## Response/execution time:

The total time required for the computer to complete a task.

## Throughput:

It is also called bandwidth. It is the number of tasks completed per unit time.

## Difference between Response time & throughput:

| Response time | Throughput |
|---|---|
| i) The total time required for the computer to complete a task. | i) Throughput is the number of tasks completed per unit time. |
| ii) The computer user is interested. | ii) The administrator of a large data center is interested |
| iii) It is usually measured in units of second/request. | iii) It is usually measured in units of request/second. |
| iv) Increasing throughput improves response time. | iv) Decreasing response time improves throughput. |

The performance and execution time for a computer X is:

$$\text{performance}_X = \frac{1}{\text{execution time}_X}$$

For two computers X and Y, if the performance of X is greater than the performance of Y, then:

$$\text{performance}_X > \text{performance}_Y$$

$$\Rightarrow \frac{1}{\text{execution time}_X} > \frac{1}{\text{execution time}_Y}$$

$$\Rightarrow \text{execution time}_Y > \text{execution time}_X$$

That is, the execution time on Y is longer than that on X, if X is faster than Y.

If "X is n times faster than Y" or "X is n times as fast as Y" - then

$$\frac{\text{performance}_X}{\text{performance}_Y} = n$$

$$\Rightarrow \frac{\text{performance}_X}{\text{performance}_Y} = \frac{\text{execution time}_Y}{\text{execution time}_X} = n.$$

P→31

⊞ Example:

If computer A runs a program in 10 seconds and computer B runs the same program in 15 seconds, how much faster is A than B?

Solve:

we know, if A is n times faster than B, then

$$\frac{\text{performance}_A}{\text{performance}_B} = \frac{\text{execution time}_B}{\text{execution time}_A} = n$$

$$\Rightarrow \frac{\text{performance}_A}{\text{performance}_B} = \frac{15s}{10s} = 1.5$$

∴ computer A is 1.5 times faster than computer B. (Ans:)

we can also say that computer B is 1.5 times slower than computer A.

$$\frac{\text{performance}_A}{1.5} = \text{performance}_B.$$