

4.1.3 Abstract Data Types

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6 An Abstract Data Type (ADT) is used to create a linked list. The linked list is created as an array of records. The records are of type `ListNode`.
An example of a record of `ListNode` is shown in the following table.

Data Field	Value
Player	"Alvaro"
Pointer	1

*TYPE ListNode
DECLARE Player : STRING
DECLARE Pointer : INTEGER
ENDTYPE*

① DECLARE Scorers : ARRAY [0:9] OF ListNode

(a) (i) Use **pseudocode** to write a definition for the record type, `ListNode`. [3]
(ii) An array, `Scorers`, will hold 10 nodes of type `ListNode`. Use **pseudocode** to write an array declaration for this array. The lower bound subscript is 0. [2]
(b) The linked list stores `ListNode` records in alphabetical order of player. The last node in the linked list always has a `Pointer` value of -1. The position of the first node in the linked list is held in the variable `ListHead`.
After some processing, the array and variables are in the state as follows:

Scorers		
	Player	Pointer
0	"Alvaro"	1
1	"Antoine"	3
2	"Dimitri"	7
3	"Cristiano"	2
4	"Gareth"	5
5	"Graziano"	6
6	"Olivier"	8
7	"Erik"	4
8	"Yaya"	9
9	"Zoto"	-1

ListHead
0

A **recursive** function traverses the linked list to search for a player.
An example of calling the function, using pseudocode, is:
`Position <- SearchList("Gareth", ListHead)`

Complete the following **pseudocode** to implement the function `SearchList()`.
The function will return a value of 99 when a player is not found.

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```
FUNCTION SearchList(Find : STRING, Position : INTEGER) RETURNS INTEGER
    IF Scorer[Position].Player = Find
    THEN
        RETURN Position
    ELSE
        IF Scorer[Position].Pointer <> -1
        THEN
            Position ← SearchList(Find, Scorer[Position].Pointer)
            RETURN Position
        ELSE
            RETURN 99
        ENDIF
    ENDIF
ENDFUNCTION
```

*New Idea
You can search a linked list using recursion.*

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