

RANDOM BLOCKING FACTORS

Contrast the two examples:

A. Seedlings are being grown in a greenhouse. Since variables such as light, heat, humidity, and pests might vary according to location in the greenhouse, the greenhouse is divided into blocks by location, and treatments are randomly assigned within each block.

B. The candle experiment (Problem 6, p. 326): Color of candle is the treatment factor, burning time of the candle is the response, and the blocks are the experimenters.

Candle experiment:

1. Treating block as fixed:

Factor	Type	Levels	Values			
BLOCK	fixed	4	1	2	3	4
COLOR	fixed	4	1	2	3	4

Analysis of Variance for TIME

Source	DF	SS	MS	F	P
BLOCK	3	151659	50553	29.58	0.000
COLOR	3	60345	20115	11.77	0.000
BLOCK*COLOR	9	15821	1758	1.03	0.431
Error	48	82025	1709		
Total	63	309850			

2. Treating block as random (unrestricted model):

Factor	Type	Levels	Values			
BLOCK	random	4	1	2	3	4
COLOR	fixed	4	1	2	3	4

Analysis of Variance for TIME

Source	DF	SS	MS	F	P
BLOCK	3	151659	50553	28.76	0.000
COLOR	3	60345	20115	11.44	0.002
BLOCK*COLOR	9	15821	1758	1.03	0.431
Error	48	82025	1709		
Total	63	309850			

3. Treating block as random (restricted model):

```
MTB > ANOVA 'TIME' = BLOCK|COLOR;  
SUBC> Random BLOCK;  
SUBC> Restrict.
```

Analysis of Variance (Balanced Designs)

Factor	Type	Levels	Values			
BLOCK	random	4	1	2	3	4
COLOR	fixed	4	1	2	3	4

Analysis of Variance for TIME

Source	DF	SS	MS	F	P
BLOCK	3	151659	50553	29.58	0.000
COLOR	3	60345	20115	11.44	0.002
BLOCK*COLOR	9	15821	1758	1.03	0.431
Error	48	82025	1709		
Total	63	309850			