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COMPUTER ARCHITECTURE EXPERIMENTAL REPORT

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Topic: Create a program to:

- Input an array of integers from the keyboard.
- Find the maximum element of the array.
- Calculate the number of elements in the range of (m, M) . Range m, M are inputted from the keyboard.

I Procedure:

- (a) Prompt to input the number of element and value of elements in array.
- (b) Initialize *max* value to be the first number of the array.
- (c) For each element inserted, check if it is greater than current maximum value, and assign new maximum if it is greater.
- (d) Print out the maximum value when all n elements are inserted.
- (e) Prompt to input 2 value, m and M .
- (f) Check if $m < M$. If not, quit the program since (m, M) is not a valid range. If yes, initialize a variable *count* = 0 to count the number of element in array satisfied the condition.
- (g) For each *value* of element in array, check if $m < value$ and $value < M$. If satisfied, increase the variable *count* by 1.
- (h) When reach the last element, print the value of *count* and quit the program.

II The meaning of used registers

\$s0 : Store the number of elements (n) in array, this will not be changed.

\$s1 : Store the maximum element of the array, this will be changed while searching for maximum element.

\$s2 : Store the pointer to the last element of the array, this register will be decreased from the register \$sp continuously.

\$s3 : Store the value of m .

\$s4 : Store the value of M .

\$s5 : Store the value of the variable *count*.

\$t0 : Running index, from 0 to n (\$s0)

\$t1 : Store the index to print, this always equals to $s1 + 1$, used to print to the user the order of element needed to be inserted.

\$t2 : Temporarily store the value of the \$t1-th element inserted above before saving it to stack.

\$t3 : First, check whether the current maximum value is smaller than the value of new element inserted above. Second, re-use it to check if $m < M$, if $m < value$, and if $value < M$ where $value$ is value of element loaded from the array to check if it is in range (m, M) .

\$t4 : Running address, from \$s2 stored above to \$sp to get the value of element in array.

\$t5 : Temporarily store the value of element loaded by \$t4.

III The meaning of used sub-program

Here I used programs defined in the library *utils.asm* as following:

PromptInt : Used to print the string whose address is loaded in the register \$a0, prompt to get new integer value inserted from keyboard, which is then stored in the register \$v0.

PrintString : Used to print the string whose address is loaded in the register \$a0.

PrintInt : Used to print the string whose address is loaded in the register \$a0 and an integer whose value is loaded in the register \$a1.

Exit : Used to quit the program.