

## Objectives

- Explain the factors that determine a microprocessor's performance (speed).
- List and describe the functions of the ROM chip and what happens when a computer is started

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## Central processing unit (CPU)

- Integrated circuit chip that processes electronic signals
- Also known as a microprocessor or processor
- Most are designed and manufactured by **Intel**
- **AMD – Advanced Micro Devices** also produces microprocessors and is competition for **Intel**

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## CPU (con't.)

- Is usually covered by a **heat sink**
  - A heat-dissipating component that drains heat from the chip
- **Registers**
  - small areas of fast memory located on the CPU chip
  - Registers hold data for a very brief amount of time while the CPU processes the data
  - Registers are like “small scratch pads” the CPU uses

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## Factors that affect CPU Speed

- More RAM
  - more program code and data can be loaded into RAM and therefore accessed quickly by the CPU
  - Computer does not have to go to the disk as often
- CPU's **Clock speed**
- Amount of **Cache** memory
- **Architecture** of the CPU

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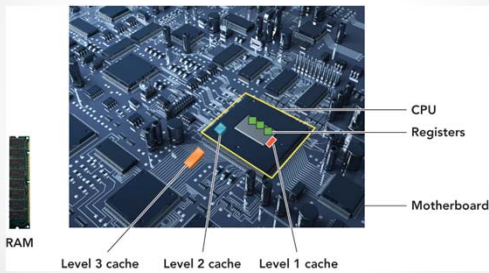
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## What's on the Motherboard?



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## CPU's Internal Clock

- Electronic circuit that produces rapid pulses that synchronize processing activities
- **Clock speed**—measurement of the electrical pulses generated by the system clock, usually **measured in gigahertz (GHz)**
  - **1 GHz** would be 1 billion pulses per second
  - Current desktop/laptop computers are about 2 to 4 GHz

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## Cache Memory

- **Cache memory**

- *Small unit of **ultrafast memory** built into or near the processor*
- ***Used to store frequently or recently access program instructions or data***
- *Faster than RAM*
- *More expensive than RAM*
- Three levels of cache on a system:
  - Level 1 (L1) cache (primary cache on the CPU)
  - Level 2 (L2) cache (secondary cache on the CPU)
  - Level 3 (L3) cache (near the CPU)

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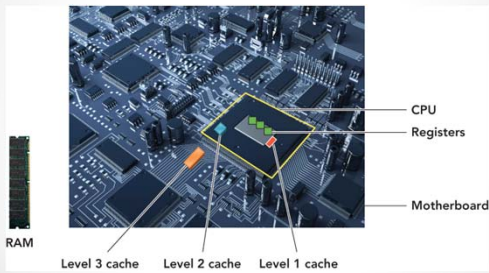
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## What's on the Motherboard?



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## CPU Architecture

- **Examples of Architecture enhancements**

- **Superscalar architecture**—enables the CPU to perform more than one instruction for each clock cycle
- **Pipelining**—enables the CPU to process more than one instruction at a time improving performance
- **Multi-core processing**

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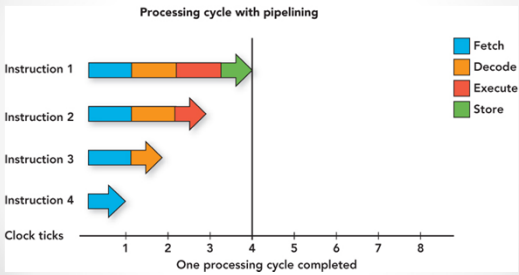
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# Pipelining



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# CPU Architecture Cont.

## • Multi-core processing

- Access time reduced
- Processing time improved
- Each core handles incoming streams of data or instructions at the same time
- Two basic types:
  - Dual core
  - Quad core

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# Rom Chip

## • Read-only memory (ROM)

- Contains *programs* to start the computer
- These programs are stored when electricity is off (like secondary storage)
  - Basic input/output system (BIOS)
    - Low level control of basic input and output devices (considered part of the Operating System)
  - Power-on self-test (POST)
    - Checks circuitry and RAM, marking defective locations
  - Bootstrap loader
    - Program—locates and loads the operating system into RAM

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