

Systems and machine code

- ▶ Processors and architecture (Monday)
- ▶ Assembly (**today**)
- ▶ (Lab: Adapter pattern (Thursday))
- ▶ Function call and return (Friday and next week Monday)
- ▶ Function pointers (next week Wednesday)

Today:

- ▶ Recap of assembly instructions so far
- ▶ Jumps and labels
- ▶ Building conditionals from jumps and labels
- ▶ Building loops from jumps and labels
- ▶ Using memory
- ▶ Building functions and calls

	Mnemonic	Operands	Description	Example
1	MOVI	imm rd	Copies the immediate value <code>imm</code> into register <code>#rd</code> .	MOVI 5 R2 // R2 = 5
3	ADD	rs rd	Adds the value in register <code>#rs</code> into register <code>#rd</code> .	ADD R1 R2 // R2 = R2 + R1
9	OUT	rs	Outputs the value in register <code>#rs</code> by printing it to the screen.	OUT R1 // PRINT R1
10	HALT		Ends the program.	HALT // QUIT

	Mnemonic	Operands	Description	Example
2	MOV	rs rd	Copies the value in register #rs into register #rd.	MOV R3 R4 // R4 = R3
4	SUB	rs rd	Subtracts the value in register #rs from register #rd.	SUB R1 R2 // R2 = R2 - R1
5	MUL	rs rd	Multiplies register #rd by the value in register #rs.	MULL R1 R2 // R2 = R2 * R1
6	IDIV	rs rd	Divides register #rd by the value in register #rs (as ints).	IDIV R1 R2 // R2 = R2 / R1

	Mnemonic	Operands	Description	Example
7	JMP	ra	"Jump." The next instruction to be executed is found at the address in register #ra.	JMP R1 // GOTO R1
8	JNZ	rs ra	If the value of register #rs is nonzero, jumps to the address in register #ra. Otherwise, does nothing and continues normally to the next instruction.	JNZ R1 R2
17	LDLO	imm rd	Loads a commandline argument indexed by negative numbers, i.e., -1 is the last argument, -2 is the second-to-last, etc.	LDLO -1 R1

	Mnemonic	Operands	Description	Example
11	LD	ra rd	Loads a value from memory, at the address in register #ra, into register #rd.	LD R1 R2 // R2 = mem[R1]
12	ST	ra rs	Stores the value of register #rs in memory, at the address in register #ra.	 // mem[R1] = R2

Coming up:

- ▶ **Due Wed, Apr 22.** *Do Project 7, no-ifs calculator*
- ▶ **Due Thurs, Apr 23.** *Read prelab reading and take quiz*
- ▶ **Due Fri, May 1.** *Do Project 8, GCD in pseudo-assembly*