### **⚡ 1. Relative Performance**

To compare how fast one computer is over another, we look at the time they take to complete the same task.

#### **🧮 Example:**

* **Computer A** takes **10 seconds**
* **Computer B** takes **15 seconds**

To find out **how much faster A is than B**, we use:

✅ **Conclusion:** Computer A is **1.5 times faster** than Computer B.

### **⏱️ 2. Measuring Performance**

Performance is generally measured by **time**, but there are different types:

#### **🧩 Types of Time:**

* **Elapsed Time**: Total time from start to finish (includes all delays like I/O, other processes, etc.)
* **CPU Time**: Time during which the CPU was actually working on the task.

### **🖥️ 3. Types of CPU Time**

CPU time is further divided into:

1. **User CPU Time**: Time spent executing **your program code**.
2. **System CPU Time**: Time spent executing **operating system tasks** (e.g., file access, memory allocation).

These give you an idea of how efficiently the CPU was used for actual computation.

### **📊 4. Example: Calculating CPU Utilization**

Let’s say, after running a program, we get:

* **User CPU Time**: 90.7 seconds
* **System CPU Time**: 12.9 seconds
* **Elapsed Time**: 159 seconds

Then,

✅ This means the CPU was **actively working** on the task for **about 65%** of the time.

### **📌 5. Key Terms Recap**

| **Term** | **Meaning** |
| --- | --- |
| **Elapsed Time** | Total wall-clock time (including waiting, I/O, etc.) |
| **CPU Time** | Actual time the CPU was working on the task |
| **User CPU Time** | Time CPU spent executing user code |
| **System CPU Time** | Time CPU spent executing OS services on behalf of the program |
| **CPU Utilization** | Percentage of time CPU was busy with your program |