# ESc101N: Fundamentals of computing(Lab Session 3)

August 19, 2009

**Instructions**

1. Please read the question carefully and write the program accordingly
2. Make sure that the TA has graded you program
3. The marks are distributed as follows. You get 60% of the marks if the basic algorithm is current, 20% if you manage to compile and execute and 20% for writing the code cleanly, i.e. using proper variable names, intending and making the code more readable.

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**Question 1**. Write a function `int sumdigit(int)` that calculates the sum of digits of an input integer. Using write a function to check whether a given number is "magical".

A number is magical if repeated adding of its digit gives 1. example 19 is magical as 1 + 9 = 10, 1 + 0 = 1 hence magical. So is 991 as $9 + 9 + 1 = 19$, $1 + 9 = 10$, $1 + 0 = 1$. However 224 is not.

(a) (5 marks) Write an iterative function `int isMagical(int)` to check whether the the number is magical.

(b) (5 marks) Write a recursive function `int isMagicalRec(int)` also to check whether the number is magical.

Hint: A number is magical if it is 1 or its digits add up to a magical number. It is slightly tricky to show that this procedure terminates.

The sample output is given below

```
$ ./a.out
enter the number: 334
Iterative:334 is magical
Recursive:334 is magical

$
$ ./a.out
enter the number: 224
Iterative:224 is not magical
Recursive:224 is not magical
$
```

**Question 2**. (0 marks) This question is for those who have completed the Question 1. There are no marks for this question, however it illustrates how to compile functions seperately.

Try out separate compilation that was discussed in the class on monday. Write the definitions of functions `int isMagical(int)`, `int isMagicalRec(int)` and the main function `int main(void)` in files `isMagical.c`, `isMagicalRec.c` and `main.c` respectively. Compile/Debug them separately and link them together to obtain the executable.