



A STEP-BY-STEP GUIDE TO
TO ADDITION, SUBTRACTION, MULTIPLICATION & DIVISION

Introduction Notes

1. This approach is based on the assumption that mastery of a complex mathematical process is dependant upon mastery of the mathematical processes which underpin it.

Conversely, inability to master a complex mathematical process *may* indicate a lack of mastery of one or more of the mathematical processes which underpin it.

2. This is a comprehensive guide showing the systematic/sequential steps that underpin the four operations of addition, subtraction, multiplication and division, to the following stages.

Addition: 3-digit number + 3-digit number with multiple “carryings”

Subtraction: 3-digit number – 3-digit number with multiple “renamings”

Multiplication: 3-digit number x 3-digit number with multiple “carryings”

Division: 3-digit number ÷ 3-digit number with multiple “remainders”

3. The kit provides the following.

(a) Separate diagnostic tests that isolate and define the weak or missing areas in a student’s sequential understanding of each of the four operations (to the above stated levels).

(b) Sets of problems directly related to a student’s weak or missing areas as identified by the diagnostic test.

(c) A simple teaching response to the weak or missing areas that have been identified.

4. These exercises are intended for use as a platform for teaching by the teacher and for practice in of areas of diagnosed weakness by the student. They are NOT intended to be used as student workbooks, with students working through every problem on their own.

How to use this guide

- 1. Give a Diagnostic Test** (addition, subtraction, multiplication or division).
- 2. Mark the Diagnostic Test**, using the appropriate Answer Key.
- 3. Analyse the student's errors** and distinguish between careless errors and errors due to lack of understanding.
- 4. Identify the code number next to the errors.** The LETTERS A, S, M & D stand for addition, subtraction, multiplication and division. The NUMBERS indicate the "step" that the student is having difficulty with.
- 5. Look for a definition of the specific problem area** in the 'List of Steps' in the appropriate Exercise Book.
e.g *A mistake in A7 refers to "Double digit + double digit, with carrying from ones' column".*
- 6. Locate the relevant set of exercises** in the related 'Exercises' section.
e.g *The relevant set of exercises for A7 is as follows:*

STEP SEVEN

- | | | | |
|-------------------|-------------------|-------------------|-------------------|
| a) 67 + 28 | b) 35 + 46 | c) 23 + 28 | d) 47 + 48 |
| e) 57 + 37 | f) 22 + 49 | g) 66 + 27 | h) 26 + 38 |
| i) 74 + 19 | j) 53 + 37 | k) 42 + 49 | l) 73 + 27 |

- 7. Work with the student.** A suggested approach follows.
 - a.** Ask the student to work through the test question again, step by step, and observe where in the process of answering it they make a mistake(s).

Notes:

- i.** Don't "butt in" too quickly – let them work right through the problem uninterrupted, as they may be making more than one error.
 - ii.** Select an example from the exercise set and have the student work through it until they make an error. Stop them and demonstrate/model the correction.
 - iii.** Have the student repeat using your corrected approach.
 - iv.** Repeat Step (ii) above, until; the student is performing the operation correctly without assistance.
 - v.** Have them do three examples on their own without assistance.
 - vi.** Mark the examples. If correct, let them finish the set. If incorrect, repeat steps (ii) to (v) above.
- b.** Have the student re-do the mistake made in the diagnostic test. If they do this correctly, both teacher and student can enjoy the satisfaction of overcoming an area of difficulty. If it is incorrect, patiently work through the sequence again.