

CMSC 204 - Activity 7.1

Module 14 - “Trees, Binary Search Tree, & Balanced Search Trees”

Algorithm

My algorithm will be the following for creating a tree from provided pre-order (PO) and in-order (IO) sequences:

1. Look at the first element of PO
2. In IO, locate the first element of PO
3. Split IO into left (L) and right (R) sections, and label accordingly
4. In PO, label the L and R section elements from IO
5. In the L section, repeat steps 1-4
6. In the R section, repeat steps 1-4

Utilizing the Algorithm

The PO and IO sequences for Activity 7.1 are:

PO: {A, B, D, E, C, F, G, H}
IO: {E, D, B, A, G, F, H, C}

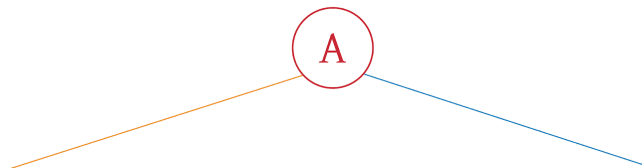
Step 1 & 2: Looking at the **first element** in PO and locating it in IO:

PO: {**A**, B, D, E, C, F, G, H} *Step 1*
IO: {E, D, B, **A**, G, F, H, C} *Step 2*

Step 3 & 4: Splitting IO into two sections **L** and **R**, and reflecting the sections in PO.

PO: {**A**, **B**, **D**, **E**, **C**, **F**, **G**, **H**} *Step 4*
IO: {**E**, **D**, **B**, **A**, **G**, **F**, **H**, **C**} *Step 3*

Tree with **A** and two sections **L** and **R**:



Recursive Step 5 with the L section of A (A.L):

PO of A.L: {B, D, E}
IO of A.L: {E, D, B}

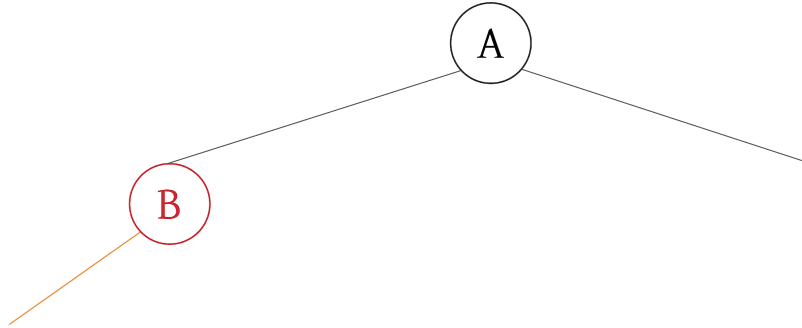
A.L Step 1 & 2:

PO of A.L: {**B**, D, E} *Step 1*
IO of A.L: {E, D, **B**} *Step 2*

A.L Step 3 & 4:

PO of A.L:	$\{\mathbf{B}, \mathbf{D}, \mathbf{E}\}$	Step 4
IO of A.L:	$\{\mathbf{E}, \mathbf{D}, \mathbf{B}\}$	Step 3; Only a <i>left</i> section, no right section

Tree with **B** and one section **L**:



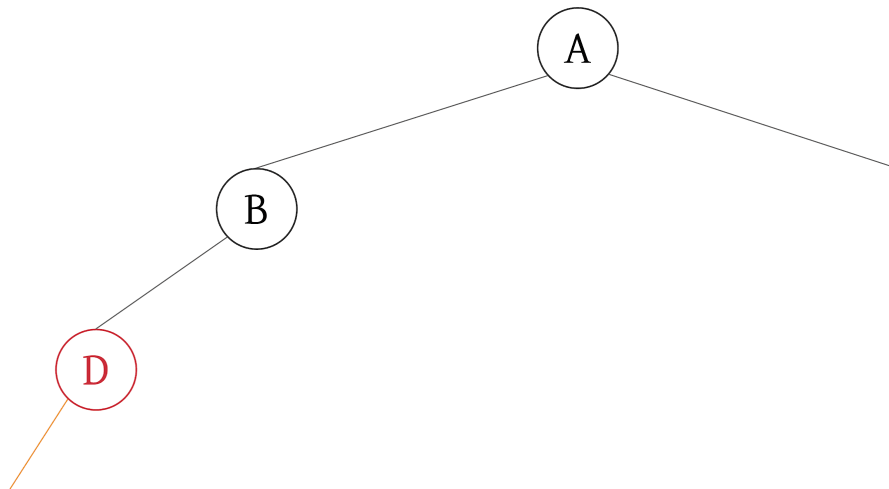
A.L.B.L Step 1 & 2:

PO of B.L:	$\{\mathbf{D}, \mathbf{E}\}$	Step 1
IO of B.L:	$\{\mathbf{E}, \mathbf{D}\}$	Step 2

A.L.B.L Step 3 & 4:

PO of B.L:	$\{\mathbf{D}, \mathbf{E}\}$	Step 4
IO of B.L:	$\{\mathbf{E}, \mathbf{D}\}$	Step 3; Only a <i>left</i> section, no right section

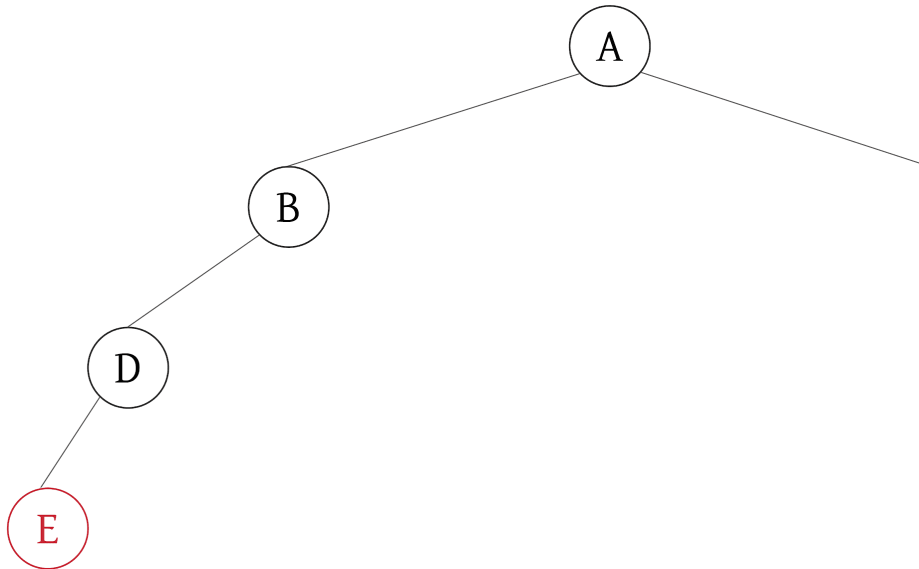
Tree with **D** and one section **L**:



A.L.B.L.D.L Step 1-4:

PO of D.L: {**E**}
 IO of D.L: {**E**} *No L or R sections*

Tree with **E** and no L or R sections:



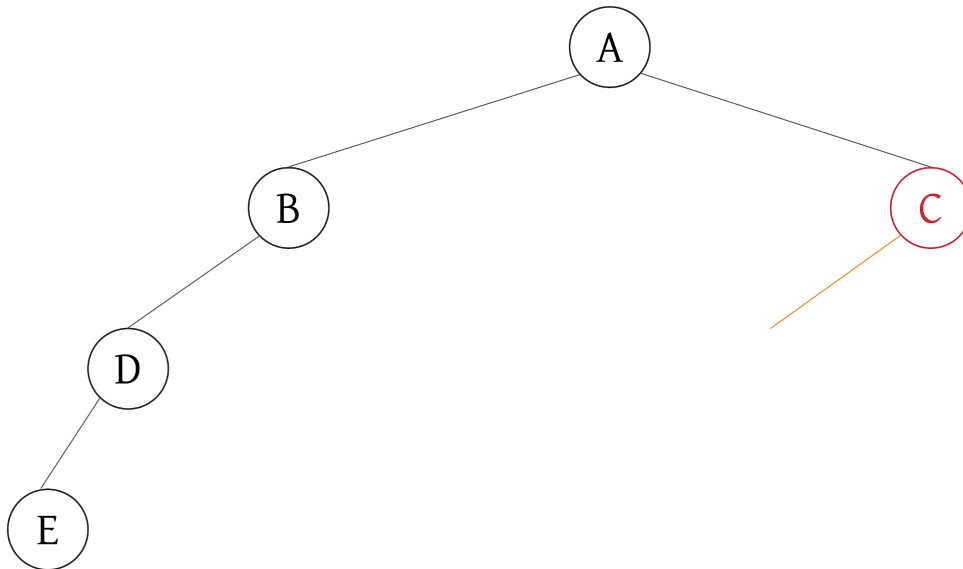
A.R Step 1 & 2 (Recursive Step 6 with the R section of A):

PO of A.R: {**C**, F, G, H} *Step 1*
 IO of A.R: {G, F, H, **C**} *Step 2*

A.R Step 3 & 4:

PO of A.R: {**C**, **F**, **G**, **H**} *Step 4*
 IO of A.R: {**G**, **F**, **H**, **C**} *Step 3; Only a left section, no right section*

Tree with **C** and one section **L**:



A.R.C.L Step 1 & 2:

PO of C.L: **{F, G, H}**

Step 1

IO of C.L: **{G, F, H}**

Step 2

A.R.C.L Step 3 & 4:

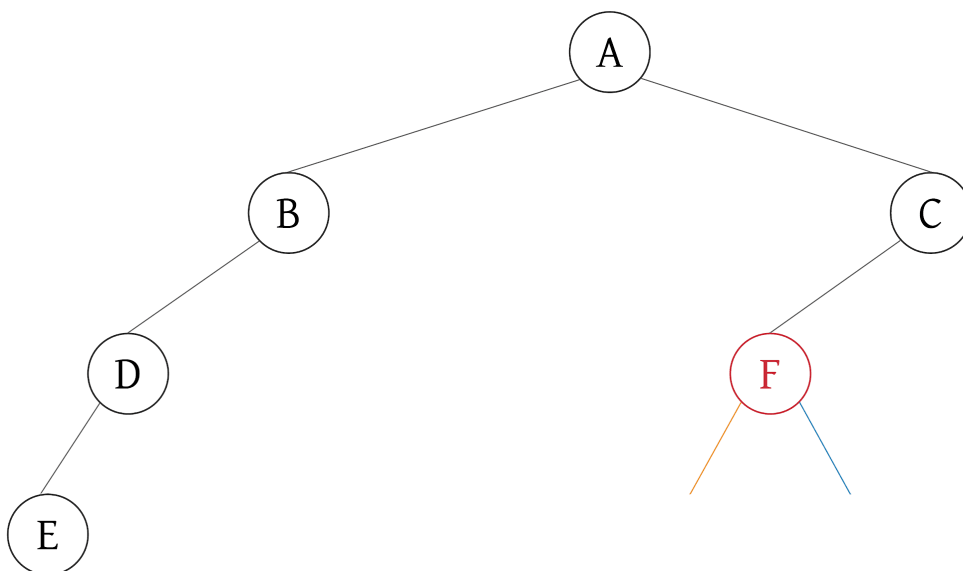
PO of C.L: **{F, G, H}**

Step 4

IO of C.L: **{G, F, H}**

Step 3; L and R sections

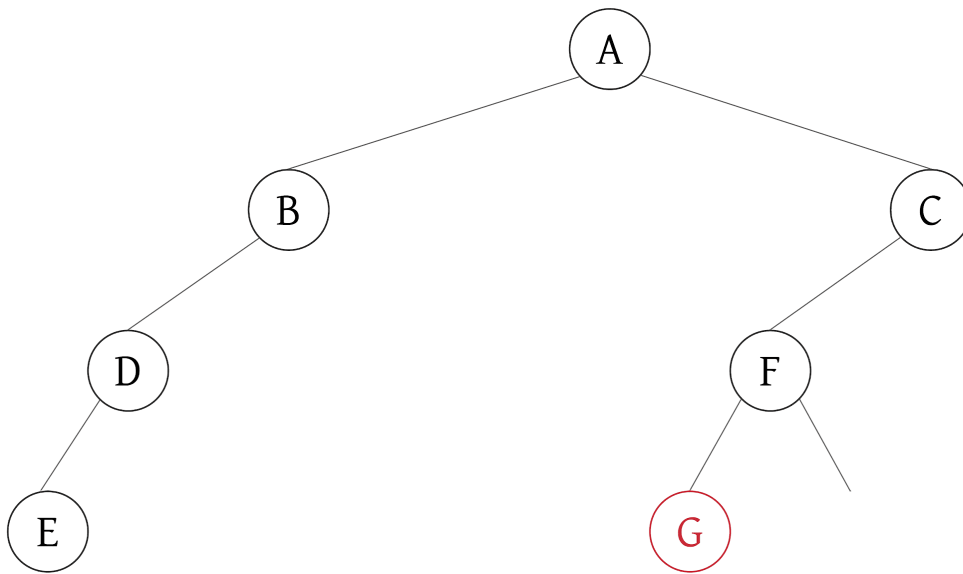
Tree with **F** and both **L** and **R** sections:



A.R.C.L.F.L Step 1-4:

PO of F.L: $\{\mathbf{G}\}$
IO of F.L: $\{\mathbf{G}\}$ *No L or R sections*

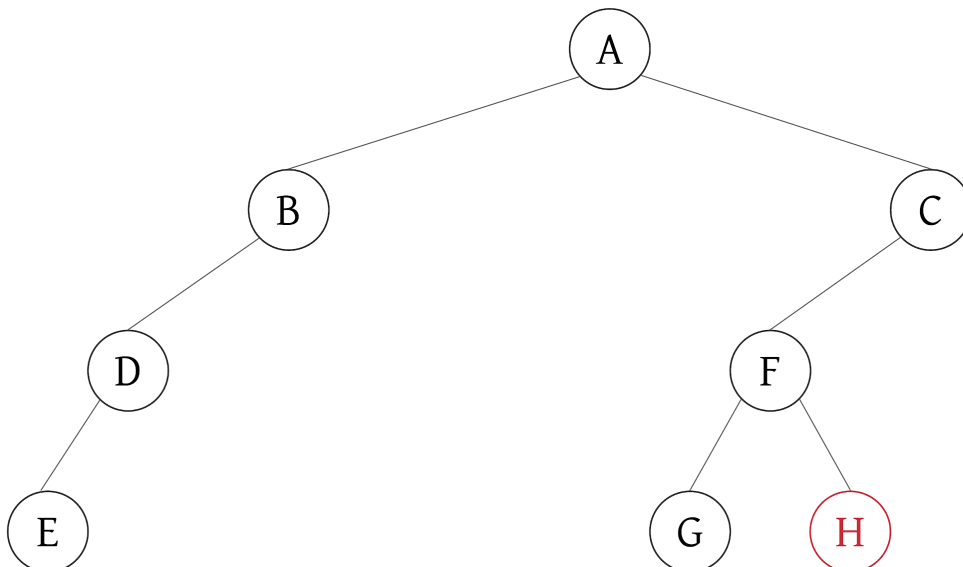
Tree with \mathbf{G} and no L or R sections:



A.R.C.L.F.R Step 1-4:

PO of F.R: $\{\mathbf{H}\}$
IO of F.R: $\{\mathbf{H}\}$ *No L or R sections*

Tree with \mathbf{H} and no L or R sections:



Result

Final tree from the PO and IO sequences provided in Activity 7.1:

