Chapter 7

GENERAL OBSERVATIONS ON THE PERFORMANCE OF PUPILS FROM CLASS V TO CLASS X IN THE EXPERIMENTAL TEST

7.1 Observations on the performance of pupils of the lower stage (Class V, VI and VII):

The analysis of the results of the experimental tests for class V, VI and VII has revealed some important points which are discussed below.

(i) Area wise performance of pupils:

We classified the pupils into three areas of urban, rural and backward origin in order to see whether any difference existed among such pupils. The combined picture of values as shown in Table 64 does not provide us any clue to make a broad generalisation. No distinction in performance has been noted with respect to class V. Only urban and backward pupils differ significantly in class VI. In class VII urban and backward and then rural and backward pupils differ significantly in performance.

Table 64

<table>
<thead>
<tr>
<th>Class</th>
<th>Areas</th>
<th>Mean score</th>
<th>Samples whose means are compared</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Urban</td>
<td>13.4</td>
<td>Urban and Rural</td>
<td>Not significant at 5% level</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>13.5</td>
<td>Urban and Backward</td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td>Backward</td>
<td>11.6</td>
<td>Rural and Backward</td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Urban</td>
<td>14.75</td>
<td>Urban and Rural</td>
<td>Not significant at 5% level</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>14.3</td>
<td>Urban and Backward</td>
<td>Significant at 5% level</td>
</tr>
<tr>
<td></td>
<td>Backward</td>
<td>12.5</td>
<td>Rural and Backward</td>
<td>Not significant at 5% level</td>
</tr>
</tbody>
</table>

Contd .......

It might, therefore, be deciphered tentatively that backward pupils come to reveal their weaknesses as they go higher up in the ladder of mathematical education. There is another significant revelation that urban-rural pupils do not differ significantly which is contrary to popular beliefs in some quarters that urban pupils are better than rural pupils.

(ii) Cognitive functions:

It has been seen that the achievement of pupils in the sub-class of knowledge is somewhat better than in other sub-classes vide table 65. On the other hand, pupils are definitely poorer with respect to their performance in the sub-class of application.

Table 65
Performance of pupils of Class V, VI and VII in cognitive domain

<table>
<thead>
<tr>
<th>Class</th>
<th>Knowledge</th>
<th>Skill</th>
<th>Understanding</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>35.9%</td>
<td>34.2%</td>
<td>35.0%</td>
<td>28.8%</td>
</tr>
<tr>
<td>VI</td>
<td>43.3%</td>
<td>32.0%</td>
<td>37.93%</td>
<td>27.5%</td>
</tr>
<tr>
<td>VII</td>
<td>42.0%</td>
<td>39.7%</td>
<td>30.7%</td>
<td>29.9%</td>
</tr>
</tbody>
</table>
(iii) Scheduling of topics for school-session:

The arrangement of topics in a text book is the same as given in the syllabus of a particular class. The items of the experimental test are also included in accordance with the order found in a text book. Thus the teaching is also done progressively for a school session according to the arrangement of topics in a text book. It is seen in the performance of the experimental test that pupils do better in the topics taught in the early part of a session than in the topics taught at the latter part. This observation will be discussed in chapter 9.

(iv) Sex difference:

(a) The mean-score of the boys in different classes is found to be consistently higher than that of the girls when their means are compared separately for each class, it is found to be significant at 5% level in all classes as seen from the Table 66.

<table>
<thead>
<tr>
<th>Class</th>
<th>Samples</th>
<th>Mean score</th>
<th>Standard deviation</th>
<th>Samples whose means are compared</th>
<th>Significance</th>
<th>Nature of ogive</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Boys</td>
<td>15.0</td>
<td>7.6</td>
<td>S.E_D = 0.89</td>
<td>Significant at 5% level</td>
<td>Boys' ogive lies right to girls' ogives</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>9.0</td>
<td>5.35</td>
<td>C.R. = 6.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Boys</td>
<td>14.9</td>
<td>6.04</td>
<td>S.E_D = 0.85</td>
<td>do-</td>
<td>do-</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>10.9</td>
<td>5.0</td>
<td>C.R. = 4.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contd .........
(b) The ogives drawn for boys and girls distributions give us the same picture that girls are inferior to boys irrespective of various characteristics discussed in this chapter.

(c) When the performance of boys and girls in the sub-classes of the cognitive domain is separately studied, the performance of boys is better than girls in all sub-classes of the cognitive domain vide Table 67.

<table>
<thead>
<tr>
<th>Cognitive domain</th>
<th>Class V</th>
<th>Class VI</th>
<th>Class VII</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>Knowledge</td>
<td>35.5%</td>
<td>28.2%</td>
<td>45.5%</td>
</tr>
<tr>
<td>Skill</td>
<td>35.6%</td>
<td>22.2%</td>
<td>36.3%</td>
</tr>
<tr>
<td>Application</td>
<td>33.7%</td>
<td>32.2%</td>
<td>27.6%</td>
</tr>
<tr>
<td>Understanding</td>
<td>38.5%</td>
<td>20.0%</td>
<td>33.2%</td>
</tr>
</tbody>
</table>
(d) The performance of boys and girls on the cognitive domain is further analysed on area basis. It appears that urban boys show better performance in class V and VI than rural and backward boys; but no distinct difference is observed in Class VII. Rural girls are better in knowledge and skill but urban girls are better in understanding and application. Backward girls are weak in all sub-classes (vide Table 63).

7.2 Major defects observed in performance:

(a) In class V: (i) the pupils of class V show the lack of ability in arithmetical operations. In the problem stated below, for example, only 35% of pupils of upper 27% (say U.G.) and 0% of pupils of lower 27% (say L.G.) get the correct answer (vide item analysis chapter 3).

* The value of $12^2 = (A) 12\times2$, (B) 144, (C) 124, (D) 134

50% of pupils of L.G. get answer (A). Similarly in the problem stated below, only 22% of L.G. pupils and 60% of U.G. pupils get correct.

* 'Divide:

$$\frac{30030}{6} = (A) 505, (B) 55, (C) 5005, (D) 550.$$ 30% of pupils of U.G. give the answer (A). These examples show that the idea of operation of squaring of a number and the fundamental operation of division of numbers are not properly grasped by pupils. Further, in the example,
<table>
<thead>
<tr>
<th>Cognitive domain</th>
<th>Urban area</th>
<th>Rural area</th>
<th>Backward area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V</td>
<td>VI</td>
<td>VII</td>
</tr>
<tr>
<td>Knowledge</td>
<td>B 51.5%</td>
<td>G 27.7%</td>
<td>B 51.0%</td>
</tr>
<tr>
<td></td>
<td>51.0%</td>
<td>36.0%</td>
<td>41.0%</td>
</tr>
<tr>
<td></td>
<td>41.0%</td>
<td>40.0%</td>
<td>43.1%</td>
</tr>
<tr>
<td>Skill</td>
<td>45.6%</td>
<td>21.2%</td>
<td>42%</td>
</tr>
<tr>
<td></td>
<td>244%</td>
<td>31%</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>27%</td>
<td>32%</td>
<td>47%</td>
</tr>
<tr>
<td>Application</td>
<td>41%</td>
<td>15%</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td>26%</td>
<td>24%</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>23%</td>
<td>23%</td>
<td>23%</td>
</tr>
<tr>
<td>Understanding</td>
<td>47%</td>
<td>16%</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td>36%</td>
<td>31%</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td>31%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>25%</td>
<td>23%</td>
<td>23%</td>
</tr>
</tbody>
</table>

$B = \text{Boys} \quad G = \text{Girls}$
* Multiply 0.75 by 100 = (A) 7500, (B) 75
  (C) 0.75 (D) 7.5

Only 4% of pupils of U.G. and 1% of pupils of L.G. can answer the problem correctly. Almost 90% of U.G. pupils give the answer (A).

(ii) Pupils are also lacking in clear knowledge of units and numbers. The example stated below will show how pupils are suffering in learning mathematics due to bad teaching.

* The meaning of 5 is (A) 5 m. (B) 5 hm.
  (C) 5 liters (D) a number

40% of U.G. pupils give correct answer. 39% of pupils put the answer (A). (Vide item analysis chapter 3 ). This example clearly shows that pupils are confusing with number and unit of a number.

(iii) Pupils have no clear knowledge about fraction. In the problem stated below, for example, only 31% of pupils get the correct answer. (Vide item analysis chapter 3 ).

* You have received Rs. ½ by selling books and your brother received Rs. ¼ by selling newspaper. How much money both of you received. (A) 1 (B) 100 Naya Paisa (C) Re. 1 (D) 10

This example shows that the knowledge of simple fraction of pupils is not adequate.
(b) In class VI:

Pupils have less understanding about the number-system. Even the correct knowledge about unity (e.i. '1') is not developed among pupils of this grade. The problem cited below, for example, shows that 66% of pupils of lower 27% and 51% of pupils of upper 27% fail to get correct answer.

* '1' means
  (A) an even number
  (B) a mixed number
  (C) None of the above
  (D) irrational number

60% of pupils of upper 27% get the answer (A) and 10% of pupils of lower 27% get the answer (B) and (D). (vide item analysis chapter 3). This indicates that there are some difficulties arisen in proper comprehension of number system. Another example:

* Whether 2Kg and 2 are
  (A) different number
  (B) same number
  (C) even number
  (D) Rational number

17% of pupils of L.G. and 33% of U.G. get correct answer and 26% of pupils of U.G. and almost 60% of L.G. get the answer (B) which shows that a number is not properly recognised by pupils.

Pupils fail to understand the diagramatic representation of fraction. The problem cited below, for example will show that 10% of L.G. and 60% of U.G. get the correct answer.
* From the diagram justify that the shaded portion is equal to (A) \(\frac{2}{5}\) (B) \(\frac{2}{3}\) (C) \(\frac{2}{10}\) (D) \(\frac{10}{2}\)

The result shows that pupils have less practical knowledge about a fraction.

So also, pupils have little knowledge about decimal fraction. In the example cited below 12\% of pupils of U.G. and 4\% of L.G. get only the correct answer.

* Express in decimal fraction \(\frac{1}{2^{10}}\)

(A) 0.01 (B) 10\(^2\) (C) 0.001
(D) 10\(^{-2}\)

30\% of pupils of U.G. give the answer (B) which shows that those pupils do not understand the questions.

(c) In class VII:

While discussing about the major defects in learning mathematics by pupils of class VII it appears that pupils are lacking in converting a verbal statement into a mathematical statement. In the problem stated below, for example, 26\% of pupils of L.G. and 23\% of pupils of U.G. get the correct answer.

* An employee spends \(\frac{3}{10}\) rd of his income as house rent and \(\frac{2}{3}\) th for other expenses. If he has only Rs. 10.00 at his hand at the end of the month, what is his total income per month.
Almost 30% of pupils of U.G. get the answer (C) and 40% of pupils of U.G. fail to attempt the sum. It shows that pupils fail to realise the underlying principles of the processes of abstraction and manipulation of mathematical relation out of a verbal statement.

The drilling of mathematical operations like multiplication and division of decimal fractions is necessary to get the computational work of those operations done correctly, otherwise though pupils have knowledge about those operations, they are frequently found committing mistakes. In the problem, cited below, for example, it is found that 44% of pupils of U.G. and 26% of pupils of L.G. get the correct answer of the problem.

* Divide 256.96 by 32
  (A) 80.3 (B) 8.3 (C) 8.03 (D) 83
30% of pupils of U.G. get the answer (A). This demands proper drilling of the mathematical operations of decimal fractions.

Further, pupils fail to understand even the relation between ‘%’ and decimal fraction. In the problem, given below, 4% of pupils of L.G. and 35% of pupils of U.G. get correct answer.

* Express 4.5% into decimal fraction
  (A) 4.5 (B) 45 (C) .45 (D) .045

These problems are collected from the question papers of class V, VI and VII of the experimental test.
Almost 30% of pupils of U.G. get the answer (A) which shows that pupils do not understand the operation of the symbol '%'.

7.3 Observations on the performance of pupils of the higher stage (class VIII, IX and X):

The analysis of the results of the experimental tests for class VIII, IX and X has shown some important points which are discussed below.

(i) Areawise performance of pupils:

The combined picture of the performance of pupils of class VIII, IX and X on urban, rural and backward area, does not provide us any clue to make a broad generalisation. The table 69 shows that in class VIII, urban and rural pupils and urban and backward pupils differ significantly; but rural and backward pupils have not indicated any difference. Similarly, when the means of urban and rural and rural and backward are compared, it is found that they do not differ significantly; whereas rural and backward pupils differ significantly in class IX. In class X, no distinction in performance has been noted in respect of three areas urban, rural and backward.
Table 69

<table>
<thead>
<tr>
<th>Class</th>
<th>Areas</th>
<th>Mean score</th>
<th>Samples whose means are compared</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>11.00</td>
<td>Urban and Rural</td>
<td>Significant at 5% level</td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td>Rural</td>
<td>14.50</td>
<td>Urban and backward</td>
<td>-do-</td>
</tr>
<tr>
<td>Backward</td>
<td>15.33</td>
<td>Rural and backward</td>
<td>Not significant</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>17.55</td>
<td>Urban and Rural</td>
<td>Not significant</td>
<td></td>
</tr>
<tr>
<td>IX</td>
<td>Rural</td>
<td>16.10</td>
<td>Urban and backward</td>
<td>-do-</td>
</tr>
<tr>
<td>Backward</td>
<td>13.15</td>
<td>Rural and backward</td>
<td>Significant at 5% level</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>12.75</td>
<td>Urban and Rural</td>
<td>Not significant at 5% level</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Rural</td>
<td>11.10</td>
<td>Urban and backward</td>
<td>-do-</td>
</tr>
<tr>
<td>Backward</td>
<td>10.90</td>
<td>Rural and backward</td>
<td>-do-</td>
<td></td>
</tr>
</tbody>
</table>

But above all, the performance of pupils of rural area has been found to be little better than the two areas in the higher stage of the secondary schools.

(ii) Cognitive functions:

It has been seen that the achievement of pupils of class VIII in all sub-classes of knowledge, skill, understanding and application is not up to the mark vide Table 70. On the other hand, the performance of pupils of all classes are definitely poorer in respect of understanding, application and knowledge.
Table 70

Performance of pupils of class VIII, IX and X in cognitive domain

<table>
<thead>
<tr>
<th>Class</th>
<th>Knowledge</th>
<th>Skill</th>
<th>Understanding</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIII</td>
<td>32.46%</td>
<td>24.96%</td>
<td>24.76%</td>
<td>30.30%</td>
</tr>
<tr>
<td>IX</td>
<td>43.40%</td>
<td>44.30%</td>
<td>36.23%</td>
<td>33.93%</td>
</tr>
<tr>
<td>X</td>
<td>27.18%</td>
<td>49.06%</td>
<td>36.23%</td>
<td>33.93%</td>
</tr>
</tbody>
</table>

(iii) Scheduling of topics for school session:

The arrangement of topics in a text book is the same as given in the syllabus of a particular class. The items of the experimental test are also included in accordance with the order found in the text book of the respective classes. Then the teaching is also done progressively for a school session according to the arrangement of topics in the respective text book. It is seen in the performance of the experimental test that pupils do better in the topic taught in the early part of a session than in the topics taught at the latter part. This observation will be discussed in chapter

(iv) Sex difference:

(a) The mean score of the boys in different classes is consistently higher than that of the girls. When their means are compared separately for each class, it is found to be significant at 5% level in all classes as seen from the Table 71.
### Table 7.1

Mean scores of boys and girls and significance of means

<table>
<thead>
<tr>
<th>Class</th>
<th>Samples</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>Samples whose means are compared</th>
<th>Significance</th>
<th>Nature of Ogives</th>
</tr>
</thead>
<tbody>
<tr>
<td>VI</td>
<td>Boys</td>
<td>14.5</td>
<td>4.42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>12.9</td>
<td>3.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Boys</td>
<td>17.33</td>
<td>3.35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>16.00</td>
<td>3.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>Boys</td>
<td>11.76</td>
<td>6.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>10.13</td>
<td>5.12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) The ogives drawn for boys and girls distributions give us the same picture that girls are inferior to boys in case of class IX and X, but the ogives of boys and girls of class VIII shows a different picture that girls' ogive lies right to the boys' ogive up to a point G (vide Fig. 21, chapter 6). But beyond G boys' ogive lies right to that of girls.

(c) When the performance of boys and girls in all sub-classes of the cognitive domain is separately analysed, the performance of boys is better than girls in all sub-classes of the cognitive domain in class IX and X, but the performance of boys of class VIII is doubtful (vide Table 47).
Table 72
Performance of boys and girls in the cognitive domain
(class VIII, IX and X)

<table>
<thead>
<tr>
<th>Cognitive domain</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boy</td>
<td>Girl</td>
<td>Boy</td>
</tr>
<tr>
<td>Knowledge</td>
<td>26%</td>
<td>34%</td>
<td>50%</td>
</tr>
<tr>
<td>Skill</td>
<td>22%</td>
<td>24%</td>
<td>50%</td>
</tr>
<tr>
<td>Application</td>
<td>22%</td>
<td>37.4%</td>
<td>43%</td>
</tr>
<tr>
<td>Understanding</td>
<td>13%</td>
<td>18.9%</td>
<td>33.6%</td>
</tr>
</tbody>
</table>

(d) The performance of boys and girls on the cognitive domain is further analysed on area-basis. It appears that rural boys show better performance than urban and backward boys in all sub-classes in class VIII and IX, but in class X urban boys show slightly better performance than rural boys. The performance of urban boys of class VIII is doubtful as it may not show their actual performance. Rural girls are better than urban and backward girls in knowledge, skill and application but urban girls show better performance in understanding. In class X, the urban girls show better result than rural and backward girls. It may therefore be reasoned that urban girls have better understanding than knowledge and rural girls show better knowledge and application (vide table 73).
Table 73

Area wise performance of boys and girls shown separately

<table>
<thead>
<tr>
<th>Cognitive domain</th>
<th>Urban area</th>
<th>Rural area</th>
<th>Backward area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VIII</td>
<td>IX</td>
<td>X</td>
</tr>
<tr>
<td>Knowledge</td>
<td>B</td>
<td>G</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>23%</td>
<td>34%</td>
<td>50%</td>
</tr>
<tr>
<td>Skill</td>
<td>19%</td>
<td>24%</td>
<td>49%</td>
</tr>
<tr>
<td>Application</td>
<td>22%</td>
<td>34%</td>
<td>40%</td>
</tr>
<tr>
<td>Understanding</td>
<td>11%</td>
<td>22%</td>
<td>37%</td>
</tr>
</tbody>
</table>

B = Boys  G = Girls
7.4 Major defects observed in performance:

(a) In class VIII:

Pupils are lacking in fundamental knowledge relating to different topics. In the problem stated below, for instance, pupils do not have proper knowledge of the topic compound interest, for which only 10% of pupils of upper, 27% (i.e. U.G.) and 7% of pupils of lower, 27% (L.G) get correct answer.

* 'Ram deposits Rs. 200.00 in a bank at the rate of 2% compound interest per annum. How much total money he will get after 2 years. (A) Rs. 203.008 (3) Rs. 203.00
   (C) Rs. 203.03 (C) Rs. 210.00

Almost 56% of pupils of U.G. have got the answer (3) which shows that pupils fail to understand the difference between the simple interest and compound interest. Similarly, in the example cited below, 10% of pupils of U.G. and 3% of pupils of L.G. can get the correct answers.

* 'A map is drawn on a scale of 1 cm representing 1 km. What is the ratio of the scale'.

(A) 1 cm : 1 km  (B) 1 cm : 1000 m
(C) 1 cm : 1000.00 cm
(D) 1 : 100,000

It is found that majority of pupils give the answer (A). Which clearly shows that they have not developed the proper knowledge of the particular topic.
Pupils have inadequate knowledge about zero, indices and square of a number. In the problem stated below, for instance, 30% of pupils of U.G. do not know the multiplication of zero by a number; 36% of pupils of U.G. fail to work out sums on indices correctly and 10% of pupil do not know the square of a number.

* 'Select the correct sum':

\[
\begin{align*}
(A) \quad 0^2 \times 2^1 &= 2^1 \\
(B) \quad 2^6 \div 2^2 &= 2^3 \\
(C) \quad (24)^2 &= 4^4 \\
(D) \quad 1^5 + 1^3 &= 2
\end{align*}
\]

This shows that pupils are basically weak in different fundamental operations which are aught to have been taught at the lower stage.

(b) In class IX:

Pupils are unable to understand clearly the algebraic properties of numbers and to differentiate an algebraic number from an arithmetic number. In the problem cited below, only 20% of pupils of U.G. and 10% of pupils of L.G. can get the correct answer.

* 'What \((x^a)^6\). \(x\) is equal to

\[
\begin{align*}
(A) \quad x^{7a} \\
(B) \quad x^{a(6+1)} \\
(C) \quad x^{5x+1} \\
(D) \quad x^{(a+1)6}
\end{align*}
\]

Almost 30% of pupils of U.G. and 50% pupils of L.G. get the answer (A) which shows that those pupils never realise the difference of '6a' and '1'.
Pupils also found difficulty in writing a mathematical statement from a verbal statement of a problem. 60% pupils of U.G. pupils fail to attempt this type of questions. In the problem given below, for example, 40% pupils of U.G. and 20% of pupils of L.G. get correct answer.

* 'When 6 is added to three times of a number, the sum becomes 13. Find the required number'.

(A) 6 (B) 4 (C) 0 (D) 12

Most of the pupils are incapable of converting verbal statements of the problem of H.C.F. and L.C.M. into Mathematical statement.

(c) In class X:

The graphical solution of an algebraic equation is not correctly understood by the pupils of class X. In the problem given below, 20% of pupils of U.G. and 5% of the pupils of L.G. can only get the correct answer.

* 'Use the graph to solve the question, (scale: along x-axis and y-axis, side of one small square = 1 unit); which of the lines k, n and p represents the equation \(y=x+4\). (A) k (B) n (C) p (D) none of them.

Almost 55% of pupils of U.G. get the answer (D) which shows that pupils have less knowledge on graph for which they could not get the correct answer.

* Problems are collected from the question papers of class VIII, IX and X of the experimental test.
7.5 Typical errors committed in the experimental test:

At the time of administering the experimental test, pupils are asked to do necessary calculations on extra-pieces of paper as work-sheets supplied to them along with the answer sheet. After examining the answer sheets and the work-sheets, the errors are collected. The errors so collected are separated under items of knowledge, understanding, skill and application. Then errors under each head are discussed below.

(i) Errors on knowledge items:

The knowledge of a unit and the unit of a number, are the two basic essentials in learning mathematics. In higher mathematics and engineering technology, the units and dimensions are highly necessary. So the correct understanding about units and unit of a number are to be taught in school mathematics in the lower stage. But it is seen from the error-analysis that pupils often make mistake with units. Often, they can compute a problem but hardly to put its correct unit. In the same way, the idea of a set and that of a variable are the two most basic things in mathematics. The idea of a variable is indeed a key concept in Algebra, but pupils have no clear concept about a variable. It is found that only 20% of pupils could identify a quadratic equation in the experimental test. Many pupils failed even to identify the degree of a quadratic equation and number of variables it contained. 50% of pupils are found to give the answer to the
question as "the equation \( x(x-y) = 3y \) is a quadratic equation". Regarding 'zero' many pupils have wrong conception. Such as '0x2=2' is the answer of almost 30% of pupils. The basic difference of a multiplier, a factor and a prime factor can not properly differentiated. This type of defects is found even in pupils of class IX. The power of a number, a literal number and numerical number are found misleading. The distributive properly of numbers is not clear to pupils. It is seen that 50% of pupils of class IX have failed to expand \((a+b)^3\) correctly. The knowledge of unitary method is not upto the level as is found in the performance of items of simple and compound interest. The word 'percentage' and its symbol '%' are not clearly understood by pupils. Even the pupils of class VIII write 5% as 'per hundred only'. The concept of 'ratio' is found to be poor, which is evident from the answer like the ratio of 3 Kg and 9 Kg is "3:9 Kg". The knowledge of decimal numbers is not sufficient. So also the recurring decimal number. Pupils often write a recurring decimal number as '3.3 .......'. The sign '.......' which carries some meaning, is not understood. The idea of average means the addition of data only which is the conception of many pupil. The concept of H.C.F. and L.C.M. is also so so. The meaning of the words 'factor' and 'multiple' can not be differentiated by pupils of class X.

(ii) Errors on skill items:

It is seen that the skill of writing multiplication tables upto 20th division is not developed even in higher classes and pupils are found committing mistakes in computing long multiplication and division
as well as wasting times. The symbolic operation in mathematics from the lower classes to the higher classes are not properly explained from the utilitarian point of view. The symbols are not understood without their proper perspective. It is perhaps due to this reason, pupils failed to write symbols correctly. Due to the lack of knowledge pupils could not write prime numbers, odd and even numbers, multipliers correctly. Similarly in decimal numbers 50% of pupils failed to write a decimal number in terms of vulgar fraction. The idea of 'place-value' in decimal numbers is very poor. Even in the multiplication of a decimal number by 100, pupils are confused how to put decimal point in the product of the multiplication. That the skill of understanding a mathematical formula is not developed correctly, is seen in the solution of quadratic equation where pupils are confused with the '+' sign of the formula. The skill of transforming the verbal statements into mathematical models is found to be very poor.

(iii) Errors on understanding items:

Pupils have commit mistakes in placing decimal points in multiplications and divisions, such as '4.32x10 = .432'. 33% of pupils of class VII have made the above mistake. The factorisation of algebraic expression is also not properly understood as is evident that 30% of pupils of class IX have done done factorisation of \( x^2+4x+4=(x+2)(x-2) \) which is perhaps due to the lack of proper understanding of arithmetical factorisation. Most of the pupils fail to understand the mathematical language. They do not know the abstraction and manipulation of a verbal statement.
(iv) Errors on application items:

The proper drill of computation is seemed to be insufficient, so long multiplications and long divisions are not correctly worked out even by the pupils of higher classes, as is evident that 50% of pupils have failed to multiply correctly '53x53x53'. The application of zero in various numerical and physical problems is not correctly done. Pupils have still expressed "1/1=0". The various fundamental processes of simple fraction can easily done by pupils but in case of the operation with 'of', pupils failed miserably as is seen in '1/3 of 300 = 3'. The application of literal numbers is not correctly done as is seen that 50% of pupils answer the problem as '(x^a).x = x^{7a}'. In the application of algebraic formulae, many pupils state that

\[ p^2 + \frac{1}{p^2} = (p + \frac{1}{p})^2. \]

Tables I, II, III, IV, V, VI show the classwise typical errors of pupils of class V to class X. The typical mistakes which have been observed in the work sheets as well as answer sheets are mostly of misconception and misunderstanding. These roughly correspond to the observations made earlier in this chapter.

7.6 The general conclusion on pupils' achievement in the experimental test:

An attempt has been made in this chapter to assess the achievement of pupils in the experimental test. We have already analysed the results in chapter V and VI, though these were restricted strictly to
factual observations made there in. Those factual observations have been further analysed in our discussion on general observations on the performance of pupils from class V to class X in the experimental test, in the early part of this chapter. It would however be premature to arrive at definite conclusions in view of the limitations observed up to the present position and a further attempt will be made to subject them to a close scrutiny in subsequent chapters. The present discussion will be made on the following heads, (i) General performance, (ii) performance on sex-difference, (iii) area-wise performance of pupils, (iv) performance on cognitive domain.

(i) General performance:

From the factual analysis and observation of the performance of the pupils of the lower stage (i.e. Class V, VI and VII), it appears that pupils are found to be poor on arithmetical computation. They have committed mistakes on long multiplications and divisions. This observation can easily be compared with the findings of the study in 1969. The findings are (1) pupils did not progressed well in arithmetic computation, (2) pupils did not know the entire processes of addition, subtraction, multiplication and division.

Pupils fail to acquire correctly the basic knowledge of each topic of arithmetic at the lower stage. The inadequate drilling of counting tables at the primary stage leads pupils to suffer at the

*S. I. E. Gujarat - 'A diagnostic test in the basic skill in arithmetic computations-addition, subtraction, multiplication and division - Ahmedabad - 1969."
secondary stage while they are engaged in computational work. The proper and correct steps are needed to develop logically and systematically the main properties and their relations of different topics while the teaching of arithmetic is done in the class.

The performance of the pupils of higher stage (i.e. Class VIII, IX and X) shows that the elementary operations of arithmetic such as squaring, extracting square roots, laws of indices etc. are not correctly acquired by pupils even at this stage and therefore pupils are finding difficulty in proper understanding of algebra. The main difficulties in learning algebra as observed in the experimental test are:

(1) failure to realise the necessity of using symbols in place of arithmetic numbers,
(2) conversion of a verbal statement into a mathematical statement,
(3) development of the problem-solving attitude among pupils,
(4) use of correct mathematical language in proper logical sequence.

(ii) Performance on sex-difference:

From the study, it is seen that boys have shown better performance in the test than girls. This is supported by the survey report on the achievement of mathematics (primary, middle and high school) shows that boys secured higher marks than girls. This is also further

(1) All India Survey of Achievement in Mathematics - N.C.E.R.T. - 1968.
supported by the report (2) that the performance of boys is superior to girls in arithmetic in the junior classes of the secondary schools of Assam. In the lower stage, the performance of boys is better than girls in all sub-classes of the cognitive domain. The urban boys show better performance in class V and VI where as rural girls show better result in knowledge and skill and urban girls are found better in application and understanding. In the higher stage also, the performance of boys in all sub-classes is found superior than that of girls. The rural boys have better performance than urban and backward boys and the urban girls show better understanding than rural and backward girls. The rural girls have better performance in knowledge and skill.

(iii) Areawise performance:

When the performance of pupils is analysed on area basis, it has been observed that the pupils of the urban area are found better in the higher stage than in the lower stage. The pupils of rural area show better performance than the pupils of urban and backward area.

(iv) Performance on cognitive domain:

(a) Knowledge:

The overall performance on sub-class of knowledge is not encouraging. The maximum score obtained in the lower stage is 56% and that in the higher stage is 46% (Ref. chapter 5 and 6) which indicates

FIG. 32 THE PERFORMANCE OF PUPILS IN THE SUB-CLASS OF KNOWLEDGE OF THE TEST.
FIG. 33 THE PERFORMANCE OF PUPILS IN THE SUB-CLASS OF SKILL OF THE TEST.
FIG. 34 The performance of pupils in the sub-class of understanding of the test.
that pupils fail to achieve almost 50% marks in items relating to knowledge of different topics. The graph in the Figure 32 shows the difference of performance of the pupils of urban, rural and backward area on the sub-class of knowledge. The performance of the pupils of rural area is better in the lower stage, whereas that of the pupils of urban area is better in the higher stage.

(b) Skill:

In the sub-class of skill, the performance shows that the highest score obtained in the lower stage is 42% and that in the higher stage is 53%. In the lower classes the arithmetical skill is not properly developed, pupils often commit mistakes (Ref. error analysis pages 230-23). The graph in the Figure 33 indicates that the skill attained by the pupils of rural area is better than urban and backward areas in the lower stage. But the skill of urban pupils is found better in the higher stage than rural and backward pupils.

(c) Understanding:

In the sub-class of understanding and logical reasoning, the maximum marks secured in the lower classes is 46% and that in the higher classes is 5%. This shows that the understanding is poor throughout the secondary stage. Since mathematics is a subject of logical understanding, the understanding of topics is necessary for better performance in mathematics. From the graph (Fig. 34) it is seen that the pupils of rural area have shown better understanding in the lower stage...
FIG. 35 THE PERFORMANCE OF PUPILS IN THE SUB-CLASS OF APPLICATION OF THE TEST.
but on the other hand, the pupils of urban area have shown better understanding in the higher classes.

(d) Application:

In the sub-class of application, the maximum score secured in the lower classes is 35% and that in the higher classes is 45%. This low performance in application may be due to the less understanding and knowledge of different topics. The graph (Fig. 35) shows that the performance of rural-pupils is better in the lower stage but poor in the higher stage.

Summary:

To summarise the achievement of pupils in the experimental test, the overall performance of pupils in all classes is found to be lying below 52%. This shows that the achievement in arithmetic and algebra is half of the total achievement of the course. The reasons for this low achievement are noted to be (1) the change of syllabus, (2) the change of text books, (3) teachers and teaching. The new syllabus of mathematics is not properly understood by the teachers. They are not aware of the objectives and the procedure for imparting the kind of teaching implied in the new syllabus. They are found to be lacking in the spirit of accepting a new challenge for the improvement of teaching in the subject.
### Table VI
#### Class X

Type of misconception of knowledge, type of error in answer, related distractor, difficulty index and percentage of frequency

<table>
<thead>
<tr>
<th>Type of misconception</th>
<th>Question</th>
<th>Type of error in answer</th>
<th>Related distractor</th>
<th>Difficulty Index</th>
<th>Percentage of frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of identifying equation</td>
<td>Aa. 1</td>
<td>$x(x-y) = 3y$ was shown as a quadratic equation</td>
<td>Aa. 1(C)</td>
<td>.22</td>
<td>65</td>
</tr>
<tr>
<td>2. Lack of differentiating identity and equation</td>
<td>Aa. 2</td>
<td>$3x^2 + 2 = 5$ and $z = 3x^2 - 3x = 7$ were called identity and secondly those were not at all identity</td>
<td>Aa. 2(3)</td>
<td>.50</td>
<td>(1) 15</td>
</tr>
<tr>
<td>3. Idea of '+' sign</td>
<td>Ca. 2</td>
<td>Sol. of $(x+1)^2 = 25$ is $x = 4.$</td>
<td>Ca. 2(C)</td>
<td>.45</td>
<td>25</td>
</tr>
<tr>
<td>4. Idea of percentage</td>
<td>Bb. 1</td>
<td>Express 4% in a ratio?</td>
<td>Bb. 1(3)</td>
<td>.90</td>
<td>25</td>
</tr>
<tr>
<td>5. Verification of obtained data with the equation is poor</td>
<td>Ad. 1</td>
<td>$\frac{n}{30} \begin{array}{c</td>
<td>c</td>
<td>c</td>
<td>c} 1 &amp; 2 &amp; 3 &amp; 30 \ \hline 0 &amp; 60 &amp; 90 &amp; \end{array} (3) c = \frac{n}{30}$ is formula, is satisfied</td>
</tr>
<tr>
<td>6. Verification of graph</td>
<td>Da. 1</td>
<td>$y = 4 + x$ that equation could not be identified in the graph</td>
<td>Dd. 1(D)</td>
<td>.12</td>
<td>55</td>
</tr>
<tr>
<td>Type of misconception</td>
<td>Question</td>
<td>Type of error in Answer</td>
<td>Related distractor</td>
<td>Difficulty values</td>
<td>Percentage of frequency</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------</td>
<td>-------------------------</td>
<td>--------------------</td>
<td>------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>1. Lack of understanding between numerical number and literal number</td>
<td>$x = ?$</td>
<td>$x^a$</td>
<td>Ba. 3 (A)</td>
<td>.15</td>
<td>(1) 30 (2) 20</td>
</tr>
<tr>
<td>2. Lack of differentiating a multiplier and a power.</td>
<td>$(a+b)^2 = ?$</td>
<td>$2a+2b$</td>
<td>Ba. 4 (D)</td>
<td>.90</td>
<td>30</td>
</tr>
<tr>
<td>3. Squaring of a number</td>
<td>$(43)^2 = ?$</td>
<td>$14x2$</td>
<td>Ba. 1 (A)</td>
<td>.90</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>$(5y-6)^2 = ?$</td>
<td>$(5y)^2-(6)^2$</td>
<td>Ba. 2 (C)</td>
<td>.65</td>
<td>45</td>
</tr>
<tr>
<td>4. Lack of understanding of a formula</td>
<td>$x = \frac{p+1}{p}$, $y = \frac{p-1}{p}$</td>
<td>$x^2 = y^2 = ?$</td>
<td>Ba. 3 (C)</td>
<td>.10</td>
<td>40</td>
</tr>
<tr>
<td>5. Use of unit</td>
<td>Answer is 3.14 sq. cm. but answer given 3.14(9+8)</td>
<td>Ba. 3 (D)</td>
<td>.22</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>6. H.C.F. and L.C.M.</td>
<td>H.C.F. of $x^2-y^2$, 2(x-y) is</td>
<td>Cc. 1 (A)</td>
<td>.35</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) 2(x-y)</td>
<td>Cc. 2 (B)</td>
<td>.57</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>7. Solution of equation</td>
<td>$x = \frac{a}{b} - b -a$, $x= ?$</td>
<td>Ba. 1 (A)</td>
<td>.25</td>
<td>(1) 40 (2) 20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) 0, (2) 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table IV

**Class VIII**

Type of misconception, type of error in answer, related distractor value and percentage of frequency

<table>
<thead>
<tr>
<th>Type of misconception</th>
<th>Question</th>
<th>Type of error in answer</th>
<th>Related distractor</th>
<th>Difficulty value</th>
<th>Percentage frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of proper knowledge of simple interest</td>
<td>Aa. 2</td>
<td>Amount is called principal value</td>
<td>-</td>
<td>.47</td>
<td>30</td>
</tr>
<tr>
<td>2. Misconcept of 5%</td>
<td>Aa. 3</td>
<td>5% means - (i) 5 (ii) Rs 5.00 only (iii) every hundred</td>
<td>Aa.3 (A)</td>
<td>.42</td>
<td>(1) 23 (2) 20 (3) 30</td>
</tr>
<tr>
<td>3. Failure to write the formula for simple interest</td>
<td>Ba. 1</td>
<td>The formula of finding is $I = pxTxRx100$</td>
<td>Ba.1 (D)</td>
<td>.44</td>
<td>26</td>
</tr>
<tr>
<td>4. Knowledge of compound interest inadequate</td>
<td>Ab. 1</td>
<td>The present worth of a compound interest is written as (i) principal value</td>
<td>Ab.1 (A)</td>
<td>.30</td>
<td>43</td>
</tr>
<tr>
<td>5. Lack of fundamental of ratio</td>
<td>Ac. 2</td>
<td>Ratio of 3 Kg and 9 Kg is (1) 3:9 Kg</td>
<td>Ac.2 (B)</td>
<td>No</td>
<td>46</td>
</tr>
<tr>
<td>6. Failure to justify greater or smaller ratio</td>
<td>Cc. 1</td>
<td>Select the greater ratio between 3:7 and 6:5 answer is 3:7</td>
<td>Cc.1 (A)</td>
<td>.21</td>
<td>30</td>
</tr>
<tr>
<td>7. Failure to write a ratio</td>
<td>Dc. 1</td>
<td>Ratio of 2.54 cm and 1 inch is 1:2.54 inch</td>
<td>Dc.1 (A)</td>
<td>.10</td>
<td>30</td>
</tr>
<tr>
<td>8. Operation with zero</td>
<td>Cd. 1</td>
<td>$2' x 0^2 = ?$ (1) 2'</td>
<td>Cd.1 (A)</td>
<td>.18</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$2^6 x 2^2 = ?$ (1) 2^3</td>
<td>Cd.1 (B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Operation of whole number</td>
<td>Dc. 1</td>
<td>$p + \frac{r}{q} = ? \quad \frac{p+r}{qs}$</td>
<td>De.1 (B)</td>
<td>.40</td>
<td>20</td>
</tr>
<tr>
<td>Type of misconception</td>
<td>Question</td>
<td>Type of error in answer</td>
<td>Related distractor</td>
<td>Difficulty value</td>
<td>Percentage of frequency</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------</td>
<td>--------------------</td>
<td>-----------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>1. Lack of comprehension of process of simplification</td>
<td>Ca. 1</td>
<td>$\frac{1}{2} + \frac{1}{2} : (\frac{1}{2} \times \frac{2}{3}) = ?$</td>
<td>Ca. 1(A)</td>
<td>.13</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 5 \div \frac{1}{2} = 10$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Misplacing decimal point in decimal multiplication</td>
<td>Ab. 1 Db. 1</td>
<td>$4.32 \times 10 = ?$ (1) $432$</td>
<td>Ab. 1(A)</td>
<td>.15</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$343 \times 1000$ c.m. = ?</td>
<td>Db. 1(C)</td>
<td>.26</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= (1) 34300$ c.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Lack of knowledge of recurring decimal</td>
<td>Bb. 2</td>
<td>$3.333 \ldots$ (1) $3.3 \ldots$</td>
<td>Bb. 2(A)</td>
<td>.29</td>
<td>(1) 57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) $3.4$ (B)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Lack of understanding of an index of a number</td>
<td>Ob. 3</td>
<td>$32.4 \div 10^4 = ?$ (1) $32.4$</td>
<td>Ob. 3(A)</td>
<td>.88</td>
<td>57</td>
</tr>
<tr>
<td>5. Difficulty in understanding the symbol %</td>
<td>Cd. 1</td>
<td>$10%$ of Rs. $240.00 = ?$</td>
<td>Cd. 1(A)*</td>
<td>.29</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) $24%$ (D)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Lack of knowledge of understanding average</td>
<td>Bb. 1</td>
<td>The average of $7,5,9$, $11$ is ?</td>
<td>Bb. 1(a)</td>
<td>.22</td>
<td>(1) 35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) 32, (2) 7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The type of misconception, type of error in answer, related distractor used, difficulty value and percentage of frequency

<table>
<thead>
<tr>
<th>Type of misconception</th>
<th>Question</th>
<th>Type of error in answer</th>
<th>Related distractor</th>
<th>Difficulty value</th>
<th>Percentage of frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of understanding of prime multiplier</td>
<td>Ca. 3</td>
<td>Prime multiplier of 180 is (1) $3 \times 4 \times 15$ (2) $2 \times 6 \times 5$</td>
<td>Ca. 3 (A)</td>
<td>.23</td>
<td>(1) 26 (2) 30</td>
</tr>
<tr>
<td>2. Lack of knowledge of the H.C.F. and L.C.M.</td>
<td>Cb. 2</td>
<td>H.C.F. of 24, 32, 6 is (1) $2 \times 3$ (2) Not at all</td>
<td>Bb. 2 (B)</td>
<td>.42</td>
<td>(1) 30 (2) 30</td>
</tr>
<tr>
<td></td>
<td>Cb. 3</td>
<td>L.C.M. of 9, 12, 16 is (1) $3 \times 2 \times 2$ (2) $9 \times 12 \times 16$</td>
<td>Bb. 2 (C)</td>
<td>.21</td>
<td>(1) 43 (2) 17</td>
</tr>
<tr>
<td>3. Inadequate knowledge of place value of decimal number</td>
<td>Bd. 1</td>
<td>54.032 when expanded: (1) $54 + \frac{3}{10} + \frac{2}{100}$</td>
<td>Bd. 1 (A)</td>
<td>.20</td>
<td>(1) 60</td>
</tr>
<tr>
<td>4. Interchange of decimal number to fractional number</td>
<td>Cd. 1</td>
<td>Change .625 to fraction (1) $\frac{625}{100}$ (2) $\frac{625}{10}$</td>
<td>Cd. (A)</td>
<td>.23</td>
<td>(1) 30 (2) 22</td>
</tr>
</tbody>
</table>
### Table I

**Class V**

Type of misconception, type of error in answer, related distractor used, difficulty value and percentage of frequency

<table>
<thead>
<tr>
<th>Type of misconception</th>
<th>Question</th>
<th>Type of error in answer</th>
<th>Related distractor</th>
<th>Difficulty value</th>
<th>Percentage of frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of knowledge of the use of units.</td>
<td>Da. 1: Rs. $5.1 \times 4 = (1) 20.4$ (2) Rs. 20.4</td>
<td></td>
<td>D.a.I(B)(A)</td>
<td>.17</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Ca. 1: Instead of writing 2.22 m, answer given as (1) 222, (2) 222 c.m.</td>
<td></td>
<td>Ca. I(A)(B)</td>
<td>.15</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Ac. 1: Rs. $\frac{1}{2}$ = how many paisa, answer 25</td>
<td></td>
<td>AC. 1(A)</td>
<td>.17</td>
<td>29</td>
</tr>
<tr>
<td>2. Lack of knowledge of the counting table</td>
<td>Ab. 1: $12 \times 9 = (1) 112$ (2) 93</td>
<td></td>
<td>Ab. 1(A)(B)</td>
<td>.34</td>
<td>26</td>
</tr>
<tr>
<td>3. Division of number misplacing of zero</td>
<td>Bb. 1: $\overline{30030} = (1) 55$ (2) 505</td>
<td></td>
<td>Bb. 1(A)(B)</td>
<td>.26</td>
<td>33</td>
</tr>
<tr>
<td>4. Use of bracket in simplification</td>
<td>Bb. 2: $(55 \div 11) \times 5 = (1) 1$ (2) 0</td>
<td></td>
<td>Bb. 2(A)(C)</td>
<td>.25</td>
<td>24</td>
</tr>
<tr>
<td>5. Lack of knowledge of multiplication of simple fraction</td>
<td>Co. 3: $(\frac{1}{3} \text{ of } 300) = (1) 3$</td>
<td></td>
<td>Co. 3(A)</td>
<td>.12</td>
<td>24</td>
</tr>
</tbody>
</table>
The text books are also found to be defective.

Another significant result obtained from the analysis of the performance of the experimental test is that the achievement of urban pupils is better in the higher classes and the rural pupils show better result in the lower classes. The factors for this difference are noted as (a) for urban pupils (i) guardian's awareness (ii) availability of study materials (iii) pupils' awareness of future prospects (iv) suitable home environment. (b) for rural pupils: (i) lack of awareness on the part of guardians (ii) poverty (iii) unsuitable home and neighbourhood environment.

Further, the teaching of different topics of a class during a session is not found to be of the same level. It is seen that the performance of pupils towards the latter part of the session decreases sharply. It is noted to be due to (1) shortage of time (2) difficult nature of topics (3) lack of adequate teaching of the latter topics of a session and (4) selective study by pupils.