

**STA Online Computer Programming Contest (DWITE)**  
**January 2003**

**Problem 2**

**SIN Check Digit**

In Canada, each person is uniquely identified by the Government with a **Social Insurance Number (SIN)**. The original purpose for the SIN was to deal with claims for Old Age Security, Unemployment Insurance and Canada Pension Plan. More recently the SIN is used for

- \$ Income Tax identification
- \$ Canada Student Loan applications
- \$ Banks and other financial institutions that sell investments, use a person's SIN to declare interest generated by the investment
- \$ Benefit programs established by Veteran Affairs
- \$ Employers use a person's SIN number to make contributions to UI, CPP, etc.

A Social Insurance Number consists of nine digits. The first eight digits are *assigned digits* and the last digit is a *check digit*. A person can determine the check digit of a Social Insurance Number by doing the following: (using an example SIN of: **130692544**)

**Step 1:** Multiply every **assigned digit** in an even position by 2.

$$3 * 2 = 6$$

$$6 * 2 = 12$$

$$2 * 2 = 4$$

$$4 * 2 = 8$$

**Step 2:** Add all of the digits of the products obtained in Step 1.

$$6 + 1 + 2 + 4 + 8 = 21$$

**Step 3:** Add together all of the **assigned digits** that were not multiplied by 2 (i.e. the digits in the first four odd positions).

$$1 + 0 + 9 + 5 = 15$$

**Step 4:** Add together the results from Step 2 and Step 3.

$$21 + 15 = 36$$

**Step 5:** Subtract the sum in Step 4 from the next highest multiple of 10 that will produce a single digit. This is the check digit.

$$40 - 36 = 4 \text{ [check digit]}$$

The input file (DATA2) will contain five lines of data. Each line will contain a nine digit SIN.

The output file (OUT2) will contain five lines of data, corresponding to the input file. Each output line will contain either:

- the word **VALID**, if the SIN has a valid check digit

**or**

- the word **INVALID** followed by a hyphen and the **correct** check digit, if the SIN does not have a valid check digit.

**The words **VALID** and **INVALID** must be upper-case!**

**Sample Input (Only three lines given)**

123456789  
432123123  
130692544

**Sample Output**

INVALID-2  
VALID  
VALID