**Assignment Questions for Practice**

1. Given an integer **N**. write a program to find the number in the range from **1** to **N-1** which is having the maximum number of terms in its [Collatz Sequence](https://en.wikipedia.org/wiki/Collatz_conjecture" \t "_blank) and the number of terms in the sequence.

For example when **N = 13**:  
13 -> 40 -> 20 -> 10 -> 5 > 16 -> 8 -> 4 -> 2 -> 1

1. Write a program to count the occurrence of a particular digit in a given number.

For example,if n=12311 and in which we want to find occurrence of 1 - The occurrence of 1 will be 3 in number 12311.

1. In mathematics, a Kaprekar number is a nonnegative integer whose square can be split into two equal parts that add up to the original number again. For instance, 45 is a Kaprekar number, because 452 = 2025 and 20+25 = 45. Write a program to find all Kaprekar numbers within a given range.
2. Write a program to Check Whether a Number can be Express as Sum of Two Prime Numbers.   
   If n=16  
   Expected Output :  
   16 = 3 + 13  
   16 = 5 + 11
3. Write a program to convert a decimal number to a binary number and count length and number of 1’s in the binary number.

For Example, if n=12

Binary Number is 1100

Length is 4

No. of 1’s is 2

1. Write a program to print the sum of the following series.

1/2 + 1/3 + 2/5 + 3/7 + 5/11 + 8/13 + 13/17+ 21/19 + .......... up to nth term . Use the separate functions to find the numerator and denominator of each term.

1. Write a function power(a,b) , to calculate the value of a raised to b.
2. Consider the following process which can be applied to any positive integer: if the integer is odd multiply it by three and add one. If the integer is even divide it by 2. This process is repeated until integer remaining is 1. Ex. The following sequence is 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2, 1 stop the process when 1 occurs. Write a function to determine how many steps are required to complete this process. Use functions.
3. Write a function that simulates coin tossing. For each toss of the coin , the program should print heads or tails. Let the program toss the coin 100 times and count the number of times each side of the coin appears. Print the results. The program should call a separate function flip() that takes no arguments and returns 0 for tails and 1 for heads.
4. Write a program that converts from 24-hour notation to 12-hour notation. For example, it should convert 14:25 to 2:25PM.The input is given as two integers. There should be at least three functions, one for input, one to do the conversion and one for output. Record the AM/PM information as a value of type char, ‘A’ for AM and char ‘P’ for PM. Thus the function for doing the conversions will have a call-by-reference formal parameter of type char to record whether it is AM or PM.
5. Write a function to perform multiplication of two complex numbers. The value parameters to the function should be real1, imag1m reak2, imag2 and the reference parameters should be realpart and imagpart. The formula is (a+ib) X (c+id) = (ac-bd)+i(bc+ad)
6. Write a function to calculate nth number in the Newman-Conway sequence defined by P(1) = P(2) = 1, and for n >= 3 P(n) = P(P(n-1))+ P(n-P(n-1))
7. Given an integer array of n integers, write a program to find sum of bit differences in all pairs that can be formed from array elements. Bit difference of a pair (x, y) is count of different bits at same positions in binary representations of x and y. For example, bit difference for 2 and 7 is 2. Binary representation of 2 is 010 and 7 is 111 (first and last bits differ in two numbers).
8. Write a program that reads in an array of type int. You may assume that there are fewer than 50 entries in the array. Your program determines how many entries are used. The output is to be a two-column list. The first column is a list of the distinct array elements; the second column is the count of the number of occurrences of each element. The list should be sorted on entries in the first column, largest to smallest. For the array values

–12 3 –12 4 1 1 –12 1 –1 1 2 3 4 2 3 –12

The output should be

N Count

4 2

3 3

2 2

1 4

-1 1

-12 4

1. A square matrix is a matrix with the same number of rows and columns. Write a program to find the sum of diagonal elements of a square matrix A of size *n x n*.

# A maze can be represented by a two dimensional Boolean array in which true elements represents walls and false one represents hall-ways. For Example write a program to move a mice through a maze so represented.

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|  |  |  |  |  |

1. Implement your own string library functions : (i) strcpy (ii) strncpy (iii) strcmp (iv) strncmp (v) strlen (vi) strnlen (vii) strcat (viii) strncat (ix) atoi (x) itoa
2. Assuming that a text file named FIRST.TXT contains some text written into it, write a function named vowel words(), that reads the file FIRST.TXT and creates a new file named SECOND.TXT, to contain only those words from the file FIRST.TXT which start with a lowercase vowel (i.e., with 'a', 'e', 'i', 'o', 'u'). For example, if the file FIRST.TXT contains “Carry umbrella and overcoat when it rains”.Then the file SECOND.TXT shall contain “umbrella and overcoat it”.
3. Write a program to create a structure called BankDeposit. Structure members are amt (amount to deposit in bank), tenure (No. of years deposit to be maintained). Create another structure called Dates, structure members are int date, int month, int year. Enter DOB of person, Date of deposit using Dates structure variables. Calculate present age of the person. If the person is senior citizen (age >=60 yrs) then rate of interest is 9% else 8%. Calculate the total amount that person receives after date of maturity (date of deposit+ tenure).