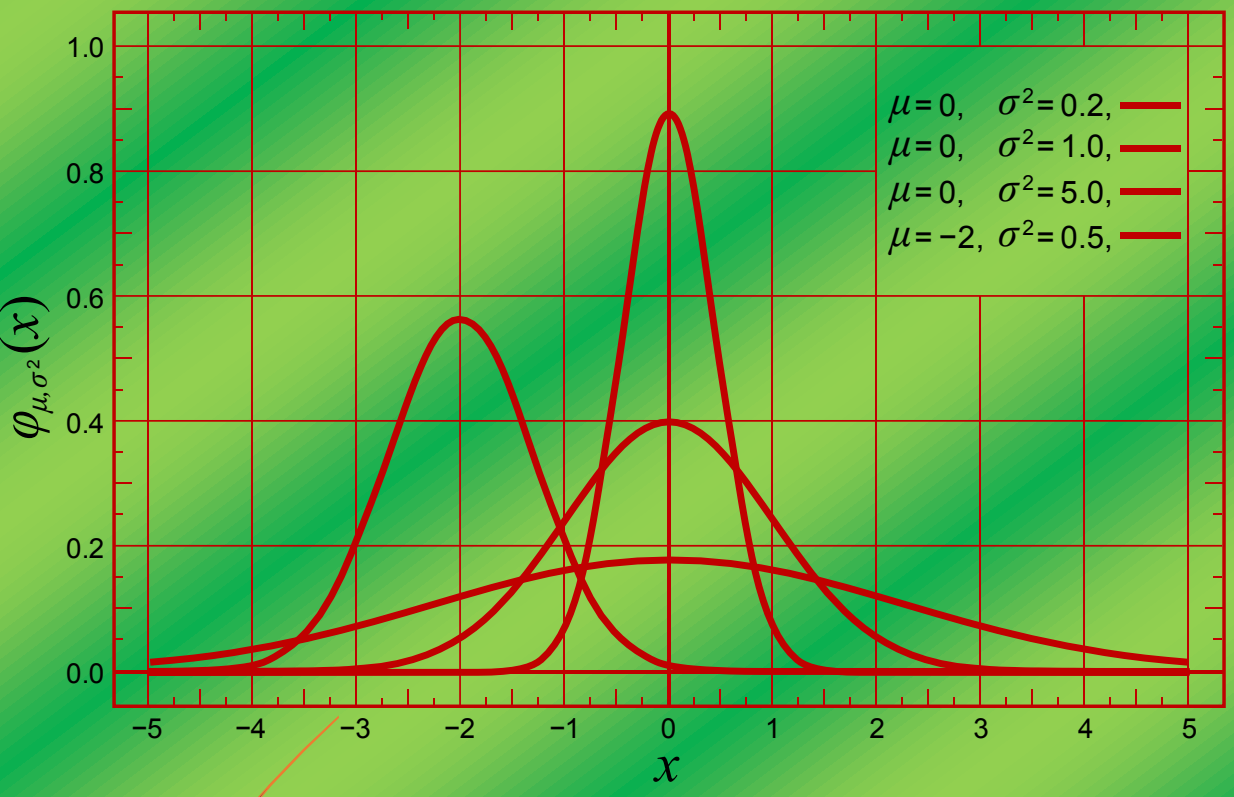
SPSS Practical Manual on Randomized Block Design (RBD)



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Example:

The yields of 4 varieties (A, B, C and D) of a crop in lbs. along with the plan of the experiment are given bellow. The number of replications is 3

treatment	R1	R2	R3
A	18	28	17
B	30	32	28
C	24	29	21
D	21	30	26

18,28,17,30,32,28,24,29,21,21,30,26

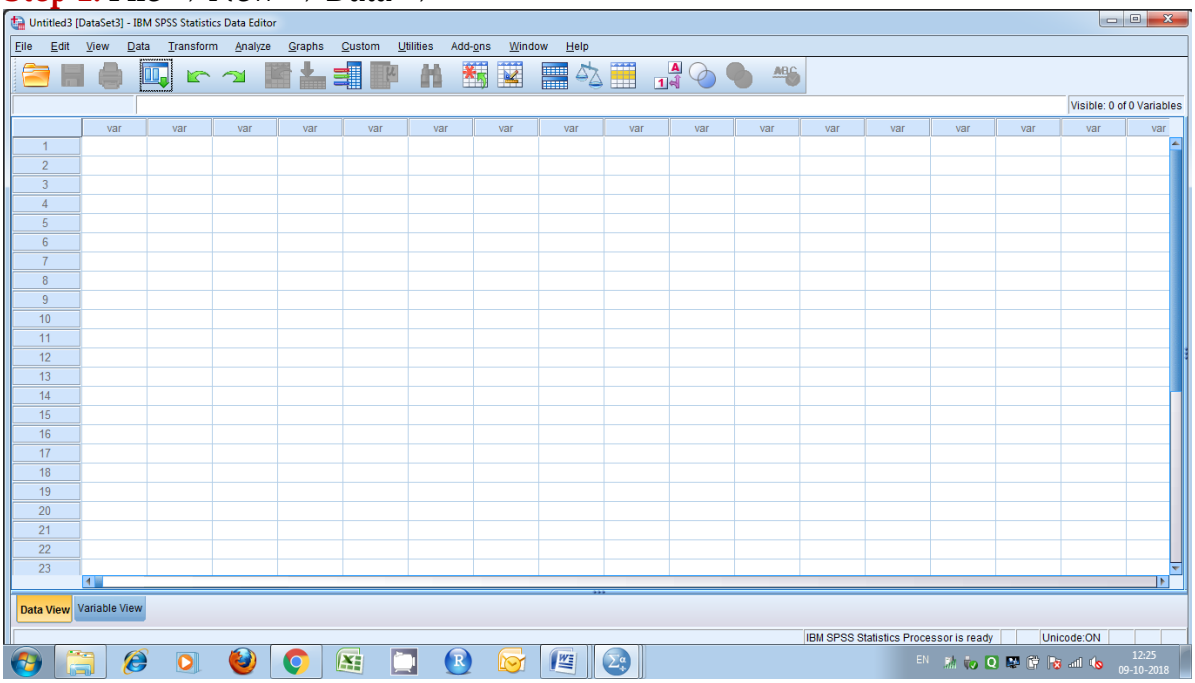
Arrangement of data for Analysis

Rep	treat	yield
1	1	18
1	2	30
1	3	24
1	4	21
2	1	28
2	2	32
2	3	29
2	4	30
3	1	17
3	2	28
3	3	21
3	4	26

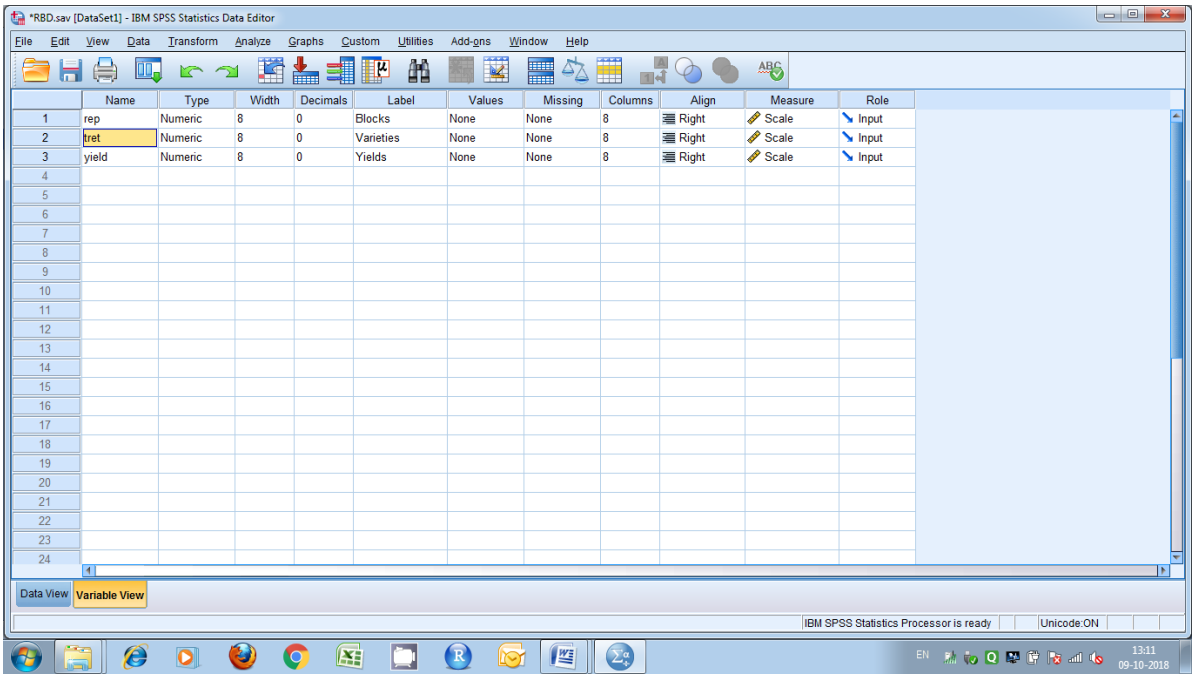
SPSS commands for Analysis

The input data file can be created as shown below:

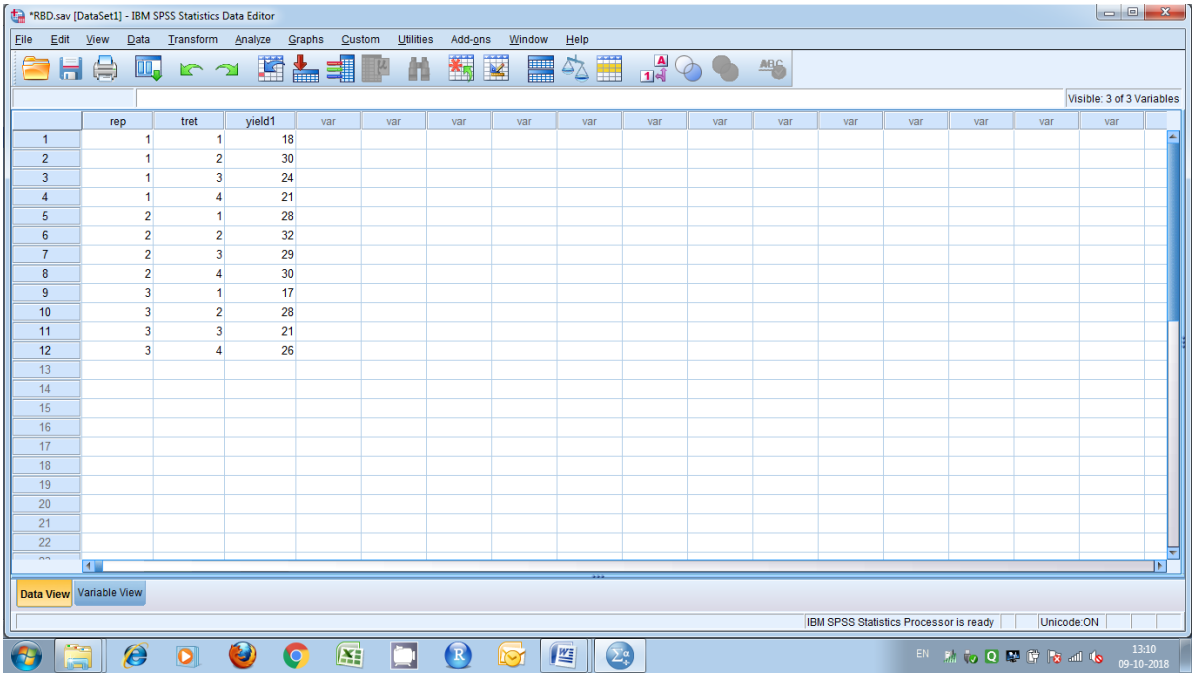
Step 1: File → New → Data →



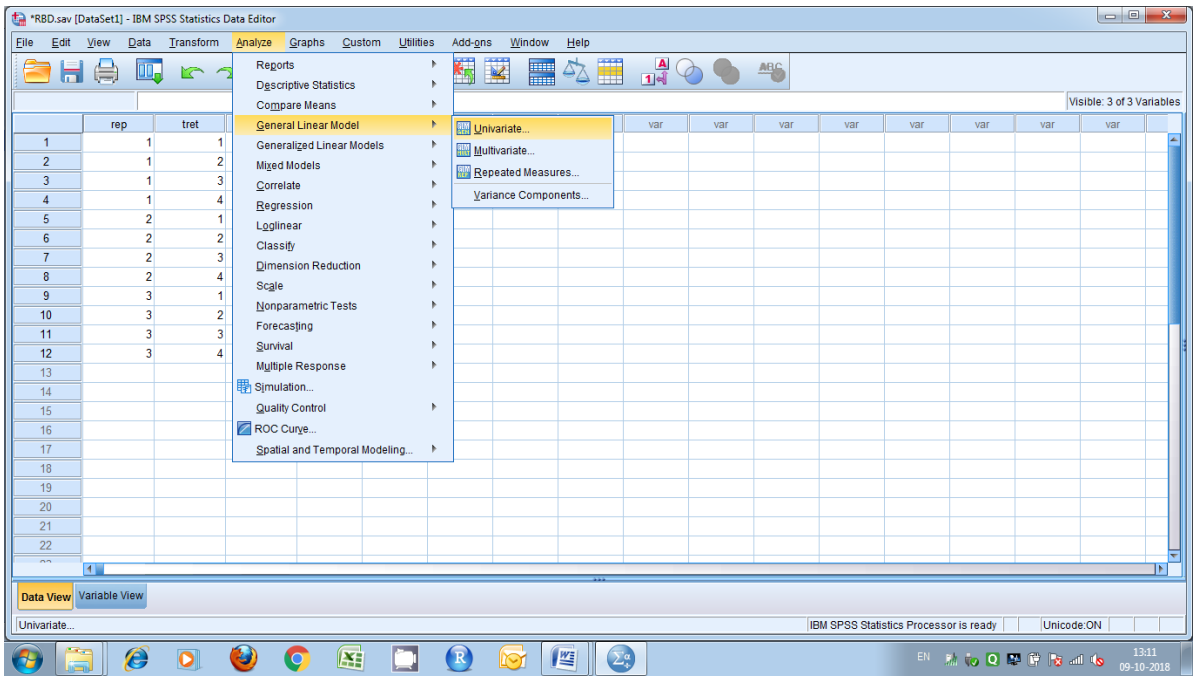
Step 2: Variable view → Name (rep, treat, yield) →



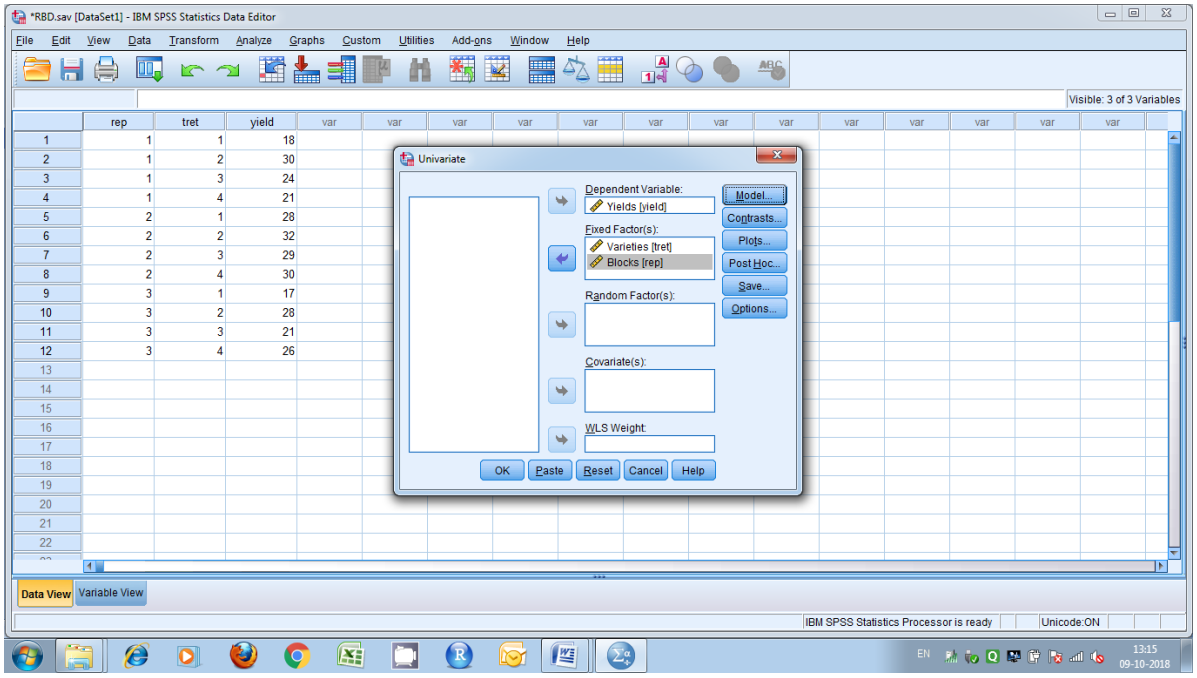
Step 3: Data view → Enter data → File → Save (with file name)



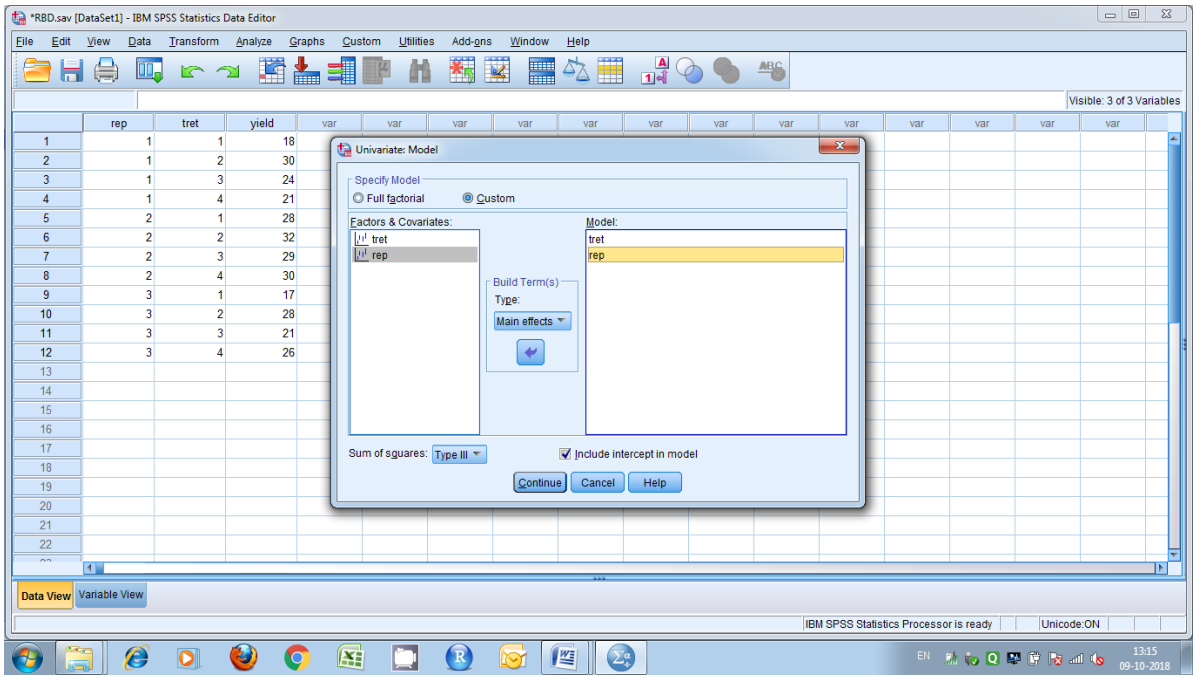
Step 4: Analyze → General linear model → Univariate →



Step 5: Dependent variable (yield) → Fixed factors (rep, treat)



Step 6: Model → Custom → Main effects → Build terms (treat) → Sum of Squares (Type III) → Continue



Linear model:

$$y_{ij} = \mu + a_i + \beta_j + \varepsilon_{ij}\ ;\ (i=1,2,\ldots,k;\ j=1,2,\ldots,r)$$

$$\textbf{Yield} = \mu + \textbf{Treatment} + \textbf{block} + \varepsilon_{ij}$$

where y_{ij} = Response of the j^{th} replication and i^{th} treatment

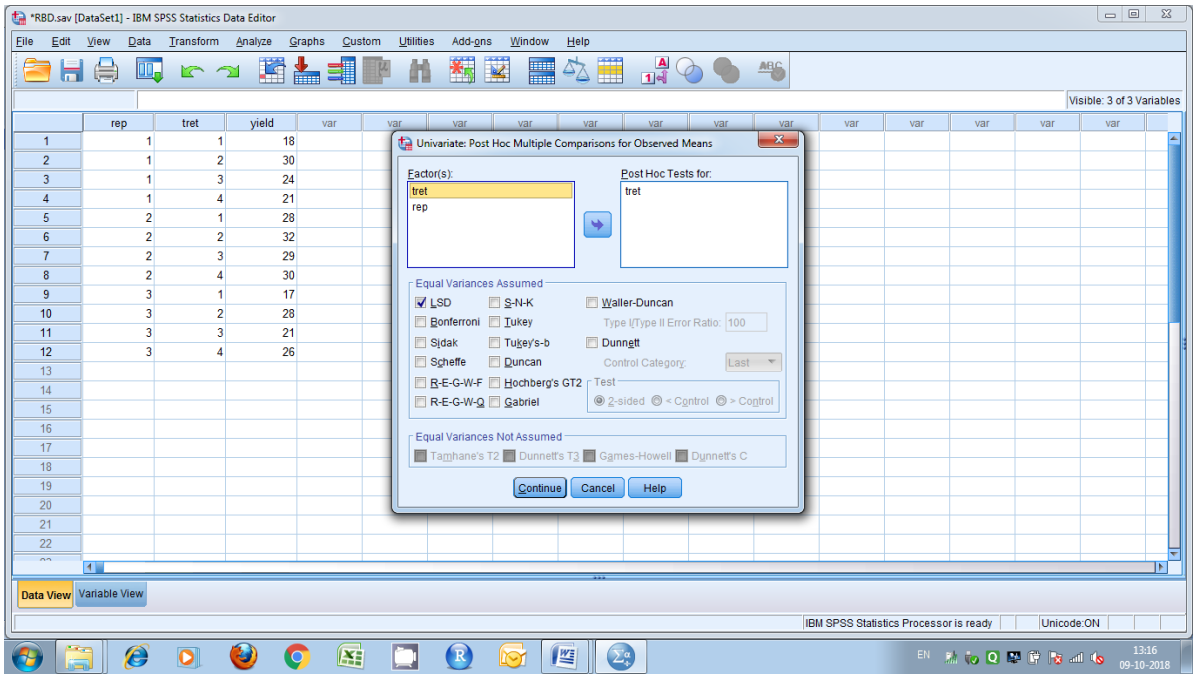
μ = general mean effect

a_i = i^{th} treatment effect

β_j = j^{th} block effect

ε_{ij} = error effect with mean=0 and variance = σ^2 [$N(0, \sigma^2)$]

Step 6: Post Hoc → Post Hoc Tests for (treat) → LSD → OK



ANOVA –Treatments

Tests of Between-Subjects Effects

Dependent Variable: Yields

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	240.500[a]	5	48.100	7.562	.014
Intercept	7701.333	1	7701.333	1210.690	.000
rep	117.167	2	58.583	9.210*	.015
tret	123.333	3	41.111	6.463*	.026
Error	38.167	6	6.361		
Total	7980.000	12			
Corrected Total	278.667	11			

a. R Squared = .863 (Adjusted R Squared = .749)

* Significant at 5% level of significance

Yields

Varieties	Mean	N	Std. Deviation
1	21.00	3	6.083
2	30.00	3	2.000
3	24.67	3	4.041
4	25.67	3	4.509
Total	25.33	12	5.033

POSTHOC TESTS – Treatments

Multiple Comparisons

Dependent Variable: Yields

LSD

(I) Varieties	(J) Varieties	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-9.00*	2.059	.005	-14.04	-3.96
	3	-3.67	2.059	.125	-8.71	1.37
	4	-4.67	2.059	.064	-9.71	.37
2	1	9.00*	2.059	.005	3.96	14.04
	3	5.33*	2.059	.041	.29	10.37
	4	4.33	2.059	.080	-.71	9.37
3	1	3.67	2.059	.125	-1.37	8.71
	2	-5.33*	2.059	.041	-10.37	-.29
	4	-1.00	2.059	.644	-6.04	4.04
4	1	4.67	2.059	.064	-.37	9.71
	2	-4.33	2.059	.080	-9.37	.71
	3	1.00	2.059	.644	-4.04	6.04

Yields

	Varieties	N	Subset	
			1	2
Duncan[a,b]	1[c]	3	21.00	
	3[c]	3	24.67	
	4[ab]	3	25.67	25.67
	2[a]	3		30.00
	Sig.		.071	.080

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 6.361.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = 0.05.

Do Yourself

The following table gives the yields in pound per plot of five varieties of wheat after being applied to each of 4 plots, tested in a randomized block design. Carry out the randomized block design for data.

Varieties	Repetitions			
A	8	8	6	10
B	10	12	13	9
C	18	17	13	16
D	12	10	15	11
E	8	11	9	8

Reference Books:

1. A Hand Book of Agricultural Statistics, S. R. S. Chandel, Achal Prakashan Mandir, Kanpur.
2. A Text book of Agricultural Statistics, R. Rangaswamy, New Age International (P) Limited, publishers.
3. Biometrical Methods in Quantitative Genetic Analysis, R.K. Singh and B. D. Chaudhary, Kalyani Publishers.
4. Design Resources Server: www.iasri.res.in
5. E-Manual Winter School IASRI.
6. Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons Educational Publications.
7. Fundamentals Applied Statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons Educational Publications.
8. Programmed Statistics, B.L. Agarwal, New Age International (P) Limited, publishers.
9. Probability and Statistical Inference Theory and Practice, D. Bhattacharya and S. Roy Chowdhury, U. N. Dhur & Sons.
10. Statistics Theory and Practice, D. Bhattacharya and S. Roy Chowdhury, U. N. Dhur & Sons.
11. Statistical Methods, K.P. Dhamu and K. Ramamoorthy, AGROBIOS (INDIA)
12. Statistics for Agricultural Sciences, G. Nageswara Rao, Second Edition, BS Publications, Hyderabad.