APPENDIX VII(a)

Calculations for application of Statistical Technique of Analysis of Variance (F-Test) and Least Significant Difference (L.S.D.) Test

Suppose the scores on some trait for Group I : All boys Vs. All girls (Sex X Birth Order) as given in Table 1(a) are to be subjected to statistical technique of analysis of variance and L.S.D. Test, computations would be as under :

Table 1 showing Mean Scores

	No. of Boys Mean	No. of Girls Mean	Total No. Mean
First-born	----	----	----
Second-born	----	----	----
Middle-born	----	----	----
Last-born	----	----	----
Total	----	----	----

(i) Note the total number of observations or scores in each group and grand total number, i.e. n_1, n_2 ..... etc. and N (i.e. grand total number).

(ii) Find out total or original scores in each group and also grand total, i.e. $\leqslant$ Boys, $\leqslant$ Girls; $\leqslant$ First-born, $\leqslant$ Second-born, $\leqslant$ Middle-born, $\leqslant$ Last-born; and $\leqslant X$ (i.e. grand total of all scores).

(iii) Find out total of squares of all original scores i.e. $\leqslant X^2$

(iv) Compute correction Term : $C = (\leq X)^2/_N$

(v) Compute total sum of squares or total variance :

$$SS_T = \leq X^2 - C$$

(vi) Compute sum of squares for each main variable :

$$SS_{Sex} = \frac{(\leq \text{Boys})^2}{n_B} + \frac{(\leq \text{Girls})^2}{n_G} - C$$

$$SS_{\text{Birth Order}} = \frac{(\leq \text{F.B.})^2}{n_{\text{F.B.}}} + \frac{(\leq \text{S.B.})^2}{n_{\text{S.B.}}} + \frac{(\leq \text{M.B.})^2}{n_{\text{M.B.}}} + \frac{(\leq \text{L.B.})^2}{n_{\text{L.B.}}} -$$

and so on for other main effects, if any.

(vii) Compute sum of squares for interaction effects :

$$SS_{S \times B} = \frac{(\leq \text{B:FB})^2}{n_1} + \frac{(\leq \text{B:SB})^2}{n_2} + \frac{(\leq \text{B:MB})^2}{n_3} + \frac{(\leq \text{B:LB})^2}{n_4}$$
$$+ \frac{(\leq \text{G:FB})^2}{n_5} + \frac{(\leq \text{G:SB})^2}{n_6} + \frac{(\leq \text{G:MB})^2}{n_7} + \frac{(\leq \text{G:LB})^2}{n_8}$$
$$- C - SS_{sex} - SS_{\text{Birth Order}}$$

and so on for other interaction effects, if any.

(viii) Compute sum of squares within or error term :

$$SS_W = SS_T - \text{all above}$$

(ix) Compute Mean sum of squares in each case : MS = SS/df

Find out F-Ratio for each : F = MS of each / MS_W

Prepare a table showing summary of results thus :

Table showing summary of results of Analysis of Variance

Source	df	SS	MS	F-Ratio	Significance
Sex	1	--	--	--	--
Birth Order	3	--	--	--	--
S X O	3	--	--	--	--
Within	1428	--	--	--	--
Total	1435	---			

Application of L.S.D. Test :

$t = D / \quad D$ where $D = M_1 - M_2$, i.e. difference and σD or Std. error of df.= $MS_W/n_1 + MS_W/n_2$ - Comparison of F

$D = t \times \quad D$ where t .05 or t .01 for df of MS_W can be replaced from table.

Now, if observed actual D in any pair of comparison is greater than this least significant compared D, the difference is significant.

APPENDIX VII(b)

Calculations to analyse scores on statements in 'Study Habits' Inventory

(t-test to study the significance of difference between percentages) :

Suppose the scores on some sentence in 'Study Habits' Inventory stand thus , calculations are given below :

	Total No.	Scores	Percentages	Difference in Percentage
All Boys	735	120	16.59	56.16
All Girls	701	500	72.75	

$P = \frac{N_1P_1 + N_2P_2}{N_1 + N_2}$; where P_1 is percentage score in Group 1
P_2 is percentage score in Group 2
N_1 is number of observations in Gp.1
N_2 is number of observations in Gp.2

$= \frac{735 \times 16.59 + 701 \times 72.75}{735 + 701} = 44.00$

$Q = 100 - P$
$= 100 - 44.00$
$= 56.00$

$\sigma_{P_1 - P_2} = \sqrt{PQ\ (1/N_1 + 1/N_2)}$
$= \sqrt{44 \times 56\ (1/735 + 1/701)} = \sqrt{2.464} = 1.43$

C.R. or $t = (P_1 - P_2) - 0 \ / \ \sigma_{P_1 - P_2} = 56.16/1.43 = 39.27$

Our C.R. exceeds, therefore the obtained difference is significant

From table of t , For df = 1434 at .05 level t = 1.96
at .01 level t = 2.58

Statistical calculations on scores, on other traits and remaining sentences of 'Study Habits Scale' for all groups are as above. Therefore, they are not given again.