order: i.e.
\[ S[i] \leq S[i+1] \]

Binary Search:
Assume \( N = 2^n \)

Recursive definition
\[
\text{BinS}[S[L..U], m] =
\begin{cases} 
  \text{true} & \text{if } L = U \text{ and } S[L] = m \\
  \text{false} & \text{else}
\end{cases}
\]
if \( L \leq U \) then
\[
SZ = U - L + 1
\]
\[
\text{mid} = L + \frac{SZ}{2}
\]
if \( m \leq S[L + \lfloor \frac{SZ}{2} \rfloor] \) then return
\[
\text{Bins} \left( S[L : L + \lfloor \frac{SZ}{2} \rfloor - 1], m \right)
\]
else return
\[
\text{Bins} \left( S[L + \lfloor \frac{SZ}{2} \rfloor, U], m \right)
\]
Divide-and-Conquer:

\[ N - 1 \]

Problem of size \( \leq m \) is broken down into problem
of size \( \frac{N}{2} \)

\[
T(N) = 1 + T\left(\frac{N}{2}\right)
\]

\[
= 1 + 1 + T\left(\frac{N}{4}\right)
\]

\[
= 1 + 1 + \ldots + 1
\]

\[
= \log_2(N)
\]
Linear Search: $N$

Binary Search: $\log N$

\[
\log_{2} (1024) = 10 \\
\log_{2} (2048) = 11
\]
Time = \# steps x time arch.

Algorithm (inst.) \rightarrow\ M/C design \rightarrow Compiler

1. Compiler
2. Compiler

IC \times CC/4 \times time\%e

T = L = P

\text{Parallelism}

\text{Throughput} \rightarrow \text{Latency}

\text{Background}:
- Program → Compiler
- Program in Assembly

\text{High Level}

\text{Program in Assembly Lang.}

\text{Assembly Lang.}
Rep. tuple set

(1,0) (2,x) (3,x)
(4,0) (7,0) (5,x)
(9,0) (9,x)

8 possibilities.

7 possibilities.

a possibilities.
Andy Groove's Leader Article

Do Engg's have any role to play in job outsourcing/lay-off problem/crisis? Need for Engineer's leaders.
Leaders who are Engineers
Bill Gates
Andy Grove

Brain Drain

US ➔ China ➔ Best minds ➔ India
Decision Making
Oil rig problem in Gulf of Mexico

Ethics
To succeed in University, you need to:

1. Take Notes!
2. Ask Questions!
3. Study!
4. Show up

Ferpa?

\[ \equiv \]

privacy

5. Go to the mile house.