Techno India University,W.B.
Department of Computer Applications
Subject:-Tools and Techniques of Programming using Python
ASSIGNMENT-3
Topic:Iteration Logic in Python

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Develop Python scripts to solve following problems:

1. To obtain the sum of the first n natural numbers for some given n without using any formula.
2. To obtain all the whole numbers which are divisible by some given p but not by some other given q.
3. To generate a table of any given number n.
4. To obtain all the groups of three successive numbers within 1000 that have the property that the square of the middle one is greater by unity than the product of the other two numbers. For example, 18^2 =17*19+1
5. To find out the series of five consecutive numbers within 1000,for which the sum of the squares of the first three is equal to the sum of the squares of the last two. For example, $(-2)^2+(-1)^2+0^2 = 1^2+2^2$
6. To find out Pythagorean numbers x, y, z within 100 such that $z^2 = x^2 + y^2$.
7. To print the value of a given amount of currency value in words.
8. To obtain the sum of the following series for some given values of x and n:

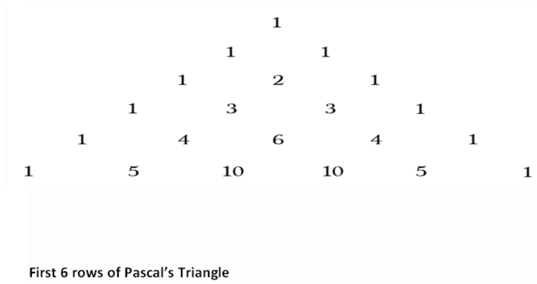

Figure 1: **First Six rows of Pascal's Triangle**

(a) x - $x^3/3 + x^5/5 - x^7/7 \pm \cdots$ ...... up to n terms.

(b) $x^2/2 - x^4/4 + x^6/6 \pm \cdots$........ up to n terms

(c) $x^1/1! - x^3/3! + x^5/5! \pm \cdots$........ up to n terms

(d) $x^2/2! - x^4/4! + x^6/6! \pm \cdots$........ up to n terms

(e) $x - \frac{x^3}{2} + \frac{3*x^5}{2*4} - \frac{3*5*x^7}{2*4*6} \pm \cdots$ ......up to n terms

9. Twin prime numbers are primes that differ by 2(e.g. 3 and 5, 101 and 103). To find out all twin primes within 10000.

10. To find out the list of months with a Friday the 13^{th} for any given year.

11. To draw a Pascal triangle based on given number of rows

    Hints for drawing the Pascal's Triangle

    The first 6 rows of Pascal's Triangle are shown in Figure-1:

    Let us learn how to Build the Pascal's Triangle manually.

    - At the top center of a piece of paper let us write the number "1."
    - On the next row we write two 1's so that they form a triangle.
    - On each of the subsequent rows we start and end with 1's and compute each interior term by adding the two numbers above it.

    This is illustrated below:

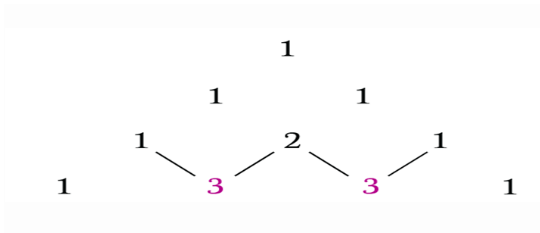

Figure 2: **Illustration of forming intermediate terms of the Pascal's Triangle**

12. A program is required which accepts two numbers then prints out a random number somewhere between those two numbers without using the built in random function.

13. A program is required which will accept a date in either long hand or short hand (e.g. either 19/7/2019 or 19^{th} July, 2019) with a view to determine if the given date is valid. e.g. 14/13/2019 is clearly not valid.

14. To determine various types of numbers as defined below within a given range:

    (a) A **Harshad number** is a number that is divisible by the sum of its own digits. For example, 1729 is a Harshad number because $1 + 7 + 2 + 9 = 19$ and $1729 = 1991$. **Harshad numbers** are also known as **Niven numbers**.

    (b) An **Abundant number** is a number that is smaller than the sum of its **aliquot parts** (Proper divisors). For example, twelve is the smallest abundant number, because, the sum of its aliquot parts is 1+2+3+4+6=16—-followed by 18, 20, 24 and 30.

    (c) A **weird number** is an abundant number that is not **semiperfect**; in other words, n is weird if the sum of its divisors is greater than n, but n is not equal to the sum of any subset of its divisors. The first few weird numbers are 70, 836, 4030, 5830, and 7192.

    (d) **Amicable numbers** are pairs of numbers, also known as friendly numbers, each of whose aliquot parts add to give the other number. (An **aliquot part** is any divisor that doesn't include the number itself).

(e) An **Automorphic number,** also known as an **automorph,** is a number n whose square ends in n. For instance 5 is automorphic, because $5^2 = 25$, which ends in 5. A number n is called **trimorphic** if n^3 ends in n. For example $49^3, = 117649$, is trimorphic. Not all trimorphic numbers are automorphic. A number n is called tri-automorphic if $3n^2$ ends in n; for example 667 is tri-automorphic because $3 \times 667^2, = 1334667$, ends in 667.

(f) A **Fermat number** is a number defined by the formula $F_n = 2^{2^n} + 1$ numbers, $F_0 = 3$, $F_1 = 5$, $F_2 = 17$, $F_3 = 257$, and $F_4 = 65{,}537$. It is required **to test whether all the Fermat numbers are prime or not**.

(g) A **Happy number** is one which ultimately generates 1 through the iterative process of summing of the squares of the digits.For example,7 $\rightarrow (7^2) \rightarrow 49 \rightarrow (4^2 + 9^2) \rightarrow 97 \rightarrow (9^2 + 7^2) \rightarrow 130 \rightarrow (1^2 + 3^2) \rightarrow 10 \rightarrow 1$. So, **7 is a Happy number**.But, 20 is not a happy number, since,
$2^2 + 0^2 =4$
$4^2 = 16$
$1^2 + 6^2 =37$
$3^2 + 7^2 =58$
$5^2 + 8^2 =89$
$8^2 + 9^2 =145$
$1^2 + 4^2 + 5^2 =40$
$4^2 + 0^2 =4$(Reappears a number obtained earlier)

(h) **A special two-digit number** is such that when the sum of its digits is added to the product of its digits, the result equals the original two-digit number. For example, for the number 59,Sum of the digits=5+9=14 and product of its digits=5*9=45 and hence total=14+45=59.

(i) WAP to accept a number and then to check whether it is a perfect square or not. If it is a perfect square then show a message for that; if not, then find out the least number to be added to the number to make the given number a perfect square. For example, if the given number is 1950, then the least number to be added to the number to make it a perfect square is determined as follows: 452 - 1950=75.

(j) A number is said to be a **Niven number** if it is divisible by the sum of its digits. For example,126 is a **Niven number**.

(k) A number is said to be a **Neon number** if the sum of the digits of the square of the number equals the number. For example, 9 is a Neon number.

(l) A number is said to be an **Automorphic number** if the number is contained in the ending digits of its square. For example, 25 is such a number because 252 =625 where 25 the original number is contained.

(m) Two numbers are said to be **co-prime** if their HCF is one.

(n) WAP to display the product of the successors of even digits of a given number.

(o) A number is said to be a **Pronic number** if it a product of two consecutive integers. Example: 12, 20, 42 etc. such numbers are also known as **Oblong numbers**.

(p) A **prime number is said to a Twisted Prime**, if the new number formed by reversing its digits is also a prime number. For example, 167 is a twisted prime because 761 is also prime.

(q) A number is said to a **Duck number** if it contains a zero.

(r) A number is said to be an **Abundant number** if the sum of its proper divisors is greater than the number itself. For example, 12 is an **abundant number**.

(s) A number is said to a **Spy number** if the sum of its digits equals the product of its digits. For example, 1124 is a Spy number.

(t) A number is said to be a **Harshad number**, if it is divisible by the sum of its digits. For example, 132 is a **Harshad number**.

(u) A number is said to be a Sunny number if the square root of its successor is a whole number.

(v) **Tribonacci numbers** are a sequence of numbers similar to **Fibonacci numbers** except that such a number is formed by adding the three preceding numbers. For example, 1, 1, 2, 4, 7,13, ...are **Tribonacci numbers**.

(w) The sum of given n terms for some given value of x(where there is x) is required for the following series:

i. 1+ (1+2) +(1+2+3) + $\cdots$ +(1+2+3+$\cdots$n)

ii. 1+(1*2) +(1*2*3)+$\cdots$+(1*2*3*$\cdots$ *n)

iii. $1 + \frac{1+2}{1*2} + \frac{1+2+3}{1*2*3} + \cdots + \frac{1+2+3+\cdots+n}{1*2*3*\cdots*n}$ ...up to n terms

(x) A number is said to be a **Multiple Harshed Number** if a **Harshed Number**, when divided by the sum of its digits, produces another **Harshed Number**. For example, 6804 is a Multiple **Harshed Number**.

(y) A number is said to be a **Magic Number** if the eventual sum of the digits of the number becomes 1. For example, 55 and 289 are magic numbers because, for 55,5+5=10, 1+0=1, similarly for 289,2+8+9=19,1+9=10,1+0=1

15. To determine various types of numbers as defined below within a given range:

(a) A right-angled triangle of consecutive natural numbers from 1 to n is called a **Floyd's triangle**.

(b) A **hyperfactorial number** is a number such as 108, which is equal to $3^3 \times 2^2 \times 1^1$. In general, the n^{th} **hyperfactorial H(n) is given by:** H(n) = $n^n(n-1)^{(n-1)}\cdots 3^3 2^2 1^1$

(c) A **Kaprekar number** of d digits is defined as a number the square of which if separated into two parts of d and d / (d-1) digits depending on the availability of digits, can regenerate the number by the sum of the two parts. For example: 9 is a Kaprekar number; because, 9^2=81 and as 9 is a one-digit number, we separate the digits in the square in two parts each containing one digit i.e. 8 and 1. Again, 8+1=9, regenerates the number.

(d) A **vampire number** is a natural number x that can be factorized as y $\times$ z in such a way that the number of occurrences of a particular digit in the representation of x in a given base (say 10) appears the same number of times in the representations in that same base of y and z together. For example, 2187 is a vampire number since $2187 = 21 \times 87$; similarly 136948 is a vampire because $136948 = 146 \times 938$. Vampire numbers are a whimsical idea that was introduced by **Clifford Pickover** in 1995.

(e) A **sublime number** is a number such that both the sum of its divisors and the number of its divisors are perfect numbers. The smallest sublime number is 12. There are 6 divisors of 12 – 1, 2, 3, 4, 6, and 12 – the sum of which is 28. Both 6 and 28 are perfect. The second sublime number begins 60865..., ends ...91264, and has a total of 76 digits! It is not known if there are larger even sublime numbers, nor if there are any odd sublime numbers.

(f) A **Smith number** is a composite number, the sum of whose digits equals the sum of the digits of its prime factors. The name stems from a phone call in 1984 by the mathematician Albert Wilansky to his brother-in-law, called Smith, during which Wilansky noticed that the phone number, 4937775, obeyed the condition just mentioned. Specifically: $4937775 = 3 \times 5 \times 5 \times 65837$

(g) A **lucky number** is a number in a sequence, first identified and named around 1955 by Stanislaw Ulam, that evades a particular type of number "sieve" (similar to the famous Sieve of Eratosthenes), which works as follows. Start with a list of integers, including 1, and cross out every second number: 2, 4, 6, 8, ... The second surviving integer is 3. Cross out every third number not yet eliminated. This removes 5, 11, 17, 23, ... The third surviving number from the left is 7; cross out every seventh integer not yet eliminated: 19, 39, ... Repeat this process indefinitely and the numbers that survive are the "lucky" ones:

(h) A **Pandigital number** is an integer that contains each of the digits from 0 to 9 and whose leading digit is nonzero. The first few pandigital numbers are 1023456789, 1023456798, 1023456879, 1023456897, and 1023456978. A ten-digit pandigital number is always divisible by 9. If zeros are excluded, the first few "zeroless" pandigital numbers are 123456789, 123456798, 123456879, 123456897, 123456978, and 123456987, and the first few zeroless pandigital primes are 1123465789, 1123465879, 1123468597, 1123469587, and 1123478659. The sum of the first 32423 (a palindromic number) consecutive primes is 5897230146, which is pandigital. No other palindromic number shares this property. Examples of palindromic numbers that are the product of pandigital numbers are 2 970 408 257 528 040 792 (= 1 023 687 954 $\times$ 2 901 673 548) and 5 550 518 471 748 150 555 (= 1 023 746 895 $\times$ 5 421 768 309), both found in 2001. A pandigital product is a product in which the digits of the multiplicand, multiplier, and product, taken together, form a pandigital number