INSTRUCTION SET ARCHITECTURE

1. The instruction set, also called ISA (instruction set architecture), is part of a computer that pertains to programming, which is more or less machine language.
2. The instruction set provides commands to the processor, to tell it what it needs to do.
3. The instruction set consists of addressing modes, instructions, native data types, registers, memory architecture, interrupt, and exception handling, and external I/O.
4. An instruction is a set of codes that the computer processor can understand. The code is usually in 1s and 0s, or machine language.
5. It contains instructions or tasks that control the movement of bits and bytes within the processor.

The instruction set consists of a limited set of unique codes that let the processor know what to do next, along with some basic rules of how to express them. We can explain more about it using the following:

1. Instruction length (this can vary)
2. Opcodes (the command to be carried out)
3. Operands (what the command will operate on)
4. Registers (internal locations--limited in number and ability, but quick to access)
5. Memory (external storage--a larger and more versatile number of locations, but slower to access)

1. An example of an instruction set is the x86 instruction set, which is common to find on computers today.
2. Different computer processors can use almost the same instruction set while still having very different internal design.
3. Both the Intel Pentium and AMD Athlon processors use nearly the same x86 instruction set.
4. An instruction set can be built into the hardware of the processor, or it can be emulated in software, using an interpreter.
5. The hardware design is more efficient and faster for running programs than the emulated software version.
6. The ISA defines the types of instructions to be supported by the processor.

Examples of instruction set

1. ADD - Add two numbers together.
2. COMPARE - Compare numbers.
3. IN - Input information from a device, e.g., keyboard.
4. JUMP - Jump to designated RAM address.
5. JUMP IF - Conditional statement that jumps to a designated RAM address.
6. LOAD - Load information from RAM to the CPU.
7. OUT - Output information to device, e.g., monitor.
8. STORE - Store information to RAM.

Based on the type of operations they perform MIPS Instructions are classified into 3 types:

Arithmetic/Logic Instructions:

These Instructions perform various Arithmetic & Logical operations on one or more operands.

Data Transfer Instructions:

These instructions are responsible for the transfer of instructions from memory to the processor registers and vice versa.

Branch and Jump Instructions:

These instructions are responsible for breaking the sequential flow of instructions and jumping to instructions at various other locations, this is necessary for the implementation of functions and conditional statements.

What an ISA do

1. The ISA defines the types of instructions to be supported by the processor.
2. Based on the type of operations they perform MIPS Instructions
3. The ISA defines the maximum length of each type of instruction.
4. Since the MIPS is a 32 bit ISA, each instruction must be accommodated within 32 bits.
5. The ISA defines the Instruction Format of each type of instruction.

6. The Instruction Format determines how the entire instruction is encoded within 32 bits
7. There are 3 types of Instruction Formats in the MIPS ISA:

1) R-Instruction Format
2) I-Instruction Format
3) J-Instruction Format

Types of Instruction Set

1. **Reduced Instruction set Computer (RISC)**
2. **Complex Instruction Set Computer (CISC)**