What is a CPU?

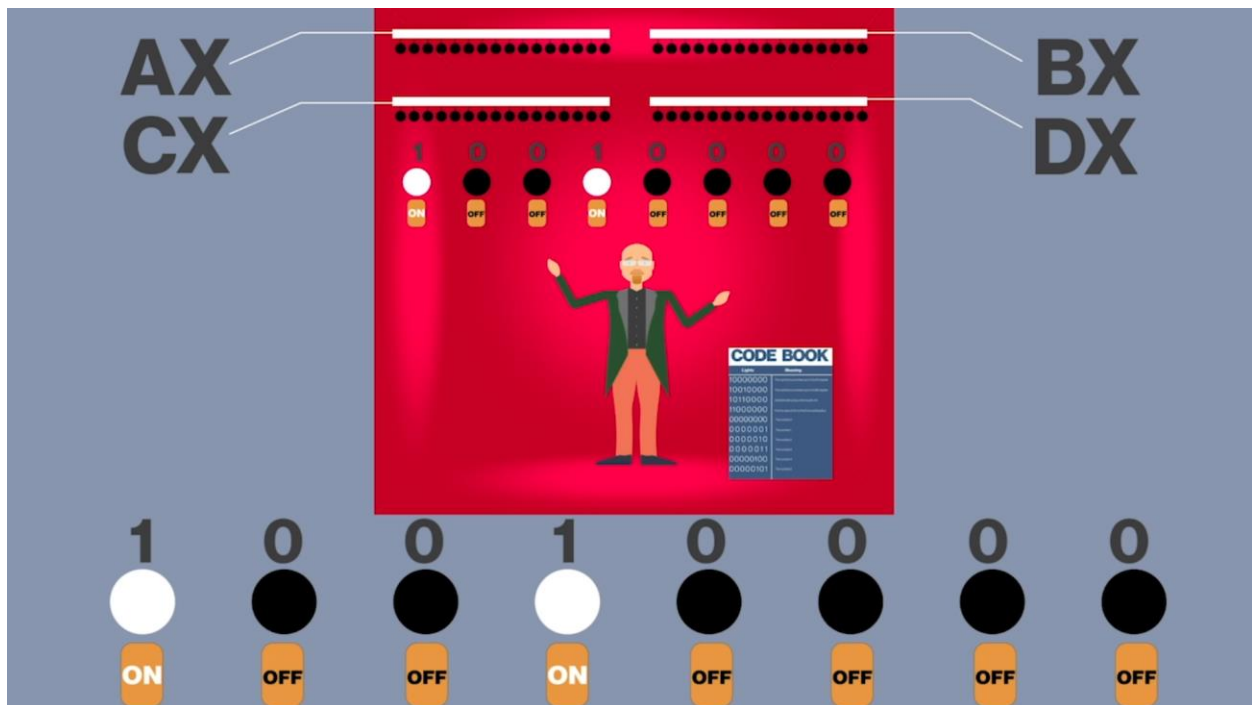- **- Central processing units run programs**
- **- Every CPU has internal features to process commands**
- **- Every CPU runs code based on a specific machine language**
- **- CPUs use pipelines to optimize the processing commands**

EDB (External Data Bus) - lightbulb communication device from outside to inside the box with the worker inside of it (enables you to communicate with the Man in the Box)

    This is **_NOT the Kernel_** (Kernel is the Core of the OS!!)

    Bus - Set of conductors carrying data and control signals

4 General Purpose Registers - AX; BX; CX; DX

Modern CPUs

We can measure the capability of the CPU by how many tasks per second they can do
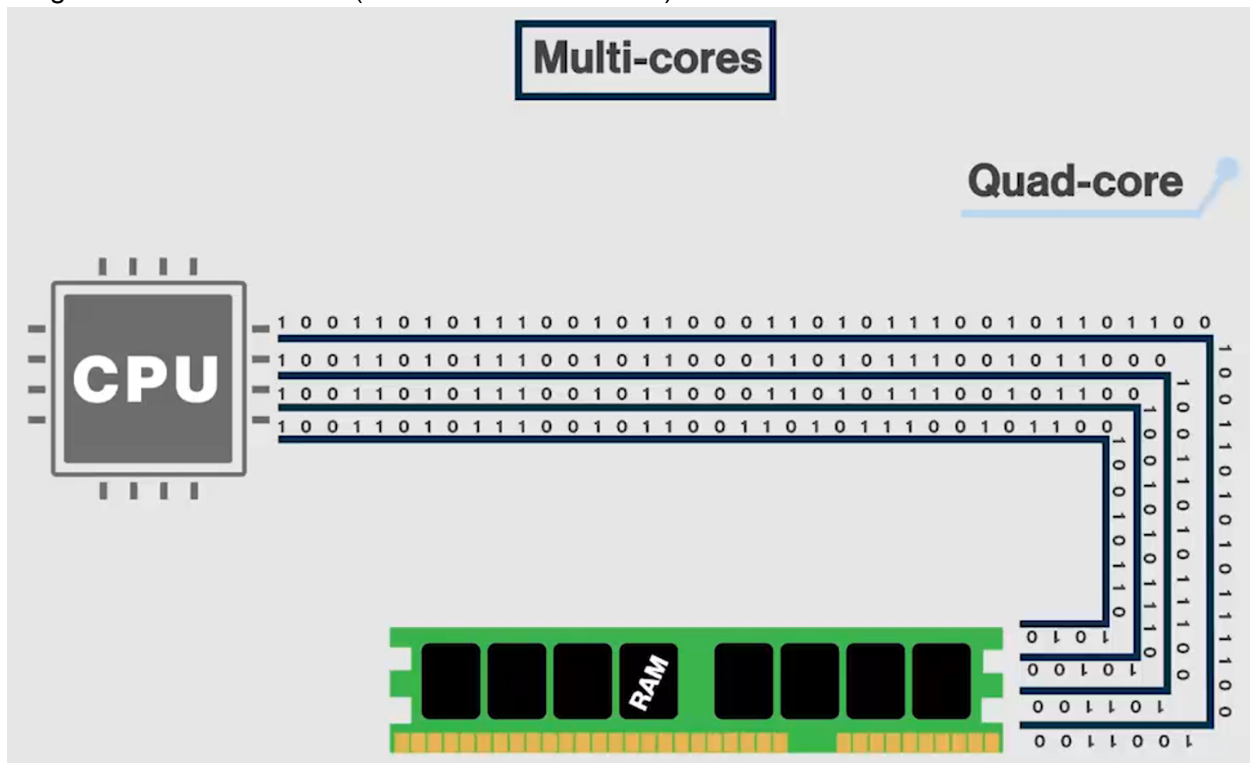
    Clock Speeds

        1 hertz (Hz) = 1 cycle per second

        1 megahertz (MHz) = 1 million cycles per second

        1 gigahertz (GHz) = 1 billion cycles per second   (most common for clock speeds)

    CPU Cores – multiple processors on 1 Chip

Single-core vs Multi-cores (Dual-core & Quad-core)

Multiple Cores (Multiple Pipelines) - Handle multiple pieces of code at a time,
rather than 1 piece of code with only 1 Core/Pipeline

Raspberry Pi - Advanced Risk Machine (ARM)
For a Reduced Instruction Set Computing (RISC)
resulting in a much higher speed of processing, and reduced workload

ARM Chips are also found in the Macbook Pro, Air, and Macbook Mini, etc

Accelerated Processing Unit (APU) - CPU with graphics cards built in

CPU-Z

Code Name "Pinnacle Ridge" is the name of the Microarchitecture
Base Speed = 100MHz (Motherboard Speed)
Multiplier = 40

32-Bit vs 64-Bit Computing

Amount of Data the CPU can handle
>
> x86 (32-Bit) - …..for the exam, just know there's also Intel Architecture, 32-bit (IA-32)
>
> x64 (64-Bit) - greater data handling, improved graphics performance, better security

Almost all modern hardware & software supports 64-bit systems
>
> and are backwards compatible with 32-bit systems
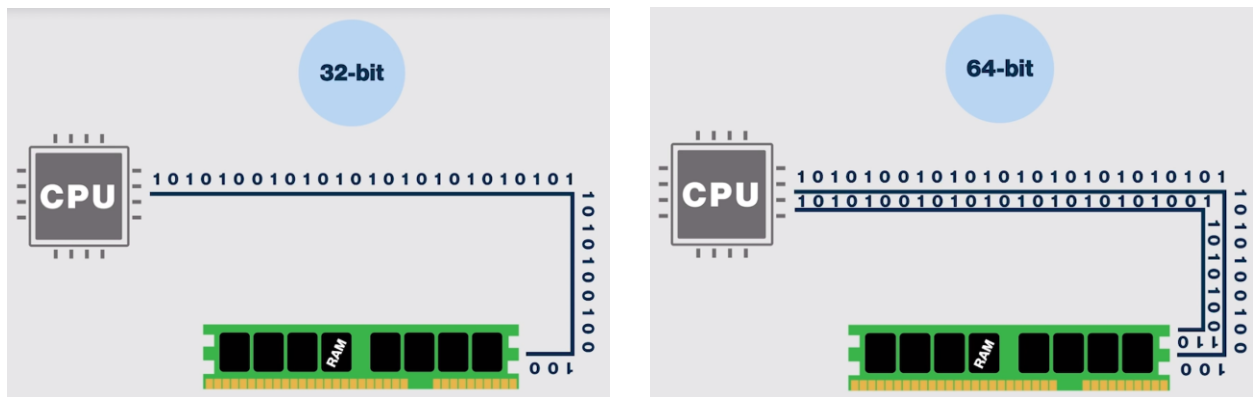
Instruction Set Architecture (ISA)	Supports 32-bit applications?	Supports 64-bit applications?
X86	Yes	No
X86-64	Yes	Yes
x64		

Choosing the Right CPU

- CPUs designed for laptops - features for better power consumption & battery usage
- Higher-end CPUs - more cores & faster clock speed
- Intensive tasks such as 3D gaming & video editing benefit from CPUs with extra cores
- Some CPUs are unlocked & can be overclocked

What type of system do you want?
What's the primary use of the computer?
How long do you want this system to last?

pcpartpicker.com

Overclocking - Special Motherboards have the ability to talk to a CPU
              telling it to set the Metronome Up, but this makes systems unstable
              (There would be a lot more heat coming from the CPU,
               which would require the Cooling Unit to work harder too)
              Just keep the "knob" where it is -no need to turn it up

CPU Generations and Architecture

- Intel and AMD are the main brands for CPUs
- The higher a CPU's tier, the better the performance
- Generation gives good indicator of the CPU's age
- Model refers to the performance of the CPU
- Suffix denotes whether the CPU is unlocked or has integrated graphics

Multithreading – parallel computing on a certain task

https://techgamesnews.com/cpus/

CPU Cooling

There's no other piece of hardware in our PC that generates more heat than the CPU
Keeping temperatures under control is key for a system's longevity

Overheating – leads to system instability and may experience Intermittent Shutdowns

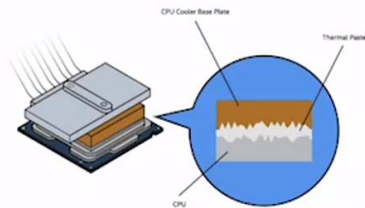Heat Sink - Anything that can take heat from another device
Heat is transferred into these metal fins & pipes to transfer heat from the CPU

Thermal Paste & Pads - used to fill in gaps & provide better thermal conductivity
between CPU & heat sink
Use a pea-size amount.
If you have over-spill,
use a cleaning kit (thermal material remover or 70% isopropyl alcohol)

Fans (air-cooling) - 120mm to 180mm
Bigger Fans don't have to turn as fast, so they don't create as much noise

Liquid cooling - higher thermal transfer capabilities than air-cooling

General Rule - Pull Cool Air In from the front & top of the system,
and Push the Hot Air Out (typically with the Power Supply)
(We could have Fans on the back to help pull the hot air out)
-Make sure you have good airflow!

Installing and Troubleshooting the CPU

Always use electrostatic discharge (ESD) prevention methods when handling CPUs

Land Grid Array (LGA) and Pin Grid Array (PGA) are the 2 most common types of CPU sockets
LGA (lands) - Intel
PGA (pins) - AMD

Zero-Insertion Force (ZIF) mechanism - secures the CPU into the motherboard's CPU socket

Align the Orientation notch on the CPU with the notch on the Socket

Troubleshooting a Non-functional CPU – check all connections!
Make sure the fan, heat sink, and CPU itself are seated properly before proceeding