanA <- tapply(dat$y, dat$temp, mean)
meanB <- tapply(dat$y, dat$material, mean)
meanAB <- tapply(dat$y, list(dat$temp, dat$material), mean)
```

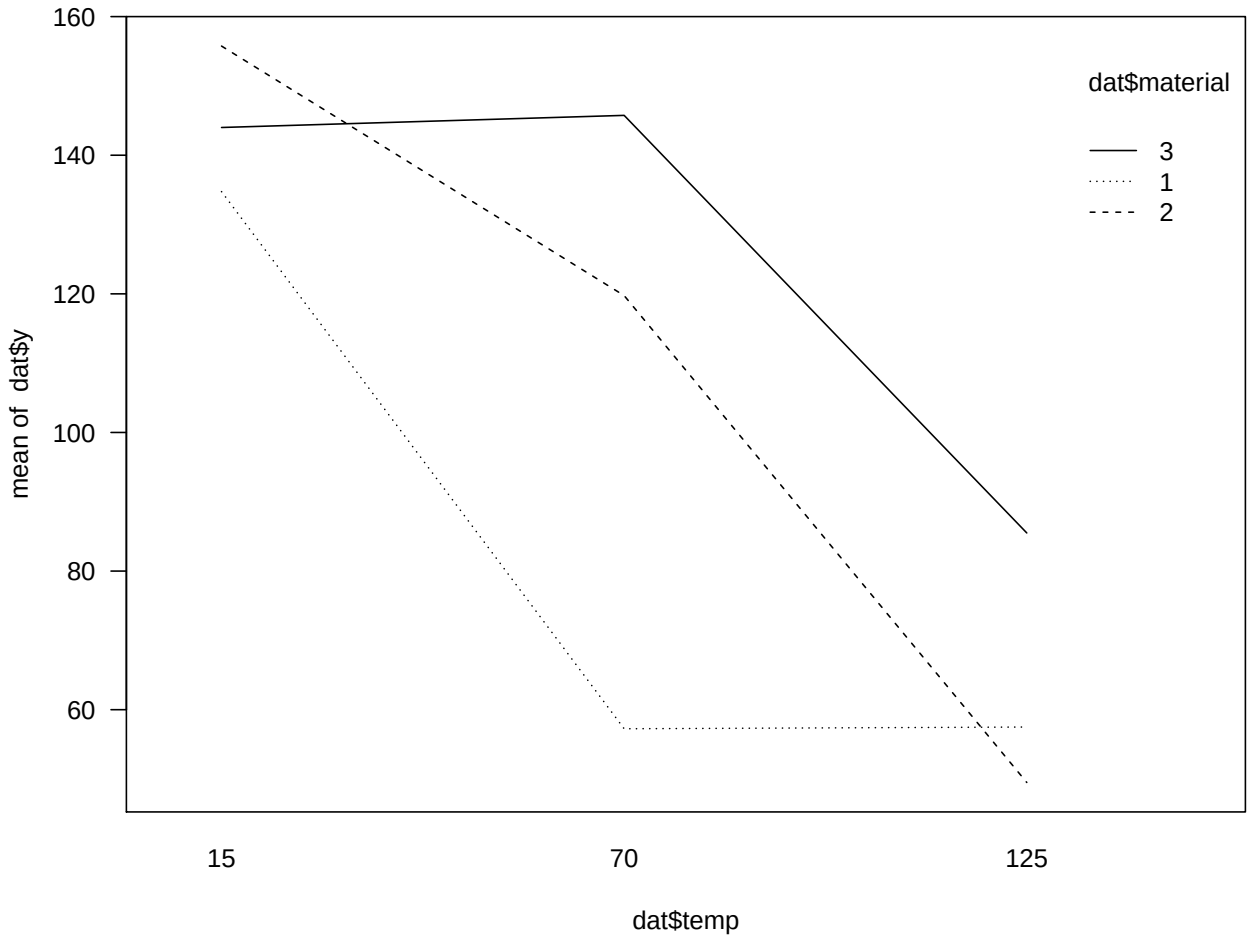
Two-way ANOVA

```
aov <- aov(y ~ temp * material, data = dat)
lm <- lm(y ~ temp * material, data = dat)
anova(lm)
```

```
## Analysis of Variance Table
##
## Response: y
##               Df Sum Sq Mean Sq F value    Pr(>F)
## temp           2  39119 19559.4 28.9677 1.909e-07 ***
## material       2  10684  5341.9  7.9114  0.001976 **
## temp:material  4   9614  2403.4  3.5595  0.018611 *
## Residuals     27  18231   675.2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Interaction plot

```
interaction.plot(dat$temp, dat$material, dat$y, las = 1)
```




```
par(mar = c(4.1, 4, 1, 0.8))
plot(rep(c(15, 70, 125), 3), c(meanAB), pch = 16, las = 1,
     xlab = "Temperature (degree F)", ylab = "Average life (hrs)")
```

```
lines(c(15, 70, 125), meanAB[, 1])
lines(c(15, 70, 125), meanAB[, 2], lty = 5)
lines(c(15, 70, 125), meanAB[, 3], lty = 3)
legend("topright", legend = paste("Material", 1:3), bty = "n",
lty = c(1, 5, 3))
```