DS_Note

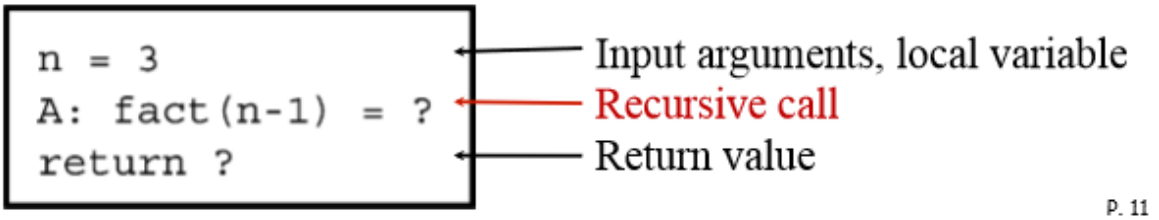
Recursion

- different between Interation
  - Iteration : 將以求得得數值帶入迴圈，重複執行程式碼來獲得新數值。

- use divide and conquer strategy

- the least one smaller problem : base case (do nothing)

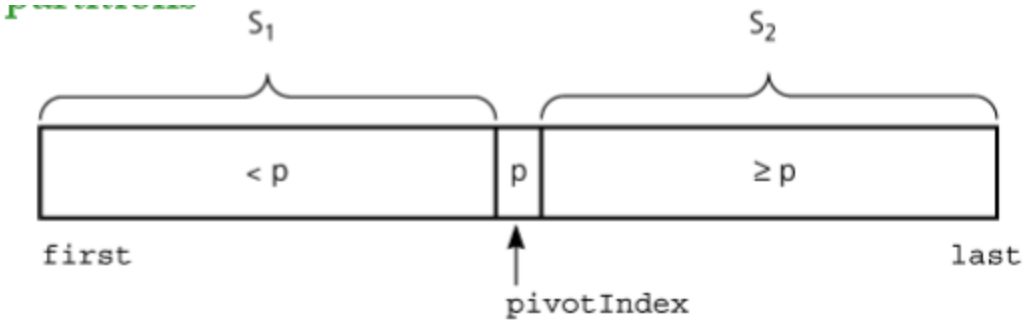
- box trace :
  - roughly corresponds to an activation record



- four steps:
  1. define smaller problem
  2. decrease the problem size
  3. find a complete set of Base cases
  4. will always reach a base case

Finding the kth smallest item in an array

- solution proceeds:
  1. selecting a pivot item in array
  2. cleverly arranging the item in array about pivot item
  3. recursively applying strategy to one of the partitions



Data Abstraction

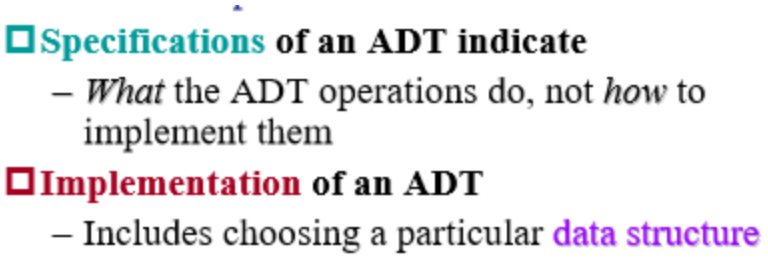
- Object-Oriented 物件導向觀念
  - A class combine :
    1. Attributes : data member
    2. Behaviors : member function
  - Three features :
    1. Encapsulation 封裝 : Hides inner details.
    2. Inheritance 繼承 : reused
    3. Polymorphism 多型 : 為不同資料類型的實體提供統一的介面

- Achieve a Better Solution

1. Cohesion 高內聚 : 每個函式只做一件事，較有效率
2. Coupling 低耦合 : 參數傳得越少越好

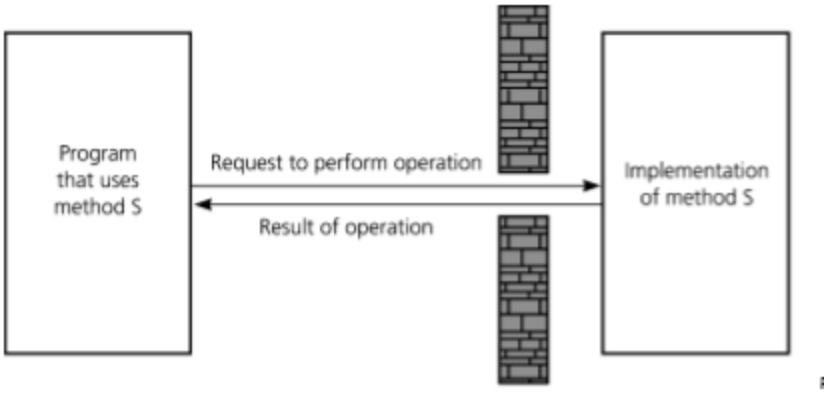
- Operation contract
  - Purpuse, Assumptions, Input, Output

- Abstract Data Types : motive
  - Modularity : Isolates error and eliminates redundancies
  - Function abstraction : Specifications 描述 and implementation 實作



  - Information hiding : Hide certain implementation detail

- Abstract Data Types : concepts
  - the isolation of modules is not total



- Abstract Data Types : goals

  – Asks you to think what you can do to a collection of data independently of how you do it
  – Allows you to develop each data structure in relative isolation from the rest of the solution
  – A natural extension of functional abstraction

- C++ classes
  - Constructor : complier will generate a default constructor
  - Destructor : destroy an instance of an object
  - Inheritance : An instance of a derived class can invoke public methods of the base class

  Private: only class instances
  Protected: subclass instances
  Public: any class instances

- C++ namespace
  - a method for logically grouping declarations and definions into a common declarative region
  - use scope resolutions operator(::) to access

- C++ Exceptions
  - handling an error during execution
  - throwing an exception
  - use try block and catch block (similar to switch)

Linked List

- array v.s. linked list
  - array : has a fixed size and need to shift data
  - linked list : able to grow in size as need

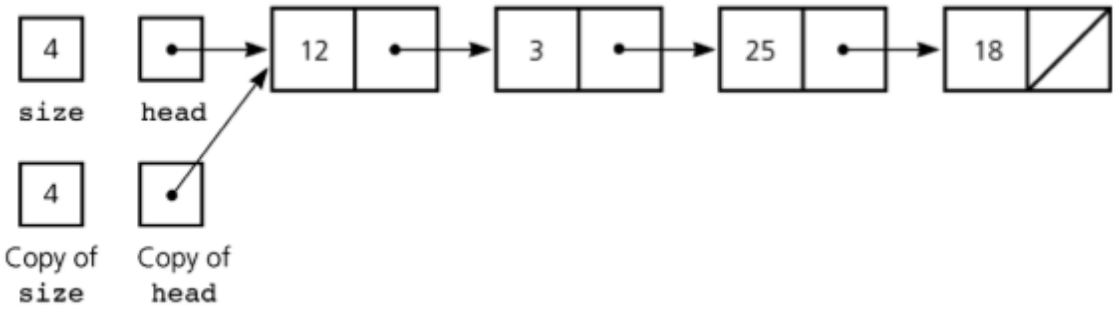
- pointer
  - contain the address in memory
  - delete operator return dynamically allocated memory to the system for reuse

- Dynamic allovation of arrays

```
int arraySize = 50;
double *anArray = new double[arraySize];

   double *oldArray = anArray;
   anArray = new double[3*arraySize];
```

- Shallow Copy vs. Deep Copy
  - Shallow Copy : the copy of head points to the copied linked list



  - Deep Copy : the copy of head points to the original linked list