Computer Programming
Assignment 2
Deadline:

1. Cody loves the number 1. Let P(n) denote a number consisting of sequence of 'n' 1s. Now, he wants to compute S(n) which is the sum of the digits of P(n)'s square. For n = 3, P(n) = 111 and S(n) = 9 as the square of P(n) is 12321. Given ‘n’ you have to find S(n).

   The first line contains ‘T’ the number of test cases, the next ‘T’ lines contain an integer ‘n’. For each ‘n’, print S(n).

   Given: $1 \le n \le 10^{18}$, $1 \le T \le 10^5$

   Sample Input:
   3
   5
   9
   10

   Sample Output:
   25
   81
   82

2. A number N is called half-prime if it has the following properties. It is odd and has distinct prime factors, say $N = p_1 * p_2 * \dots * p_k$ with $p_i \neq p_j$, where the number of factors k is at least 3. Moreover, for all i = 1..k, $(p_i - 1)$ divides (N - 1). For instance, 561 = 3 * 11 * 17 is a half-prime.

   The input contains a number N, print ‘Yes’ if it is half-prime, else print ‘No’.

   Given: $1 \le N < 2^{31}$

   Sample Input:
   561

   Sample Output:
   Yes

3. To play a perfect prank on their friend Fred, Zack and Cody need to find a perfect number. A perfect number is a positive integer that is equal to the sum of its proper positive divisors, that is, the sum of its positive divisors excluding the number itself. For example 6 is a perfect number as 1 + 2 + 3 = 6.

   First line of input contains T, the number of test cases. Next T lines contain a number N. For every N you have to output the sum of its proper positive divisors, In the next line, print 'Yes' if it is a perfect number, else print 'No'.

   Given: $1 \leq N \leq 2^{63}$, $1 \leq T \leq 10^5$

   Sample Input:
   2
   6
   15

   Sample Output:
   6
   Yes
   9
   No

4. Zack and Cody are quite notorious amongst their friends. They often play pranks on their friends. To keep the communication regarding prank a secret, they encode their messages to each other.

   Each of their messages is a sequence of alphabets. When Zack wants to send a message to Cody, he chooses two numbers: n and x. For the first n alphabets of the message, he shifts the character FORWARD by x and takes the ASCII equivalent of it. For the next n characters, he shifts the character BACKWARDS by x and takes the ASCII equivalent of it. They both agree to consider the alphabets to be circular. They both also agree to append a -1 to denote the end of message after encoding.

   For example:
   n = 3
   x = 10
   Input message: AttacK
   After shifting: KddqsA
   After converting to ASCII: 75 100 100 113 115 65
   Encoded message: 75 100 100 113 115 65 -1

Carol, is a friend of Zack and Cody. She got her hands on some of their messages and is having hard time decoding them. Help her decode them.

INPUT: The first lines contains number of encoded messages Carol found - an integer T. Each of this message has two lines. The first line has integers n and x. The next line has the encoded message i.e. a series of integers in [65,90] U [97,122], ending with a -1.

OUTPUT: For all the t messages, print in a new line the decoded message.

Given: $1 \leq n < 10^6$, $1 \leq x \leq 10^5$, $1 \leq T \leq 10^4$

Sample Input:
2
2 3
99 114 108 106 108 113 107 108 122 -1
3 1
68 80 77 75 90 79 84 70 -1

Sample Output:
zoominnow
COLLAPSE

5. Given an integer N, check if it is a palindrome or not. If it is not a palindrome, print NO. If it is a palindrome, print YES. If it is an even palindrome, print the ratio of first half of first half to second half, upto the precision of 2 decimal places. In cases where such a division results in an error print 0.00. If it is an odd palindrome, print the sum of the digits.

Given: $0 \leq N \leq 10^{15}$

Sample Input:
1234321
89088098
780

Sample Output:
YES
16
YES
1.10

NO

6. A sequence is called a Martin sequence if any term a_n ($n > 3$) of the sequence is of the following form: $a_n = a_{n-1} + a_{n-2} + a_{n-3}$. Given the first three numbers of the sequence, you have to find the n^{th} term.

   The input contains the number of test cases T followed by T lines containing 4 numbers, a_1, a_2, a_3 and n. You have to output a_n for every test case.

   Given: $1 \le n \le 10^6$, $-10^{15} \le a_i \le 10^{15}$

   Sample Input:
   2
   2 3 5 5
   6 14 -1 8

   Sample Output:
   18
   183