Chapter 16: Identification Numbers

Section 16.1 Check Digits
(Bank Checks and Codabar)

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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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■ Bank Identification Number
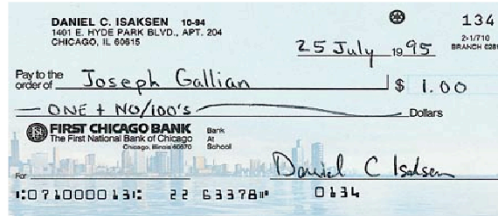　❑ Here is what the string of numbers at the bottom of a check mean:

0710 Bank's Federal Reserve District, office, and state or special collection arrangement

0001 Bank's ID number

3 Check digit (error detection)

22 633 78 Checking account number

0134 Customer's check number

The First Chicago Bank has the routing number 07100001 3 on the bottom of all its checks. Scheme uses the multipliers 7 - 3 - 9 (without the check digit) on the first 8 digits.

7 (digit 1) + 3(digit 2) + 9(digit 3) +7(digit 4)+3(digit 5)+9(digit 6)+7(digit 7)+3(digit 8)

The check digit 3 is the last digit of the sum:
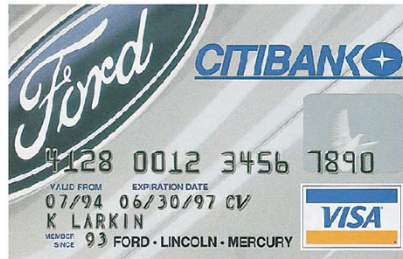
$(7) \cdot 0 + (3) \cdot 7 + (9) \cdot 1 + (7) \cdot 0 + (3) \cdot 0 + (9) \cdot 0 + (7) \cdot 0 + (3) \cdot 1 = 33.$

Check Digit

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- **Codabar**
  - ❑ An error-detection method used by all major credit-card companies, many libraries, etc.
  - ❑ After the bank issues a card number, it adds an extra digit for error detection created by certain math calculations using a check digit scheme. This makes it difficult to create phony credit cards!
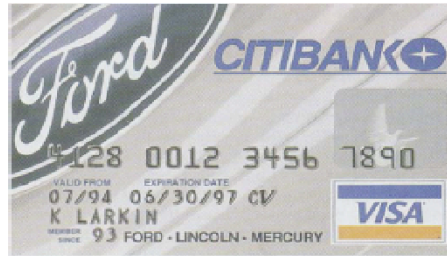

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One of the most efficient error-detection methods: **Codabar**

The Codabar system is a variation of UPC using a similar sum with weights 2 (odd positions) and 1 (even positions). To this sum, <u>add the number of digits in odd positions that exceed 4</u>; The resulting number must end in 0 to be a valid Codabar code.

$(4+2+0+1+3+5+7+9)*2$
$+(1+8+0+2+4+6+8)*1$
$+3=94$

which does not end in 0, so This credit card is not valid.

Position number: 1 2   3   4   5   6   7 8   9 10 11 12   13 14 15 16
Card #: 4 1   2   8 - 0   0 1   2 - 3   4   5   6 - 7   8   9 0

Example:

Determine the check digit that should be appended
to the Codabar number 3125-8001-6535-003#.

Example:

Determine the check digit that should be appended to the Codabar number 312580016535003.

Solution:

Position number: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Card #: 3 1 2 5 8 0 0 1 6 5 3 5 0 0 3 ?

Odd Positions: $2*(3 + 2 + 8 + 0 + 6 + 3 + 0 + 3) = 50$

Even Positions: $(1 + 5 + 0 + 1 + 5 + 5 + 0 + ?) = 17$

Add even and values to get 67. Now add in the number of values in the odd positions that exceed four = 2. $(67 + 2 = 69)$. The calculated sum is 69. When 1 is added to 69, the result is 70, which ends in zero. The check digit is then 1.

Try the example without reading the answer first.