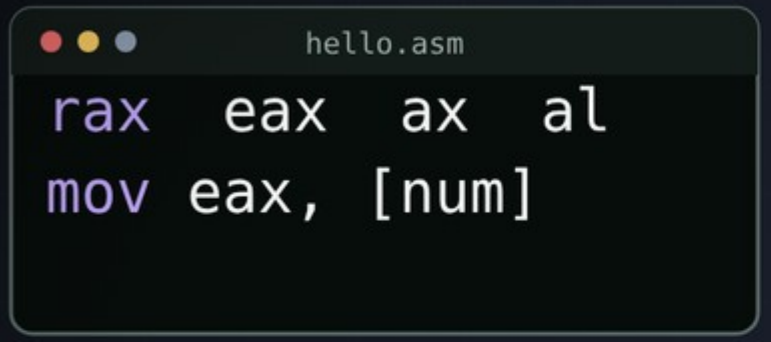
LESSON 2



ASM

Registers & Memory

Learn it all @MyWebUniversity



A FREE MYWEBUNIVERSITY COURSE

ASSEMBLY LANGUAGE

LESSON 2

The CPU, Registers and Memory

Binary and hex, bits and bytes, the x86-64 registers, and memory addresses

Binary and Hexadecimal

ASSEMBLY LANGUAGE · 2

Decimal	Binary	Hex
10	0000 1010	0x0A
65 ('A')	0100 0001	0x41
255	1111 1111	0xFF
4096	0001 0000 0000 0000	0x1000

- Computers store everything as bits, zeros and ones. Eight bits make a byte, which holds a …
- Hexadecimal uses sixteen digits, zero to nine and A to F. One hex digit is exactly four …

01

Data Sizes

ASSEMBLY LANGUAGE · 2

Name	Bits	NASM
byte	8	db · byte
word	16	dw · word
dword	32	dd · dword
qword	64	dq · qword

- x86 names its sizes: a byte is eight bits, a word sixteen, a double word thirty-two, and a …
- x86-64 is a sixty-four-bit architecture: its registers and addresses are quad words.

02

General-Purpose Registers



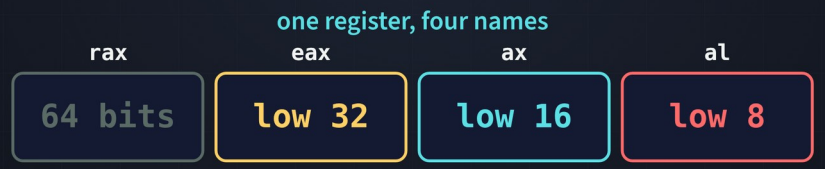
- rax rbx rcx rdx — accumulator, counter…
- rsi rdi rbp rsp — index, stack
- r8 … r15 — extra registers

03

Register Parts

hello.asm

```
mov rax, 0x1122334455667788
; eax = 0x55667788  ax = 0x7788  al = 0x88
```



- You can use smaller parts of each register. eax is the low thirty-two bits of rax, ax the …
- Writing to eax also clears the upper half of rax, a detail that often surprises beginners.

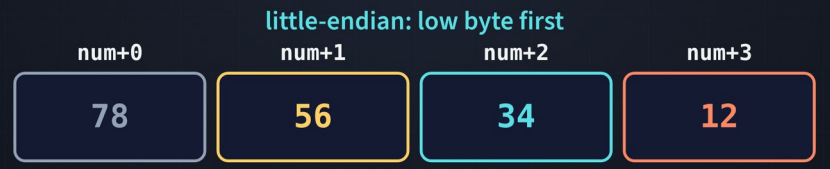
04

Memory and Addresses

ASSEMBLY LANGUAGE · 2

hello.asm

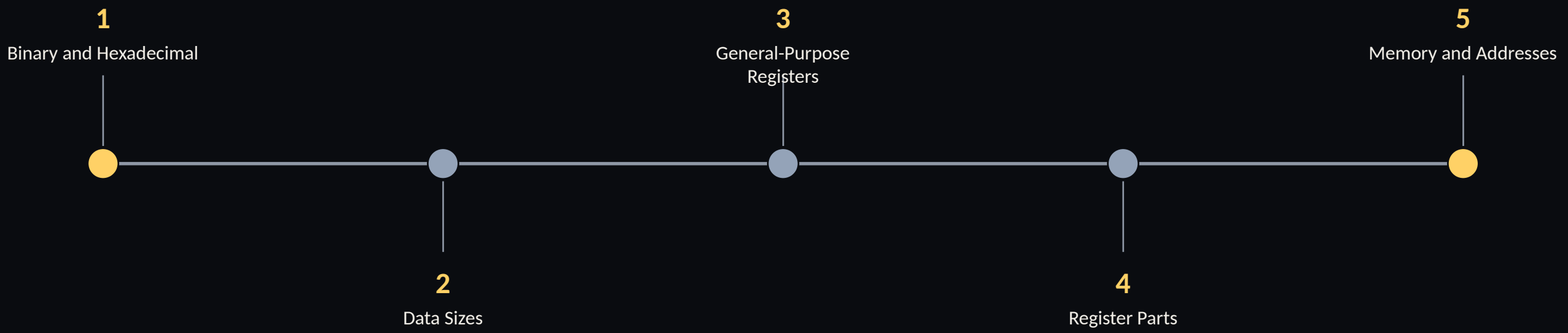
```
num dd 0x12345678
mov eax, [num]     ; load from memory
```



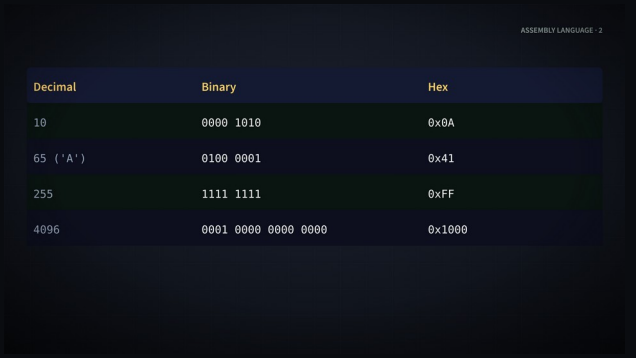
- Memory is a huge array of bytes, each with a numeric address. Square brackets in assembly …
- x86 is little-endian: a multi-byte number is stored with its lowest byte first.

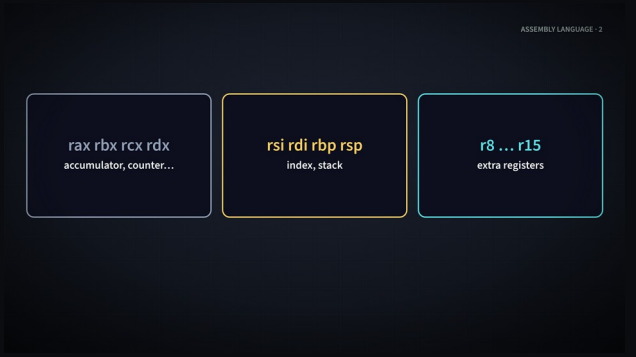
05

Lesson Map


1
Binary and Hexadecimal
2
Data Sizes
3
General-Purpose Registers
4
Register Parts
5
Memory and Addresses

Sources and Further Reading





Thank you for watching

MyWebUniversity.com

Free technical education since 2000 — English and Dari

@MyWebUniversity · @MyWebUniversity-Dari