



# Tracking Products

Number theory, an area of mathematics on which the security of Internet communication is based, also guarantees the authenticity of a book's ISBN (International Standard Book Number) and its UPC (Universal Product Code). Authentic ISBN numbers allow computerized tracking of books, and UPC's identify each book as unique—ensuring that authors get the royalties they're due.

All digits of an ISBN number but the last are multiplied in modular arithmetic by predetermined numbers. The sum of these products is used to create a check digit. The check digit is then appended to the end of the number. Not only does the check digit guard against intentional fraud, but it also detects human error, like transposing two digits. This process is also used with most state driver's licenses and with airline tickets.

**More information:**

*Contemporary Abstract Algebra*, Joseph A. Gallian, 1998.



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