SHEET 3: NUMBERS
TECHNICAL CEC, GEHU

1. Given a number n, the task is to find n^{th} Ugly number. Ugly numbers are numbers whose only prime factors are 2, 3 or 5. The sequence 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, … shows the first 11 ugly numbers. By convention, 1 is included.

2. Given a number, the task is to check if it is Kaprekar number or not. A Kaprekar number is a number whose square when divided into two parts and such that sum of parts is equal to the original number and none of the parts has value 0.
Ex: 45 is Kaprekar
13 is not Kaprekar

3. Given a number in base 10, our task is to check if it is a Harshad Number or not. An integer number in base 10 which is divisible by the sum of its digits is said to be a Harshad Number.
Ex: 171 is Harshad
353 is not Harshad

4. Given a number N, the task is to check whether the number is an Automorphic number or not. A number is called an Automorphic number if and only if its square ends in the same digits as the number itself.
Ex: 25,76 are Automorphic
7 is not automorphic

5. Given a positive integer n, the task is print all Mersenne Primes smaller than 'n'. Mersenne Prime is a prime number that is one less than a power of two. In other words, any prime is Mersenne Prime if it is of the form 2^k-1 where k is an integer greater than or equal to 2. First few Mersenne Primes are 3, 7, 31 and 127.

6. Given a number n, the task is to find if a given number is Lychrel number or not with a given limit on the number of iterations. Lychrel Number is a natural number that cannot form a palindrome through the iterative process of repeatedly reversing its digits and adding the resulting numbers. (The process is also called the 196-algorithm).
Ex: 196…a lyrchel number
56…..not a lyrchel number
Explanation : 56 becomes palindromic after one iteration :
56 + 65 = 121

7. Write a program in Java to check two numbers are Amicable numbers or not. Amicable numbers are two different numbers so related that the sum of the proper divisors of each is equal to the other number. (A proper divisor of a number is a positive factor of that number other than the number itself).
Ex: 220 and 284…are amicable numbers
1 and 2….are not amicable numbers

8. Given a number n, the task is to check whether the number is circular prime or not. A prime number is said to be a circular prime if after any cyclic permutations of the digits, it remains a prime.
Ex: 113…Yes, Circular Prime
Explanation: All cyclic permutations of 113 (311 and 131) are prime.

9. The task is to find if a given number 'x' is Keith Number or not. A 'n' digit number x is called Keith number if it appears in a special sequence (defined below) generated using its digits. The special sequence has first n terms as digits of x and other terms are recursively evaluated as sum of previous n terms.

Ex: x = 197….is Keith Number
197 has 3 digits, so n = 3
The number is Keith because it appears in the special sequence that has first three terms as 1, 9, 7 and remaining terms evaluated using sum of previous 3 terms.
1, 9, 7, 17, 33, 57, 107, 197, ...
x = 12…. Is not Keith Number
The number is not Keith because it doesn't appear in the special sequence generated using its digits.
1, 2, 3, 5, 8, 13, 21, ...

10. Given an integer n, the task is to check and print Pronic Numbers in a range. Pronic number is a number which is the product of two consecutive integers, that is, a number n is a product of x and (x+1).
Input :56….is a Pronic Number
Explanation: 56 = 7 * 8 i.e 56 is a product
of two consecutive integers 7 and 8.

Input : 8…is not a Pronic Number
Explanation: 8 = 2 * 4 i.e 8 is a product of
2 and 4 which are not consecutive integers.

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