
UNIT 7 **DIAGNOSTIC TESTING AND REMEDIAL TEACHING IN MATHEMATICS**

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7.1 INTRODUCTION

Your main role as a teacher is to promote quality learning among the students. This is possible only when you act as a guide and the students actively participate in the process of learning. During the teaching-learning process, you have to locate and identify the areas where the learner commits mistakes. It is the crucial stage of the teaching-learning process where you have to **DIAGNOSE** and prepare instructional material for **REMEDIAL TEACHING** to ensure the desired quality of learning.

At this stage the role of a teacher is just like a doctor's. The doctor takes all the steps necessary to diagnose the disease by performing different tests and then prescribes medicines for the particular disease.

In the case of education the process of Diagnostic Testing is the **STEP** and **REMEDIAL TEACHING** is the **PRESCRIPTION**. Hence diagnostic testing and remedial teaching are very essential for ensuring effective learning and in improving the quality of education.

In this unit an attempt is being made to discuss the organization of Diagnostic Tests in Mathematics and undertaking appropriate remedial measures.

7.2 OBJECTIVES

After going through this unit, you should be able to:

- explain the meaning of importance of Diagnostic Testing;
- elaborate the nature and purpose of Diagnostic Testing;
- follow the steps and stages of Diagnostic Testing in the classroom teaching-learning process; and
- conduct remedial teaching in mathematics in classroom situations.

7.3 DIAGNOSTIC TESTING : ITS MEANING AND IMPORTANCE

In general, after completing a particular unit/topic you conduct a test to assess the achievements of learners. After evaluation you draw some conclusions and you find that some of the students have fared very well and a particular group of students have achieved below your expectations. Now you will have to find out the causes for this slow learning. There would be certain reasons for this low achievement. Now it is very essential to find out the particular area where the difficulty lies or the particular concept where the learner commits errors. To *locate* and *identify* the areas of learning difficulties leads to Diagnostic Testing.

After identifying the areas where the error lies, you have to find out the reasons due to which the particular child/group of students have not responded well. At this stage you have to play the role of a doctor. If a patient visits the doctor's clinic he suggests different tests relevant to the symptoms observed by him. After getting reports he is in a position to identify and diagnose the disease and then prescribe the medicine for it.

Likewise, as a teacher, you have to first identify and locate the area where the error lies. The process adopted for this purpose in educational situations is known as Diagnostic Testing. We may say that Diagnostic Testing implies a detailed study of learning difficulties.

In diagnostic testing the following points must be kept in mind:

- i) Who are the pupils who need help?
- ii) Where are the errors located ?
- iii) Why did the error occur ?

Let us take the following examples to make this point more clear.

Example 1

Suppose you have taught the simple method of subtraction of two-digit numbers without borrowing and then conducted a test which indicates the solutions as follows :

Student's name—Mr. 'X'

$\begin{array}{r} 98 \\ - 62 \\ \hline 36 \end{array}$	$\begin{array}{r} 77 \\ - 52 \\ \hline 25 \end{array}$	$\begin{array}{r} 85 \\ - 35 \\ \hline 5 \textcircled{5} \end{array}$	$\begin{array}{r} 81 \\ - 40 \\ \hline 41 \end{array}$	$\begin{array}{r} 97 \\ - 67 \\ \hline 3 \textcircled{7} \end{array}$
$\begin{array}{r} 38 \\ - 26 \\ \hline 12 \end{array}$	$\begin{array}{r} 68 \\ - 61 \\ \hline \textcircled{6}7 \end{array}$	$\begin{array}{r} 96 \\ - 26 \\ \hline 7 \textcircled{6} \end{array}$	$\begin{array}{r} 54 \\ - 24 \\ \hline 3 \textcircled{4} \end{array}$	$\begin{array}{r} 75 \\ - 25 \\ \hline 5 \textcircled{5} \end{array}$

After conducting test you are in a position to assess the whole group. This assessment is followed by an analysis i.e., you have to find out about each individual the area of difficulty or the concept where the learner commits errors. For example, Student 'X' has solved all the questions of subtraction of two-digit numbers without borrowing correctly except for the subtraction of one digit from same one-digit number. You find that his answers are $5 - 5 = 5$, $7 - 7 = 7$, $6 - 6 = 6$, $4 - 4 = 4$ etc. You are in a position to diagnose the particular concept which Mr. 'X' could not understand. This is known as Diagnostic Testing.

While performing a Diagnostic Test you have the specific aim to analyze the exact nature of the progress made by the learner in a particular topic/unit and to know the particular area of weakness/error which requires a series of carefully graded tests. The main aim of Diagnostic Testing is to analyze not to assess. It will be more clear in the following example.

Example 2

Student's name –Mr. John

370	590	860	870	
- 210	- 230	- 330	- 353	
<u>160</u>	<u>260</u>	<u>530</u>	<u>52</u> ⓪	
67	39	28	75	88
- 43	- 20	- 15	- 40	- 45
<u>24</u>	<u>1</u> ⓪	<u>13</u>	<u>3</u> ⓪	<u>43</u>
347	182	883	578	
- 101	- 90	- 570	- 200	
<u>2</u> ⓪6	<u>9</u> ⓪	<u>31</u> ⓪	<u>37</u> ⓪	
513	654	845		
- 206	- 352	- 203		
<u>307</u>	<u>2</u> 02	<u>6</u> ⓪2		
	Careless slip			
260	280	370		
- 109	- 140	- 143		
<u>1</u> ⓪⓪	<u>240</u>	<u>23</u> ⓪		

Skill analysis of subtraction performance

You have conducted a test in the classroom to assess subtraction skill. After this assessment you have to find out how many students have not acquired this skill and who they are. For that particular group you will have to prepare a list to find the concept which is not clear to the learner or the particular step where the learner makes mistakes. For instance, in John's case you have found that he makes a mistake when the question involves subtraction of zero from a number or of a number from zero through borrowing from the next digit. John knows how to subtract zero. You can conclude from this analysis that John makes a mistake only when the concepts of zero and a number come together in subtraction. This is identification of the area of learning difficulties, and the process involved in identifying and testing the problem is called Diagnostic Testing.

Check Your Progress

- Notes:** a) Write your answers in the space given below.
- b) Compare your answer with the one given at the end of this unit.
1. Fill in the blanks using the words : 1) detailed, 2) errors, 3) assess, 4) located, 5) identify, 6) analysis.
 - i) The aim of class test is to the performance of pupils.
 - ii) Diagnostic Test implies study of learning difficulties.

- iii) In the Diagnostic Testing process the problem is.....through due.....
- iv) Diagnostic Testing means to..... the problem areas.
- v) In diagnostic Testing we try to find the area where..... occur.

7.4 NATURE AND PURPOSE OF DIAGNOSTIC TESTING

If we consider arithmetical attainments from both a qualitative and quantitative standpoints, we can distinguish four main points (i) accuracy (ii) speed of writing (iii) methods of work and (iv) extent of the arithmetic process mastered.

It is obvious that you will try to find the feedback through the medium of class work or through weekly or monthly tests which indicate pupils' ability in each of the four aforesaid directions. But it is not enough for teaching purposes particularly with those pupils/learners who are slow learners. With this group of learners you are required to have a more analytical estimate of their achievements. Let us take the following example :

Example 3

After teaching basic operations (addition, subtraction, multiplication and division) to a group of students, you conduct a test of say 10 items and the results are summarized as below :

Items	Errors
1	2
2	1
3	3
4	2
5	3
6	10
7	8
8	9
9	32
10	32

From the above data it is possible to analyze the test items. It is clear that items 9 and 10 have been missed by most of the students. At this stage you have to rethink to make some modifications in items 9 and 10. This is the stage where you have identified and located the problem and hence diagnosed the area of error committed by the learners. Similarly, for items 6, 7 and 8, you will rethink and evolve instructional material to improve the quality of learning.

The above example suggests that Diagnostic Testing is analytical in nature where the teacher has to look at the performance of pupils in order to examine why they have not learned or mastered the particular concept or competency. For each pupil individually one has to pinpoint the specific kind of mistake he makes. This analysis is based on the date of performance rather than the general opinion of the teacher. It may be interpreted in terms of each student, a group of students, each concept/competency and for each of the questions.

Why should the teacher undertake this kind of probe into the performance of pupils? The obvious response is that he/she wants to ensure the quality of learning (at the level of mastery) and is curious to know what specific action should be taken to obtain the desired results. Thus the main purpose of Diagnostic Testing is to spot the learning difficulties of pupils with a view to developing corrective measures, termed as remedial teaching.

7.5 STEPS AND STAGES IN DIAGNOSTIC TESTING

The essential steps in educational diagnosis are:

- i) Identifying the students who are having trouble or need help.
- ii) Locating the errors or learning difficulties.
- iii) Discovering the causal factors of slow learning.

i) Identifying the students who are having trouble or need help

First, one must know the learners who require help. For this you can administer a general achievement test based on the topics already taught. After evaluation you will be in a position to make lists who are below average, average or above average. Next, one has to locate the area where the error occurs in order to have a deeper insight into the pupils' difficulties.

ii) Locating the errors or learning difficulties

After identifying the students who need help and visualising the necessity of additional instructional material to improve the quality of learning, your main role is to find out the area where the learner commits mistakes or which is the area where learning difficulties lie. For example we examine the pupils' responses as follows:

i) $\frac{3}{4} + \frac{5}{4} = \frac{8}{4}$

ii) $\frac{2}{3} + \frac{5}{3} = \frac{7}{3}$

iii) $\frac{7}{12} + \frac{4}{12} = \frac{11}{12}$

iv) $\frac{4}{13} + \frac{5}{13} = \frac{9}{13}$

v) $\frac{3}{4} + \frac{5}{4} = \frac{8}{4}$

vi) $1 + \frac{3}{4} = \frac{4}{4}$

vii) $3 + \frac{5}{7} = \frac{8}{7}$

viii) $5 + \frac{1}{7} = \frac{6}{7}$

ix) $\frac{1}{2} + \frac{1}{3} = \frac{2}{5}$

x) $\frac{3}{7} + \frac{4}{5} = \frac{7}{12}$

From the above example you would realize that the learner has the knowledge of adding fractions having the same denominator but the concept of addition of fractions having different denominators is not clear to him even though it was taught in the classroom. Thus you have located the area where the learning difficulty lies.

iii) Discovering the causal factors of slow learning

In some cases of learning difficulties, the learner may have a specific learning disability (SLD) such as dyscalculia, which is a learning disability that affects the ability to understand numbers and manipulate them. This can lead to difficulties in learning mathematics. The learner may also have a general learning disability (GLD) which affects the ability to learn in general. This can lead to difficulties in learning all subjects, including mathematics. The learner may also have a specific learning disability (SLD) such as dyscalculia, which is a learning disability that affects the ability to understand numbers and manipulate them. This can lead to difficulties in learning mathematics. The learner may also have a general learning disability (GLD) which affects the ability to learn in general. This can lead to difficulties in learning all subjects, including mathematics.

Sometimes the cause is ill-health or faulty work habits etc. It has also been observed sometimes that the basic cause of low achievement is a feeling of helplessness or the complexity of the subject-matter which perhaps is much above the level of their comprehension.

Sequential presentation in Fig. 7.1 shows how diagnosis leads to improved quality of learning.

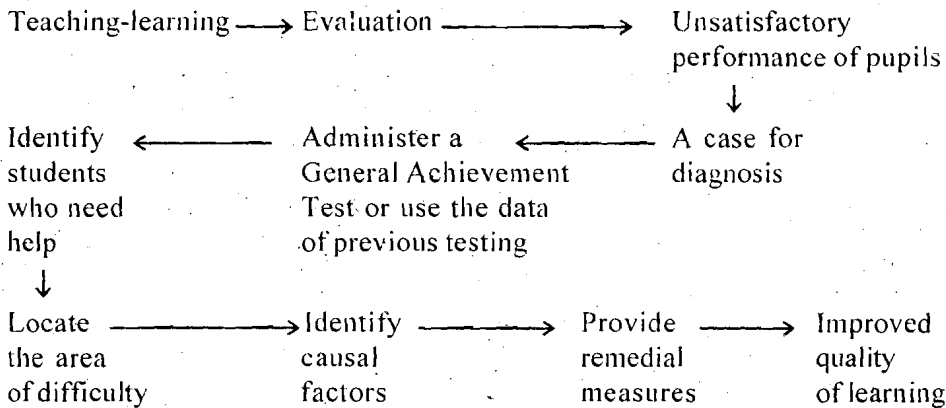


Fig. 7.1

This is how quality can be improved through diagnosis.

7.6 REMEDIAL TEACHING

While diagnosis is the process of investigating the learners' difficulties and the reasons for this, its follow up leads to actions that may help children make up their deficiencies. This step is generally termed Remedial Teaching. So you have to be skilled in preparing or arranging for such materials which may be used to undertake corrective instruction and thus enhancing the quality of learning.

Selection of Materials

The following points should be kept in mind while selecting appropriate instructional material:

- i) The corrective material should be designed to correct the students' individual difficulties.
- ii) You have to analyze the work of slow learners by means of observation, interview and Diagnostic Testing. A careful consideration of the three may help decide what kind of corrective material is to be designed and whether material will be adequate to correct the specific difficulties of learners.
- iii) The corrective material should be graded, self-directive and should permit students to work independently. Written directions, which accompany the material, should be easily readable and comprehensible by the students.
- iv) The corrective material must permit individuals to progress according to their pace.
- v) The material should encourage systematic recording of evidence of pupils' progress.

Some examples

The following examples will illustrate the points discussed above.

Example 1

For preparing the material for remedial teaching, let us explain the example discussed in 7.5 above. In this you had diagnosed that the learners had not understood the concept of adding fractions of the following type:

$$1 + \frac{3}{4}, 2 + \frac{5}{7}, 3 + \frac{6}{7}, \text{ etc.}$$

On the other hand, they had attained mastery over adding fractions of the type

$$\frac{1}{2} + \frac{3}{2}; \frac{3}{2} + \frac{5}{2}; \frac{3}{4} + \frac{5}{4}; \frac{4}{5} + \frac{7}{5}; \text{ etc.}$$

Accordingly now you will have to prepare material where the learner should have plenty of opportunity to exercise on equalization of denominators in the given fractions.

$$\text{i) } 1 + \frac{3}{4} = \frac{1}{1} + \frac{3}{4} = \frac{1 \times 4}{1 \times 4} + \frac{3}{4} = \frac{4}{4} + \frac{3}{4} = \frac{4+3}{4} = \frac{7}{4}$$

$$\text{ii) } 2 + \frac{5}{7} = \frac{2}{1} + \frac{5}{7} = \frac{2 \times 7}{1 \times 7} + \frac{5}{7} = \frac{14}{7} + \frac{5}{7} = \frac{14+5}{7} = \frac{19}{7}$$

$$\text{iii) } 3 + \frac{6}{7} = \frac{3}{1} + \frac{6}{7} = \frac{3 \times 7}{1 \times 7} + \frac{6}{7} = \frac{21}{7} + \frac{6}{7} = \frac{21+6}{7} = \frac{27}{7}$$

$$\text{iv) } \frac{1}{2} + \frac{1}{3} = \frac{1 \times 3}{2 \times 3} + \frac{1 \times 2}{3 \times 2} = \frac{3}{6} + \frac{2}{6} = \frac{3+2}{6} = \frac{5}{6}$$

$$\text{v) } \frac{3}{7} + \frac{4}{5} = \frac{3 \times 5}{7 \times 5} + \frac{4 \times 7}{5 \times 7} = \frac{15}{35} + \frac{28}{35} = \frac{15+28}{35} = \frac{43}{35}$$

Enough practice should be provided to pupils on similar questions until they attain mastery. While selecting and implementing the instructional material the most important thing is the individual need of the student in a particular area. You have to give differential treatment. Different methodologies have to be adopted for different kinds of students. Other modes of interaction such as learner-learner interaction and learner-material interaction may also be utilized, besides the traditional teacher-learner interaction, using appropriate instructional material.

Example 2

The following are graded exercises to diagnose the difficulty in addition.

1st step

1 4	1 5	1 2	2	(10 to 18 in one line, 1 to 9 in the other; no carrying)
+ 3	+ 4	+ 6	+ 1 7	
——	——	——	——	
——	——	——	——	

2nd Step

1 0	1 3	1 2	1 1	(10 to 19 in both lines, zero introduced; no carrying)
+ 1 5	+ 1 6	+ 1 4	+ 1 0	
——	——	——	——	
——	——	——	——	

3rd Step

3 1	6 5	2 3	2 8	(10 to 89 in both lines; no carrying)
+ 6 6	+ 2 2	+ 7 3	+ 3 0	
——	——	——	——	
——	——	——	——	

4th Step

$$\begin{array}{r} 123 \\ + 145 \\ \hline \hline \end{array} \quad \begin{array}{r} 346 \\ + 212 \\ \hline \hline \end{array} \quad \begin{array}{r} 482 \\ + 305 \\ \hline \hline \end{array} \quad \begin{array}{r} 543 \\ + 126 \\ \hline \hline \end{array}$$

(Hundreds and tens in both lines; no carrying)

5th Step

$$\begin{array}{r} 9 \\ + 19 \\ \hline \hline \end{array} \quad \begin{array}{r} 15 \\ + 6 \\ \hline \hline \end{array} \quad \begin{array}{r} 6 \\ + 17 \\ \hline \hline \end{array} \quad \begin{array}{r} 9 \\ + 17 \\ \hline \hline \end{array}$$

(1 to 9 in one line, 10 to 19 in the other; with carrying)

6th Step

$$\begin{array}{r} 57 \\ + 7 \\ \hline \hline \end{array} \quad \begin{array}{r} 58 \\ + 6 \\ \hline \hline \end{array} \quad \begin{array}{r} 6 \\ + 89 \\ \hline \hline \end{array} \quad \begin{array}{r} 8 \\ + 68 \\ \hline \hline \end{array}$$

(1 to 9 in one line, 10 to 89 in the other; with carrying)

7th Step

$$\begin{array}{r} 87 \\ + 31 \\ \hline \hline \end{array} \quad \begin{array}{r} 96 \\ + 63 \\ \hline \hline \end{array} \quad \begin{array}{r} 84 \\ + 94 \\ \hline \hline \end{array} \quad \begin{array}{r} 50 \\ + 81 \\ \hline \hline \end{array}$$

(Tens in both the lines; carrying in tens place)

8th Step

$$\begin{array}{r} 23 \\ + 17 \\ \hline \hline \end{array} \quad \begin{array}{r} 39 \\ + 48 \\ \hline \hline \end{array} \quad \begin{array}{r} 14 \\ + 79 \\ \hline \hline \end{array} \quad \begin{array}{r} 37 \\ + 59 \\ \hline \hline \end{array}$$

(Tens in both the lines; carrying in units place)

9th Step

$$\begin{array}{r} 401 \\ + 607 \\ \hline \hline \end{array} \quad \begin{array}{r} 209 \\ + 39 \\ \hline \hline \end{array} \quad \begin{array}{r} 874 \\ + 83 \\ \hline \hline \end{array} \quad \begin{array}{r} 635 \\ + 944 \\ \hline \hline \end{array}$$

(Numbers over 100 in one or both lines. carrying in units or tens or hundreds place)

10th Step

$$\begin{array}{r} 56 \\ + 69 \\ \hline \hline \end{array} \quad \begin{array}{r} 38 \\ + 86 \\ \hline \hline \end{array} \quad \begin{array}{r} 57 \\ + 59 \\ \hline \hline \end{array} \quad \begin{array}{r} 54 \\ + 97 \\ \hline \hline \end{array}$$

(Tens in both the lines; carrying in both units and tens place)

11th Step

$$\begin{array}{r} 74 \\ + 56 \\ 43 \\ \hline \hline \end{array} \quad \begin{array}{r} 38 \\ + 78 \\ 94 \\ \hline \hline \end{array} \quad \begin{array}{r} 46 \\ + 37 \\ 96 \\ \hline \hline \end{array} \quad \begin{array}{r} 86 \\ + 48 \\ 39 \\ \hline \hline \end{array}$$

(Column addition 3 lines number under 100; with carrying)

12th Step

$$\begin{array}{r} 897 \\ + 497 \\ \hline \hline \end{array} \quad \begin{array}{r} 953 \\ + 818 \\ \hline \hline \end{array} \quad \begin{array}{r} 765 \\ + 488 \\ \hline \hline \end{array} \quad \begin{array}{r} 925 \\ + 469 \\ \hline \hline \end{array}$$

(Hundreds, tens and units in both lines; carrying in 2 or 3 places)

13th Step

$$\begin{array}{r} 77 \\ + 48 \\ 32 \\ 65 \\ \hline \hline \end{array} \quad \begin{array}{r} 94 \\ + 83 \\ 76 \\ 59 \\ \hline \hline \end{array} \quad \begin{array}{r} 277 \\ + 183 \\ 149 \\ \hline \hline \end{array} \quad \begin{array}{r} 126 \\ + 848 \\ 976 \\ \hline \hline \end{array}$$

(Column addition 4 lines of 2-digit numbers and 3 lines of 3-digit numbers; with carrying)

14th Step

28	608	3	951	(Variation in column addition; introducing difficult number combinations)
+ 103	+ 705	+ 81	+ 382	
784	33	19	467	
9	219	827	539	
_____	_____	94	196	

After conducting the above test you will be able to locate all the possible errors which students could commit while performing the addition. For example one child, say Neeta, has not learnt to carry. She worked the first sixteen sums correctly but after that all her efforts were like this:

9	15	6	9
+ 19	+ 6	+ 17	+ 17
<u>118</u>	<u>111</u>	<u>113</u>	<u>116</u>
57	58	6	7
+ 7	+ 96	+ 89	+ 68
<u>514</u>	<u>514</u>	<u>815</u>	<u>615</u>

In the case of a second student, Lata, you find evidence of a persistent error in a certain combination, e.g.,

96	635	56
+ 63	+ 944	+ 69
<u>129</u>	<u>1279</u>	<u>122</u>

You may notice that this child finds it difficult to add 9 with 6 or *vice versa*. You have to prepare different remedial teaching material for these two students, namely Neeta and Lata. In the case of Neeta questions based on carrying will be set in exercises. In Lata's case questions based on adding the two numerals 6 and 9 will be set to remove the errors.

The following example takes into account graded subtraction with a view to diagnosing pupils' difficulties in subtraction.

Example 3

1st Step

98	57	84	38	(Tens and units in minuend: units in subtrahend; no borrowing)
- 3	- 4	- 1	- 8	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	

2nd Step

55	99	78	97	(Tens and units in minuend and subtrahend; no borrowing)
- 23	- 54	- 21	- 81	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	

3rd Step

346	987	378	496	(Hundreds, tens and units in minuend and subtrahend; no borrowing)
- 215	- 832	- 122	- 261	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	

4th Step

$$\begin{array}{r} 18 \\ - 14 \\ \hline \hline \end{array} \quad \begin{array}{r} 19 \\ - 18 \\ \hline \hline \end{array} \quad \begin{array}{r} 16 \\ - 10 \\ \hline \hline \end{array} \quad \begin{array}{r} 17 \\ - 15 \\ \hline \hline \end{array}$$

(Numbers less than 20. Unit digit in subtrahend less than the unit digit in minuend; tens digit unity in both)

5th Step

$$\begin{array}{r} 71 \\ - 2 \\ \hline \hline \end{array} \quad \begin{array}{r} 62 \\ - 4 \\ \hline \hline \end{array} \quad \begin{array}{r} 46 \\ - 7 \\ \hline \hline \end{array} \quad \begin{array}{r} 84 \\ - 6 \\ \hline \hline \end{array}$$

(Tens in minuend; unity in subtrahend; borrowing in units)

6th Step

$$\begin{array}{r} 54 \\ - 39 \\ \hline \hline \end{array} \quad \begin{array}{r} 22 \\ - 17 \\ \hline \hline \end{array} \quad \begin{array}{r} 58 \\ - 19 \\ \hline \hline \end{array} \quad \begin{array}{r} 46 \\ - 27 \\ \hline \hline \end{array}$$

(Tens and units in minuend and subtrahend; borrowing in units)

7th Step

$$\begin{array}{r} 331 \\ - 18 \\ \hline \hline \end{array} \quad \begin{array}{r} 543 \\ - 25 \\ \hline \hline \end{array} \quad \begin{array}{r} 283 \\ - 29 \\ \hline \hline \end{array} \quad \begin{array}{r} 786 \\ - 58 \\ \hline \hline \end{array}$$

(Hundreds, tens and units in minuend, tens and units in subtrahend; borrowing in units)

8th Step

$$\begin{array}{r} 316 \\ - 27 \\ \hline \hline \end{array} \quad \begin{array}{r} 564 \\ - 59 \\ \hline \hline \end{array} \quad \begin{array}{r} 68 \\ - 59 \\ \hline \hline \end{array} \quad \begin{array}{r} 387 \\ - 279 \\ \hline \hline \end{array}$$

(Borrowing in units and tens or borrowing in units, and '0' result in tens)

9th Step

$$\begin{array}{r} 980 \\ - 930 \\ \hline \hline \end{array} \quad \begin{array}{r} 160 \\ - 68 \\ \hline \hline \end{array} \quad \begin{array}{r} 80 \\ - 57 \\ \hline \hline \end{array} \quad \begin{array}{r} 430 \\ - 416 \\ \hline \hline \end{array}$$

(Introduction of '0' difficulty in units or tens)

10th Step

$$\begin{array}{r} 180 \\ - 71 \\ \hline \hline \end{array} \quad \begin{array}{r} 250 \\ - 49 \\ \hline \hline \end{array} \quad \begin{array}{r} 160 \\ - 31 \\ \hline \hline \end{array} \quad \begin{array}{r} 890 \\ - 889 \\ \hline \hline \end{array}$$

(Introduction of examples having zero as units in minuend and 1 to 9 as units in subtrahend)

11th Step

$$\begin{array}{r} 346 \\ - 284 \\ \hline \hline \end{array} \quad \begin{array}{r} 629 \\ - 473 \\ \hline \hline \end{array} \quad \begin{array}{r} 756 \\ - 382 \\ \hline \hline \end{array} \quad \begin{array}{r} 387 \\ - 196 \\ \hline \hline \end{array}$$

(Borrowing in tens place; numbers over 100)

12th Step

$$\begin{array}{r} 364 \\ - 295 \\ \hline \hline \end{array} \quad \begin{array}{r} 831 \\ - 276 \\ \hline \hline \end{array} \quad \begin{array}{r} 8354 \\ - 5676 \\ \hline \hline \end{array} \quad \begin{array}{r} 8112 \\ - 6798 \\ \hline \hline \end{array}$$

(Borrowing in hundreds, tens and units places)

13th Step

800	607	700	906	(Advanced '0' difficulty and borrowing)
- 695	- 298	- 192	- 109	
——	——	——	——	
——	——	——	——	

14th Step

891	904	705	60 67	(Advanced '0' difficulty and borrowing)
- 207	- 206	- 109	- 59 70	
——	——	——	——	
——	——	——	——	

After conducting this test you would be able to know the nature of errors committed by individual students in subtraction. For example: In the case of Student 'X', the following pattern of errors and learning difficulties were observed:

In 1st Step; One error

$$\begin{array}{r} 38 \\ - 8 \\ \hline 3\textcircled{8} \end{array}$$

2nd and 3rd Steps, No errors.

4th Step : Four errors

18	19	16	17
- 14	- 18	- 10	- 15
<u>①4</u>	<u>①1</u>	<u>①6</u>	<u>①2</u>

5th, 6th, 7th & 8th Steps; No errors

9th Step; Two errors

80	430
- 57	- 416
<u>3⑦</u>	<u>④2⑥</u>

10th Step; Four errors

180	250	160	890
- 71	- 49	- 31	- 889
<u>11①</u>	<u>21②</u>	<u>13①</u>	<u>⑧1②</u>

11th & 12th Step; No errors

13th Step; Four errors

800	607	700	906
- 695	- 298	- 192	- 199
<u>2②⑤</u>	<u>4②9</u>	<u>6②②</u>	<u>8②7</u>

14th Step; Three errors

904	705	69 67
- 206	- 109	- 59 70
<u>7①8</u>	<u>6①6</u>	<u>1②①⑦</u>

You have come to know the types of errors committed by 'X' in different steps. Now you will think to prepare material for remedial teaching for different learning difficulties faced by 'X'. The diagnosis made on the basis of a graded test provides a definite direction to remedial teaching. The teaching-learning strategy should of course, put emphasis on exercises in the relevant area of difficulty until mastery is achieved. Further testing would be desirable to examine the impact of remedial teaching.

7.7 LET US SUM UP

In this unit you have learnt about Diagnostic Testing which is the most important part of the teaching-learning process. It implies a detailed study of learning difficulties. Its aim is to analyze, not to assess. The nature and purpose of Diagnostic Testing is to identify the areas of difficulties where the learner commits errors. The stages of diagnostic testing are:

- i) Identifying the students who need help.
- ii) Locating the error/learning difficulties.
- iii) Discovering the causal factors.

After locating the area where the difficulty lies, as a teacher you will devise some strategy to remove problems in learning and the causes due to which the learner has faced the difficulties. The strategy used by you to remove the weakness of the learner is known as remedial teaching. Diagnostic Testing leads to remedial teaching in which you have to prepare instructional material for quality learning, adopting different methodologies as per needs of the individual or a particular group.

7.8 UNIT-END EXERCISES

1. Define Diagnostic Testing.
2. Distinguish between Test and Diagnostic Testing.
3. Explain the nature and purpose of Diagnostic Testing.
4. Prepare a graded test for diagnosing problems in multiplication.
5. What is remedial teaching?
6. Prepare remedial teaching material for enhancing the learning of multiplication technique.

ANSWERS TO CHECK YOUR PROGRESS

1. i) assess
ii) detailed
iii) located, analysis
iv) identify
v) errors