Pep/8 Introduction

The aim of this Lab Task is to encourage you to solve some simple tasks using Pep/8 in preparation for Assignment 2. Each Exercise has some sample code which should help you get started.

Exercise 1: Create an assembly program to output "Hello World".

```
        CHARO 0x0048, i   ; Output character '48' i.e. 'H'
        CHARO 'H', i      ; Output character 'H'
        STRO  msg, d      ; Output string stored in memory location msg

        STOP

msg:    .ASCII  "Hello\x00"

        .END
```

You should show two solutions, one using CHARO and one using STRO.

Exercise 2: Create a program which take two decimal numbers and calculates, stores and outputs the numbers multiplied together. **Before** attemping this excercise, review the example program overleaf.

```
        BR      main
sum:    .WORD   0x0000
num1:   .BLOCK  2

main:   DECI    num1, d
loop:   LDA     num1, d
        BREQ    done
        LDA     num1, d
        SUBA    0x0001, i
        STA     num1, d
        BR      loop

done:   DECO    sum, d
        STOP
        .END
```

Syntax Cheat Sheet

```
STOP                    ; Stop Execution

LDA     0x0010, i       ; Load 0010 into the accumulator
LDA     0x0010, d       ; Load the contents of 0010 into the accumulator

STA     0x0010, d       ; Store the contents of accumulator in location 0010

ADDA    0x0010, i       ; Add 0010 to the accumulator
ADDA    0x0010, d       ; Add the contents of 0010 to the accumulator

SUBA    0x0010, i       ; Subtract 0010 from the accumulator
SUBA    0x0010, d       ; Subtract the contents of 0010 from the accumulator

ASRA                    ; Apply arithmetic shift right to accumulator i.e. divide by 2

CHARI   0x0010, d       ; Read a character and store it into location 0010
CHARO   0x0010, i       ; Output the character 0010
CHARO   0x0010, d       ; Output the character stored in 0010

STRO    memLoc, d       ; Output the string stored in memLoc

DECI    0x0010, d       ; Read a decimal number and store it in 0010
DECO    0x0010, i       ; Write the decimal number 16 (10 in Hex)
DECO    0x0010, d       ; Write the decimal number stored in 0010

BR      memLoc          ; Change the Program Counter to memory location memLoc
BRLT    memLoc          ; If accumulator is less than zero change the Program Counter
                        ; to memory location memLoc
BREQ    memLoc          ; If accumulator is equal to zero change the Program Counter
                        ; to memory location memLoc

Pseudo-Op Codes

.ASCII
.BLOCK
.WORD
.END
```

Example Program

Read in two numbers and store them, add them together and store the result. Output the result.

```
        BR      main        ; Update Program Counter to memory location labelled main
sum:    .WORD   0x0000      ; Reserve a Word (2 Bytes) to store sum with value zero
num1:   .BLOCK 2            ; Reserve 2 Bytes to store num 1
num2:   .BLOCK 2            ; Reserve 2 bytes to store num 2

main:   LDA     sum, d      ; Load the current sum (zero) into the accumulator
        DECI    num1, d     ; Take a decimal input and store it into num1
        ADDA    num1, d     ; Add the value stored in num1 to the accumulator
        DECI    num2, d     ; Take a decimal input and store it into num3
        ADDA    num2, d     ; Add the value stored in num2 to the accumulator
        STA     sum, d      ; Store the accumulator in sum
        DECO    sum, d      ; Output the decimal value stored in sum
        STOP
        .END
```

Thinking carefully about this:

- Our first block of code branches over itself (we do not want the computer to run our data! The rest of the block is reserving memory locations for our data).
- Our second block of code, which starts with the named memory location ‘main’, takes in two numbers, calculates the sum, and outputs it.