# CS 315-02 RISC-V Assembly 3

Lab02 due tonight Tue Sep 10th 11:59pm
Lab02 exam problems due tomorrow
Wed Sep 11 11:59pm problems.pdf
Project02 due Mon Sep 16th 11:59pm
No IG

Today:
Arrays
Functions

## Arrays

Pointers

a0 - int *arr

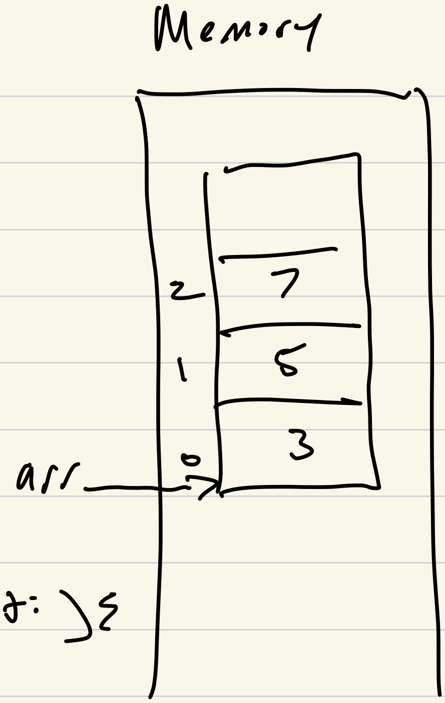
```
lw t0, (a0)
add t1, t1, t0
addi a0, a0, 4
```
$\leftarrow$ pointer arith

# Array indexing

int arr[3] = {3, 5, 7}

Question:

x = arr[i];



```
int arr_get_c (int arr[], int i){
    return *(arr + i);
}
```

```
# a0 - int arr[]
# a1 - int i

arr_get_s:
    li t0, 4
    mul t1, t0, a1       # t1 = t0(4) * a1 (i)
    add t2, a0, t1       # t2 = a0 (arr) + offset
                                     ^base      t1
    lw t3, (t2)
    mv a0, t3
    ret
```

```
arr_get_s:
    li t0, 4
    mul t0, t0, a1
    add t0, a0, t0
    lw t0, (t0)   ⎤
    mv a0, t0     ⎦ → lw a0, (t0)
    ret
```

```
x = arr[i];
arr[i] = x;
```

# RISC-V Assembly Functions

## Simple functions

arguments in a0, a1, a2, ...
return value in a0

```
func_s:
```

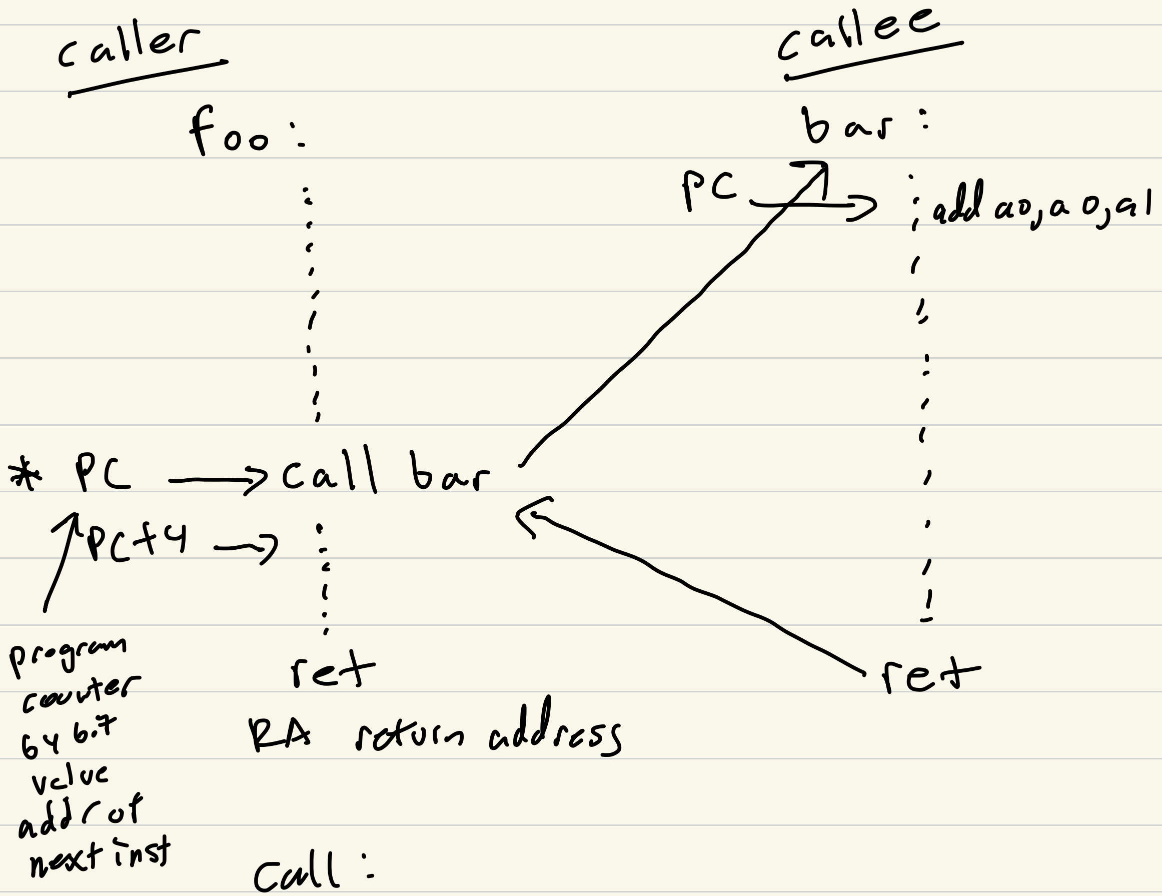
Only use 'a' and 't' resisters

no calls to other functions

```
        ret
```

"leaf" function

# Complex functions



call:

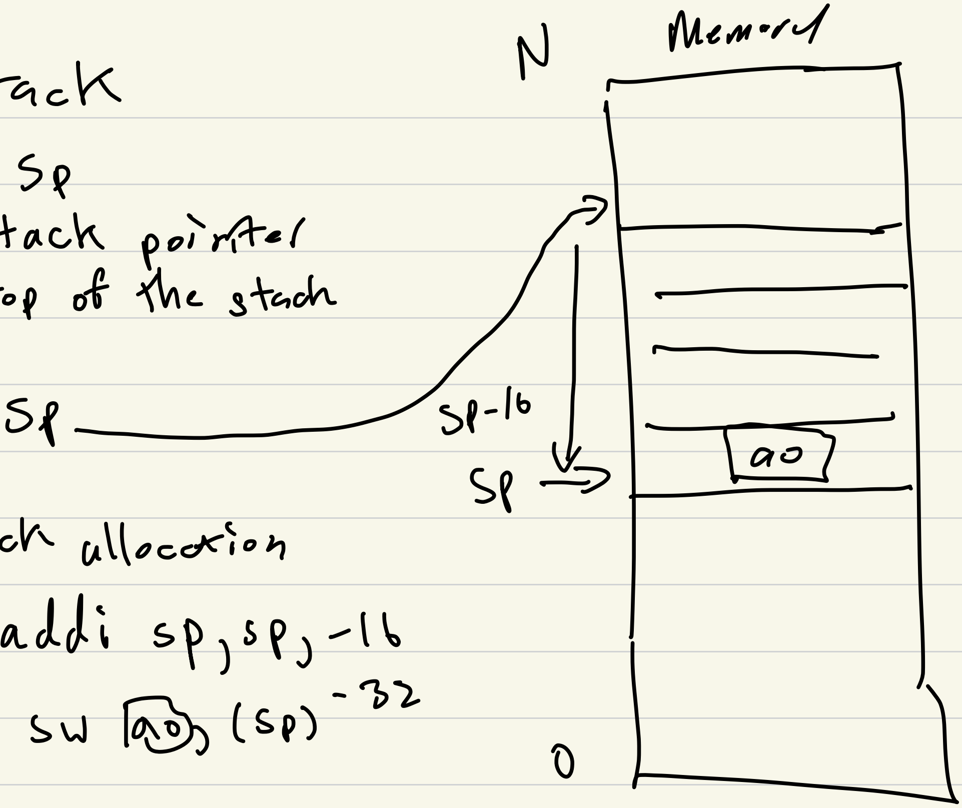
1) update RA to be PC+4

2) update PC to addr of first instruction in callee

ret: 1) set PC to RA

Stack

sp
stack pointer
top of the stack



Stack allocation

addi sp, sp, -16
sw $\boxed{a0}$, (sp) -32

Stack deallocation

addi sp, sp, $\underline{16}$