

Introduction to Computer Organization (CCIT4026)

HKU SPACE Community College

(Lab 04 – CL01/CL07/CL08)

Instructions:

1. Fill in your personal information on the provided answer sheet (WORD) file.
2. The lab. submission consists of two components: a) A lab. report in PDF format which includes the material stated in the lab. sheet and b) The original assembly source code file for output verification.
3. Submission missing **EITHER** the lab. report (.pdf) **OR** the final source code (.asm) would **NOT** be graded.
4. Screen captures your final assembly source codes (with colors) and the input/output messages onto a WORD file and then convert to PDF format. The file would be considered as lab. report.
5. Source code listing shown in the lab. report file CANNOT be superseded by the source code ".asm" file. Mark deduction would be imposed if no source code listing is shown in the report file.
6. Upload **BOTH** the lab. report PDF file **AND** the final source code to SOUL.
7. Make sure the source codes are readable and neatly formatted. Unclear, incorrectly-sized or codes of poor readability would **NOT** be graded.
8. Each instruction should be associated with suitable comments to improve readability.
9. All problems are expected to be answered by using the **instructions** mentioned in the course materials ONLY. If you have to bring in instructions out of this scope, **prior consent** from the lecturer should be sought and a proper citation has to be provided otherwise the answers would be considered as INCORRECT.
10. Make sure to run (and single-step) your codes on MARS simulator to confirm its functionality before submission.
11. Photo capture of the results shown on the monitor is **NOT** acceptable. Use screen capturing software such as "Snipping Tool" on Window, then copy and paste the images onto the WORD file.
12. No late submission will be accepted.
13. Please read the Student Handbook for issues related to academic honesty. The College places very high importance on honesty in academic work submitted by students, and adopts a policy of zero tolerance on cheating and plagiarism. Any related offense may be passed to the Guidance Committee. Possible disciplinary action, including termination of study, may follow.
14. By making a submission, you also confirm to have read and understood the above-listed instructions and HKU SPACE Community College's academic honesty policy, and agree to comply with them. Failure to comply with the above instructions may lead to disqualification of your assignment results and possible disciplinary actions.

Introduction

In this lab, we are going to study how to perform decision making and writing loops using MIPS programming.

Program Specification

Given an array A with 8 integers (in **words**), the 8 elements of the array are defined based on your student ID. (SID) and then,

1. Display a prompt message to ask the user to enter his/her SID in ASCII string.
2. Setup a “**for**” loop to convert each SID character in the input ASCII string to its decimal equivalent, i.e., “0” (ASCII code 48) to value 0. Each converted decimal value should be checked whether it is within the valid range using a “**while**” loop, i.e., $0 \leq A[i] \leq 9$ for all $i = 0..7$. If the decimal value is out of range, the user should be asked to enter the SID ASCII string again until the input is valid and store them to A one by one.
3. Then setup another “**for**” loop to do the following tasks:
 - i. Display your input SID digit in $A[i]$ one by one,
 - ii. Count no. of even digit and no. of odd digit in the SID.
 - iii. Display both the count values according to the specified format shown in the sample output.

For example, assume your input SID ASCII string is “20210342”, then the array A should contain the values,

$$A = [\begin{array}{|c|c|c|c|c|c|c|c|} \hline 2 & 0 & 2 & 1 & 0 & 3 & 4 & 2 \\ \hline \end{array}]$$

Thus the no of even digit should be equal to 6 while the no. of odd digit should be equal to 2.

Sample **Input** & Output:

(Show at least **TWO** invalid input cases such as “2!210342” and “202a0342”.)

```

Mars Messages Run I/O
Pls. enter your SID (in 8-digit ASCII string) = 2!210342
Invalid input SID string, pls. enter again!
Pls. enter your SID (in 8-digit ASCII string) = 202a0342
Invalid input SID string, pls. enter again!
Pls. enter your SID (in 8-digit ASCII string) = 20210342
Your input SID array is [2,0,2,1,0,3,4,2]
The number of even digits = 6
The number of odd digits = 2
Clear
CCIT4026 ICO By Chan Tai Man, 20210342, class on Mon.
-- program is finished running --

```

Below is the Pseudo-code of this program:

Initialization

- Reserve an ASCIIZ string to use the SID input and 8 words in data segment to store the array *A*.

Step 1

Step 1.1 Display the SID input string prompt, read in the SID input and store to a ASCIIZ string buffer.

Step 1.2 Setup a “for” loop such as: “for *i* in (0, No of digits in your SID, 1):”.

Step 1.3 Inside the “for” loop body, setup a while loop.

Step 1.4 Inside the while loop body, load one character from the input SID string to a register and convert the ASCII character in the register to decimal equivalent value.

Step 1.5 Check the decimal equivalent valid whether it is within the valid range, i.e., $0 \leq \text{input_value} \leq 9$

Step 1.6 If the input value is out of range, display the invalid message, exit the while loop and go back to Step 1.

Step 1.7 Otherwise store the input value to the array element *A*[*i*] and continue the “for” loop until end of loop.

Step 2

Step 2.1 Use two registers to associate with two counters, *evencount* and *oddcoun*t and clear them to zero.

Step 2.2 Echo the entered SID by display the message “Your input SID is [“

Step 2.3 Setup another “for” loop such as: “for *i* in (0, No of digits in your SID, 1):”.

Step 2.4 Inside the “for” loop body, read out the array elements *A*[*i*].

Step 2.5 Display the digit value.

Step 2.6 If the element *A*[*i*] is an even number, increment the “*evencount*” by 1.

Step 2.7 Otherwise increment the “*oddcoun*t” by 1

Step 2.8 Continue the “for” loop in Step 2.4 until end of loop.

Step 2.9 Display the message “]”.

Step 3

Step 3.1 Print the two count values stored in “*evencount*” and “*oddcoun*t” as shown in the sample output.

Step 3.2 Display your author message.

Step 3.3 Exit program.

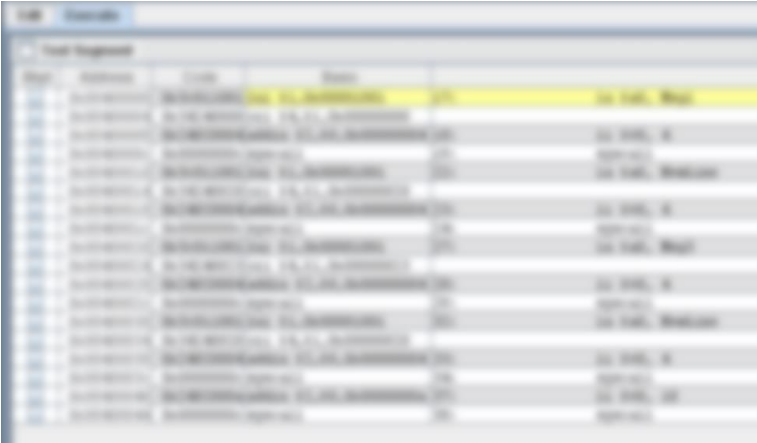
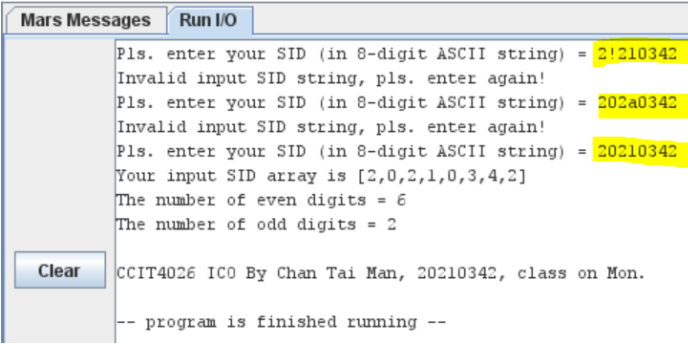
Submission instructions:

- i. Write the MIPS assembly program to complete the lab. tasks above.
- ii. **Strictly follow** the steps shown in the Pseudo-code.
- iii. Copy each of the step descriptions shown in the **Pseudo code as comments** in your program.
- iv. Complete each step with your MIPS instructions.
- v. Copy and paste the screen capture of the source code from the MARS editor onto the provided answer sheet template in WORD file.
- vi. Copy and paste the screen capture of the assembled window that shows your assembled machine codes.
- vii. Copy and paste the screen capture of the "Run I/O" window that shows your program execution output (Program termination message **MUST** be shown).
- viii. Fill in your name, class, student ID and a photo of your student ID card at the beginning of the WORD file. A sample submission format is shown below.
- ix. Convert the provided answer sheet template WORD file to PDF format as your lab. report.
- x. Rename your revised ".asm" and lab. report ".pdf" file to the file names according to the following format,
 - i. **"ICO_Lab4_CL<classNO>_<yourname>_<studentID>.asm"and**
 - ii. **"ICO_Lab4_CL<classNO>_<yourname>_<studentID>.pdf"**
 - iii. e.g., For CL01,
 1. **"ICO_Lab4_CL01_CHANTaiMan_20002000.asm"and**
 2. **"ICO_Lab4_CL01_CHANTaiMan_20002000.pdf"**
- xi. Upload **BOTH** the **lab. report PDF file** and your **".asm"** to SOUL before the deadline.
- xii. **No mark would be given if no source code file ".asm" is submitted OR missing your student ID card photo.**
- xiii. **Late submission will NOT be graded.**

Submission Sample:

		(Insert a photo of your student ID card below)
Student Name:		(No mark would be given if no student ID is present here)
Student no.:		
Class Number:		

Manual calculations	Fill in your SID below: A = [<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>2</td><td>0</td><td>2</td><td>1</td><td>0</td><td>3</td><td>4</td><td>2</td></tr></table>] even count = 6 odd count = 2	2	0	2	1	0	3	4	2
2	0	2	1	0	3	4	2		
Source Code (Captured from MARS)	Screen capture ALL the source listing directly from MARS Editor. 								
Assembled Results (Captured from MARS)	Screen capture the ALL output directly from “Execute – Text Segment” window:								

	
Run I/O results (Captured from MARS)	Screen capture the output directly from “Run I/O” window: 

— THE END —