# Assignment 2

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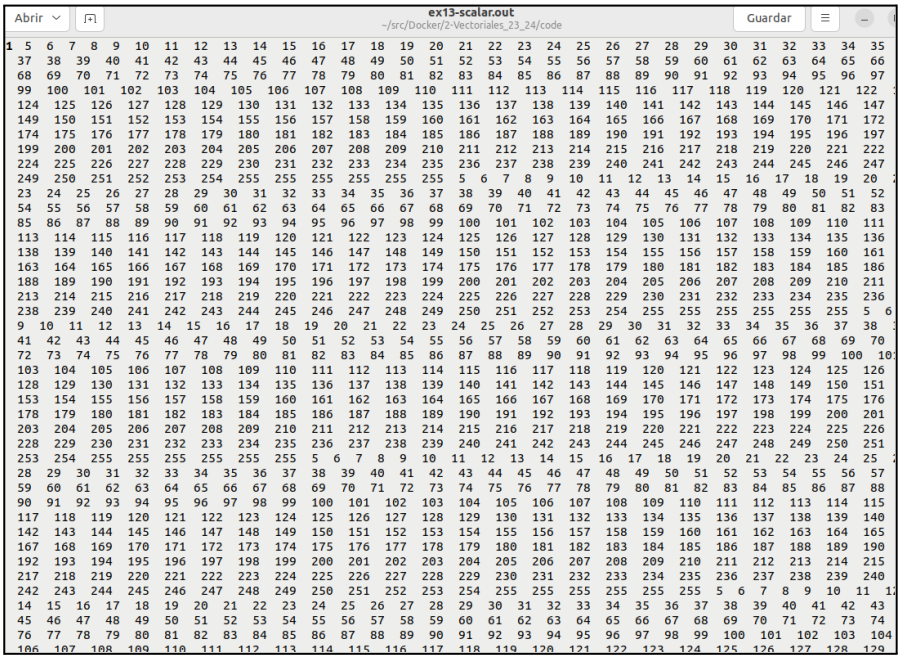
## Exercise 13 (Worksheet 3)

### 1. Scalar Version

- Compile and Execute ***scalar***:

**mipsisa64r6-linux-gnuabi64-gcc-10 -mmsa ex13.c -o ex13-scalar.elf -static**
**qemu-mips64 -cpu I6400 ex13-scalar.elf > ex13-scalar.out**

**- Save the output in an .out file to check the values.**


### 2. MIPS MSA Version (With addvi.b)

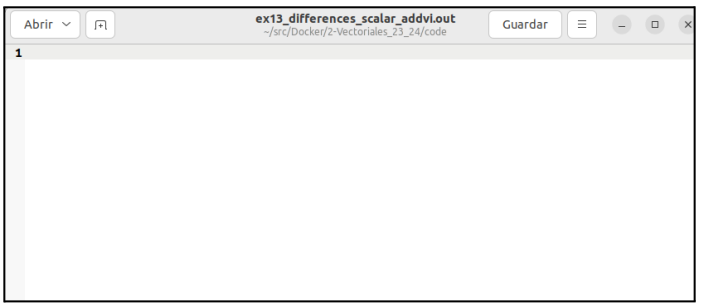
- Compile and Execute ***addvi.b***:

**mipsisa64r6-linux-gnuabi64-gcc-10 -mmsa ex13.c -o ex13-addvi.elf -static -DADDVI_VERSION**
**qemu-mips64 -cpu I6400 ex13-addvi.elf > ex13-addvi.out**

- Compare results of ***addvi.b*** with ***scalar***:

**diff ex13-scalar.out ex13-addvi.out > ex13_differences_scalar_addvi.out**

**- Save the output in an .out file to check the values.**
**- Compare scalar and addvi and save the output in an .out file to see if there is any difference.**
**- Both outputs are identical *(differences file is empty)*.**



## 3. MIPS MSA Version (With adds_u.b)

- Compile and Execute ***adds_u.b***:

**mipsisa64r6-linux-gnuabi64-gcc-10 -mmsa ex13.c -o ex13-adds.elf -static -DADDS_VERSION**
**qemu-mips64 -cpu I6400 ex13-adds.elf > ex13-adds.out**

- Compare results of ***adds_u.b*** with ***addvi.b*** and ***scalar***:

**diff ex13-scalar.out ex13-adds.out > ex13_differences_scalar_adds.out**
**diff ex13-addvi.out ex13-adds.out > ex13_differences_addvi_adds.out**

**- Save the output in an .out file to check the values.**
**- Compare scalar and addvi and save the output in an .out file to see if there is any difference.**
**- All three outputs are identical *(differences files are empty)*.**

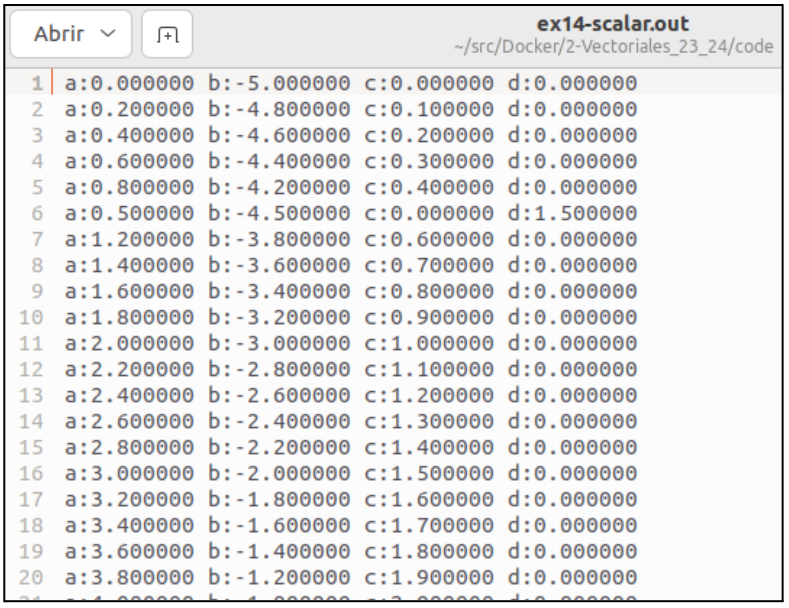

# Exercise 14 (Worksheet 3)

## 1. Scalar Version

- Compile and Execute ***scalar***:

**mipsisa64r6-linux-gnuabi64-gcc-10 -mmsa ex14.c -o ex14-scalar.elf -static**
**qemu-mips64 -cpu I6400 ex14-scalar.elf > ex14-scalar.out**

**- Save the output in an .out file to check the values.**

## 2. MIPS MSA Version

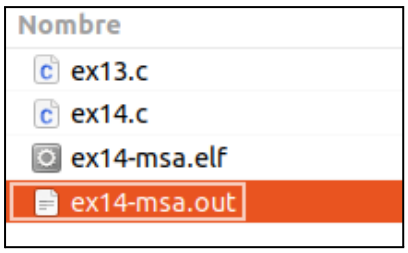
- Complete the code for ***MIPS MSA***:

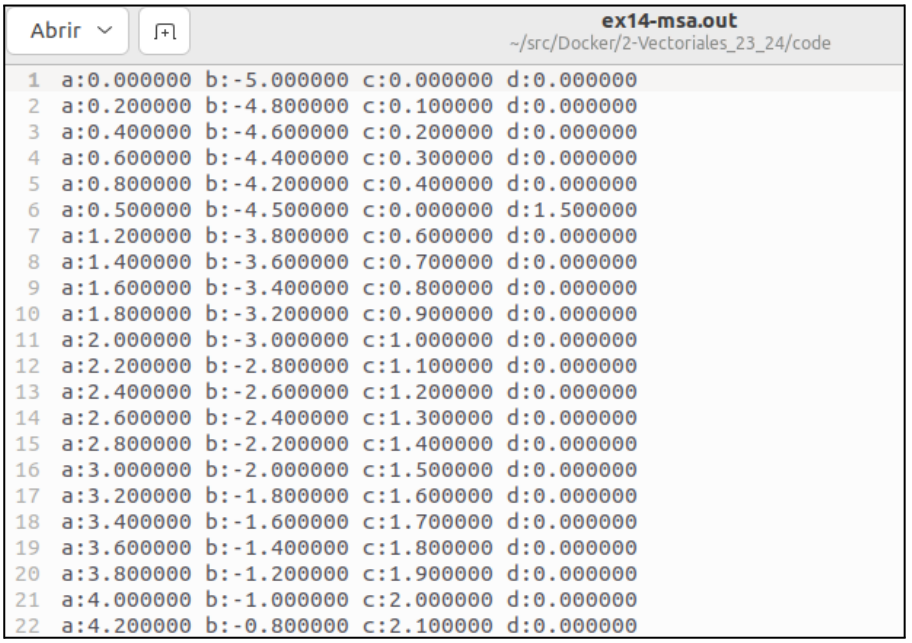
```
        LD.D    $w7, 0(%[Rthree])
        LD.D    $w8, 0(%[Rfive])
        li      $1, 256             // i = 256
        li      $6, 0x10            // increment the address of the vectors by 16
        move    $2, %[Ra]           // &a[0]
        move    $3, %[Rb]           // &b[0]
        move    $4, %[Rc]           // &c[0]
        move    $5, %[Rd]           // &d[0]
loop:
        LD.D    $w0, 0($3)          // load b[i] and b[i+1] into $w0
        LD.D    $w1, 0($4)          // load c[i] and c[i+1] into $w1
        FADD.D  $w2, $w0, $w1       // a[i] = b[i] + c[i] and a[i+1] = b[i+1] + c[i+1]
        ST.D    $w2, 0($2)          // store a[i] and a[i+1]
        FCEQ.D  $w3, $w2, $w0       // compare a[i] == b[i] and a[i+1] == b[i+1]
        FMUL.D  $w4, $w2, $w7       // a[i]*3 and a[i+1]*3
        AND.V   $w5, $w4, $w3       // d[i] = a[i]*3 for elements where a[i] == b[i]
        ST.D    $w5, 0($5)          // store d[i] and d[i+1]
        FSUB.D  $w6, $w2, $w8       // a[i] - 5 and a[i+1] - 5
        ST.D    $w6, 0($3)          // store b[i] and b[i+1]
        dsubu   $1,$1,2             // decrement i - 2 as we are loading i and i+1
        dadd    $2,$2,$6            // increment address &a
        dadd    $3,$3,$6            // increment address &b
        dadd    $4,$4,$6            // increment address &c
        dadd    $5,$5,$6            // increment address &d
        bgtz    $1, loop            // continue loop if i > 0
        nop
```

- Compile and Execute ***adds_u.b***:

**mipsisa64r6-linux-gnuabi64-gcc-10 -mmsa ex14.c -o ex14-msa.elf -static -DMSA_VERSION**
**qemu-mips64 -cpu I6400 ex14-msa.elf > ex14-msa.out**

**- Save the output in an .out file to check the values.**




- Compare results of ***scalar*** with ***msa***:

**diff ex14-scalar.out ex14-msa.out > ex14_differences_scalar_msa.out**

**- Compare scalar and msa and save the output in an .out file to see if there is any difference.**
**- Both outputs are identical *(differences file is empty)*.**