

algorithm :- It's an step by step process to solve a computational problem's in very efficient way

Program :- Program is also step by step process to solve problem.

But Difference b/w program & Algorithm

Algorithm's	Program
* Design time	→ Its written at Implementation time.
* Domain Knowledge	→ Programmer,
* Can use any language	→ only use programming language ex:- C, C++, python, Java
* Hardware/software operating system	→ Hardware & OS
* Independent on anyone Req. or Requirement	→ Testing with program
* Analyze an algo.	

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Prior Analysis

posteriori analysis
Testing...

① Algorithm's

① programme

② independent of language

② language dependent

③ Hardware independent

③ Hardware dependent

④ Time & Space Function

④ Watch time & Bytes

Characteristic of Algorithms :-

- ① Input \rightarrow 1 or more input will take
- ② Output \rightarrow atleast one output.
- ③ Definiteness \rightarrow all the steps known steps
- ④ Finiteness \rightarrow have to stop at some point.
- ⑤ Effectiveness \rightarrow no unnecessary code programme.

How to write an Algorithm

ex: Algorithm's Swap (a, b)

```

begin {
    temp  $\leftarrow$  a;
    a  $\leftarrow$  b;
    b  $\leftarrow$  temp;
}
end {

```

How to Analyze an algorithm's :

① Time

* Every time whatever we are doing with problem to find a solution through the algo. first factor is time whether it's on paper with pen or in computer machine it'll depend on the time how much time it'll taking.

② Space.

after the time 2nd criteria is Space how much space of memory it's taking through the algorithm's you will see

③ Network / consumption.

* Now days, Every app is Internet based, web based (or) cloud based Done transfer (or) Network consumption

It's also imp criteria.

→ How much data is going to transfer

④ power consumption.

* This also an imp criteria ~~if~~ if your using all machines

ex: mobile, laptops, PC, Tablets, in your hand.

⑤ CPU Register's if we are develop.

Device driver or system level program

~~we need to know algorithms~~

we need to know how much of

CPU register it's consuming

These are all the factors and criteria required to analyze based on an algorithm's

Based on your project Reqⁿ (or) specification.

Ex: ① How we analyze an algorithm

1. for analysis purpose we need to know the time. We will do the space analysis.

ex: algo swa (a, b)

{

Temp = 0; → 1

a = b; → 1

b = temp; → 1

→ 3 unit of time

}

* Every statement in an algo. Takes 1 unit of time, Every stmt = 1 unit of time

another ex: for unit of time

$x = 5 * a + b$

→ it's only one unit of time in General on paper

at programming time in prog lang

But

there's four statements

ex:

$x = 5 * a + b$

↓
assigning
(4)

↓
addition
(1)

↓
multiplication
(2) (3)

Space analysis

algo. swap(a, b)

```
{
    temp = a; → 1
    a = b; → 1
    b = temp; → 1
}
```

Space: Variables

a → variable 1

b → 1

temp → local variable 1 word

$S(n) \rightarrow \text{constant}$

Constant mean = $O(1)$

* if it is constant whatever the value is if it is constant then we'll name it $O(1)$

Time & Space

Time

- ① depends on the each statement of problem or code
- ② each statement is equal to ① one unit
- ③ if the unit is constant then $O(1)$

④ Time = statement

Space

- ① depends on the words (or) variable
- ② each variable = one unit
- ③ same as time if $\text{Const} = O(1)$
- ④ Space = variable (or) word