Week 2 Lab

Lab Sheet - Little Man Computing (LMC)

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Read the lab provided in relation to the Little Man Computer model and use the additional material provided if required.
Tasks 1-4 carry an equal mark of 1 and Task 5, 6 &7 carry the remaining marks equally.

Q1

a) What does the Program Counter start at?

It starts at 0

b) What does the 901 make happen?

It Inputs

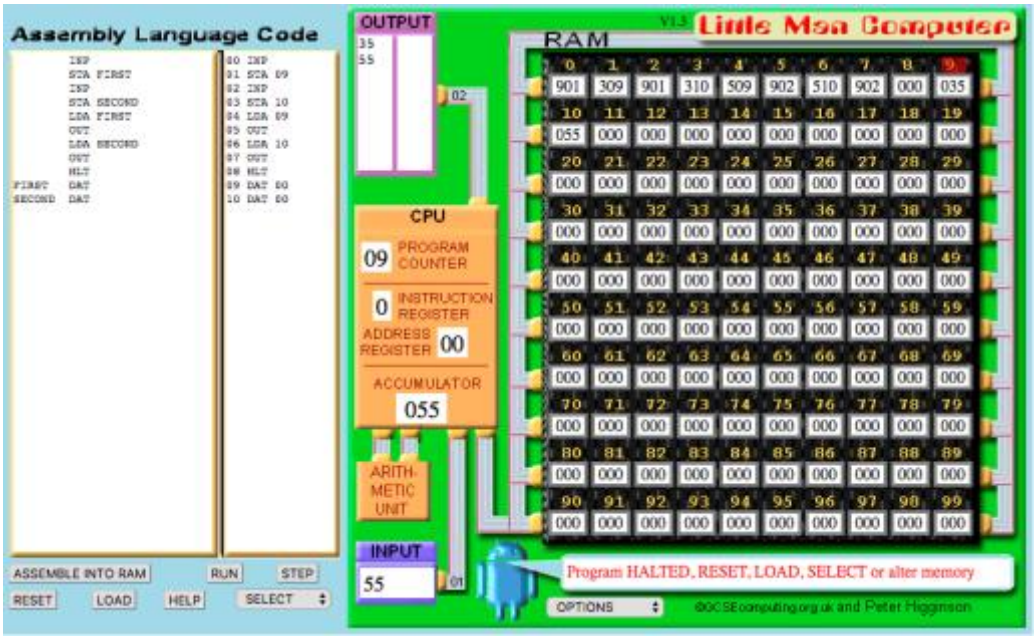
Q 2

a) Note what is saved in the mailboxes.

Both instructions and stored inputs are saved in the mailboxes

b) What is the purpose of FIRST and SECOND?

To select the first input or second input



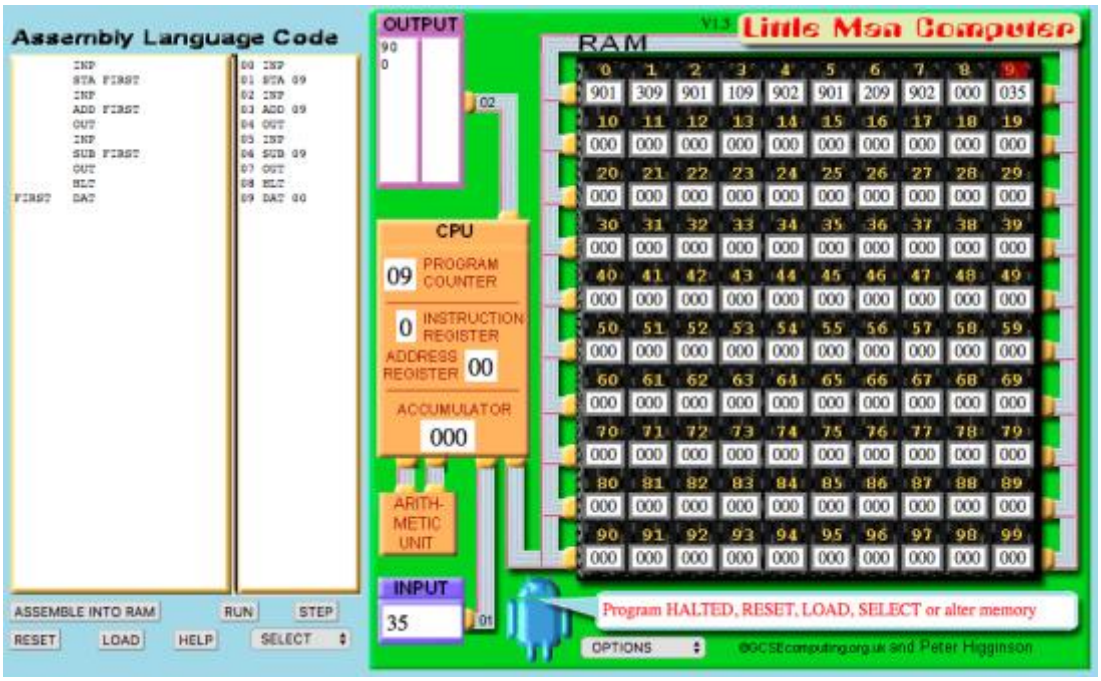
Q 3

a) How many mailboxes were filled in this program run?

9 in total

b) What is within the 10th mailbox (#9 after the initial first =0)?

The first inputted data



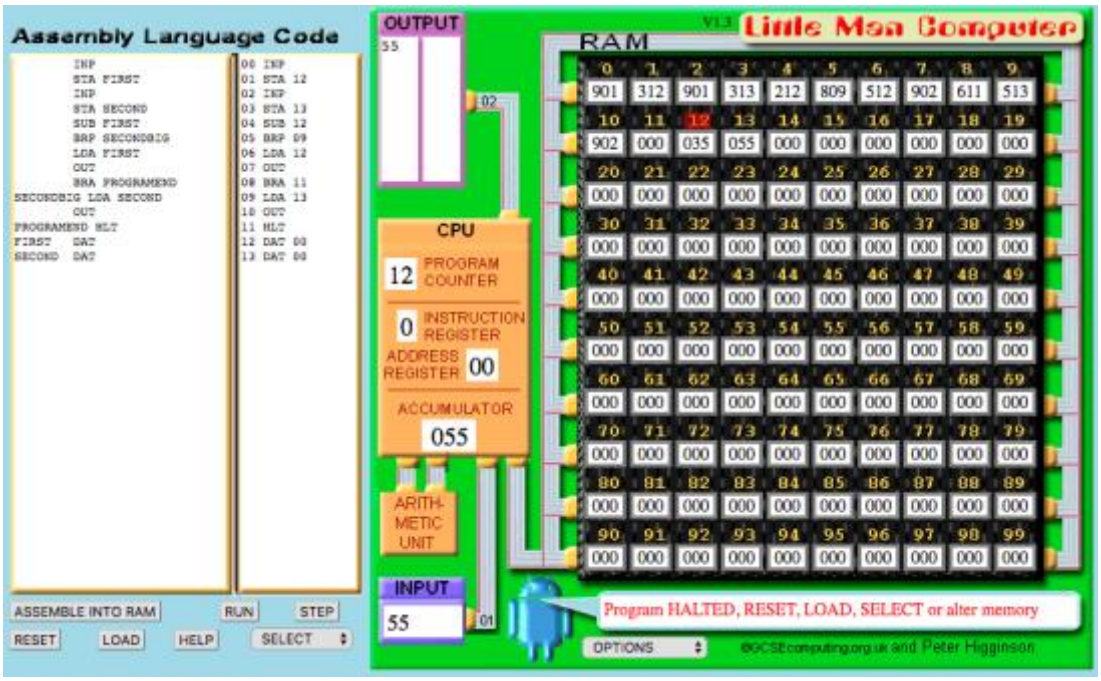
Q 4

a) What does BRA PROGRAMEND translate to in machine code?

08 BRA 11

b) Which mailbox is reserved for the FIRST item?

12

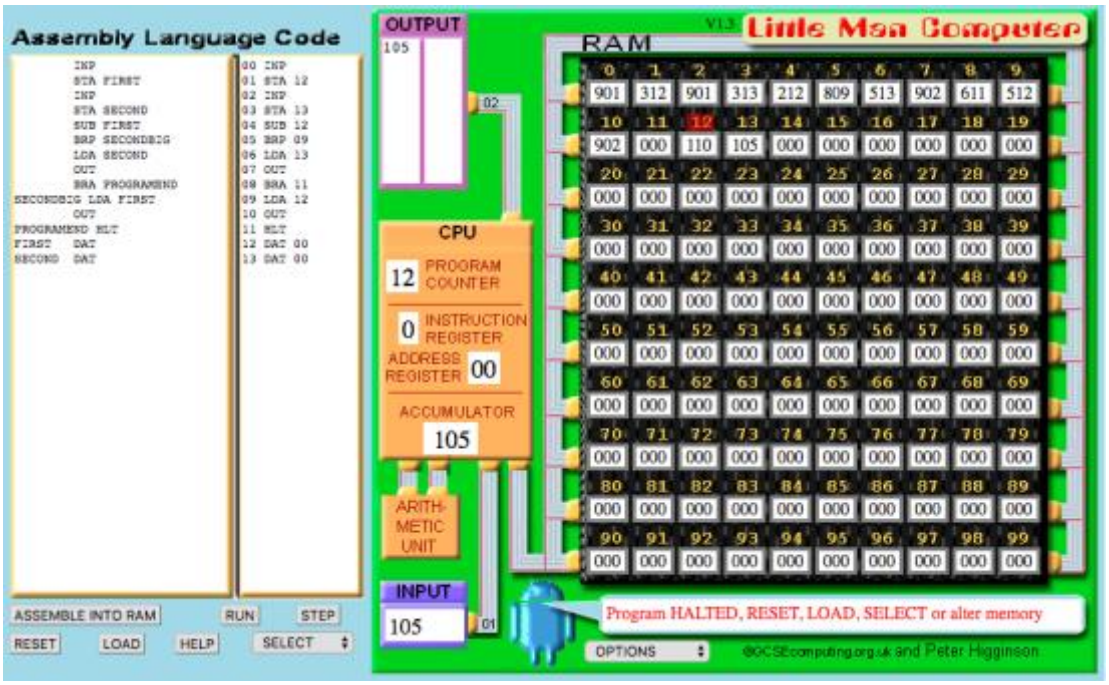


Q 5

a) Create a Program that takes input for two numbers, stores those numbers and returns the smallest number to output first and then the largest second.

```
INP
STA FIRST
INP
STA SECOND
SUB FIRST
BRP SECONDBIG
LDA SECOND
OUT
BRA PROGRAMEND
SECONDBIG LDA FIRST
OUT
PROGRAMEND HLT
FIRST   DAT
SECOND  DAT
```

b) Paste a snip of the run program



Q6

Base 10	Binary	Octal	Hexadecimal
1	1	1	1
5	101	5	5
10	1010	12	A
15	1111	17	F
30	11110	36	1E
60	111100	74	3C
120	1111000	170	78

Converting Binary: You can convert decimal to binary by dividing the number by 2 and the subsequently divide each answer by 2 until you can no longer divide. You then count the remaining numbers which will either be 1 or 0

Converting Octal: You can convert decimal to octal by long division or by using Microsoft Excel with the formula of =DEC2OCT(A1)
Converting Hexadecimal: You can convert decimal to hexadecimal by long division and matching the results to the hexadecimal table or by using Microsoft Excel with the formula of =DEC2HEX(A1)

Explain when each number system is used within Computer architecture, hardware or within the OS.

Binary is used to write to the CPU with instructions
Octal is used within some programming languages

Hexadecimal is used as an assembly language

Q7

a) Which number system would you use to best suit the method, explain why?

Binary as it only has 2 states

b) The user wishes to add the numbers 234567 and 2345 in the program and again must use the 16 switches to enter the data. Is it possible to add these large numbers and if so represent them in the 16 digit number in the number system chosen in part a). Show all workings.

No as if you wanted to input such as large number through binary you would require an additional 2 switches which is a total of 18 switches.
234567 = 111001010001000111

c) What range of values does an 8 bit or byte and 16 bit input word allow? Show all workings

An 8 bit can only hold a single digit state of either on or off or simply 1 or 0
An 8 byte is a group of 8 bits but can here they can hold 1 or 0 or a single character

A 16 bit input word can hold up to 2^{16} worth of characters

https://web.stanford.edu/class/cs101/bits-bytes.html