

16.482 / 16.561: Computer Architecture and Design

Summer 2014

Lecture 1: Key Questions May 20, 2014

1. What information is required to translate a high-level statement such as $X[i] = i * 2;$ to assembly language?

2. Describe how a processor executes a typical instruction.

6. Describe each of the addressing modes listed below:

- Immediate
- Register direct
- Register indirect
- Memory indirect
- Base + displacement
- PC-relative

7. What are the benefits of having few instruction formats? What are the benefits of having many formats?

10. Describe the different mnemonics used for MIPS integer registers.

11. Describe the MIPS data transfer instructions.

12. Describe what it means for data to be aligned.

13. Compare and contrast big-endian and little-endian data.

14. Say memory holds the word 0xABCD1234, starting at address 0x1000, \$t0 holds the value 0x1000, and \$s0 holds 0xDEADBEEF. What are the results of the following instructions?

- lh \$t1, 2(\$t0)
- lb \$t2, 1(\$t0)
- lbu \$t3, 0(\$t0)
- sh \$s0, 0(\$t0)
- sb \$s0, 3(\$t0)

15. Describe the MIPS arithmetic and logical instructions.

16. Say $\$t0 = 0x00000001$, $\$t1 = 0x00000004$, $\$t2 = 0xFFFFFFFF$. What are the results of the following instructions?

- `sub $t3, $t1, $t0`
- `addi $t4, $t1, 0xFFFF`
- `andi $t5, $t2, 0xFFFF`
- `sll $t6, $t0, 5`
- `slt $t7, $t0, $t1`
- `lui $t8, 0x1234`

17. Describe the different classes of MIPS branch instructions.

18. Explain the use of pseudoinstructions in MIPS assembly.

19. Describe the different jump instructions in MIPS.

20. Describe how if statements are compiled to MIPS assembly, using the example provided in lecture.

21. Describe how loops are compiled to MIPS assembly, using the example provided in lecture.

22. Describe the basic semantics of function calls in MIPS assembly.