Alg.: an ordered set of unambiguous, executable steps, defining a terminating process. (Lead to an end)

Parallel alg. do not possess a single thread of its own

Primitives: building blocks from which algorithms can be constructed. Precise definition with no ambiguity between syntax and semantics. Concepts represented meaningfully.

Primitives & collection of rules => complex ideas => programming language.

"High level" primitives are constructed from lower-level primitives resulting in formal programming language.

Pseudocode: notational system in which ideas can be expressed informally during the algorithm development process.

1. If (condition) then (activity) else (activity)
   
   Exam: GDP ↑, Buy Stocks, else Sell
   Leap year div 366 else 365

2. If (condition) then (activity)
   Exam: sales ↓ then price ↓ 5%

3. While (condition) do (activity)
   Ex: tickets remain do sell a ticket
assign (name) the value (expression)

Ex: assign (Total) the value (Price + Tax)

Indentation enhances the readability

Procedure or subprogram, subroutine, procedure, module, function (Should be generic as possible)

Procedure Name
Ex: Procedure Greeting p176 Fig 4.4

Procedure Sort (List) ← Argument or parameter

Problem Solving
Ex: Example p179

1. Understand the problem
2. Get an idea of how algorithm may solve problem
3. Formulate algorithm & represent as a program
4. Evaluate program for accuracy & other problems

Iterative Structures: collection of instructions is repeated in a looping manner.
Sequential Search Algorithm  p185 Fig 4.6
processes ➔ algorithm

Loop: execute in a repetitive fashion under the direction of some control process
   while (condition) do (body)
   repeat (activity) until (condition)

Fig 4.7 Components of repetitive control
   Initialize
   Test
   Modify

Insertion Sort Algorithm  p192 Fig 4.10 & 4.11

Recursive Structures:
   Binary Search / divide-and-conquer methodology
Efficiency for 30,000 records

Sequential Search vs Binary Search
Ave depth would be half
or $15,000 / \sqrt{n}$ search

$\frac{n}{2}$

Divide by 2

$15,000 \div 2 = 7,500$ (takes wrong step)

Only 15/2 search

$\log n$

Insertion Sort:

Best case: $n - 1$

Worst case for $n$: $1 + 2 + 3 + \ldots + (n-1)$

or $\frac{n(n-1)}{2}$ or $\frac{1}{2} (n^2 - n)$

Ave $= \frac{1}{2} \text{(Worst Case)} = \frac{1}{4} (n^2 - n)$

parabolic shape

Big-theta notation

$\Theta(n^2)$

Binary Search

logarithmic expression

$\Theta(\log n)$