1. What is the usage of $zero? What happens if you execute addi $zero, $zero, 5 ? (5%)

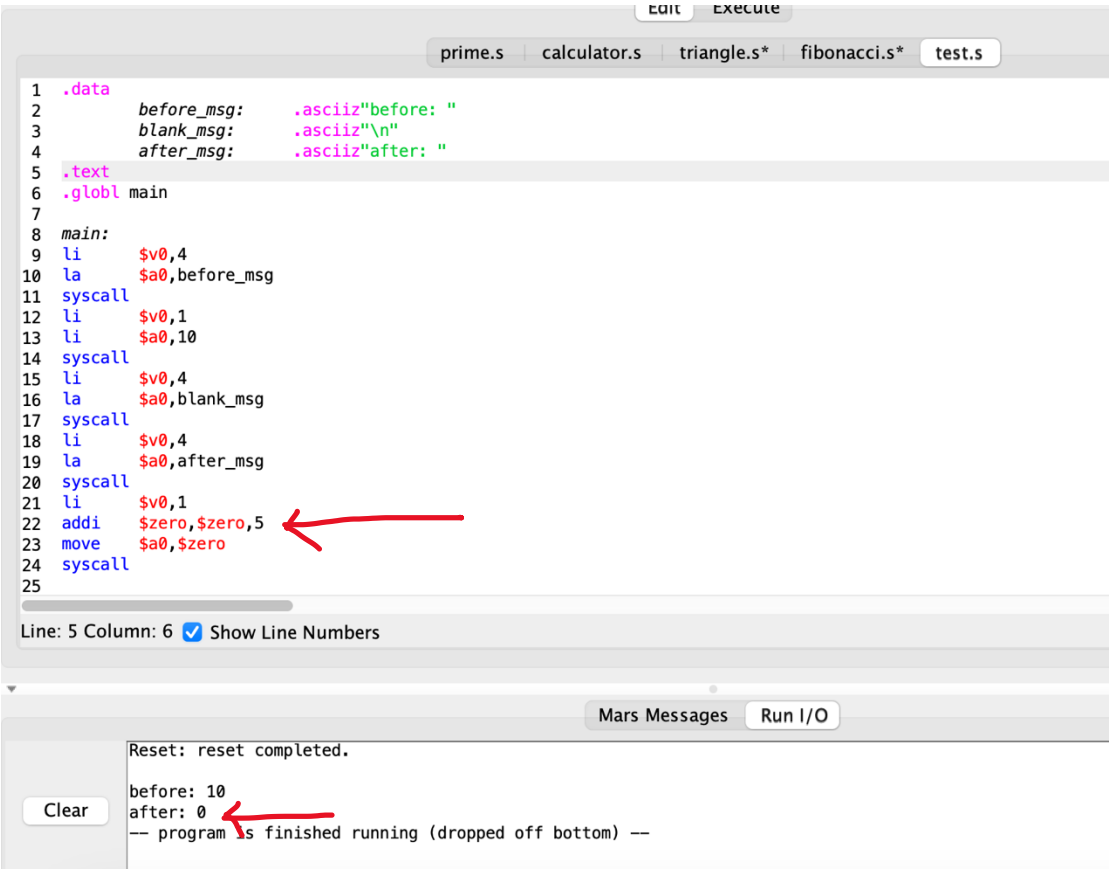
$zero 常用來執行二進制的 NOT 運算

例如

$a0=0x00000006

執行 nor $s0,$a0,$zero

則$s0=0x11111119



2. How to use the stack to ensure that the value of each register is correctly saved when executing a recursive function? (5%)

先 push 出要用到的 stack 空間，如果要存 2 個 word，因為每個

word 為 4Bytes，所以 $ sp 就要-8，當使用完後$sp 要+8 使其復位

MIPS code:

```
fact:
    addi $sp, $sp, -8      # adjust stack for 2 items
    sw   $ra, 4($sp)       # save return address
    sw   $a0, 0($sp)       # save argument
    slti $t0, $a0, 1       # test for n < 1
    beq  $t0, $zero, L1    # branch if n >= 1
    addi $v0, $zero, 1     # if so, result is 1
    addi $sp, $sp, 8       #   pop 2 items from stack
    jr   $ra               #   and return
L1: addi $a0, $a0, -1      # else decrement n
    jal  fact              # recursive call
    lw   $a0, 0($sp)       # restore original n
    lw   $ra, 4($sp)       #   and return address
    addi $sp, $sp, 8       # pop 2 items from stack
    mul  $v0, $a0, $v0     # multiply to get result
    jr   $ra               # and return
```

3. What was the most challenging part for you in this homework? (10%)

因為是第一次寫組合語言，思路跟高階語言不太一樣，作業這幾題寫下來有意識到自己遇到迴圈常常會卡住，要很清楚硬體下一步該幹嘛、暫存器存的值多少以及執行指令的順序，如果用到 jal 指令時要記得$ra 存的位址會變動，使用 jr 指令進行 return 時也要確認現在$ra 存的位址是否為想要跳回去的位址