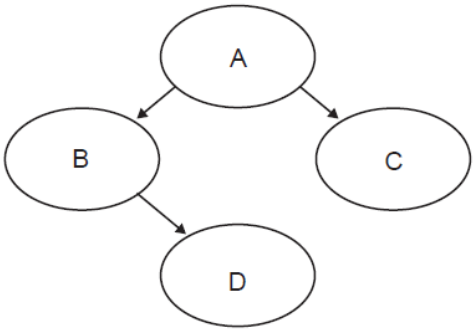
HL Unit 5 – Abstraction Data Structures

Quiz 1 - Trees

Question 1			
Objectives:	5.1.15, 5.1.16	Exam Reference:	Nov-16 7

Consider the following binary tree.



(a) Identify all leaf nodes in this binary tree. [1]

D and C;

(b) For this binary tree, state the result of:

(i) inorder tree traversal, [1]

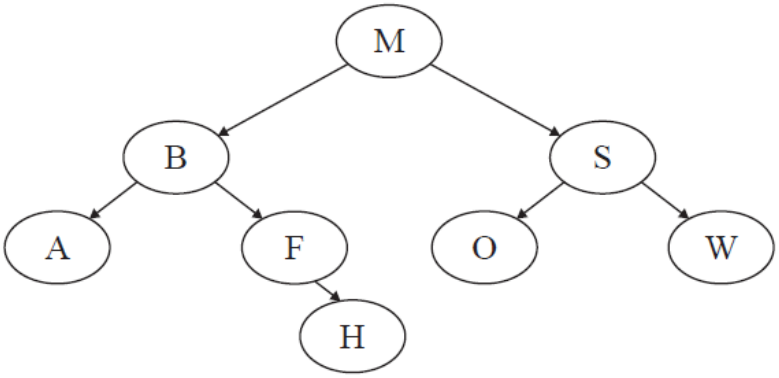
B D A C;

(ii) postorder tree traversal. [1]

D B C A;

Question 2			
Objectives:	5.1.15, 5.1.16, 5.1.17	Exam Reference:	Nov-14 10

1. Consider the following binary search tree.



(a) State the order in which data will be listed using *preorder traversal*. [1]

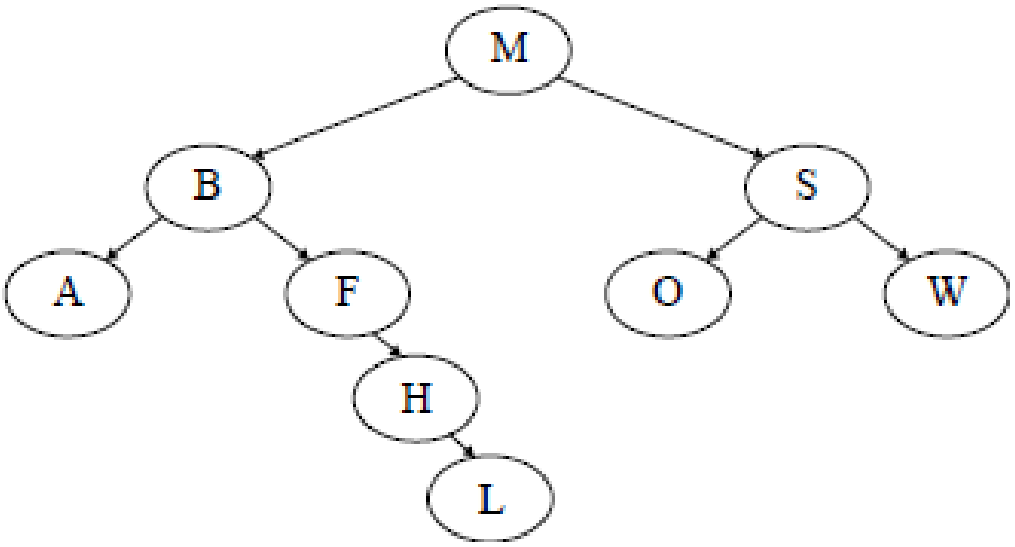
*Award **[1 mark]** for correctly stating the solution.*
M B A F H S O W;

(b) State the number of leaf nodes in the tree. [1]

*Award **[1 mark]** for stating the correct number of leaf nodes.*
4;

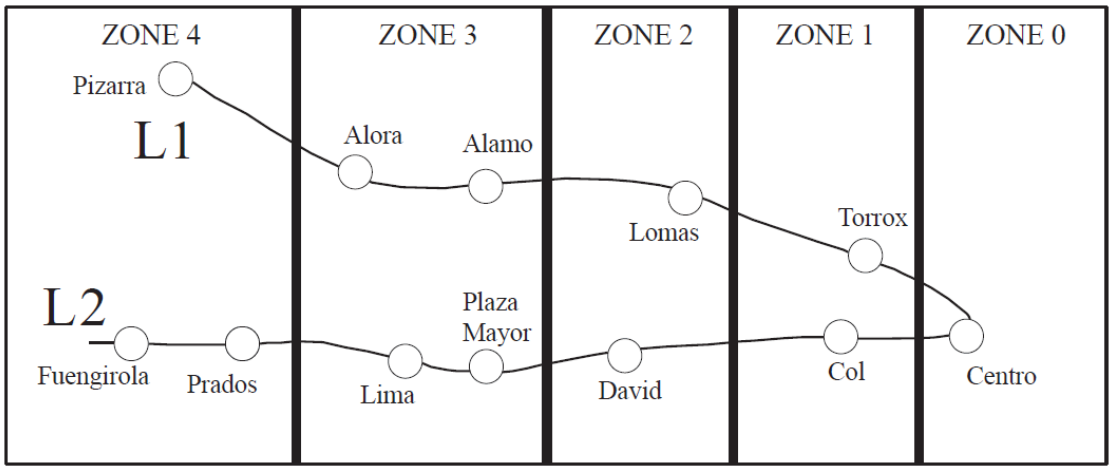
(c) Construct the tree after adding the node L. [1]

Award [1 mark] for correctly adding the node L.



Question 3			
Objectives:	5.1.15, 5.1.17	Exam Reference:	May-14 15

A suburban railway system for a large city in Southern Europe consists of two lines **L1** and **L2**, which meet at the station Centro, where passengers can change from one line to the other. The system is shown below.



Each station is located in a particular zone, and the total number of zones in which the journey takes place determines the train fare. Note, if a passenger starts in **Zone 1**, goes to **Zone 0** and then back to **Zone 1**, the journey has taken place in **three** zones. Examples of the number of zones are shown below for different journeys.

Travelling from	Travelling to	Number of zones
Lima	Plaza Mayor	1
Alora	Plaza Mayor	7
Lomas	Col	4

(a) State the number of zones in which the journey takes place when travelling from Alora to Fuengirola. [1]

8;

The data for each station (station name, line, zone) is stored on the system's server in the
collection *TRAIN_DATA*. There are 12 stations in total. The first part of the collection is shown below.

```
Centro, L1, 0, Alora, L1, 3, Torrox, L1, 1, Col, L2, 1, ...
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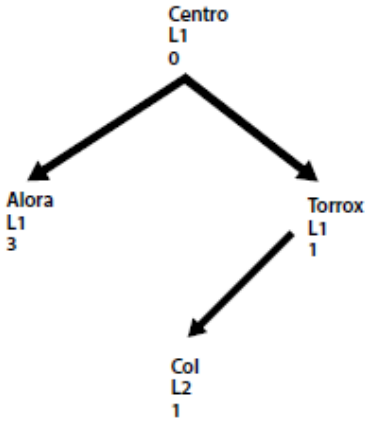
From this we can see that Alora is part of line L1 and is located in Zone 3.
At the start of each day, the data in *TRAIN_DATA* is read in to the binary tree *TREE*, in which
each node will hold the data for one station. The binary tree will be used to search for a specific
station's name.

(b) Sketch the binary tree after the station data from the first part of the collection, given above, has been added. [3]

Centro as root;
Station names in correct position;
All 3 items of data for each node;



The *TRAIN_DATA* collection is also used to construct the one-dimensional array *STATIONS* (which only contains the list of station names sorted into alphabetical order), where *STATIONS[0] = Alamo*.

(c) State the value of *STATIONS[4]*. [1]

David;

The two data structures (*STATIONS* and *TREE*) are now used to construct the two-dimensional array *FARES* containing the fares between stations, partly shown below. Note that the fare for travelling in each zone is €1.00.

FARES	Alamo	Alora	Centro	Col	...
Alamo	0	1.00	4.00	5.00	...
Alora	1.00	0	4.00	5.00	...
Centro	4.00	4.00	0	2.00	...
Col	5.00	5.00	2.00	0	...
...	...	...	...	...	... *etc*

(d) Calculate the fare for travelling from Torrox to Lima. [1]

5.00 (Euros);
Accept 5.