

MATH 204: PRINCIPLES OF STATISTICS 2
WINTER 2026
ANOVA TABLES FOR THE RANDOMIZED BLOCK DESIGN

1. **No interaction case**

Use the given information to complete the ANOVA tables in the format

SOURCE	DF	SS	MS	F
TREATMENTS	$k - 1$	SST	MST	F_1
BLOCKS	$b - 1$	SSB	MSB	F_2
ERROR	$n - b - k + 1$	SSE	MSE	
TOTAL	$n - 1$	SS		

and complete the F-tests for the following analyses using statistical tables. As usual

- k is the number of levels of the treatment factor
- b is the number of levels of the blocking factor
- r is the number of replicates, which is the same for all treatment/blocking factor level combinations.

(i) Summary data: $k = 8, b = 5, r = 4$

$$SST = 4.726 \quad SSB = 4.492 \quad SSE = 117.443$$

(ii) Summary data: $k = 3, b = 4, r = 3$

$$SST = 4.730 \quad SSB = 15.625 \quad SSE = 147.319$$

(iii) Summary data: $k = 3, b = 3, r = 3$

$$SST = 15.000 \quad SSB = 12.090 \quad SSE = 175.987$$

(iv) Summary data: $k = 7, b = 4, r = 5$

$$SST = 3.604 \quad SSB = 10.128 \quad SSE = 137.914$$

(v) Summary data: $k = 7, b = 5, r = 2$

$$SST = 5.122 \quad SSB = 25.407 \quad SSE = 137.407$$

(vi) Summary data: $k = 8, b = 5, r = 6$

$$SST = 9.610 \quad SSB = 16.261 \quad SSE = 148.168$$

2. Interaction case

Use the given information to complete the ANOVA tables in the format

SOURCE	DF	SS	MS	F
TREATMENTS	$k - 1$	SST	MST	F_1
BLOCKS	$b - 1$	SSB	MSB	F_2
INTERACTION	$(b - 1)(k - 1)$	SSI	MSI	F_3
ERROR	$n - bk$	SSE	MSE	
TOTAL	$n - 1$	SS		

and complete the F-tests for the following analyses using statistical tables or software.

(i) Summary data: $k = 5, b = 5, r = 4$

$$SST = 12.694 \quad SSB = 8.377 \quad SSI = 23.507 \quad SSE = 66.536$$

(ii) Summary data: $k = 5, b = 4, r = 2$

$$SST = 3.704 \quad SSB = 12.517 \quad SSI = 11.788 \quad SSE = 64.224$$

(iii) Summary data: $k = 5, b = 5, r = 4$

$$SST = 22.642 \quad SSB = 13.454 \quad SSI = 17.246 \quad SSE = 64.301$$

(iv) Summary data: $k = 3, b = 4, r = 6$

$$SST = 5.990 \quad SSB = 5.244 \quad SSI = 22.781 \quad SSE = 63.492$$

(v) Summary data: $k = 6, b = 3, r = 4$

$$SST = 4.611 \quad SSB = 46.677 \quad SSI = 15.722 \quad SSE = 67.756$$

(vi) Summary data: $k = 5, b = 4, r = 3$

$$SST = 8.838 \quad SSB = 18.313 \quad SSI = 10.433 \quad SSE = 72.286$$

Solutions:

1. No interaction case

(i) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	7	4.726	0.675	0.851
BLOCKS	4	4.492	1.123	1.415
ERROR	148	117.443	0.794	
TOTAL	159	126.661		

Treatment Critical value: 2.07 $\therefore$ Do not reject H_0

Blocks Critical value: 2.43 $\therefore$ Do not reject H_0

(ii) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	2	4.730	2.365	0.482
BLOCKS	3	15.625	5.208	1.061
ERROR	30	147.319	4.911	
TOTAL	35	167.674		

Treatment Critical value: 3.32 $\therefore$ Do not reject H_0

Blocks Critical value: 2.92 $\therefore$ Do not reject H_0

(iii) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	2	15.000	7.500	0.938
BLOCKS	2	12.090	6.045	0.756
ERROR	22	175.987	7.999	
TOTAL	26	203.077		

Treatment Critical value: 3.44 $\therefore$ Do not reject H_0

Blocks Critical value: 3.44 $\therefore$ Do not reject H_0

(iv) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	6	3.604	0.601	0.566
BLOCKS	3	10.128	3.376	3.182
ERROR	130	137.914	1.061	
TOTAL	139	151.646		

Treatment Critical value: 2.17 $\therefore$ Do not reject H_0

Blocks Critical value: 2.67 $\therefore$ Reject H_0

(v) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	6	5.122	0.854	0.367
BLOCKS	4	25.407	6.352	2.727
ERROR	59	137.407	2.329	
TOTAL	69	167.936		

Treatment Critical value: 2.26 $\therefore$ Do not reject H_0

Blocks Critical value: 2.53 $\therefore$ Reject H_0

(vi) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	7	9.610	1.373	2.113
BLOCKS	4	16.261	4.065	6.256
ERROR	228	148.168	0.650	
TOTAL	239	174.039		

Treatment Critical value: 2.05 $\therefore$ Reject H_0

Blocks Critical value: 2.41 $\therefore$ Reject H_0

2. Interaction case

(i) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	4	12.694	3.173	3.577
BLOCKS	4	8.377	2.094	2.361
INTERACTION	16	23.507	1.469	1.656
ERROR	75	66.536	0.887	
TOTAL	99	111.114		

Treatment Critical value: 2.49 $\therefore$ Reject H_0

Blocks Critical value: 2.49 $\therefore$ Do not reject H_0

Interaction Critical value: 1.78 $\therefore$ Do not reject H_0

(ii) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	4	3.704	0.926	0.288
BLOCKS	3	12.517	4.172	1.299
INTERACTION	12	11.788	0.982	0.306
ERROR	20	64.224	3.211	
TOTAL	39	92.233		

Treatment Critical value: 2.87 $\therefore$ Do not reject H_0

Blocks Critical value: 3.10 $\therefore$ Do not reject H_0

Interaction Critical value: 2.28 $\therefore$ Do not reject H_0

(iii) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	4	22.642	5.661	6.602
BLOCKS	4	13.454	3.363	3.923
INTERACTION	16	17.246	1.078	1.257
ERROR	75	64.301	0.857	
TOTAL	99	117.643		

Treatment Critical value: 2.49 $\therefore$ Reject H_0

Blocks Critical value: 2.49 $\therefore$ Reject H_0

Interaction Critical value: 1.78 $\therefore$ Do not reject H_0

(iv) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	2	5.990	2.995	2.830
BLOCKS	3	5.244	1.748	1.652
INTERACTION	6	22.781	3.797	3.588
ERROR	60	63.492	1.058	
TOTAL	71	97.507		

Treatment Critical value: 3.15 $\therefore$ Do not reject H_0

Blocks Critical value: 2.76 $\therefore$ Do not reject H_0

Interaction Critical value: 2.25 $\therefore$ Reject H_0

(v) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	5	4.611	0.922	0.735
BLOCKS	2	46.677	23.339	18.600
INTERACTION	10	15.722	1.572	1.253
ERROR	54	67.756	1.255	
TOTAL	71	134.767		

Treatment Critical value: 2.39 $\therefore$ Do not reject H_0

Blocks Critical value: 3.17 $\therefore$ Reject H_0

Interaction Critical value: 2.01 $\therefore$ Do not reject H_0

(vi) ANOVA table

SOURCE	DF	SS	MS	F
TREATMENTS	4	8.838	2.210	1.223
BLOCKS	3	18.313	6.104	3.378
INTERACTION	12	10.433	0.869	0.481
ERROR	40	72.286	1.807	
TOTAL	59	109.871		

Treatment Critical value: 2.61 $\therefore$ Do not reject H_0

Blocks Critical value: 2.84 $\therefore$ Reject H_0

Interaction Critical value: 2.00 $\therefore$ Do not reject H_0