LESSON 12



ASM

Final Project



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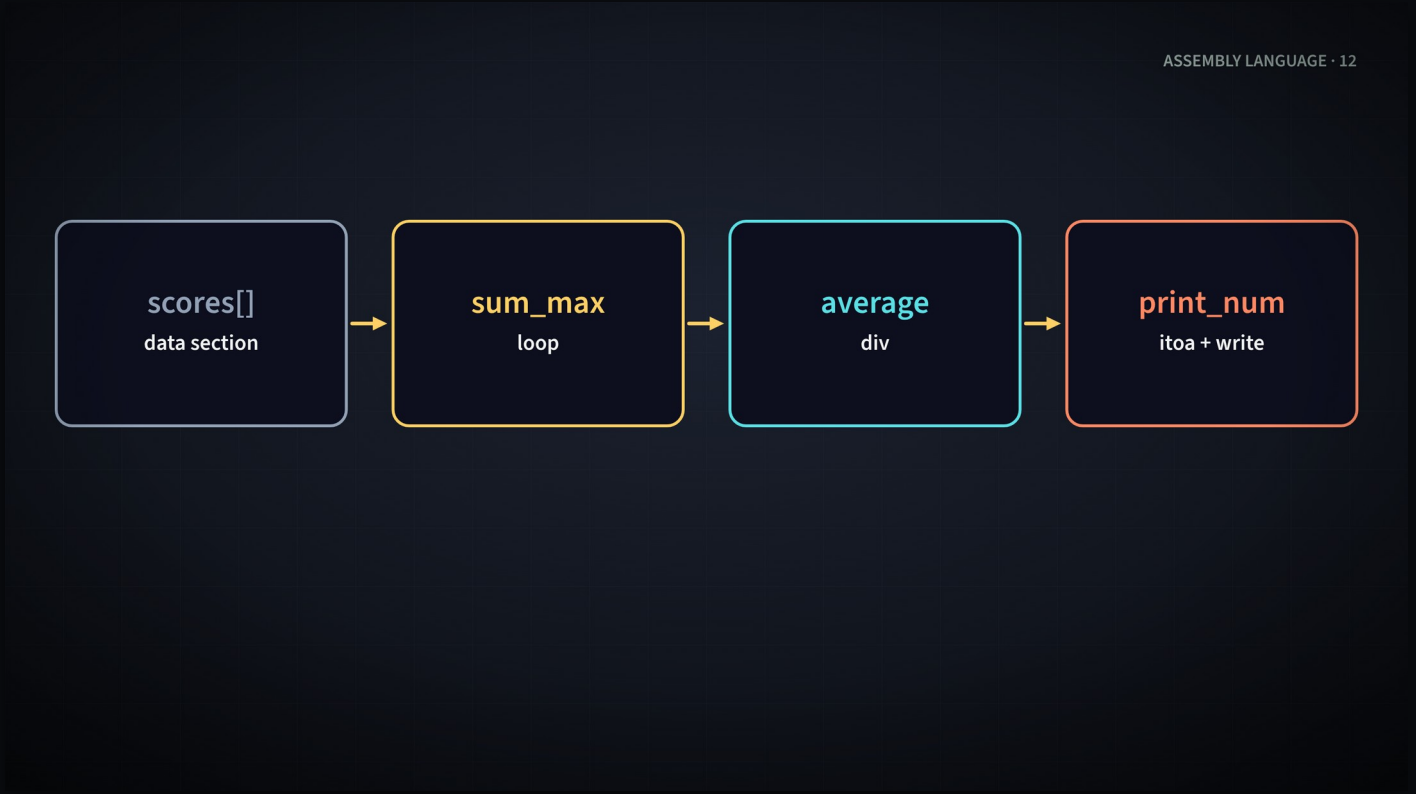
ASSEMBLY LANGUAGE

LESSON 12

Project: A Grade Calculator, and ARM64

Building a complete program, a Makefile, a first look at ARM64, and next steps

The Project



- scores[] — data section
- sum_max — loop
- average — div

01

Sum and Maximum

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grades.asm

```
; rdi = array, rsi = count  →  rax = sum, rdx = max
sum_max:
    xor eax, eax
    xor edx, edx
    xor ecx, ecx
.loop:
    mov r8d, [rdi + rcx*4]
    add eax, r8d
    cmp r8d, edx
    cmovg edx, r8d
    inc ecx
    cmp rcx, rsi
    jl  .loop
    ret
```

- One loop walks the array, adding each score to the total and keeping the largest with cmov.
- The function returns the sum in rax and the maximum in rdx, following our own small …

02

Main and the Makefile

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terminal

```
# Makefile
grades: grades.o
 ld grades.o -o grades
grades.o: grades.asm
 nasm -f elf64 -g grades.asm
$ make && ./grades
Total:   432
Average: 86
Highest: 95
```

- _start calls sum_max, divides the sum by the count for the average, and calls print_num ...
- A Makefile rebuilds only what changed. Type make, then run the program.

03

A First Look at ARM64

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hello_arm64.s

```
.global _start
_start:
    mov x0, #1              // stdout
    adr x1, msg             // address of text
    mov x2, #15             // length
    mov x8, #64             // write
    svc #0
    mov x0, #0
    mov x8, #93             // exit
    svc #0
msg: .ascii "Salaam, World!\n"
```

- ARM64 has thirty-one general registers, x0 to x30, and fixed-size four-byte instructions. …
- The same ideas apply: registers, the stack, a calling convention and system calls. Here is …

04

Where to Go Next



- Explore — godbolt.org
- Read — Intel SDM · ARM docs
- Build — a tiny OS kernel

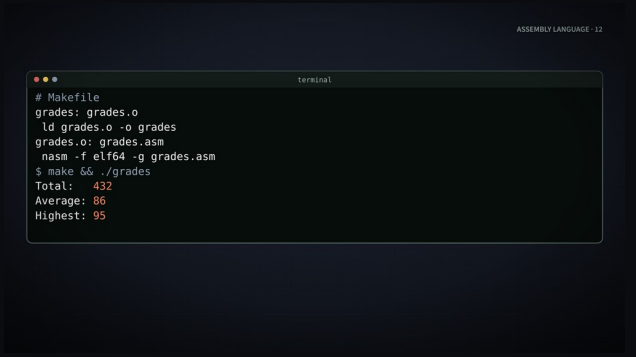
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Lesson Map


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Sources and Further Reading





Thank you for watching

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