

	area	shaking	light
01	264	control	low
02	200	control	low
03	225	control	low
04	268	control	low
05	215	control	low
06	241	control	low
07	232	control	low
08	256	control	low
09	229	control	low
10	288	control	low
11	253	control	low
12	288	control	low
13	230	control	low
14	235	stress	low
15	188	stress	low
16	195	stress	low
17	205	stress	low
18	212	stress	low
19	214	stress	low
20	182	stress	low
21	215	stress	low
22	272	stress	low
23	163	stress	low
24	230	stress	low
25	255	stress	low
26	202	stress	low
27	314	control	moderate
28	320	control	moderate
29	310	control	moderate
30	340	control	moderate
31	299	control	moderate
32	268	control	moderate
33	345	control	moderate
34	271	control	moderate
35	285	control	moderate
36	309	control	moderate
37	337	control	moderate
38	282	control	moderate
39	273	control	moderate
40	283	stress	moderate
41	312	stress	moderate
42	291	stress	moderate
43	259	stress	moderate
44	216	stress	moderate
45	201	stress	moderate
46	267	stress	moderate
47	326	stress	moderate
48	241	stress	moderate
49	291	stress	moderate
50	269	stress	moderate
51	282	stress	moderate
52	257	stress	moderate

Analysis of Variance continued: randomized blocks, factorial designs

```
> # do randomized block alfalfa (SW p.487 "alfalfa and acid rain")
```

```
> alf = read.table(file="D:\\stat141\\alfalfa.dat", header = T)
```

```
> attach(alf)
```

```
> interaction.plot(trt, block, height) # plot of cell means, here n=1
```

```
> tapply(height, list(trt,block), mean) #table cell means
```

	a	b	c	d	e
control	2.47	2.15	1.46	2.36	1.0
high	1.10	1.05	0.50	1.00	1.5
low	1.58	1.15	1.27	1.25	1.0

```
> rndb = aov(height ~ trt + block) # two factor anova, no interaction
```

```
> summary(rndb) #match Table 11.9
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
trt	2	1.98601	0.99301	5.4709	0.03182 *
block	4	0.83963	0.20991	1.1565	0.39740
Residuals	8	1.45205	0.18151		

```
> TukeyHSD(rndb)
```

```
Tukey multiple comparisons of means
```

```
95% family-wise confidence level
```

```
Fit: aov(formula = height ~ trt + block)
```

```
$trt
```

	diff	lwr	upr
high-control	-0.858	-1.627935	-0.088065
low-control	-0.638	-1.407935	0.131935
low-high	0.220	-0.549935	0.989935

---

factorial designs soybean data. (plus co2 toads, summary in text)

```
> soy = read.table(file="D:\\stat141\\soybean.dat", header = T)
```

```
> attach(soy); tapply(area, list(shaking,light), mean) # Table 11.11 p.492
```

	low	moderate
control	245.3077	304.0769
stress	212.9231	268.8462

```
> tapply(area, list(shaking,light), sd)
```

	low	moderate
control	27.02278	26.92416
stress	29.74744	35.23220

```
> tapply(area, list(shaking,light), length)
```

	low	moderate
control	13	13
stress	13	13

```
> interaction.plot(shaking, light, area) # Fig 11.4 p.493
```

```
> soyaov = aov(area ~ shaking*light)
```

```
> summary(soyaov) #
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
shaking	1	14858	14858	16.5954	0.0001725 ***
light	1	42752	42752	47.7490	1.010e-08 ***
shaking:light	1	26	26	0.0294	0.8645695
Residuals	48	42976	895		

```
---
```

```
> TukeyHSD(soyaov) [single contrast, row and column]
```

