USPS money order number

The US Postal office uses an identification number for postal orders. It's an 11 digit number and the last number is the check digit as we have seen in other cases.

Calculation of the check digit

To calculate the check digit, add up the first 10 digits and the sum is divided by 9. The remainder is the check digit. Let's calculate the check digit for **84310325021**. Check digit => 8+4+2+1+0+3+2+5+0+2+1 => 28 mod 9 => 1. Hence 1 is the check digit.

International Standard Book Number (ISBN)

This is a unique number created by Gordon Foster in 1961. The 10 digit format was developed by ISO (International Organization for Standardization). An ISBN is assigned to each edition of a book.

- 10 digit is assigned before Jan 1, 2007 and 13 digits is assigned after that.
- Three parts:

1. the group identifier
2. the publisher code
3. the item number (title of the book).

- Separated by spaces or hyphen.
- Group Identifier: 1-5 digits (country, language).
- The Publisher code: The national ISBN agency assigns the publisher number.
- The publisher selects the item number.

Example: 9971-5-0210-0, 0-943396-04-2, 0-85131-041-9

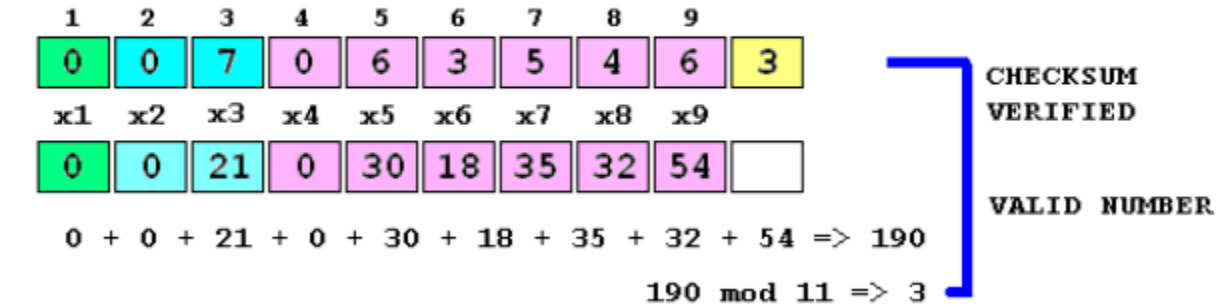
Calculation of the check digit

- **ISBN check digit (10 digits) - mod11 algorithm**

The last digit in an ISBN is the check digit, must range from 0 to 10. The ISBN uses a weighted system of checking. Each digit from left to right is assigned a weight from ten to one. Each digit is multiplied by its position weight and the resulting numbers are summed.

Let's calculate the check digit for **0-07-063546-3**.

Hence 3 is the check digit. Here is an illustration.

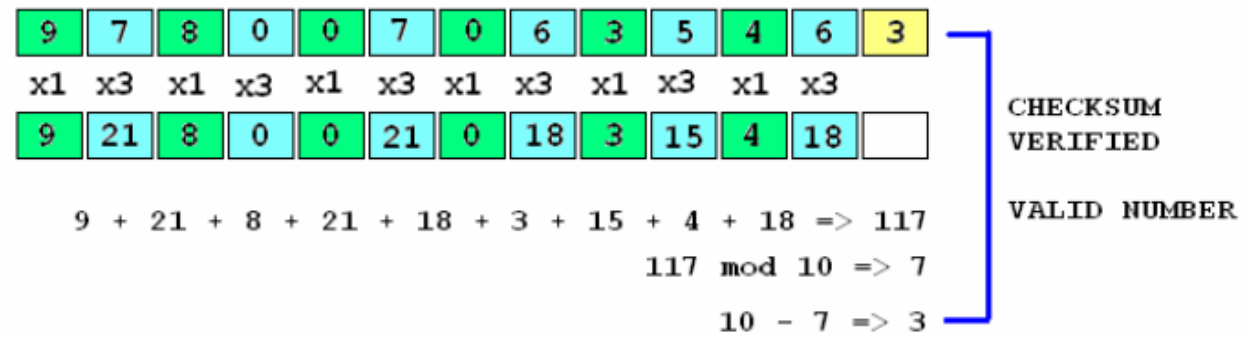


- **ISBN check digit (13 digits)**

Each digit, starting from the left to right, is multiplied by 1 or 3 alternatively. The sum of the products modulo 10 gives us either zero or a number between 1 to 9. Subtract the number from 10 and it gives us the checksum.

Hence 3 is the check digit.

Here is an illustration:



ISSN (International Standard Serial Number)

An ISSN is a unique eight number used to identify a print or electronic periodical publication. The code format is divided by a hyphen into a four digit number. The last number is the check digit as in the other codes that we have covered.

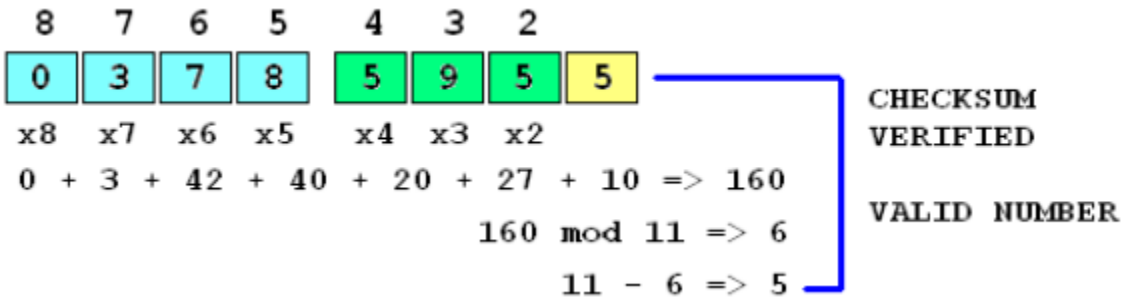
Calculation of the check digit

Starting from the left, each digit is multiplied by its position in the number. Add those numbers and the sum is divided by 11 (mod11). If the remainder is not zero, then the remainder is subtracted from 11 and that gives us the check digit. So for example, this number – **0378-5955**.

Leave out the last digit because we want to verify this digit: 0x8 + 3x7 + 7x6 + 8x5 + 5x4 + 9x3 + 5x2 = >160 % 11 = 6.

Now because the remainder is a non-zero digit, we will subtract it from 11 to get the check digit, so 11 - 6 => 5. Hence the check digit is 5.

Here is an illustration:



UPC and EAN

The UPC (Universal Product Code) is a barcode symbol and is used to track trade items in stores. The most common form of UPC is the UPC-A which consists of 12 digits which is unique for a trade item. It consists of a strip of black and

white spaces which can be scanned. The area that can be scanned in a UPC-A follows this pattern:

SLLLLLLLMRRRRRRE
Here S -> Start, M -> Middle and E -> End
L -> Left and R -> Right make the barcode unique. The last digit in the barcode is the check digit.

Calculation and Verification of the check digit

Verification: To verify the number, we can use this formula:

[3.d1 + 1.d2 + 3.d3 + 1.d4 + 3.d5 + 1.d6 + 3.d7 + 1.d8 + 3.d9 + 1.d10 + 3.d11 + 1.d12] mod10 = 0`````

Here d1, d2, d3...etc. are the digits. Starting from the left, we multiply the digits with 3 and 1 alternatively.

Example: 036000 291452

3x0 + 1x3 + 3x6 + 1x0 + 3x0 + 1x0 + 3x2 + 1x9 + 3x1 + 1x4 + 3x5 + 1x2
=> 0+3+18+0+0+0+9+3+4+15+2 => 60 => 60mod10 => 0.

Hence the number is verified:

Calculation: To calculate the check digit, we use the same formula but subtract the remainder from 10 to get the check digit.

Example: 036000 29145?

3x0 + 1x3 + 3x6 + 1x0 + 3x0 + 1x0 + 3x2 + 1x9 + 3x1 + 1x4 + 3x5 + x
=> 0+3+18+0+0+0+9+3+4+15+x => 58 => 58 mod10 => 8

10 - 8 => 2

Hence 2 is the check digit.

EAN

The EAN-13 (European Article Number) is a 13 digit barcode which is a superset of the UPC (12 digits), and is used worldwide for marking products sold at retail points of sale (POS). EAN also indicates the country in which the company who sells the product is based in.

Calculation of the check digit

Verification: To verify the number, multiply the digits with 1 or 3 with respect to the position they have in the digits, starting from the left.

Example: 8 901526 206056

1x8 + 3x9 + 1x0 + 3x1 + 1x5 + 3x2 + 1x6 + 3x2 + 1x0 + 3x6 + 1x0 + 3x5+ 1x6 => 8 + 27 + 3 + 5 + 6 + 6 + 6 + 18 + 15 + 6 => 100 mod10 => 0. Hence number is verified

Calculation: We use the same method as above, however we will omit the last digit from the calculation because that is the digit we want to find. Here if the remainder is a non-zero number then it is subtracted from 10.

Example: 8 901526 206056

1x8 + 3x9 + 1x0 + 3x1 + 1x5 + 3x2 + 1x6 + 3x2 + 1x0 + 3x6 + 1x0 + 3x5 => 8 + 27 + 3 + 5 + 6 + 6 + 6 + 18 + 15 => 94 mod10 => 6. 10 - 4 = > 6.

Hence 6 is the check digit.

REF:

[1] "Data Compression: The Complete Reference", by David Salomon, Fourth Edition, 2007, Springer.

[2] "Fundamentals of Multimedia", by: Li and Drew, 2004, Prentic Hall.

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