Tutorial on Loops, Lists and Dictionaries

1. Use for loops to print a diamond like the one below. Allow the user to specify how high the diamond should be.

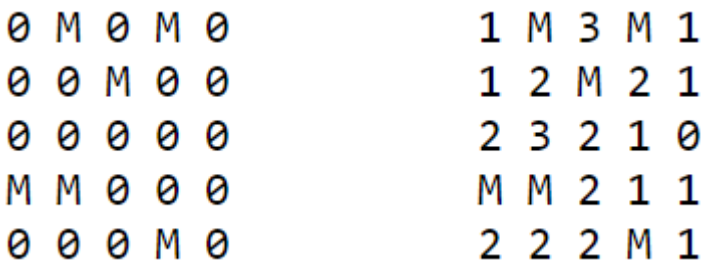
2. A number is called a *perfect number* if it is equal to the sum of all of its divisors, not including the number itself. For instance, 6 is a perfect number because the divisors of 6 are 1, 2, 3, 6 and 6=1+2+3. As another example, 28 is a perfect number because its divisors are 1, 2, 4, 7, 14, 28 and 28=1+2+4+7+14. However, 15 is not a perfect number because its divisors are 1, 3, 5, 15 and 15≠1+3+5. Write a program that finds all four of the perfect numbers that are less than 10000.

3. Write a program that repeatedly asks the user to enter a birthday in the format *month/day* (like 12/25 or 2/14). The user indicates they are done entering birthdays by entering done. The program should return a count of how many of those birthdays are in February and how many are on the 25th of some month (any month).

   When you accept the month/day using input(), it will be available as a string. Now split the portions which contain month / day. Use the following code segment for separation

   ```
   inp = input()
   month, day = inp.split('/')
   ```

4. The following is useful as part of a program to play *Minesweeper*. Suppose you have a 5 × 5 list that consists of zeros and *M*'s. Write a program that creates a new 5 × 5 list that has *M*'s in the same place, but the zeroes are replaced by counts of how many *M*'s are in adjacent cells (adjacent either horizontally, vertically, or diagonally). An example is shown below. [Hint: short-circuiting may be helpful for avoiding index-out-of-range errors.]



   Create the array as list of lists
   Arr = [[0,'M',0,'M',0],[0,0,M,0,0],[0,0,0,0,0],['M','M',0,0,0],[0,0,0,'M',0]]

This list Arr has 5 elements; each element is another list with 5 elements in it.
To pick an element in the list Arr, use Arr[index]
Ex Arr[2] would return [0,0,0,0,0]
To pick third element in the second list , use Arr[list index][element index in the list]
Ex Arr[1][2] would return 'M'

5. A Pythagorean triple is a triple of numbers (x,y,z) such that x2+y2=z2. For instance (3,4,5) is a Pythagorean triple because 32+42=52. Pythagorean triples correspond to triangles whose sides are all whole numbers (like a 3-4-5-triangle). Write a python script to find all the Pythagorean triples (x,y,z) where x, y, and z are positive and less than 100.

6. Accept value of n and two subsets with elements from {1,2,3,4,5….n}. Compute and print A∪B, A∩B, A-B, B-A, A^c, B^c

   Ex: n = 10
   A = {1,2,3,4,5}
   B={2,8,5,10}
   A∪B={1,2,3,4,5,8,10}
   A∩B={2,5}
   A-B={1,3,4}
   B-A={8,10}
   A^c={6,7,8,9,10}
   B^c={1,3,4,6,7,9}

7. For a set X, its difference multiset will contain the positive differences between every pair of elements in the set. Accept a set and print its multiset.
   Ex: if the set = {2,4,7}, multiset will be {2,3,5}

8. Compute the resistance value of 5-band resistor, coded with five colours.
   Ignore the last color as it indicates tolerance. Using the first four color compute the resistance using the coding table provided below.

Black	Brown	Red	Orange	Yellow	Green	Blue	Violet	Grey	White
0	1	2	3	4	5	6	7	8	9

   Encode the table using dictionary, accept four colors find its number using the dictionary and compute the resistance.

   Ex: If the first four colors are Yellow, Violet, Black and Orange
   resistance value is (470) * 10^3 ohm

   Values of first three colors are concatenated and fourth color is used as the multiplier(10^{color}) for computing the resistance

9. Accept two lists L1 and L2. Find the absolute difference between consecutive pair of elements in L1. For every difference value computed, find the nearest integer value in L2
   Ex: L1 = {8,19,21,17} L2 = {5,10,15,20}
   difference b/w consecutive elements= {11,2,14} , nearest integer in L2 = {10,5,15}