Chapter 16: Identification Numbers

Section 16.1 Check Digits
(ISBN - numbers)

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Check Digits

- Check Digit
  - A digit included in an identification number for the purpose of error detection.
    - Mathematical calculations or schemes are used on the digits of the identification number to assign the check digit.
    - Computers use the check digit to help detect typing errors during data entry to prevent and detect fraud and to find other errors.

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■ International Standard Book Number (ISBN)

❑ A ten-digit identification number used on books throughout the world that contains a check digit for error detection.

❑ This scheme can detect 100% of single errors and 100% of transposition errors: *(Note: Our books also have a 13-digit ISBN)*

■ A correctly coded ten-digit ISBN $a_1 \, a_2 \ldots a_{10}$ has the property that

■ $10a_1 + 9a_2 + 8a_3 + 7a_4 + 6a_5 + 5a_6 + 4a_7 + 3a_8 + 2a_9 + a_{10}$ is evenly divisible by 11. *A very detailed check!*

Note: *ISBN is made up of ten-digits as follows: first digit—published country's language, next four digits—the publisher, next four digits—type of book, last digit—check digit.*

The International Standard Book Number (ISBN)

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$$10a_1 + 9a_2 + 8a_3 + 7a_4 + 6a_5 + 5a_6 + 4a_7 + 3a_8 + 2a_9 + a_{10}$$

is evenly divisible by 11.

Example: the ISBN of our main textbook is **0-7167-4783-9**
The initial digit **0** indicates that the book is published in an English-speaking country. The next block **7167** identifies the publisher. The third block **4783** is assigned by the publisher and identifies this book. The last digit, **9**, is the check digit.

$$10*0+9*7+8*1+7*6+6*7+5*4+4*7+3*8+2*3+9=242$$

Notice 242/11=22. So **242 is evenly divisible by 11**.

Example:
Suppose the ISBN 0-1750-3540-0 is given. Is this correct? If not what should the check number be?

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Solution:

$10(0)+9(1)+8(7)+7(5)+6(0)+5(3)+ 4(5)+3(4)$

$+2(0) + 1(0) = 147$

147 is not divisible by 11. Incorrect ISBN number.

The check digit should be 7

Try the example without reading the answer first.