

Problem 6: Calculate Check Digit

15 minutes, 150 points

Filename: prob06 (e.g. *prob06.c*, *prob06.cpp*, *prob06.java*, *prob06.py2*, *prob06.py3*)

Description

Every bank is assigned a 9-digit routing number (8 digits followed by a check digit). Given the first 8 digits (e.g. 01234567), calculate the check digit and output the 9-digit routing number.

Step 1: $(d_1 \times 3) + (d_2 \times 7) + (d_3 \times 1) + (d_4 \times 3) + (d_5 \times 7) + (d_6 \times 1) + (d_7 \times 3) + (d_8 \times 7) = \text{Total}$

Example: $(0 \times 3) + (1 \times 7) + (2 \times 1) + (3 \times 3) + (4 \times 7) + (5 \times 1) + (6 \times 3) + (7 \times 7) = 118$

Step 2: Using the Total (118), take the next highest number that is evenly divisible by 10 and subtract the total from this to produce the proper checksum digit ($120 - 118 = 2$ in this case). If the total is already an even multiple of ten, say 110, the checksum would simply be zero.

The first line of input will include a single integer that indicates how many additional lines of input need to be read. Each additional line of input will contain an 8 digit integer.

The output should contain the 9 digit integer. Be sure to pad the beginning of the number with zeroes as necessary.

Sample Input

```
3
01234567
11111111
50505050
```

Sample Output

```
012345672
111111118
505050500
```

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An ABA routing transit number (ABA RTN) is a 9-digit code which appears on the bottom of US cheques to identify the financial institution on which it was drawn. The ABA RTN was originally designed by the American Bankers Association in 1910 to facilitate the sorting, bundling, and shipment of paper cheques back to the check writer's account. The system has been expanded to accommodate ACH and Wire payment methods.

To verify a routing number, the following condition must hold (where d_n represents a digit):

$$3(d_1 + d_4 + d_7) + 7(d_2 + d_5 + d_8) + 1(d_3 + d_6 + d_9) \bmod 10 = 0$$

The ABA RTN is necessary for the Federal Reserve Banks to process Fedwire funds transfers, and by Automated Clearing House to process direct deposits, bill payments, and other transfers.

https://en.wikipedia.org/wiki/Routing_transit_number

<http://www.brainjar.com/js/validation/>

Prepared by Jason Klein. Adapted from CodeWars and St. Bonaventure University

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