

## CS1020E | PE 1 | Problem 1 (50 marks)

### Matriculation Numbers

#### Problem Description

Not too long ago, there were two types of *Student NUSNET ID* being used in NUS. One type is in the form **u***ddddddd*, and the other is in the form **a***ddddddd*, where each *d* is a numeric digit. Each ID is mapped to a corresponding *matriculation number*. For example, the ID **u0901234** is mapped to the matriculation number **U091234H**; and the ID **a0123456** is mapped to the matriculation number **A0123456J**.

The last alphabet letter in a matriculation number is called the *check digit*, and it is computed from the numeric digits in the matriculation number.

There are two types of IDs and matriculation numbers — **U-prefixed** and **A-prefixed**:

- To convert a U-prefixed ID to a matriculation number, the “u” prefix is converted to a “U”, the third numeric digit (counting from left) is discarded, and the remaining numeric digits are used to compute a check digit.
- To convert an A-prefixed ID to a matriculation number, the “a” prefix is converted to an “A”, and the numeric digits are used to compute a check digit.

The check digit is computed as follows. Let  $d_1$  to  $d_6$  (for U-prefixed) or  $d_1$  to  $d_7$  (for A-prefixed) be the numeric digits (from left to right) in the matriculation number. Compute the weighted sum  $s = w_1 \times d_1 + \dots + w_6 \times d_6$  or  $s = w_1 \times d_1 + \dots + w_7 \times d_7$  using the following weights:

Prefix	$w_1$	$w_2$	$w_3$	$w_4$	$w_5$	$w_6$	$w_7$
U	0	1	3	1	2	7	
A	1	1	1	1	1	1	1

Finally, from the following table, find the check digit that corresponds to the remainder of the weighted sum  $s$  divided by 13 ( $s$  modulo 13).

Remainder	0	1	2	3	4	5	6	7	8	9	10	11	12
Check Digit	Y	X	W	U	R	N	M	L	J	H	E	A	B

You are required to complete a C++ program that takes in a Student NUSNET ID and produces its corresponding matriculation number.

**Add your code only to the parts of the files indicated. Do not modify any other part of the given code, and do not add new file, remove file or rename any file.**

**Fill in your particulars (name, NUSNET ID, plab userID) at the beginning of every file.**

## Input

The input is a single line that contains a valid Student NUSNET ID.

## Output

The output is a single line that contains the matriculation number that corresponds to the input Student NUSNET ID. Note that a newline character is output at the end of the line.

### Sample Input 1

u0703982

### Sample Output 1

U073982U

### Sample Input 2

a0375210

### Sample Output 2

A0375210N

## Skeleton Code

```
#include <iostream>
#include <string>
using namespace std;

// Converts the input digit character to integer value.
// For example, digit_char_to_int('5') returns the integer value 5.

int digit_char_to_int( char digit )
{
    return digit - '0';
}

// Converts the input NUSNET ID to the matric number without
// the check digit.
// For example, given the input "u0901234", it returns "U091234".

string id_to_partial_matric( string id )
{
    // Write your code here.
}
```

```

// Given an input matric number without check digit, computes and
// returns the weighted sum of the numeric digits of the matric number.

int compute_weighted_sum( string partial_matric )
{
    const int U_digit_weights[6] = {0, 1, 3, 1, 2, 7};
    const int A_digit_weights[7] = {1, 1, 1, 1, 1, 1, 1};

    // Write your code here.

}

// Given an input matric number without check digit, computes and
// returns the check digit for the matric number.

char find_check_digit( string partial_matric )
{
    const char check_digits[13] = {'Y', 'X', 'W', 'U', 'R', 'N', 'M',
                                    'L', 'J', 'H', 'E', 'A', 'B'};

    // Write your code here.

}

// Given a valid Student NUSNET ID, computes and returns the
// corresponding matric number.

string id_to_matric( string id )
{
    // Write your code here.

}

int main()
{
    string nusnet_id;
    cin >> nusnet_id;
    cout << id_to_matric( nusnet_id ) << endl;
    return 0;
}

```

## Submission

Just leave your completed program file in the **skeleton/** directory. There is no need to submit it to CodeCrunch.