Binary Trees

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Agenda

- Binary Trees
- Traversals
- Reminders

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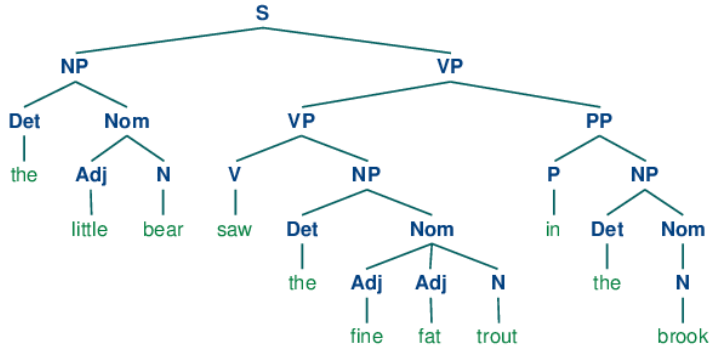
Trees in Computer Science

Trees in Computer Science

- Implementation for `TreeMap` / `TreeSet`
- Decision Trees
- How files / folders are represented
- Family Trees, Org Charts
- Parse trees
  - a = (b + c) * d
  - Natural language processing



Trees Defined

- **Tree:** Nodes linked together in some hierarchical fashion
- **Binary Tree:** A tree where each node has at most 2 children

Recursive Definition:

- A tree is either:
    1. Empty
    2. A node with data, and a left and right subtree

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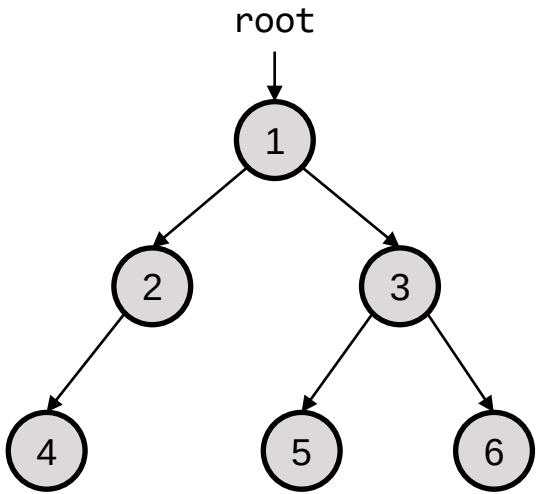

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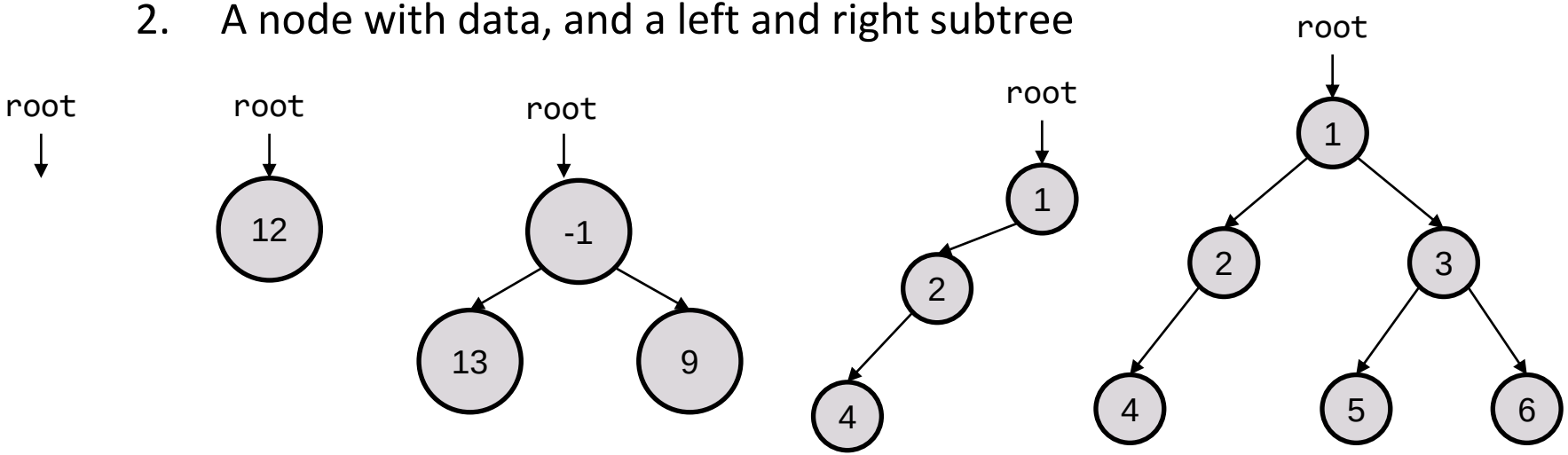
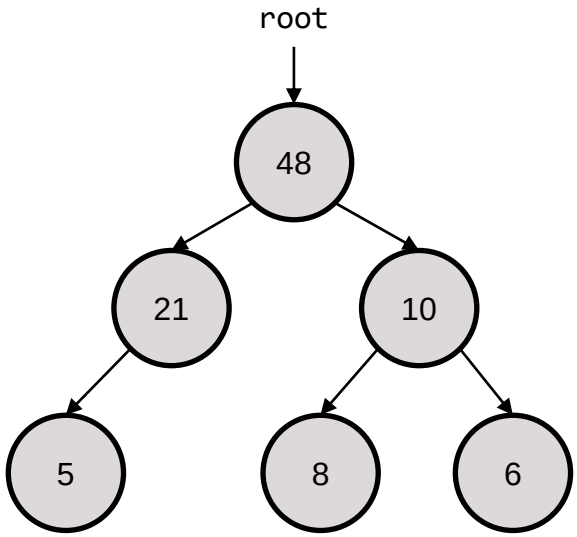


Printing Trees

- Want to print out the contents of the tree
- Our intended output:

```
48 21 5 10 8 6
```

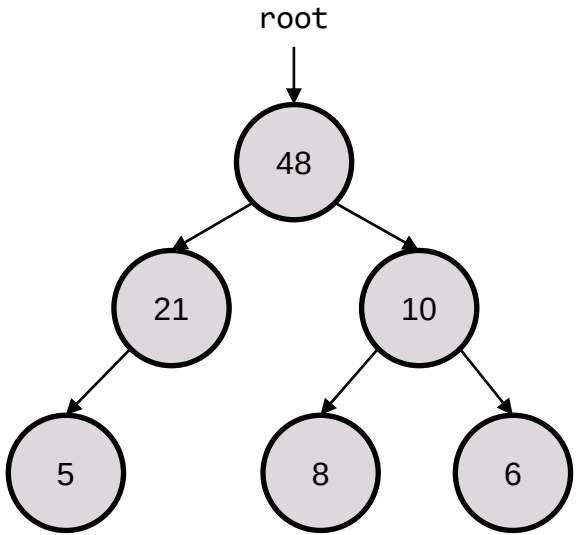


Printing Trees

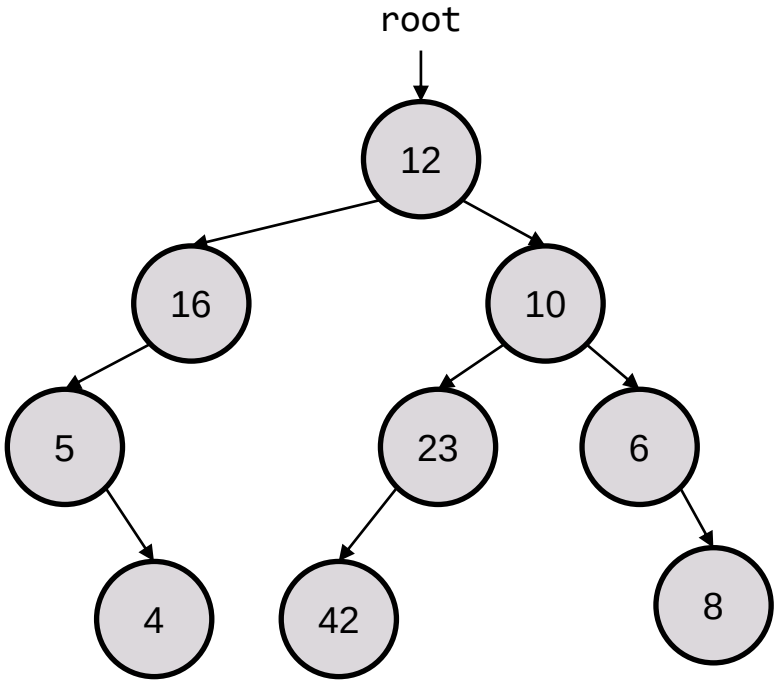
- Want to print out the contents of the tree

Different ways to do so:

Pre-order	`48 21 5 10 8 6`
In-order	`5 21 48 8 10 6`
Post-order	`5 21 8 6 10 48`



What's the in-order traversal of this tree?



slido.com
code: #su_cse123

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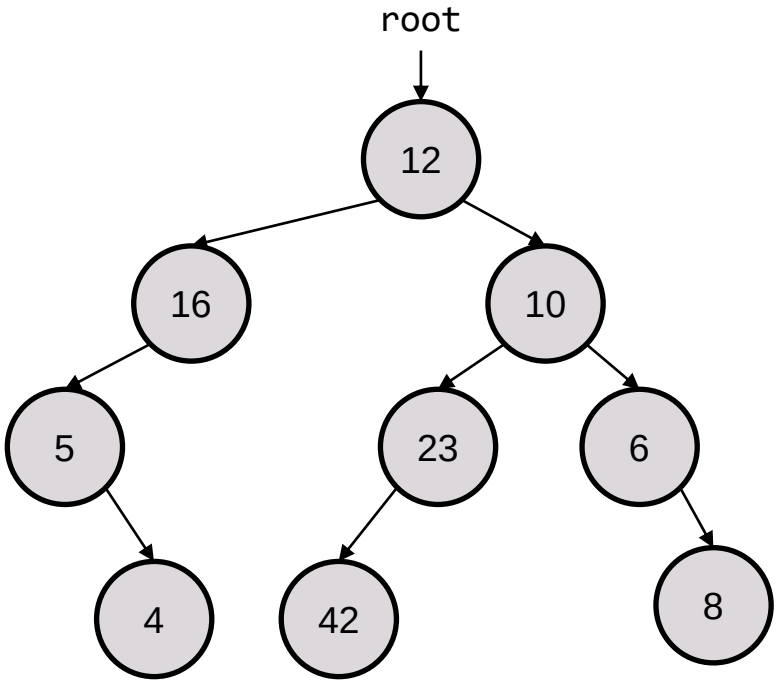

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Answer: 5 4 16 12 42 23 10 6 8

Practice: pathSum

- Given a number, print out all sums that have value greater than or equal to the given number for a tree in a pre-order fashion.

- For the tree pictured, the call `pathSum(13)` would result in the following:

```
pathSum(13)

Output:
13
23
13
```