-: MILLENNIUM PRIZE PROBLEM :-

Question:-

: P versus NP :

The class of problems for which an algorithm can find a solution quickly (in polynomial time) is termed P. The class of problems for which an algorithm can verify a solution quickly is termed NP. The question is whether all problems in NP are also in P.

Answer:-

No, All NP does not belong to P.

Proof:

It is clear that,

(a) The number of steps in an algorithm required to find a solution for a problem is always greater than or equal to the number of steps in an algorithm required to verify the solution for the same problem.

(b) The number of steps in an algorithm required to find a solution for a problem is directly proportional to the number of steps in an algorithm required to verify the solution for the same problem.

[The above statements (a) and (b) are true. Since, In general, the algorithm used to find a solution for a problem can also be reduced to verify the solution for the same problem. Similarly, the algorithm used to verify the solution for a problem can also be elaborated to find the solution for the same problem.]

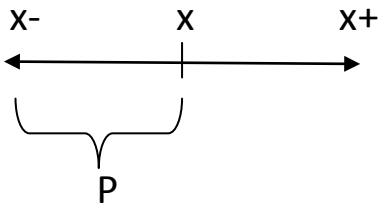
Let the time required to find and to verify the solution quickly be x.

For P;

Solving time (Quickly): x

Verifying time [From (a) & (b)]: x/x-

In time line;

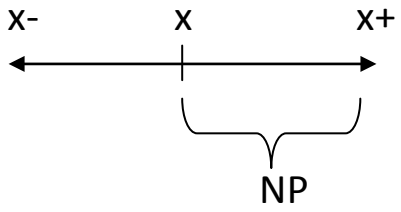


For NP;

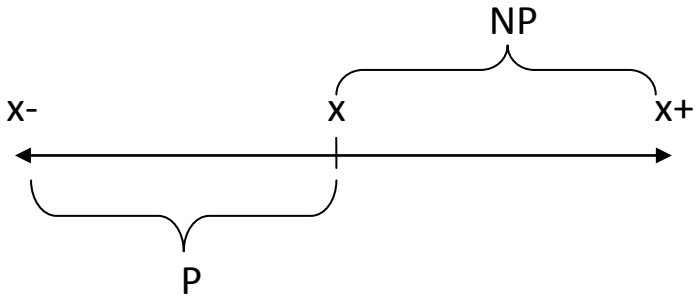
Solving time [From (a) & (b)]: x/x+

Verifying time (Quickly): x

In time line;



By combining the both time lines;



Result:

Thus, Some of NP may and most of NP may not belong to P. But, It is very clear that all the NP does not belong to P.