

STATS 3N03/3J04

2004-11-22

29-1

HOW MANY OBSERVATIONS DO I NEED?

① DECIDE ON LEVEL OF CONFIDENCE AND WIDTH OF INTERVAL, SOLVE FOR  $n$ .

② DECIDE ON  $\alpha, \beta, \delta$ , SOLVE FOR  $n$

SINGLE-FACTOR ANOVA

IDENTITY:

$$\sum_{i=1}^a \sum_{j=1}^{n_i} (Y_{ij} - \bar{Y}_{++})^2 = \sum_{i=1}^a n_i (\bar{Y}_{i+} - \bar{Y}_{++})^2 + \sum_{i=1}^a \sum_{j=1}^{n_i} (Y_{ij} - \bar{Y}_{i+})^2$$

SS:	"TOTAL"	=	"BETWEEN"	+	"WITHIN"
SS:	SST	=	SSB	+	SSE
DF:	$N-1$	=	$a-1$	+	$N-a$

$$N = \sum_{i=1}^a n_i = \text{TOTAL NUMBER OF OBSERVATIONS}$$

TEXT page 474:  $n_1 = n_2 = \dots = n_a = n$  "BALANCED DESIGN"

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CALCULATION:

$$SST = \sum_i \sum_j Y_{ij}^2 - \frac{(\sum_i \sum_j Y_{ij})^2}{N}$$

$$SSB = \sum_i \frac{(\sum_j Y_{ij})^2}{n_i} - \frac{(\sum_i \sum_j Y_{ij})^2}{N}$$

$$SSE = SST - SSB$$

EXAMPLE:

BRICK DENSITY - LECTURE 1-7

CODED DATA:  $10 * (\text{density} - 21)$ 

SU	SS	DF	MS	F	P
Firing Temp.	13.91104	3	4.637	2.616	0.083
Error	31.90714	18	1.773		
TOTAL	45.81818	21			

"SINCE  $P > 0.05$ , WE DO NOT REJECT THE HYPOTHESIS THAT FIRING TEMPERATURE DOES NOT AFFECT BRICK DENSITY, AT THE 5% LEVEL OF SIGNIFICANCE."

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```
> bricks
  density temp
1    21.8  100
2    21.9  100
3    21.7  100
4    21.6  100
5    21.7  100
6    21.5  100
7    21.8  100
8    21.7  125
9    21.4  125
10   21.5  125
11   21.5  125
12   21.9  150
13   21.8  150
14   21.8  150
15   21.6  150
16   21.5  150
17   21.9  175
18   21.7  175
19   21.8  175
20   21.7  175
21   21.6  175
22   21.8  175
```

```
> anova(lm(density~as.factor(temp),bricks))
Analysis of Variance Table
```

Response: density

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
as.factor(temp)	3	0.13911	0.04637	2.6159	0.08265 .
Residuals	18	0.31907	0.01773		

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

```
> anova(lm((10*(density-21))-as.factor(temp),bricks))
Analysis of Variance Table
```

Response: (10 \* (density - 21))

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
as.factor(temp)	3	13.911	4.637	2.6159	0.08265 .
Residuals	18	31.907	1.773		

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1