

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 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 a left (L) and a right (R) section 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*

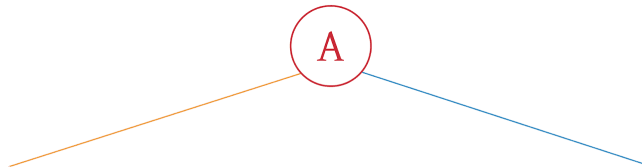
IO: {E, D, B, **A**, G, F, H, C} *Step 2*

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 with 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:

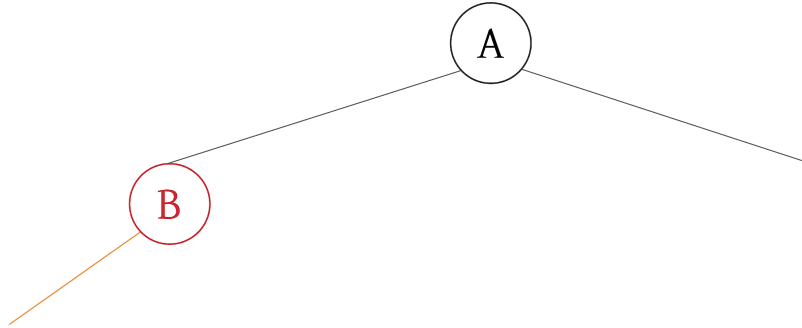
PO of A.L: {**B**, D, E} *Step 1*

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**:



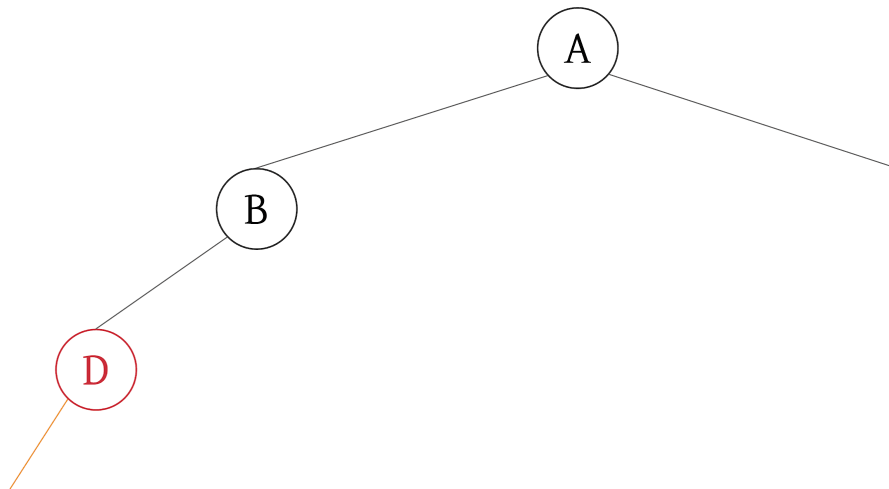
A.L.B.L Step 1 & 2:

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**:



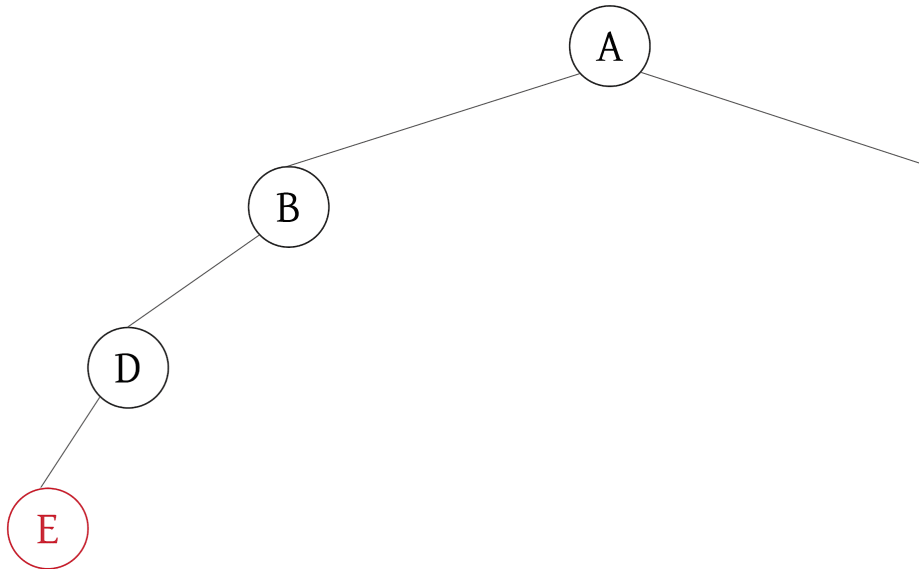
A.L.B.L.D.L Step 1-4:

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:

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:

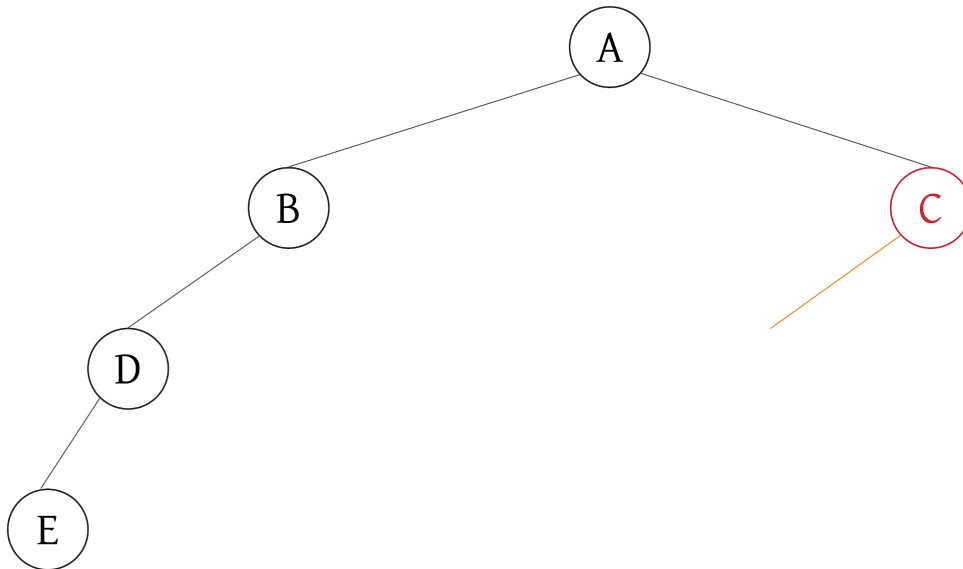
PO of A.R: {**C**, **F**, **G**, **H**}

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:

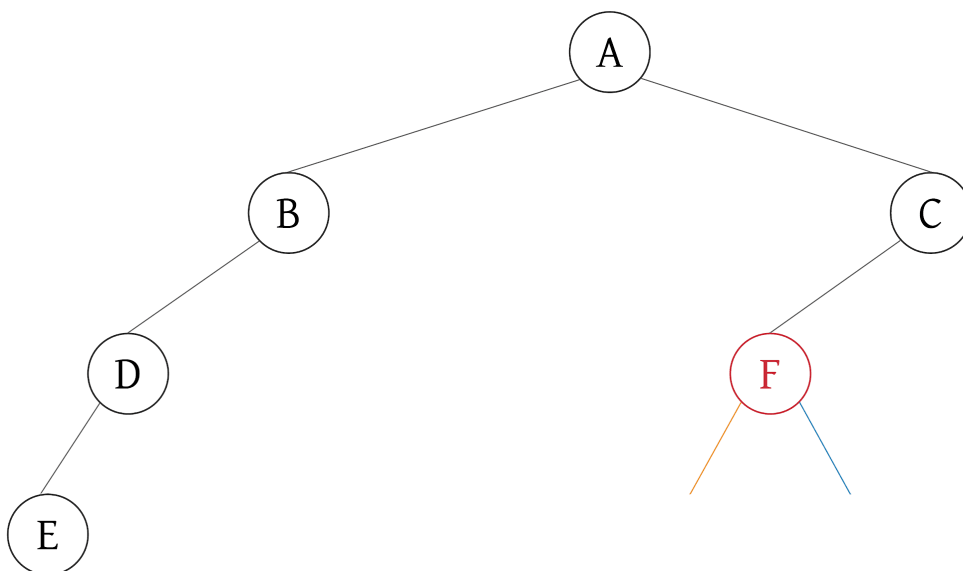
PO of C.L: **{F, G, H}**

Step 4

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

Step 3; L and R sections

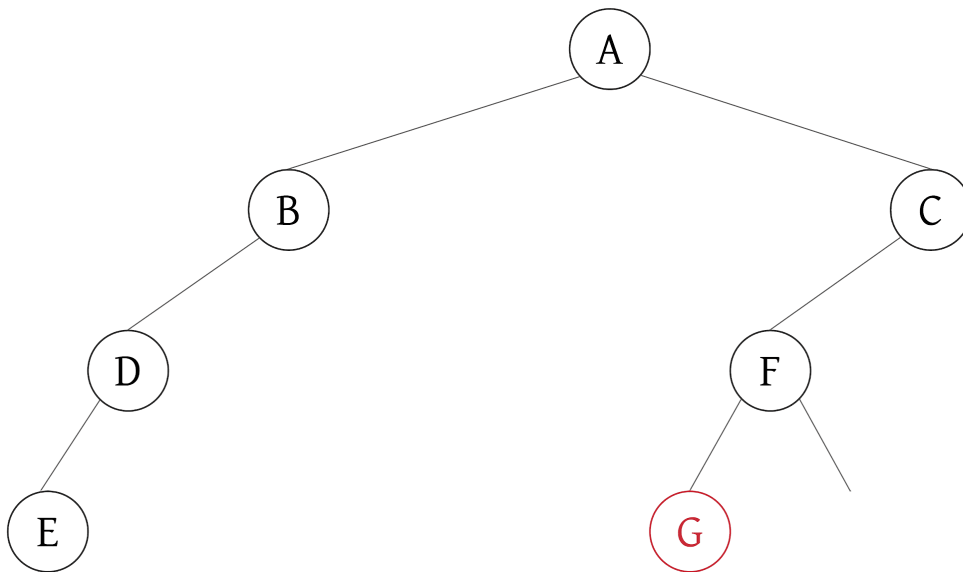
Tree with **F** and both **L** and **R** sections:



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*

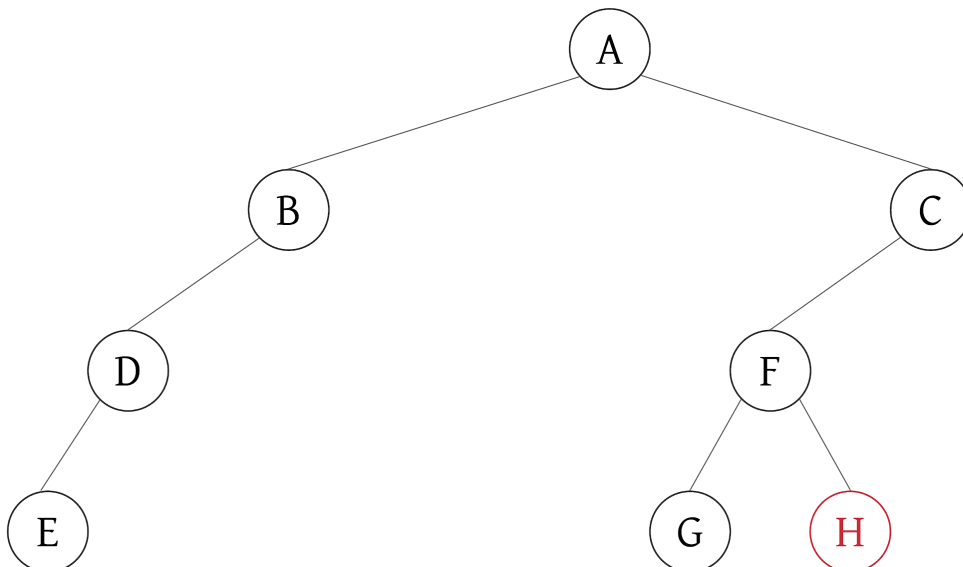
Tree with \mathbf{G} and no L or R sections:



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 given in Activity 7.1:

