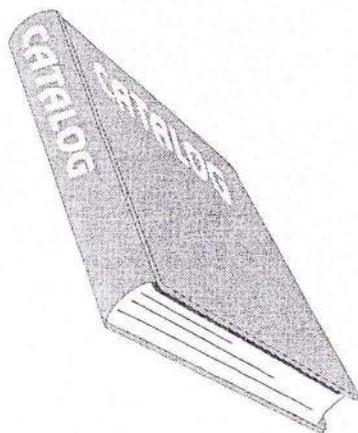# I.S.B.N

Have you ever wondered what these letters stand for? You must have noticed them on the back, or inside the front cover, of all the books in the library. I.S.B.N is the abbreviation for International Standard Book Number. This number identifies a book published anywhere in the world. This number however has some interesting arithmetic associated with it.

If you examine the I.S.B.N given below, which is the real I.S.B.N of a book called 'Easy Does It' published by P&I Ltd. you will see that it is made up of four separate parts.

1 901695 10 7

| Group identifier | Publisher identifier | Title Number | Check Digit |
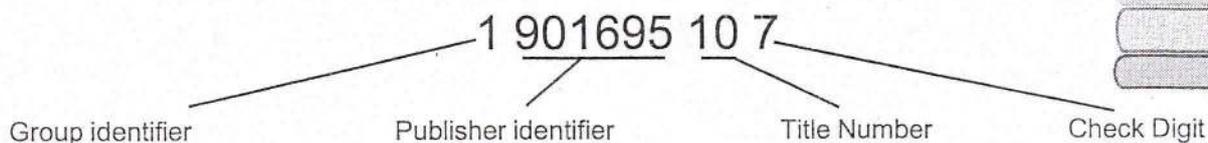
The group identifier tells you the language in which the book is published. All English language books have the identifier 1 or 0. This book is obviously written in English. The next six digits, 901695, are the numbers which identify the publisher. The next two digits 10 are the title number and the final number is called the check digit. The check digit is used by computerised ordering systems to check that the number is correct.

It works in the following way. The computer receiving an I.S.B.N. will immediately perform a simple calculation on the number as follows:- The first digit, 1 is multiplied by 10, the second digit 9 is multiplied by 9, the third digit by 8 and so on. The results of these calculations are added together. The calculation looks like this.

$$1 \times 10 = 10$$
$$9 \times 9 = 81$$
$$0 \times 8 = 0$$
$$1 \times 7 = 7$$
$$6 \times 6 = 36$$
$$9 \times 5 = 45$$
$$5 \times 4 = 20$$
$$1 \times 3 = 3$$
$$0 \times 2 = 0$$
$$7 \times 1 = 7$$
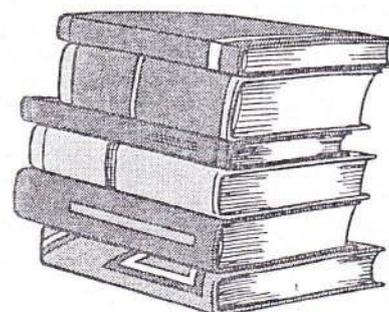
Total = 209

The total is then divided by 11 and if there is no remainder then the I.S.B.N is a valid one. In the example above 11 goes into 209 exactly 19 times so the number is valid. Dividing by 11 or Modulus 11 as it is called will detect the most common form of error, an error where two digits are swapped round. (Called a transposition error). It will also detect over 90 percent of random errors. Sometimes an I.S.B.N. may contain an 'X' as the check digit (the last digit). This represents the number 10 as in Roman numerals. This is sometimes required when using Modulus 11 as a checking system.

Your task is to check the following I.S.B.Ns to see if they are valid

a. 0 949999 07 5   b. 1 901695 20 4   c. 0 09177185 3   d. 0 330029 51 7

e. 0 900640 44 8   f. 1 901695 00 X   g. 0 713649 313   h. 0 241126 82 7