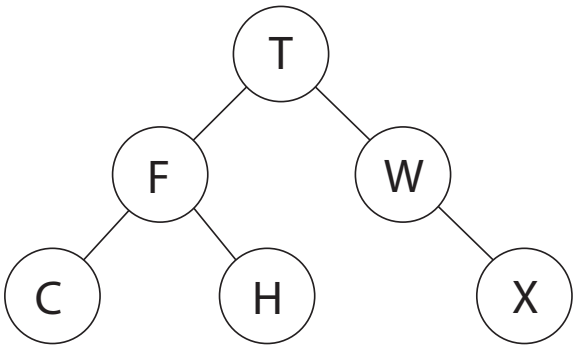
Binary Trees

1. Here is a Binary Tree.



a) annotate it to show:

root node
leaf node
right child
left child
parent
subtree

5.1.15

b) Insert the following 2 nodes into the above tree.

D, M

5.1.17

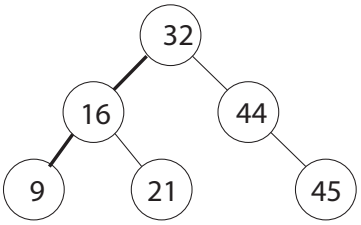
c) In your own words, describe how to insert a new node into a binary tree (remember to start at the root). 5.1.17

d) For the following 3 traversals of the tree (with your insertions from part b), write the output.

in order
pre order
post order

e) Here is another binary tree. 5.1.17

i) redraw the tree after removing 9
ii) redraw the tree after removing 16
iii) redraw the tree after removing the root node

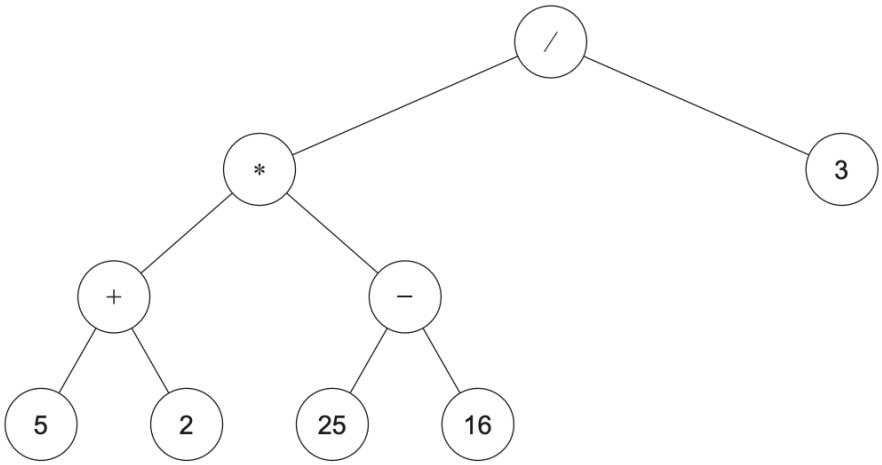


f) Describe how your completed Task e ii. Remember to start at the root. 5.1.17

g) Describe how your completed Task e iii. Remember to start at the root. 5.1.17

g) What do you know about non-binary trees? How do the differ from binary trees? 5.1.14

2022 May HL1 15 An alternative data structure in which the expression used in **part (a)** may be stored is a binary tree. If the tree is traversed using postorder tree traversal, the output is formatted in RPN.



(c) Outline the steps involved in traversing the given tree using postorder tree traversal. [4]

(d) State the output from the given tree using inorder tree traversal. [2]

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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, ...
```

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]*