# Problem B : MDST- machine

inputfile: input.B
outputfile: output.B

## Description

The object, later known as the MDST-machine, was discovered in 1991 nearby West-Knollendam. The object was made of an unknown metal. The surface was solid, smooth and seamless. All the attempts to open the object failed miserably.

On the outside only a couple of buttons and windows were visible. The button to activate the object could be recognised easily, but it didn't seem wise to activate the object without knowing its functionality. A special council, initiated by the United Nations, decided to activate the object in a specially secured environment.

D-day. The whole world watched what would happen. After a long countdown finally the object was activated... Nothing seemed to happen. No sound could be heard. Suddenly two displays lightened. The first display could be used to enter series of operations. The second display could display 9-digit numbers.

In the years that followed scientists worked hard to discover its functionality. The object appeared to be capable of manipulating numbers. For that purpose four operations exist.
These operations are:

- `mul2` (abbrev. `M`): Multiplies a given number by two
  e.g. mul2 3051 = 6102
- `div2` (abbrev `D`): Divides a given number by two
  e.g. div2 3051 = 1525
- `sort` (abbrev. `S`): Sorts the digits of a number in ascending order. Leading zeros disappear.
  e.g. sort 3051 = 135
- `tros` (abbrev. `T`): Sorts the digits of a number in descending order (opposite of sort)
  e.g. tros 3051 = 5310

Series of operations can be entered, which are successively applied to a given number. The series is processed from left to right.
e.g. MSDT 3051 = SDT 6102 = DT 126 = T 63 = 63

The functionality of the object was revealed. Still it wasn't clear for whatever purpose the object was used and by whom.
In a small cave in Peru inscriptions were found which might lead to the final answer. These inscriptions form a special number-magic. For several numbers a series of operations was given which finally lead to the number 1.

The next relations are found:

- A given representation is the shortest representation possible
- If there is more than one 'shortest' representation, the alphabetically shortest representation is given
- Only the second display is used to display the resulting numbers. So after any operation the resulting number cannot be larger than 9 digits. If an operation results in a number larger than these 9 digits, the first part of this number is ignored and only the last 9 digits are used for further operations.

# Problem

Given a number $n$ *(1 ≤ n < 20000)* calculate the smallest series of operations leading to 1. If more than one series is applicable, the alphabetically smallest has to be chosen.

# Input

The input file start with a line containing the number of tests $t$ in the inputfile, followed by $t$ lines, each containing a single number, of which the smallest series leading to 1 has to be calculated.

# Output

For each corresponding test in the input file a single line is produced, containing the smallest series leading to 1. If more than one series is applicable, the alphabetically smallest is given.

# Example

### Sample input

```
7
7
25
30
51
100
137
537
```

### Correct output for the sample input

```
DD
MMS
SD
DMMS
S
DDTDDS
TMMSDDSD
```