**MA1008 Introduction to Computational Thinking**

**Solutions to Week 7 Programming Exercises: Lists, Tuples and Dictionary**

1. Write a program to read in a Python variable and print "Valid" if it is a valid Python variable and "Invalid" otherwise. Account for Python keywords. In the case of invalid, issue a message to inform the programmer why it is invalid.

Ans: keywords = ["and", "as", "assert", "break", "class", "continue", \

"def", "del", "elif", "else", "except", "exec", \

"False", "finally", "for", "from", "global", "if", \

"import", "in", "is", "lambda", "None", "not", "pass", \

"print", "or", "raise", "return", "True", "try", \

"while", "with", "yield"]

var = input("Enter a variable: ")

valid = False

if var in keywords:

print("Invalid.", var, "is a Python keyword.")

elif var[0].isalpha() or var[0] == "\_": # check first character

valid = True

for c in var: # check the rest one by one

if not (c.isdigit() or c.isalpha() or c == '\_'):

print("Invalid.", c, "is not a valid character.")

valid = False

break

else:

print("Invalid. First character must be a letter or '\_'.")

if valid:

print("Valid.")

1. A matrix can be represented in Python using a list of lists. The elements of the lists would be the row values, and the elements of the nested lists would be the column values. Write a program that takes the list [[1, 2, 3], [4, 5, 6], [7, 8, 9]] and prints it out as a 3x3 matrix. Also print its transpose.

Ans: M = [[1, 2, 3], [4, 5, 6], [7, 8, 9]]

print("The matrix")

for i in range(3):

for j in range(3):

print("{:>4d}".format(M[i][j]), end='')

print()

print('\nIts transpose:')

for i in range(3):

for j in range(3):

print("{:>4d}".format(M[j][i]), end='')

print()

1. Write a program that converts a date given in a string in the short format “dd/mm/yyyy” to a list containing the three fields, (dd, mm, yyyy).

Ans: dateString = input("Enter date string dd/mm/yyyy: ")

dateList = dateString.split("/")

1. Given a date in the short format “dd/mm/yyyy”, print it in the long form “dd Month, yyyy” where “Month” is the month in word. For example, “1/1/2018” is printed as “1 January, 2018”. Solve this problem using the result from Q3 and the Python dictionary you created for Q 4 in the Tutorial.

Ans: month = {1:"January", 2:"February", 3:"March", 4:"April",\

5:"May", 6:"June", 7:"July", 8:"August", 9:"September",\

10:"October", 11:"November", 12:"December"}

# Read in a date string dd/mm/yyyy. Split into 3 bits and store

# in date list

date = input("Enter date string dd/mm/yyyy: ").split("/")

if len(date) != 3:

print("Wrong date format")

elif date[0].isdigit():

if date[1].isdigit():

if date[2].isdigit():

# right format

print("The long date is {} {}, {}". format(date[0], \

month[int(date[1])], date[2]))

else:

print("Wrong year format")

else:

print("Wrong month format")

else:

print("Wrong day format")

1. You can express a 3D vector as a tuple (x, y, z). Write a program that
2. sums two such vectors, and returns the result in a new vector.
3. Find the dot product of two such vectors.

v1 = (1, 2, 3) # define two vectors with arbitrary values

v2 = (6, 7, 8)

v3 = (v1[0]+v2[0], v1[1]+v2[1], v1[2]+v2[2])

print("The sum of the vectors: ", v3)

dot = v1[0]\*v2[0] + v1[1]\*v2[1] + v1[2]\*v2[2]

print("The dot product is: ", dot)

1. Write a program to read in a sentence of your choice and print every word in the sentence, one word per line. Provide two different solutions:
   1. A word may contain digits and punctuations, including hyphens and brackets.
   2. A word must contain letters only.

# Week 7 Program 6

s = input("Enter a sentence: ")

# Solution for (6 i). Use the split() method to split the words at

# space characters. This produces a list which contains the individual

# words.

print("Part (i)")

words = s.split()

for i in words:

print(i)

# Solution for (6 ii). This solution processes the characters in the

# string directly. The solution can also make use of the words list

# produced in Part (i).

print("\nPart (ii)")

for c in s:

#for c in i:

if "a"<=c<="z" or "A"<=c<="Z": # print a letter directly

print(c, end="")

else: # Print new line at space or hyphen.

if c == " " or c == "-": # All other characters are ignored.

print()