Chapter 16: Identification Numbers

Section 16.1 Check Digits (Universal Product Code - UPC)

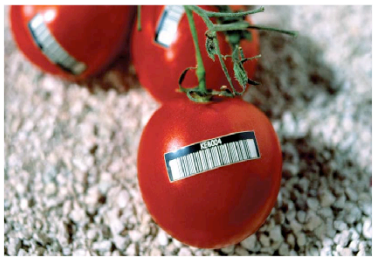
James Baglama
Department of Mathematics
University of Rhode Island

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.

2

- Universal Product Code (UPC)
  - A bar code and identification number that are used on most retail items.
  - By using weighted schemes in the calculation of the check digit, the UPC code can achieve greater error detection—up to 100% of all single -digit errors and most other types of errors.



  - Example: Consider the number 0 38000 00127 7 found on the bottom of a box of cornflakes.
    - The first digit identifies a broad category of goods.
    - The next five digits identify the manufacturer.
    - The next five digits identify the product.
    - The last is a check digit.

3

Example Universal Product Code (UPC)

The scheme used on grocery products is the so-called *Universal Product Code*.

The UPC adds a check digit at the end by adding the digits and multiplying by their weight (alternately 1 for even positions, 3 for odd positions). The sum must be a number ending in 0.

Example: an UPC number **0 38000 00127 7** ← Check digit

Category of goods | Manufacturer | product

(0+8+0+0+1+7)*3+(3+0+0+0+2+7)*1=60

The sum is a number ending in 0.

Example:
Determine the check digit that should be appended to the UPC code 0-10010-34500.

Example:
Determine the check digit that should be appended to the UPC code 0-10010-34500.

Solution:
Add the digits in the odd-numbered positions (0+0+1+3+5+0 = 9) and multiply by 3 (9 x 3 = 27).

Now add the remaining digits (1+0+0+4+0 = 5) and add this total to the 27 calculated earlier (5 + 27 = 32). Since this number must end in zero, we add 8 because 32 + 8 = 40. The check digit is then 8.

Try the example without reading the answer first.