CHAPTER: 5

DATA ANALYSIS AND INTERPRETATION

5.0. INTRODUCTION

In the previous chapter complete report of the approach to study the main theme of the present investigation was discussed. The data collected by the step-wise procedure as mention in the previous chapter has been analysed quantitatively by using suitable statistical technique. The present chapter deals with analysis and interpretation of the data collected. This chapter represents analysis of data, testing the hypotheses and then interpretation of results. The analysis of data carried out keeping in view the objectives and hypotheses. For the present study, data analysis was carried out through S.P.S.S package.

In this chapter, at the first instance, frequency distribution of the data pertaining to the achievement in Mathematics has been prepared as shown in Table:5.1 and its graph has been plotted in shown in figure:5.1. Subsequently mean, median, standard deviation, skewness and kurtosis has been computed for data pertaining achievement in Mathematics, Attitude towards Mathematics, Intelligence, SES and mathematical weaknesses as shown in table: 5.2 to table: 5.6.

5.1.Achievement in Mathematics

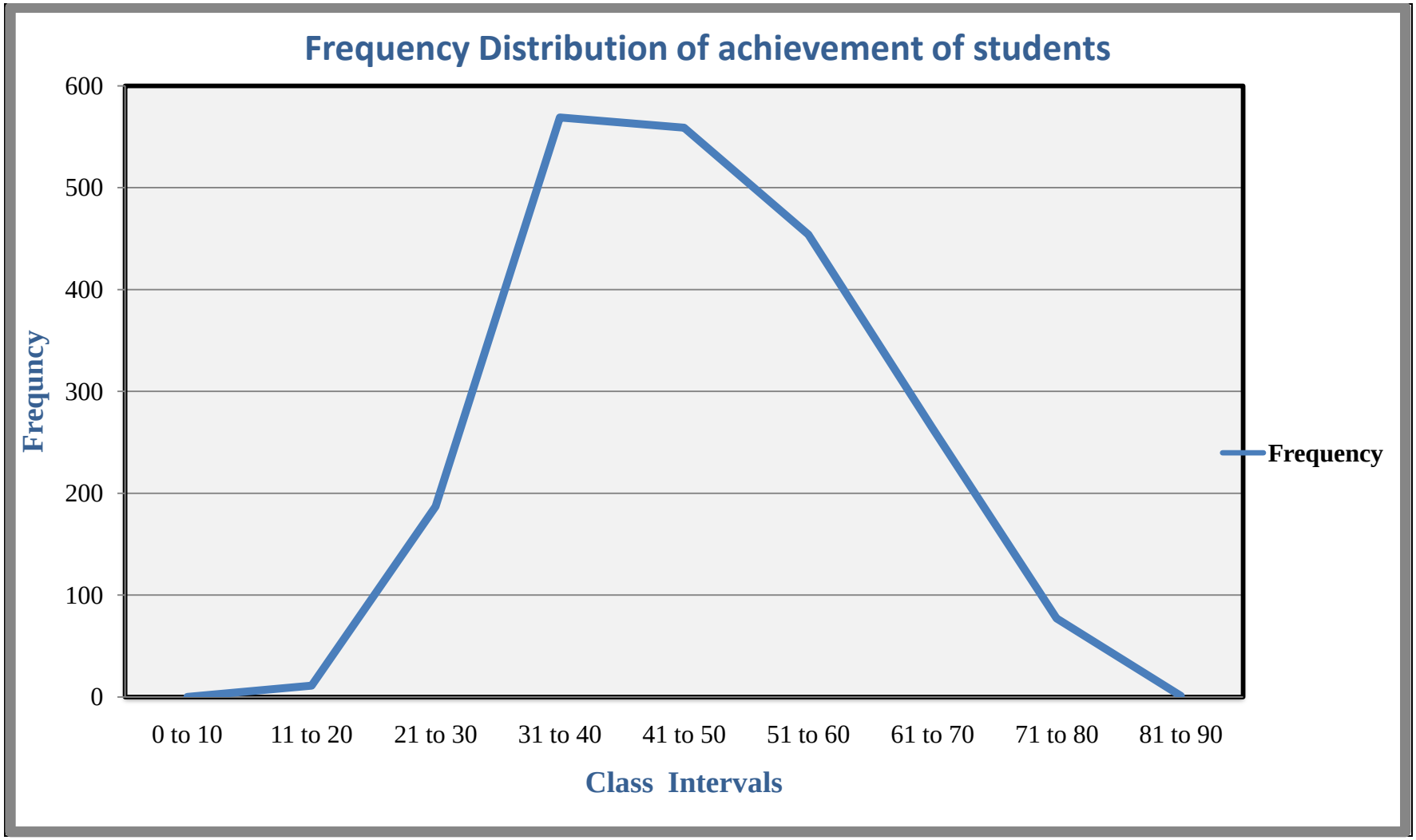
Frequency distribution of achievement in Mathematics has been shown in table: 5.1

Table: 5.1

Frequency Distribution ofAchievement in Mathematics

Class Intervals	Frequency
0 to 10	0
11 to 20	11
21 to 30	187
31 to 40	569
41 to 50	559
51 to 60	454
61 to 70	264
71 to 80	77
81 to 90	1
Total	**2,122**

Figure: 5.1


Frequency Distribution of achievement of students
600
500
400
300
200
100
0
Frequncy
0 to 10
11 to 20
21 to 30
31 to 40
41 to 50
51 to 60
61 to 70
71 to 80
81 to 90
Class Intervals
Frequency

Mean, median, standard deviation, skewness and kurtosis has been computed for data pertaining achievement in Mathematics as shown in Table:5.2

Table: 5.2

Mean Median, Standard Deviation, Skewness and Kurtosis of Achievement in Mathematics

No. Of Sample	2,122
Mean	46.63
Median	46
Standard Deviation	12.76
Skewness	0.28
Kurtosis	-0.57

The Table 5.2 indicatesthe measure of mean and median of the distribution, which are 46.63 and 46 respectively. The Standard Deviation of the distribution is 12.76. The skewness of distribution was found to be 0.28 (positively skewed). This means that score were massed at the left end of the scale and were spread out more gradually towards the rightend. It was found that KU = -0.57 < 0.236. So, distribution was leptokurtic.

5.2. Attitude towards Mathematics

Mean, median, standard deviation, skewness and kurtosis has been computed for data pertaining attitude towards Mathematicsas shown in Table: 5.3.

Table: 5.3

Mean, Median, Standard Deviation, Skewness and Kurtosis of Attitude towards Mathematics on Attitude scale

No. Of Sample	2,122
Mean	115.49
Median	113
Standard Deviation	23.94
Skewness	-0.29
Kurtosis	1.03

The Table 5.3 indicates the measure of mean and median of the distribution, which are 115.49 and 113 respectively. The Standard Deviation of the distribution is 23.94. The skewness of distribution was found to be -0.29 (negatively skewed). This means that score were massed at the right end of the scale and were spread out more gradually towards the left end. It was found that KU = 1.03 > 0.236. So, distribution was platykurtic.

5.3. Intelligence

Mean, median, standard deviation, skewness and kurtosis has been computed for data pertaining to intelligence as shown in Table: 5.4.

Table: 5.4

Mean, Median, Standard Deviation, Skewness and Kurtosis of IQ on Intelligence Scale:

No. Of Sample	2,122
Mean	91.29
Median	90
Standard Deviation	12.51
Skewness	-0.29
Kurtosis	3.01

The Table 5.4 indicates the measure of mean and median of the distribution, which are 91.29 and 90 respectively. The Standard Deviation of the distribution is 12.51. The skewness of distribution was found to be -0.29 (negatively skewed). This means that score were massed at the right end of the scale and were spread out more gradually towards the left end. It was found that KU = 3.01 > 0.236. So, distribution was platykurtic.

5.4. Socio Economic Status (SES)

Mean, median, standard deviation, skewness and kurtosis has been computed for data pertaining toSES as shown in Table: 5.5.

Table:5.5

Mean Median, Standard Deviation, Skewness and Kurtosis of SES on SES Scale

No. Of Sample	2,122
Mean	38.10
Median	37
Standard Deviation	10.23
Skewness	0.87
Kurtosis	1.98

The Table 5.5 indicates the measure of mean and median of the distribution, which are 38.10 and 37 respectively. The Standard Deviation of the distribution is 10.23. The skewness of distribution was found to be 0.87 (positively skewed). This means that score were massed at the left end of the scale and were spread out more gradually towards the right end. It was found that KU = 1.98 > 0.236. So, distribution was platykurtic.

5.5. Mathematical Weaknesses

Mean, median, standard deviation, skewness and kurtosis has been computed for data pertaining tomathematical weaknesses as shown in Table: 5.6.

Table:5.6

Mean Median, Standard Deviation, Skewness and Kurtosis of Weaknesses in Mathematics on Mathematical Weaknesses Scale

No. Of Sample	2,122
Mean	24.26
Median	22
Standard Deviation	13.22
Skewness	0.92
Kurtosis	1.32

The Table 5.6 indicates the measure of mean and median of the distribution, which are 24.26 and 22 respectively. The Standard Deviation of the distribution is 13.22.

The skewness of distribution was found to be 0.92(positively skewed). This means that score were massed at the left end of the scale and were spread out more gradually towards the right end. It was found that KU = 1.32> 0.236. So, distribution was platykurtic.

In the following section, stepwise attempt has been made to test the stated hypotheses with the help of appropriate statistical techniques.

5.6. Data Analysis Using Analysis of Variance (ANOVA)

Analysis of Variance is an extension of‘t’ test. By using‘t’ test the difference between two groups only can be studied at a time. Means Byusing‘t’ test effect of only one independent variable can be studied. In analysis of variance effect of more than two independent variables can be studied. It is useful in the sense that apart from main effect, interaction also can be studied. The analysis of variance gives its result in the form of ‘F’ ratio.

5.6.1. Attitude towards Mathematics and achievement in Mathematics.

To study the difference in achievement in Mathematics of students with respect to attitude towards Mathematics ANOVA was used. For this purpose attitude towards Mathematics has been divided into five categories namely very low, low, average, high and very high. To study the impact of attitude towards Mathematics on achievement in Mathematics of students following null hypothesis has been formulated,

There will be no significant difference in the mean achievement of Mathematics ClassVII with respect to attitude towards mathematics.

Summary of ANOVA of very low, low, average, high and very high attitudetowards Mathematics is shown in Table: 5.7.

Table: 5.7

Summary of ANOVA of very low, low, average, high and very high attitude towards Mathematics:

Source	df	Sum of Squares	Mean Square	F	p-value
Attitude A	4	49,607.920	12,401.980	88.699	0.000
Error	2,117	2,96,002.303	139.822		
Total	2,122	49,60,448.000			

The Table: 5.7 indicates that the calculated value of F=88.699 (p<0.01) for the main effect of factor attitude towards Mathematics exceeds the critical value. Therefore'F' ratio was significant at 0.01 level. So, the hypothesis:1 is rejected and there is significant difference in the mean achievement of Mathematics class VII with respect to attitude towards mathematics. The mean achievement of students whose attitude towards Mathematics was very low, low, average, high and very high on Attitude Scale is 40.25806, 40.78593, 45.53691, 52.43182 and 57.19337 respectively. It means that students whose attitude is very low, low, average, high and very high on attitude scale do differ on their achievement in Mathematics. It can be seen that attitude towards Mathematics has an impact on Mathematics achievement. The difference is in favour of students whose attitude towards Mathematics is very high.

To study further, Post Hoc Analysis was applied. To study the difference in achievement for fivecategoriesof Mathematical Attitude Scale, Tukey Test was applied. Thedetail of the same is presented in Table: 5.8.

Table: 5.8

Summary of Tukey Test (Different categories of attitude towardsMathematics)

Attitude Category (I)	**Attitude Category (J)**	**Mean Difference (I-J)**	**p-value**
very low	low	-0.527868206	0.9933*
very low	average	-5.278842338	0.0000 **
very low	high	-12.17375367	0.0000 **
very low	very high	-16.93530565	0.0000 **
low	average	-4.750974132	0.0000 **
low	high	-11.64588546	0.0000 **
low	very high	-16.40743744	0.0000 **
average	high	-6.894911328	0.0000 **
average	very high	-11.65646331	0.0000 **
high	very high	-4.761551984	0.0001 **
* (<0.05) indicate significant			
** (<0.01) indicate highly significant			

It is observed from Table: 5.8 that there is difference in achievement of students with very low, low, average, high and very high attitude towards Mathematics.

5.6.2.Intelligence and Achievement in Mathematics

To study the difference in achievement in Mathematics of students with respect to intelligence ANOVA was used. Sevencategories of intelligence were very superior, superior, average high, average, average low, border line and defective. To study the impact of intelligence on achievement in Mathematics of students following null hypothesis has been formulated,

There will be no significant difference in the mean achievement of Mathematics class VII with respect to Intelligence.

Summary of ANOVA of very superior, superior, average high, average, average low, border line and defective intelligence is shown in the Table: 5.9.

Table:5.9

Summary of ANOVA of very superior, superior, average high, average, average low, border line and defective intelligence

Source	df	Sum of Squares	Mean Square	F	p-value
Intelligence B	6	20,787.648	3,464.608	22.559	0.000
Error	2,115	3,24,822.575	153.580		
Total	2,122	49,60,448.000			

The Table: 5.9 indicates that the calculated value of F=22.559 ($p<0.01$) for the main effect of factor intelligence exceeds the critical value. Therefore F ratio was significant at 0.01 level. So, the hypothesis: 2 is rejected and there is significant difference in the mean achievement of Mathematics class VII with respect to intelligence.The mean achievement of students whose intelligence was superior, average high, average, average low, border line and defectiveon intelligence scale is 61.428857, 54.336,47.96636, 43.90017, 44.4985 and 42.93443respectively. In categoryvery superior,number of students was very less. So,same was merged with nearby category. It means that students whose intelligence was superior, average high, average, average low, border line and defective on intelligence scale do differ on their

achievement in Mathematics. It can be seen that intelligence has an impact on Mathematics achievement. The difference is in favour of students whose intelligence is superior. To study further, Post Hoc Analysis was applied. To study the difference in achievement for sevencategoriesof intelligence, Tukey Test was applied. The details of the same are presented in Table: 5.10.

Table: 5.10

Summary of Tukey Test (Different categories of intelligence)

Intelligence Category (I)	**Intelligence Category (J)**	**Mean Difference (I-J)**	**p-value**
Defective	Border Line	-1.56407	0.94503
Defective	Average Low	-0.96574	0.99236
Defective	Average	-5.03193	0.02580*
Defective	average high	-11.40157	0.00000**
Defective	Superior	-18.49415	0.00000**
Border Line	Average Low	0.59833	0.98119
Border Line	Average	-3.46786	0.00016**
Border Line	average high	-9.83750	0.00000**
Border Line	Superior	-16.93007	0.00000**
Average Low	Average	-4.06619	0.00000**
Average Low	average high	-10.43583	0.00000**
Average Low	Superior	-17.52841	0.00000**
Average	Defective	5.03193	0.02580*
Average	Border Line	3.46786	0.00016**
average high	Defective	11.40157	0.00000**
* (<0.05) indicate significant			
** (<0.01) indicate highly significant			

It was observed from Table: 5.10 that there is,

difference in achievement of students with defective intelligence and average intelligence, defective intelligence and average high intelligence, defective intelligence and superior intelligence,border line intelligence and average intelligence, border line intelligence and average high intelligence, border line intelligence and superior intelligence,average low intelligence and average intelligence, average low intelligence and average high intelligence, average low intelligence and superior intelligence, average intelligence and defectiveintelligence,average intelligence and border line intelligence, average high intelligence and defective intelligence.

It can be concluded that major difference in the achievement is not observed among defective intelligence and border line intelligence, defective intelligence and average low intelligence, border line intelligence and average low intelligence.

5.6.3. SES and Achievement in Mathematics

To study the difference in achievement in Mathematics of students with respect to SES, ANOVA was used. Five categories of SES were very high, high, average, low and very low. To study the impact SES on achievement in Mathematics of students following null hypothesis has been formulated,

There will be no significant difference in the mean achievement of Mathematics classVII with respect to SES.

Summary of ANOVA of very high, high, average, low and very low SES is shown in Table: 5.11.

Table:5.11

Summary of ANOVA of very high, high, average, low and very lowSES

Source	df	Sum of Squares	Mean Square	F	p-value
SES C	4	4,438.902	1,109.725	6.886	0.000
Error	2,117	3,41,171.321	161.158		
Total	2,122	49,60,448.000			

The Table: 5.11 indicates that the calculated value of F=6.886 (p<0.01) for the main effect of factor SES exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level. So, the hypothesis: 3is rejected and there is significant difference in the mean achievement of Mathematics class VII with respect to SES. The mean achievement of students whose SES is very high, high, average and lowon SES Scale was 45.3871, 45.57759, 48.51309 and 46.5 respectively. In category very low, number of students was very less. So,same was merged with nearby category. It means that students whose SES was very high, high, average, and low on SES Scale do differ on their achievement in Mathematics. It can be seen that SES has an impact on Mathematical achievement. The difference is in favour of students who belong to average SES.

To study further, Post Hoc Analysis was applied. To study the difference in achievement for fourcategoriesof SES, Tukey Test was applied. The detail of the same is presented in Table: 5.12.

Table:5.12

Summary of Tukey Test (Different categories of SES)

SES Category (I)	**SES Category (J)**	**Mean Difference (I-J)**	**p-value**
very high	high	-0.190495959	0.9998
very high	average	-3.125992231	0.5350
very high	low	-1.112903226	0.9973
high	average	-2.935496272	0.0000**
high	low	-0.922407267	0.9980
average	low	2.013089005	0.9803
* (<0.05) indicate significant			
** (<0.01) indicate highly significant			

It is observed from the Table: 5.12 that there is difference in achievement of students belong to high SES and average SES. It can be concluded that major difference in the achievement was not observed among very high and high, very high and average, very high and low, high and low, average and low SES. So, SES does not have that much impact like other selected variables.

5.6.4. Mathematical Weaknesses and Achievement in Mathematics

To study the difference in achievement in Mathematics of students with respect to weaknesses in Mathematics ANOVA was used. For this purpose mathematical weakness has been divided into five categories namely very low, low, average, high and very high. To study the impact of mathematical weaknesses on achievement in Mathematics of students following null hypothesis has been formulated,

There will be no significant difference in the mean achievement of Mathematics classVII with respect to mathematical Weaknesses.

Summary of ANOVA of very high, high, average, low and very low Mathematical Weaknesses is shown in the Table: 5.13.

Table: 5.13

Summary of ANOVA of veryhigh, high, average, low and very low Mathematical Weaknesses

Source	Df	Sum of Squares	Mean Square	F	p-value
Mathematical Weaknesses D	4	23,853.170	5,963.292	39.235	0.000
Error	2,117	3,21,757.052	151.987		
Total	2,122	49,60,448.000			

The Table: 5.13 indicates that the calculated value of F=39.235 ($p<0.01$) for the main effect of factor mathematical weaknessesexceeds the critical value. Therefore 'F'ratio is significant at 0.01 level. So, the hypothesis: 4is rejected and there is significant difference in the mean achievement of Mathematics class VII with respect to mathematical weaknesses. The mean achievement of students whose mathematical weaknesses was very high, high, average, low and very low on Mathematical weaknesses scale were44.64569, 46.04743, 54.32218, 60.2 and 57.5 respectively. It means that students whose Mathematical Weakness was very high, high, average, low and very low on Mathematical weaknesses scale do differ on their achievement in Mathematics. It can be seen that Mathematical weaknesses has an impact on Mathematical achievement. The difference was in favour of students whose Mathematical weaknesses waslow.

To study further, Post Hoc Analysis was applied. To study the difference in achievement for fivecategoriesof Mathematical weaknesses, Tukey Test was applied. The detail of the same is presented in Table: 5.14.

Table: 5.14

Summary of Tukey Test (Different categories of Mathematical weaknesses)

Mathematical weaknesses Category (I)	**Mathematical weaknesses Category (J)**	**Mean Difference (I-J)**	**p-value**
very low	low	-2.7	0.9940
very low	average	3.177824268	0.9863
very low	high	11.45257316	0.3427
very low	very high	12.85431235	0.2289
Low	average	5.877824268	0.0999
Low	high	14.15257316	0.0000 **
Low	very high	15.55431235	0.0000 **
Average	high	8.274748891	0.0000 **
Average	very high	9.676488087	0.0000 **
High	very High	1.401739196	0.1057
* (<0.05) indicate significant			
** (<0.01) indicate highly significant			

It is observed from the Table: 5.14 that there is difference in achievement of students with low mathematical weaknesses and high mathematical weaknesses, low mathematical weaknesses and very high mathematical weaknesses, average mathematical weaknesses and very high mathematical weaknesses, high mathematical weaknesses and very high mathematical weaknesses. It can be concluded that major difference in the achievement is not observed among very low mathematical weaknesses and low mathematical weaknesses, very low mathematical weaknesses and average mathematical weaknesses, very low mathematical weaknesses and high mathematical weaknesses, very low mathematical weaknesses and very high mathematical weaknesses, low mathematical weaknesses and average mathematical weaknesses, high mathematical weaknesses and very high mathematical weaknesses.

5.6.5. Interaction effect between attitude towards Mathematics and intelligence on achievement in Mathematics.

To study the interaction effect between Attitude towards mathematics and Intelligence on achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between attitude towards Mathematics and intelligence on achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors intelligence and attitude towards Mathematics (A X B) is shown in Table: 5.15.

Table:5.15

Summary of ANOVA of the interaction effect of factors intelligence and attitude towards Mathematics (A X B)

Source	df	Sum of Squares	Mean Square	F	p-value
A X B	29	59,511.874	2,052.134	15.006	0.000
Error	2,092	2,86,098.349	136.758		
Total	2,122	49,60,448.000			

The table: 5.15 indicates that the calculated value of F=15.006 ($p<0.01$) for the interaction effect of factorsintelligence and attitudetowards Mathematics (A X B)exceeds the critical value. Therefore F ratio was significant at 0.01 level and the hypothesis: fouris rejected. So,there was significant interaction effect between attitude towards mathematics and intelligence on achievement in Mathematics.

5.6.6. Interaction effect between attitude towards Mathematics and SES on Achievementin Mathematics.

To study the interaction effect between attitude towards Mathematics and SES on achievementin Mathematics following null hypothesis has been formulated

There will be no significant interaction effect between attitude towards Mathematics and SES on achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors SES and attitude towards Mathematics (A X C) is shown in the Table: 5.16.

Table: 5.16

Summary of ANOVA of the interaction effect of factors SES and attitude towards Mathematics (A X C)

Source	df	Sum of Squares	Mean Square	F	p-value
A X C	17	53,258.985	3,132.881	22.547	0.000
Error	2,104	2,92,351.237	138.950		
Total	2,122	49,60,448.000			

The Table: 5.16 indicates that the calculated value of F=22.547 ($p<0.01$) for the interaction effect of factors SESand attitude towards Mathematics (A X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level andthe hypothesis: 6is rejected. So,there is significant interaction effect between attitude towards Mathematics and SES on achievement in Mathematics.

5.6.7. Interaction effect between attitude towards Mathematics and mathematical weaknesseson achievement in Mathematics.

To study the interaction effect between attitude towards Mathematics and Mathematical weaknesseson achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between attitude towards Mathematics and mathematical weaknesseson achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors attitude towards Mathematics and mathematical weaknesses(A X D) is shown in the Table: 5.17.

Table: 5.17

Summary of ANOVA of the interaction effect of factors attitude towards Mathematics and mathematical weaknesses(A X D)

Source	df	Sum of Squares	Mean Square	F	p-value
A X D	22	60,599.756	2,754.534	20.286	0.000
Error	2,099	2,85,010.466	135.784		
Total	2,122	49,60,448.000			

The Table: 5.17 indicates that the calculated value of F=20.286 ($p<0.01$) for the interaction effect of factorsattitude towards Mathematics and mathematical weaknesses (A X D)exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level andthe hypothesis: 7is rejected. So,there issignificant interaction effect between attitude towards mathematics and mathematical weaknesses on achievement in Mathematics.

5.6.8.Interaction effect between intelligence and SES on achievement in Mathematics.

To study the interaction effect between intelligence and SES on achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between intelligence and SES on achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors intelligence and SES (B X C) is shown in the Table: 5.18.

Table:5.18

Summary of ANOVA of the interaction effect of factors intelligence and SES (B X C)

Source	df	Sum of Squares	Mean Square	F	p-value
B X C	20	24,853.854	1,242.693	8.140	0.000
Error	2,101	3,20,756.369	152.668		
Total	2,122	49,60,448.000			

The Table: 5.18 indicates that the calculated value of F=8.140 (p<0.01) for the interaction effect of factorsintelligence and SES (B X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the hypothesis: 8is rejected. So,there is significant interaction effect between intelligence and SES on achievement in Mathematics.

5.6.9. Interaction effect between intelligence and weaknesses in Mathematics on Achievement in Mathematics.

To study the interaction effect between intelligence and mathematical weaknesses on achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between intelligence and mathematical weaknesseson achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors intelligence and weaknesses in Mathematics (B X D) is shown in the Table: 5.19.

Table: 5.19

Summary of ANOVA of the interaction effect of factors intelligence and weaknesses in Mathematics (B X D)

Source	df	Sum of Squares	Mean Square	F	p-value
B X D	23	37,434.467	1,627.586	11.080	0.000
Error	2,098	3,08,175.756	146.890		
Total	2,122	49,60,448.000			

The Table: 5.19 indicates that the calculated value of F=11.080 (p<0.01) for the interaction effect of factorsintelligence and mathematical weaknesses(B X D) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the hypothesis: 9is rejected. So,thereis significant interaction effect between intelligence and mathematical weaknesseson achievement in Mathematics.

5.6.10. Interaction effect between mathematical weaknessesand SES on achievement in Mathematics.

To study the interaction effect between mathematical weaknessesand SESon achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between mathematical weaknesses and SES on achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors mathematical weaknessesand SES (D X C) is shown in the Table: 5.20.

Table: 5.20

Summary of ANOVA of the interaction effect of factors mathematical weaknessesand SES (D X C)

Source	df	Sum of Squares	Mean Square	F	p-value
D X C	17	29,933.195	1,760.776	11.736	0.000
Error	2,104	3,15,677.027	150.037		
Total	2,122	49,60,448.000			

The Table: 5.20 indicates that the calculated value of F=11.736 ($p<0.01$) for the interaction effect of factorsmathematical weaknessesand SES (D X C) exceeds the critical value. Therefore 'F' ratio iignificant at 0.01 level andthe hypothesis: 10is rejected. So, there is significant interaction effect between mathematical weaknessesand SES on achievement in Mathematics.

5.6.11.Interaction effect between attitude towards mathematics, intelligence and mathematical weaknesseson achievement in Mathematics.

To study the interaction effect between attitude towards mathematics, intelligence and mathematical weaknesseson achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between attitude towards mathematics, intelligence and mathematical weaknesseson achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors attitude towards Mathematics, intelligence and mathematical weaknesses (A X B X D) is shown in the Table: 5.21.

Table: 5.21

Summary of ANOVA of the interaction effect of factors attitude towards mathematics, intelligence and weaknesses in Mathematics (A X B X D)

Source	df	Sum of Squares	Mean Square	F	p-value
A X B X D	89	74,821.078	840.686	6.309	0.000
Error	2,032	2,70,789.144	133.262		
Total	2,122	49,60,448.000			

The Table: 5.21 indicates that the calculated value of F=6.309 ($p<0.01$) for the interaction effect of factorsattitude towards mathematics, intelligence and mathematical weaknesses (A X B X D) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level andthe hypothesis: 11is rejected. So, there issignificant interaction effect between attitude towards mathematics, intelligence and mathematical weaknesseson achievement in Mathematics.

5.6.12.Interaction effect between attitude towards Mathematics, intelligence and SES on achievement in Mathematics.

To study the interaction effect between attitude towards Mathematics, intelligence and SES on achievement in Mathematicsfollowing null hypothesis has been formulated,

There will be no significant interaction effect between attitude towards Mathematics, intelligence and SES on achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors attitude towards Mathematics, intelligence and SES (A X B X C) is shown in the Table: 5.22.

Table: 5.22

Summary of ANOVA of the interaction effect of factors attitude towards Mathematics, intelligence and SES (A X B X C)

Source	df	Sum of Squares	Mean Square	F	p-value
A X B X C	71	67,953.791	957.096	7.066	0.000
Error	2,050	2,77,656.431	135.442		
Total	2,122	49,60,448.000			

The Table: 5.22 indicates that the calculated value of F=7.066 (p<0.01) for the interaction effect of factorsattitude towards Mathematics, intelligence and SES(A X B X C)exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the hypothesis: 12is rejected. So, there is significant interaction effect between attitude towards Mathematics, intelligence and SES on achievement in Mathematics.

5.6.13. Interaction Effect between attitude towards Mathematics, mathematical weaknessesand SES on achievement in Mathematics

To study the interaction effect between attitude towards mathematics, mathematical weaknessesand SES on achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between attitude towards Mathematics, mathematical weaknessesand SES on achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors attitude towards Mathematics, mathematical weaknessesand SES (A X D X C) is shown in the Table: 5.23.

Table:5.23

Summary of ANOVA of the interaction effect of factors attitude towards mathematics, weaknesses in Mathematics and SES (A X D X C)

Source	df	Sum of Squares	Mean Square	F	p-value
A X C X D	53	67,899.499	1,281.123	9.540	0.000
Error	2,068	2,77,710.723	134.290		
Total	2,122	49,60,448.000			

The Table: 5.23 indicates that the calculated value of F=9.540 (p<0.01) for the interaction effect of factorsattitude towards mathematics, mathematical weaknessesand SES (A X D X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level andthe hypothesis: 13is rejected. So,there is significant interaction effect between attitude towards mathematics, mathematical weaknesses and SES on achievement in Mathematics.

5.6.14. Interaction effect between Intelligence, mathematical weaknessesand SES on achievement in Mathematics.

To study the interaction effect between intelligence, mathematical weaknessesand SES on achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between intelligence, weaknesses in Mathematics and SES on achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors intelligence, weaknesses in Mathematics and SES (B X D X C) is shown in the Table: 5.24.

Table: 5.24

Summary of ANOVA of the interaction effect of factors intelligence, weaknesses in Mathematics and SES (B X D X C)

Source	df	Sum of Squares	Mean Square	F	p-value
B X C X D	55	45,855.061	833.728	5.746	0.000
Error	2,066	2,99,755.162	145.090		
Total	2,122	49,60,448.000			

The Table: 5.24 indicates that the calculated value of F= 5.746 ($p<0.01$) for the interaction effect of factorsintelligence, weaknesses in Mathematics and SES (B X D X C)exceeds the critical value. Therefore ‘F’ ratio is significant at 0.01 level andthe hypothesis no: 14is rejected. So, there is significant interaction effect between intelligence, weaknesses in Mathematics and SES.

5.6.15.Interaction effect between attitude towards Mathematics, intelligence, weaknesses in Mathematics and SES on achievement in Mathematics.

To study the interaction effect between attitude towards Mathematics, intelligence, mathematical weaknessesand SES on achievement in Mathematics following null hypothesis has been formulated,

There will be no significant interaction effect between attitude towards Mathematics, intelligence, mathematical weaknessesand SES on achievement in Mathematics.

Summary of ANOVA of the interaction effect of factors attitude towards Mathematics, intelligence, mathematical weaknessesand SES (A X B X D X C) is shown in the Table: 5.25.

Table: 5.25

Summary of ANOVA of the interaction effect of factors attitude towards Mathematics, intelligence, weaknesses in Mathematics and SES

(A X B X D X C)

Source	df	Sum of Squares	Mean Square	F	p-value
A X B X C X D	169	87,282.978	516.467	3.903	0.000
Error	1,952	2,58,327.244	132.340		
Total	2,122	49,60,448.000			

The Table: 5.25 indicates that the calculated value of F=3.903 ($p<0.01$) for the interaction effect of factorsattitude towards Mathematics, intelligence, mathematical weaknesses and SES (A X B X D X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level andthe hypothesis: 15is rejected. So,there is significant difference between Attitude towards mathematics, Intelligence, mathematical weaknesses and SES on achievement in Mathematics.

5.7. Major Findings and Conclusion

For the present study the achievement of students of standard VII of Surat city has been studied with respect to certain variables like attitude towards Mathematics, intelligence, SES and mathematical weaknesses. Major findings of this study have been listed below:

- The Table: 5.2 show the measure of mean and median of the distribution of achievement were 46.63 and 46 respectively. The Standard Deviation of the distribution is 12.76. The skewness of distribution is found to be 0.28 (positively skewed). This means that score were massed at the left end of the scale and were spread out more gradually towards the rightend. It is found that KU = -0.57 < 0.236. So, distribution was leptokurtic.

- The Table: 5.7 indicate that the calculated value of F=88.699 ($p<0.01$) for the main effect of factor attitude towards Mathematics exceeds the critical value. Therefore F ratio is significant at 0.01 level and the null hypothesis: 1is rejected and there is significant difference in the mean achievement of Mathematics class VII with respect to attitude towards Mathematics.
- The mean achievement of students whose attitude towards Mathematics isvery low, low, average, high and very high on attitude Scale is 40.25806, 40.78593, 45.53691, 52.43182 and 57.19337 respectively. It means that students whose attitude is very low, low, average, high and very high on attitude Scale do differ on their achievement in Mathematics. It can be seen that attitude towards Mathematics has an impact on Mathematical achievement. The difference is in favour of students whose attitude towards Mathematics is very high. It can be seen from Table no. 5.8 that,
  - Significant difference in achievement is observed between students with very low attitude and low attitude towards Mathematics. Difference is in the favour of students with low attitude towards Mathematics.So, it can be concluded that those who have low attitude towards Mathematics have higher level of achievement in Mathematics
  - Significant difference in achievementis observed between students with very low attitude and average attitude towards Mathematics. Difference is in the favour of students with average attitude towards Mathematics.So, it can be concluded that those who have average attitude towards Mathematics have higher level of achievement in Mathematics.
  - Significant difference in achievement is observed between students with low attitude and high attitude towards Mathematics. Difference in the favour of students with high attitude towards Mathematics.So, it can be concluded that those who have high attitude towards Mathematics have higher level of achievement in Mathematics.
  - Significant difference in achievement is observed between students with very low attitude and very high attitude towards Mathematics. Difference is in the favour of students with very high attitude towards Mathematics.So, it can be concluded that those who have very high attitude towards Mathematics have higher level of achievement in Mathematics.

- Significant difference in achievement is observed between students with low attitude and average attitude towards Mathematics. Difference is in the favour of students with average attitude towards Mathematics.So, it can be concluded that those who have average attitude towards Mathematics have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with low attitude and high attitude towards Mathematics.Difference is in the favour of high attitude towards Mathematics.So, it can be concluded that those who have high attitude towards Mathematics have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with low attitude and very high attitude towards Mathematics. Difference is in the favour of very high attitude towards Mathematics.So, it can be concluded that those who have very high attitude towards Mathematics have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with average attitude and high attitude towards Mathematics. Difference is in the favour of high attitude towards Mathematics.So, it can be concluded that those who have high attitude towards Mathematics have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with average attitude and very high attitude towards Mathematics. Difference is in the favour of students with very high attitude towards Mathematics.So, it can be concluded that those who have very high attitude towards Mathematics have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with high attitude and very high attitude towards Mathematics. Difference is in the favour of very high attitude towards Mathematics.So, it can be concluded that those who have very high attitude towards Mathematics have higher level of achievement in Mathematics.

- The Table: 5.9 indicates that the calculated value of $F=22.559$ ($p<0.01$) for the main effect of factor Intelligence exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis: 2 is rejectedand there is

significant difference in the mean achievement of Mathematics class VII with respect to intelligence.

- The mean achievement of students whose intelligence is superior, average high, average, average low, border line and defective on intelligence scale is 61.428857, 54.336, 47.96636, 43.90017, 44.4985 and 42.93443 respectively. In category very superior, number of students was very less. So, they merged with nearby category. It means that students whose intelligence is superior, average high, average, average low, border line and defective on intelligence scale do differ on their achievement in Mathematics. It can be seen that intelligence has an impact on Mathematics achievement. The difference is in favour of students whose intelligence is superior. It can be seen from Table: 5.10 that,
  - Significant differencein achievement is observed between students with defective intelligence and average intelligence. Difference in the favour of students with average intelligence. So, it can be concluded that those who have average intelligence have higher level of achievement in Mathematics.
  - Significant differencein achievement is observed between students with defective intelligence and average high intelligence. Difference in the favour of students with average high intelligence. So, it can be concluded that those who have average high intelligence have higher level of achievement in Mathematics.
  - Significant difference in achievement is observed between students with defective intelligence and superior intelligence. Difference in the favour of students with superior intelligence. So, it can be concluded that those who have superior intelligence have higher level of achievement in Mathematics.
  - Significant difference in achievement is observed between students with border line intelligence and average intelligence. Difference in the favour of students with average intelligence. So, it can be concluded that those who have average intelligence have higher level of achievement in Mathematics.
  - Significant difference in achievement isobserved between students with border line intelligence and average high intelligence. Difference in the favour of students with average high intelligence. So, it can be concluded that those who have average high intelligence have higher level of achievement in Mathematics.

- Significant difference in achievement is observed between students with border line intelligence and superior intelligence. Difference in the favour of students with superior intelligence. So, it can be concluded that those who have superior intelligence have higher level of achievement in Mathematics.
- Significant difference in achievement isobserved between students with average low intelligence and average intelligence. Difference in the favour of students with average intelligence. So, it can be concluded that those who have average intelligence have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with average low intelligence and average high intelligence. Difference in the favour of average high intelligence. So, it can be concluded that those who have average high intelligence have higher level of achievement in Mathematics.
- Significant difference in achievement isobserved between students with average low intelligence and superiorintelligence. Difference in the favour of students with superior intelligence. So, it can be concluded that those who have superior intelligence have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with average intelligence and defective intelligence. Difference in the favour of students with average intelligence. So, it can be concluded that those who have average intelligence have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with average intelligence and border line intelligence. Difference in the favour of students with average intelligence. So, it can be concluded that those who have average intelligence have higher level of achievement in Mathematics.
- Significant differencein achievement is observed between students with average high intelligence anddefective intelligence. Difference in the favour of students with average high intelligence. So, it can be concluded that those who have average high intelligence have higher level of achievement in Mathematics.

- TheTable: 5.11 indicates that the calculated value of F=6.886 ($p<0.01$) for the main effect of factor SES exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis: 3is rejectedand there is significant difference in the mean achievement of Mathematics class VII with respect to SES.
- The mean achievement of students whose SES is very high, high, average and low on SES Scale was 45.3871, 45.57759, 48.51309 and 46.5 respectively. It means that students whose SES is very high, high, average, and low on SES Scale do differ on their achievement in Mathematics. It can be seen that SES has an impact on Mathematical achievement. The difference is in favour of students who belong to average SES. It can be seen from the Table: 5.12 that significant difference is observed between students belong to high SES and average SES.Difference in the favour of students belong to average SES. So, it can be concluded that those who belong to average SES have higher level of achievement in Mathematics.
- TheTable: 5.13 indicates that the calculated value of F=39.235 ($p<0.01$) for the main effect of factor mathematical weaknessesexceeds the critical value. Therefore 'F'ratio is significant at 0.01 level and the null hypothesis: 4 isrejected and there is significant difference in the mean achievement of Mathematics class VII with respect to mathematical weaknesses.
- The mean achievement of students whose mathematical weaknessesis very high, high, average, low and very low on mathematical weaknesses Scale is 44.64569, 46.04743, 54.32218, 60.2 and 57.5 respectively. It means that students whose mathematical weakness is very high, high, average, low and very low on Mathematical weaknesses scale do differ on their achievement in Mathematics. It can be seen that Mathematical weaknesses has an impact on Mathematical achievement. The difference is in favour of students with low Mathematicalweaknesses. It can be seen from Table: 5.14 that,
  - Significant difference in achievement is observed between students with low mathematical weaknesses and high mathematical weaknesses. Difference in the favour of students with low mathematical weaknesses. So, it can be concluded that those who have low mathematical weaknesses have higher level of achievement in Mathematics.

- Significant difference in achievement is observed between students with low mathematical weaknesses and very high mathematical weaknesses. Difference in the favour of students with low mathematical weaknesses. So, it can be concluded that those who have low mathematical weaknesses have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with average mathematical weaknesses and high mathematical weaknesses. Difference in the favour of students with average mathematical weaknesses. So, it can be concluded that those who have average mathematical weaknesses have higher level of achievement in Mathematics.
- Significant difference in achievement is observed between students with average mathematical weaknesses and very high mathematical weaknesses. Difference in the favour of students with average mathematical weaknesses. So, it can be concluded that those who have average mathematical weaknesses have higher level of achievement in Mathematics.

- TheTable: 5.15 indicates that the calculated value of F=15.006 ($p<0.01$) for the interaction effect of factors intelligence and attitude towards Mathematics (A X B) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis:5is rejected. So, there is significant interaction effect between attitude towards mathematics and intelligence on achievement in Mathematics. It concludes that intelligence and attitude towards Mathematics jointly affect on achievement in Mathematics.
- TheTable: 5.16 indicates that the calculated value of F=22.547 ($p<0.01$) for the interaction effect of factors SES and attitude towards Mathematics (A X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis: 6 is rejected. So,there is significant interaction effect between attitude towards Mathematics and SES on achievement in Mathematics. It concludes that SES and attitude towards Mathematics jointly affect on achievement in Mathematics.
- The Table: 5.17 indicates that the calculated value of F=20.286 ($p<0.01$) for the interaction effect of factors attitude towards Mathematics and mathematical weaknesses (A X D) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis:7 is rejected. So, there was significant interaction effect between attitude towards Mathematics and mathematical

weaknesses on achievement in Mathematics. It concludes that attitude towards Mathematics and mathematical weaknesses jointly affect on achievement in Mathematics.

- The Table: 5.18 indicates that the calculated value of F=8.140 ($p<0.01$) for the interaction effect of factors intelligence and SES (B X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis no: 8 is rejected. So, there is significant interaction effect between intelligence and SES on achievement in Mathematics. It concludes that intelligence and SES jointly affect on achievement in Mathematics.
- The Table: 5.19 indicates that the calculated value of F=11.080 ($p<0.01$) for the interaction effect of factors intelligence and mathematical weaknesses(B X D) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis: 9 is rejected. So, there is significant interaction effect between intelligence and mathematical weaknesses on achievement in Mathematics. It concludes that intelligence and mathematical weaknesses jointly affect on achievement in Mathematics.
- TheTable: 5.20 indicates that the calculated value of F=11.736 ($p<0.01$) for the interaction effect of factors mathematical weaknessesand SES (D X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis: 10is rejected. So, there is significant interaction effect between mathematical weaknessesand SES on achievement in Mathematics. It concludes that mathematical weaknesses and SESjointly affect on achievement in Mathematics.
- The Table: 5.21 indicates that the calculated value of F=6.309 ($p<0.01$) for the interaction effect of factors attitude towards Mathematics, intelligence and mathematical weaknesses (A X B X D) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis: 11is rejected. So, there is significant interaction effect between attitude towards mathematics, intelligence and mathematical weaknesseson achievement in Mathematics. It concludes that attitude towards Mathematics, intelligence and mathematical weaknesses jointly affect on achievement in Mathematics.
- The Table: 5.22 indicates that the calculated value of F=7.066 ($p<0.01$) for the interaction effect of factors attitude towards Mathematics, intelligence and SES (A X B X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01

level and the null hypothesis: 12is rejected. So, thereis significant interaction effect between attitude towards Mathematics, intelligence and SES on achievement in Mathematics. It concludes that attitude towards Mathematics, intelligence and SES jointly affect on achievement in Mathematics.

- The Table: 5.23 indicates that the calculated value of F=9.540 ($p<0.01$) for the interaction effect of factors attitude towards Mathematics, mathematical weaknesses and SES (A X D X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis: 13isrejected. So, there is significant interaction effect between attitude towards Mathematics, mathematical weaknesses and SES on achievement in Mathematics. It concludes that attitude towards Mathematics, mathematical weaknesses and SES jointly affect on achievement in Mathematics.
- The Table: 5.24 indicates that the calculated value of F= 5.746 ($p<0.01$) for the interaction effect of factors intelligence, mathematical weaknesses and SES (B X D X C) exceeds the critical value. Therefore 'F'ratio is significant at 0.01 level and the null hypothesis: 14is rejected. So, there is significant interaction effect between intelligence, mathematical weaknesses and SES. It concludes that intelligence, mathematical weaknesses and SES jointly affect on achievement in Mathematics.
- The Table: 5.25 indicates that the calculated value of F=3.903 ($p<0.01$) for the interaction effect of factors attitude towards Mathematics, intelligence, mathematical weaknesses and SES (A X B X D X C) exceeds the critical value. Therefore 'F' ratio is significant at 0.01 level and the null hypothesis: 15is rejected. So, there is significant difference between attitude towards mathematics, intelligence, mathematical weaknesses and SES on achievement in Mathematics. It concludes that attitude towards Mathematics, intelligence, mathematical weaknesses and SES jointly affect on achievement in Mathematics.