[320] Trees

Department of Computer Sciences
University of Wisconsin-Madison

Adding BST Nodes

BST: example 1

Assume this insertion order for a BST: **3, 2, 5, 1, 4**

Draw the tree:

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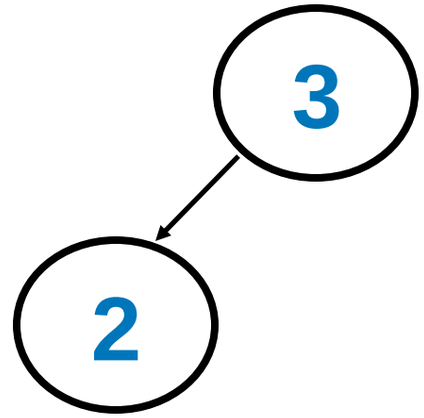

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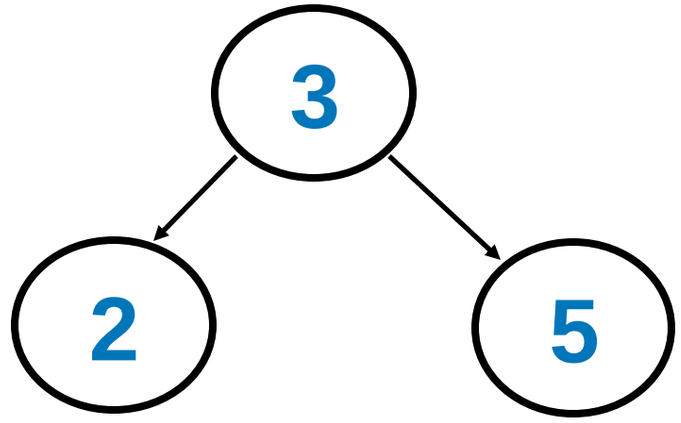

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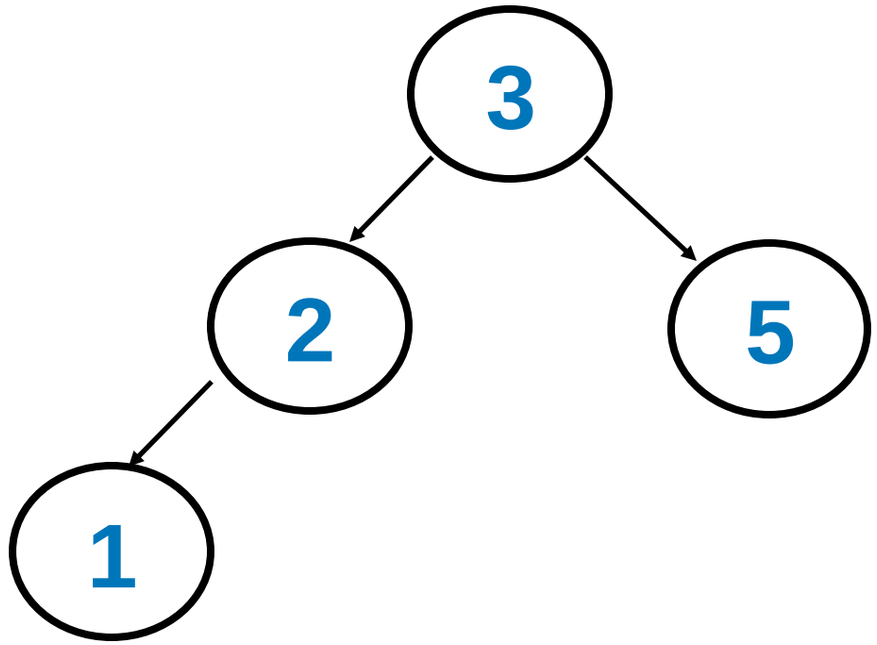

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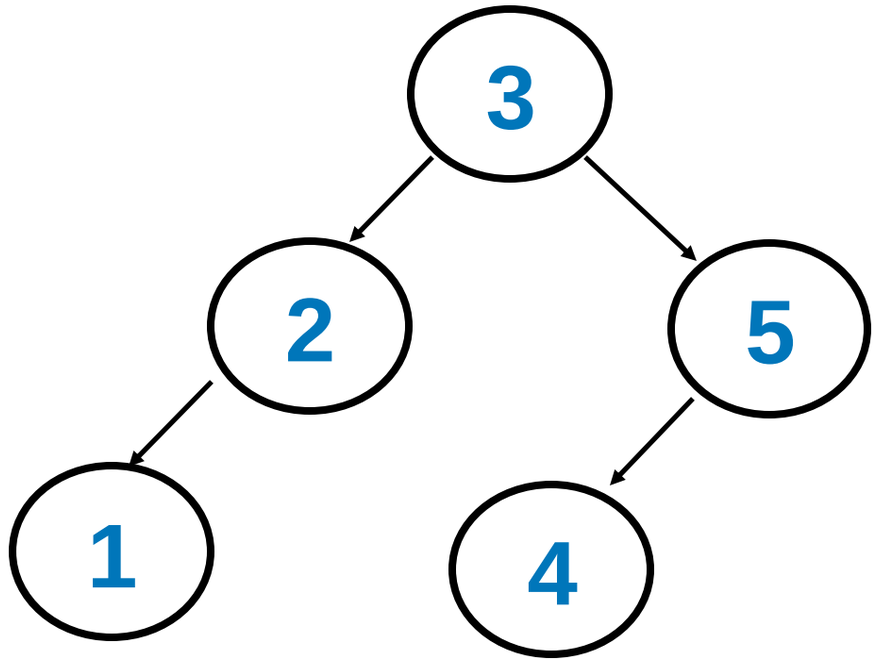

BST: example 2

Assume this insertion order for a BST: **2, 3, 1, 4, 5**

Draw the tree:

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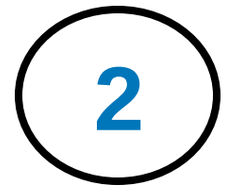

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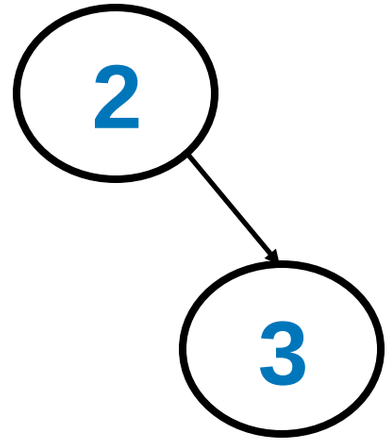

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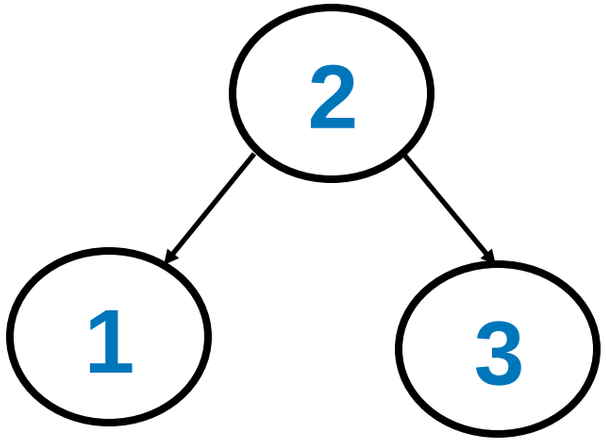

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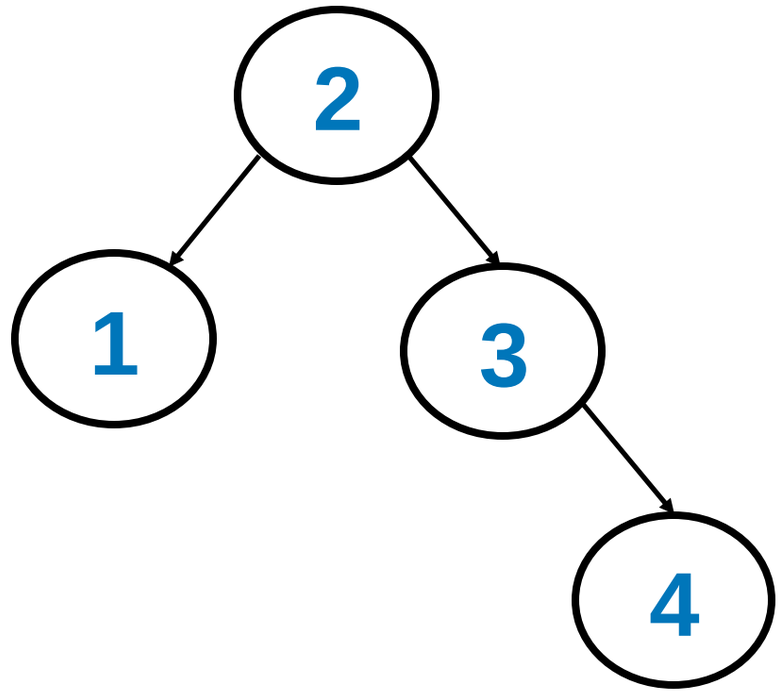

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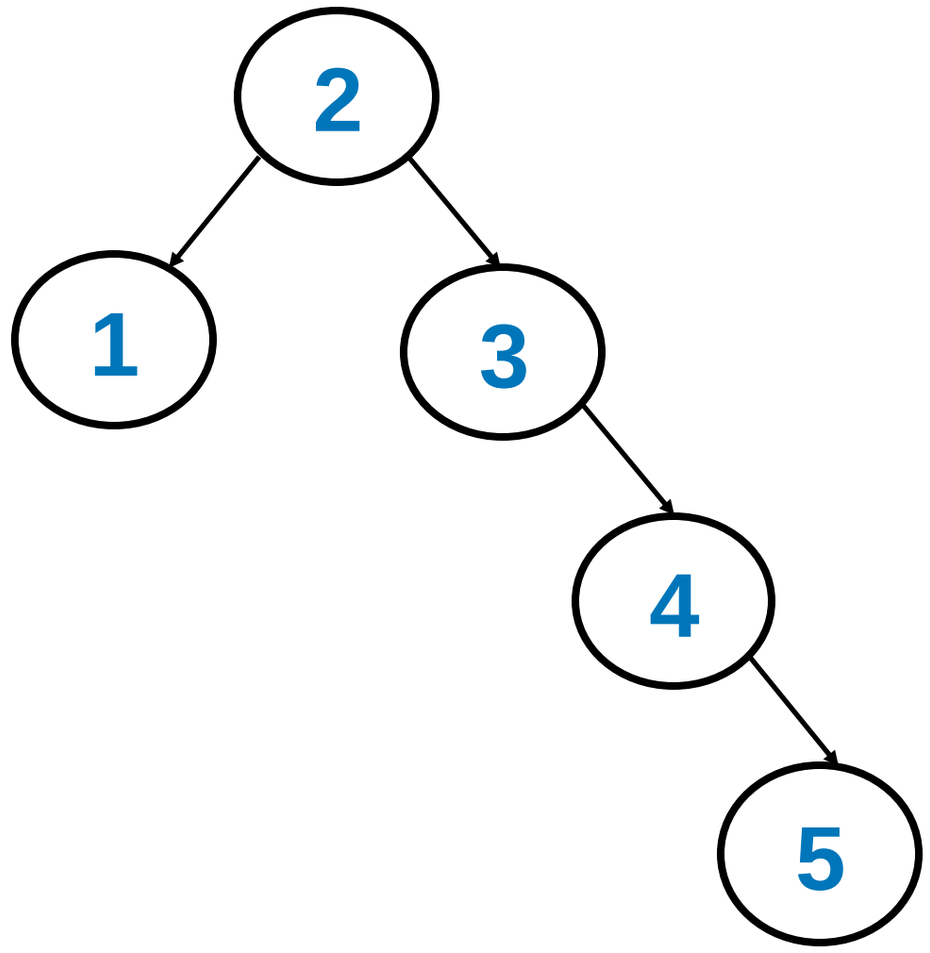
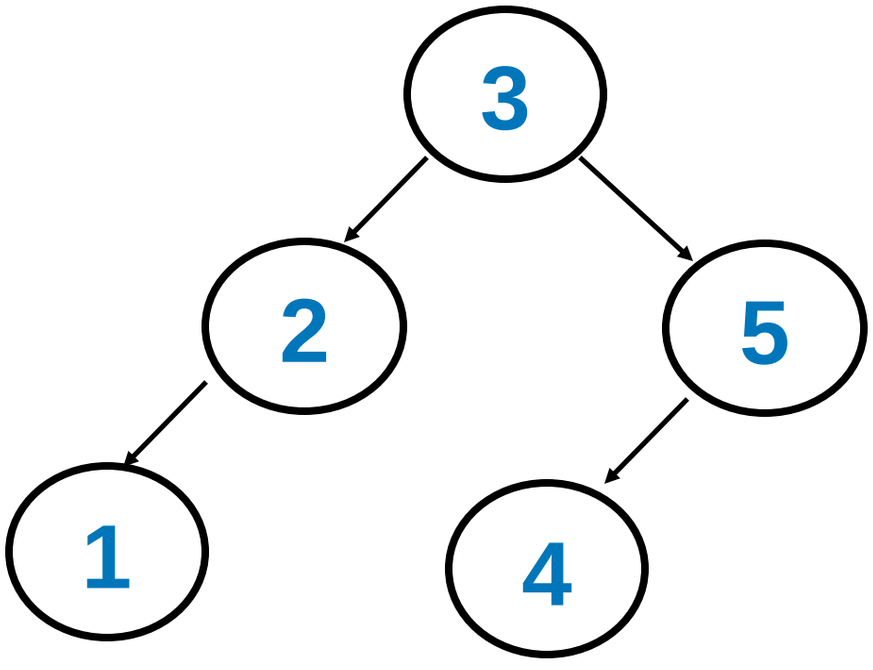


Tree Height

Tree Height

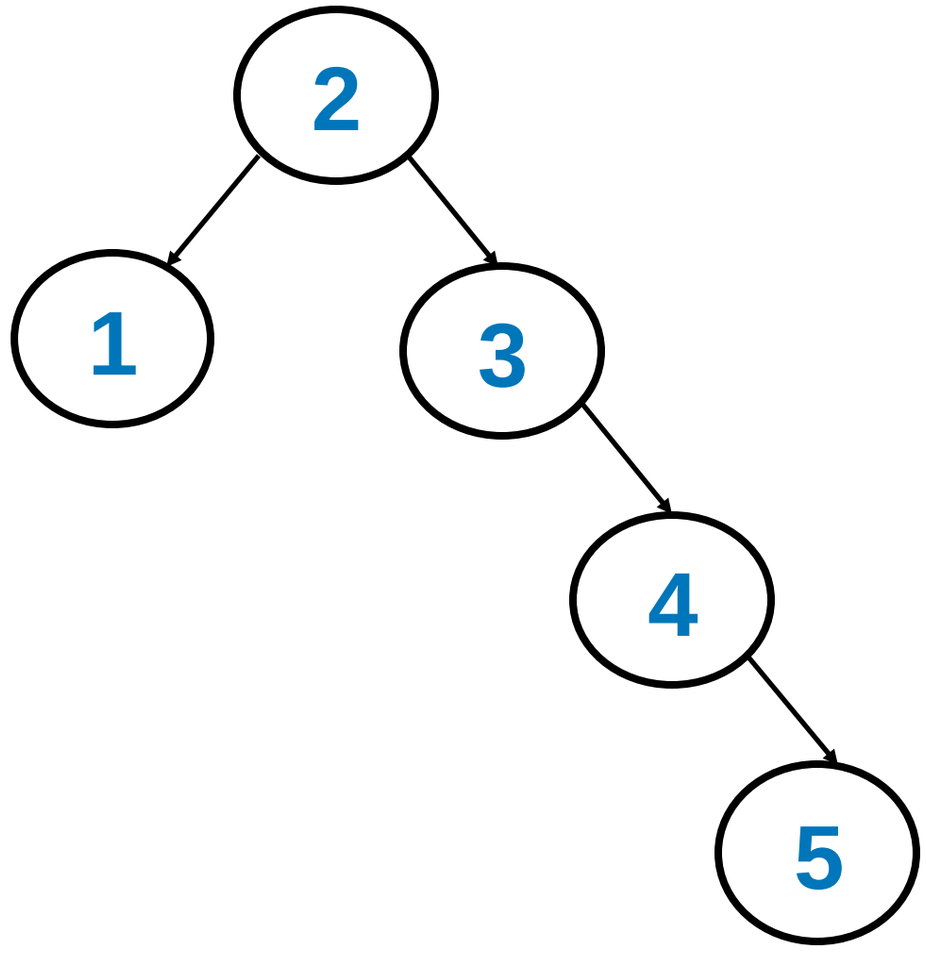
Height: the number of nodes on the longest root-to-leaf path (including the root)

Tree with nodes 3, 2, 1, 4, 5



Height = 3

Tree with nodes 2, 3, 1, 4, 5



Height = 4

BST: example 3

Assume this insertion order for a BST: **25, 24, 21, 4, 3, 2, 11**

Draw the tree:

BST: example 3

Assume this insertion order for a BST: 25, 24, 21, 4, 3, 2, 11

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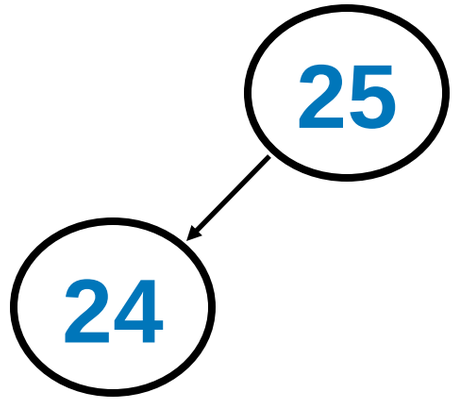

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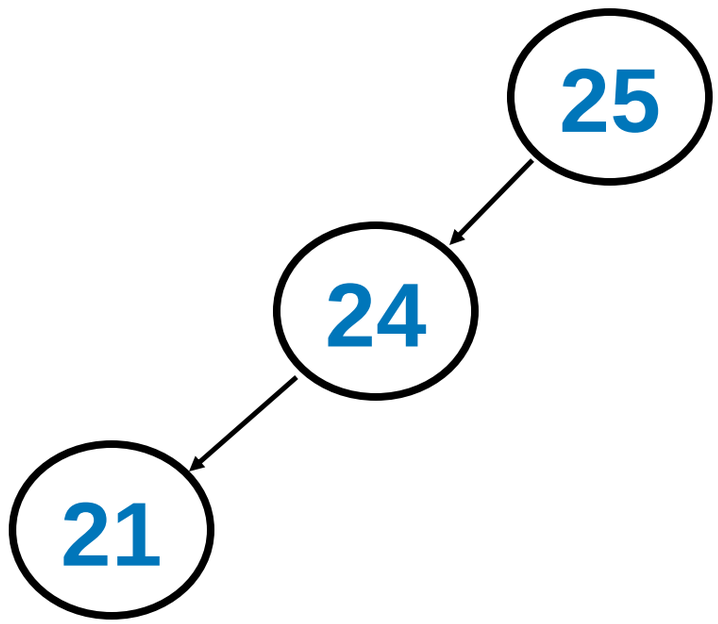

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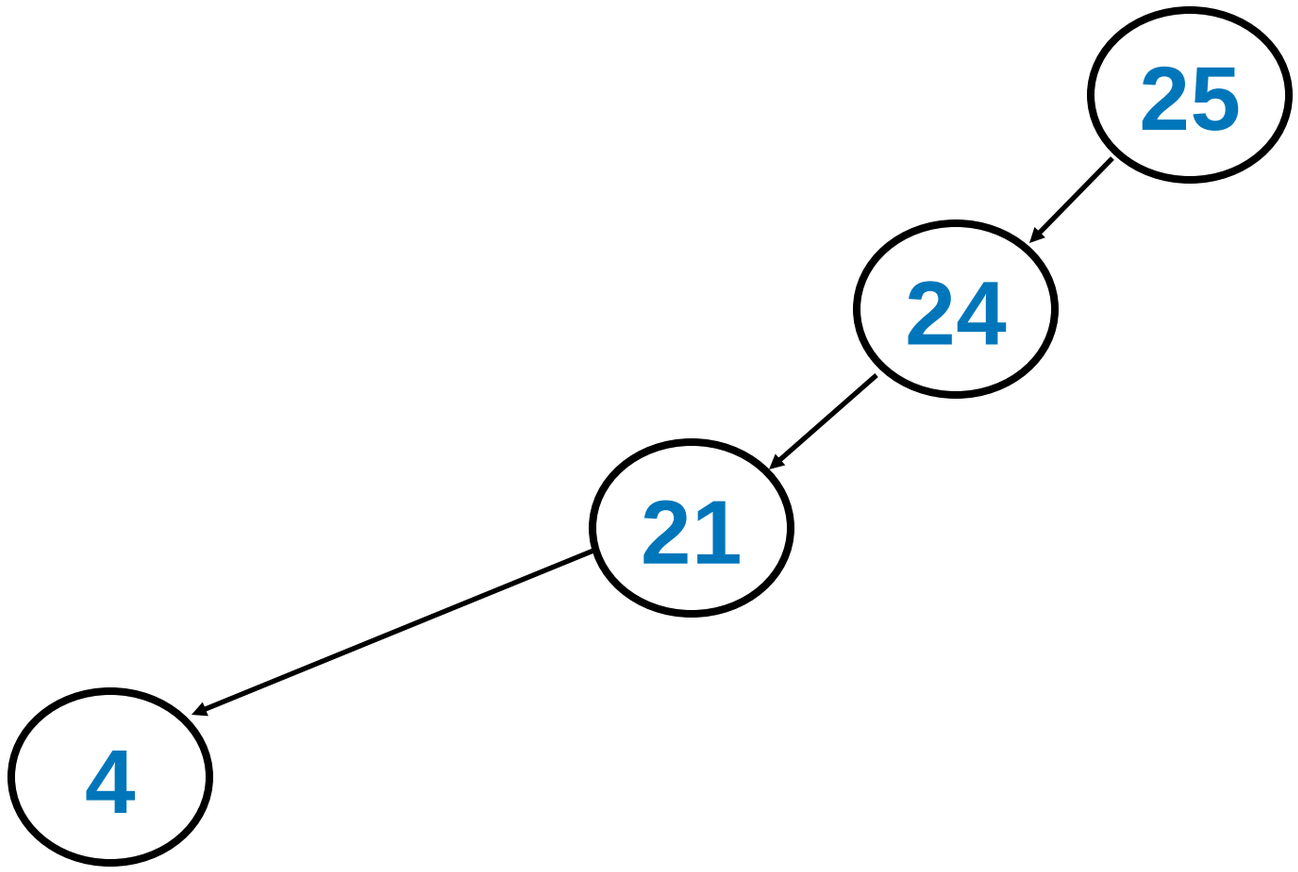

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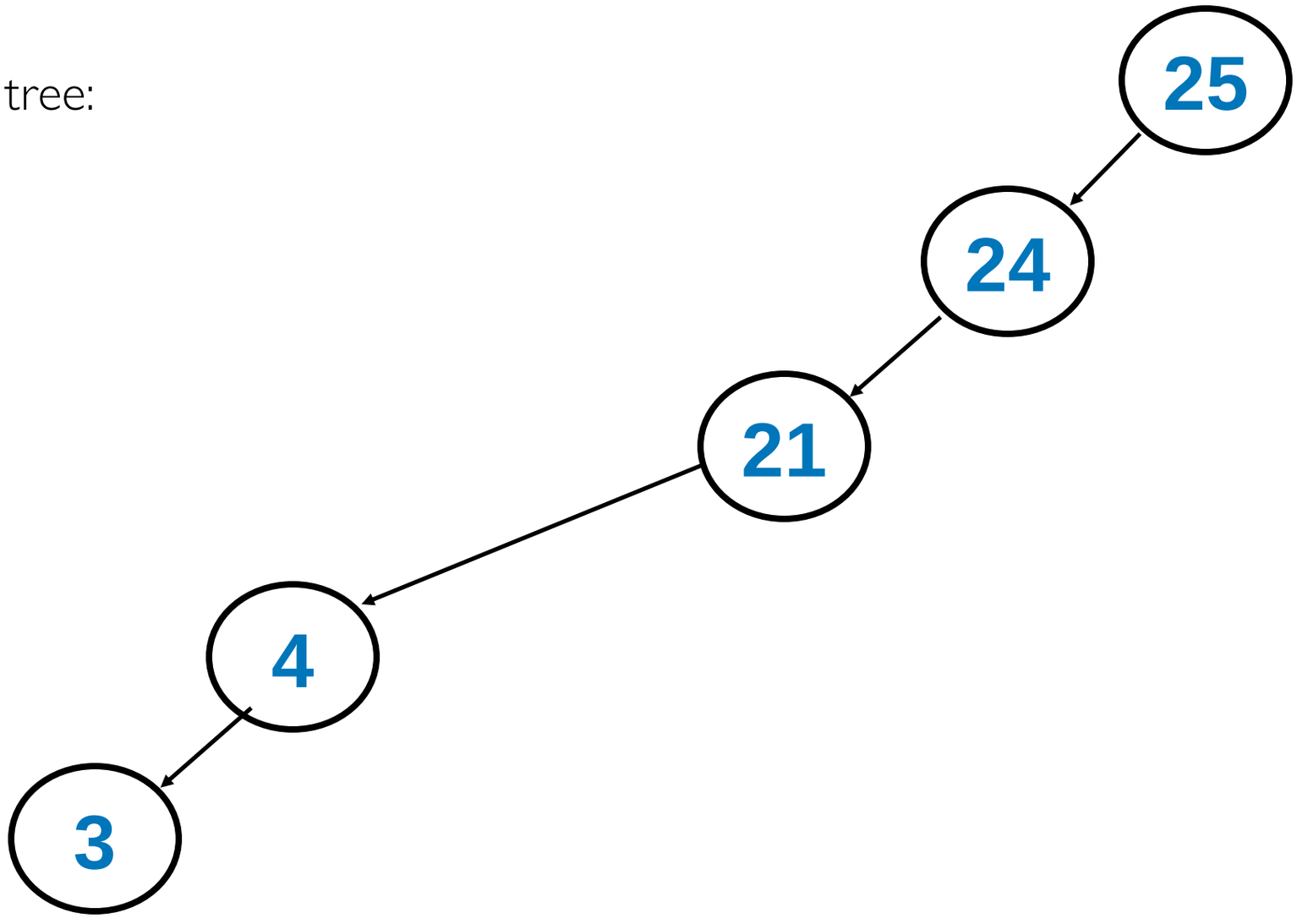

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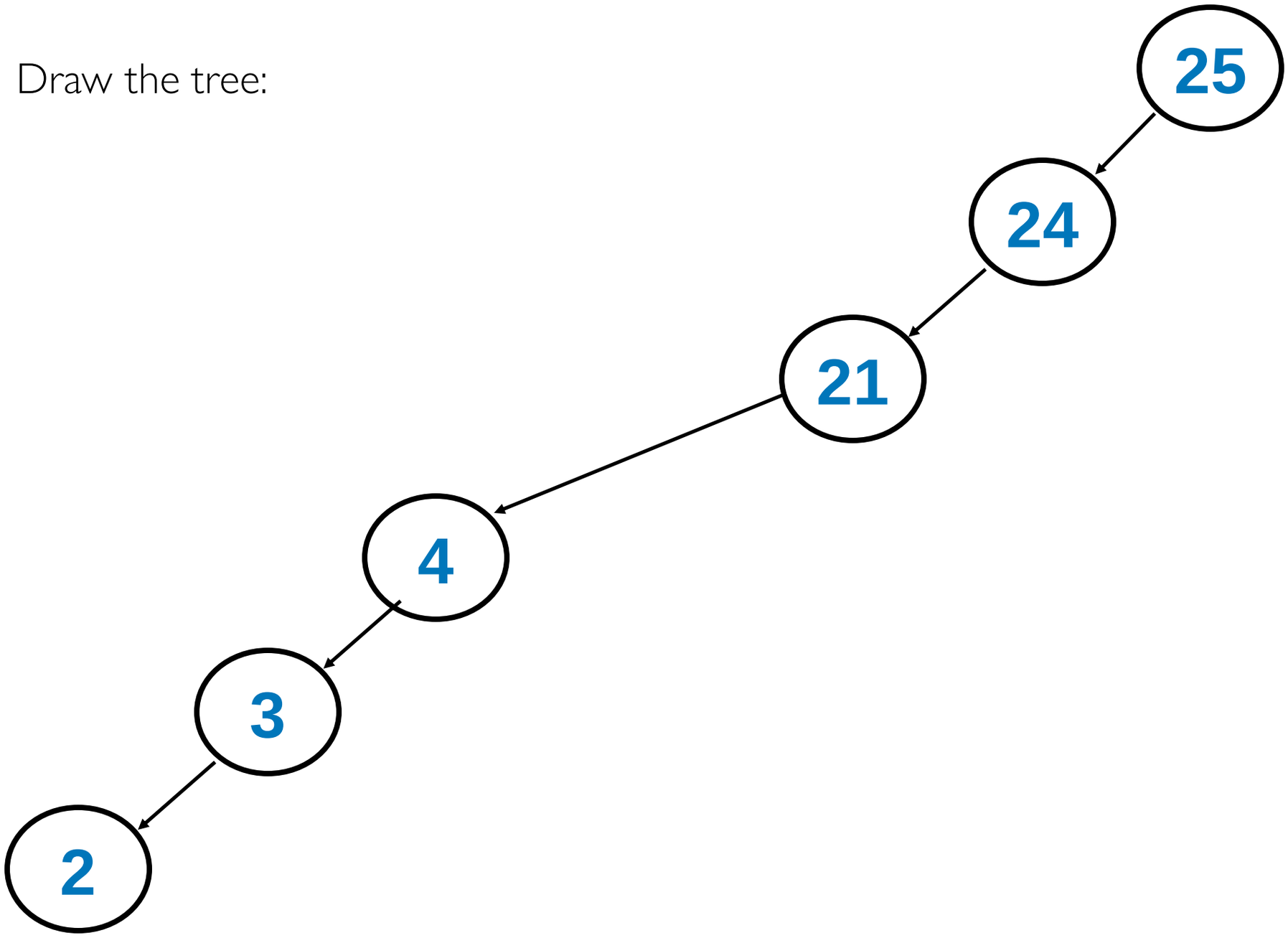

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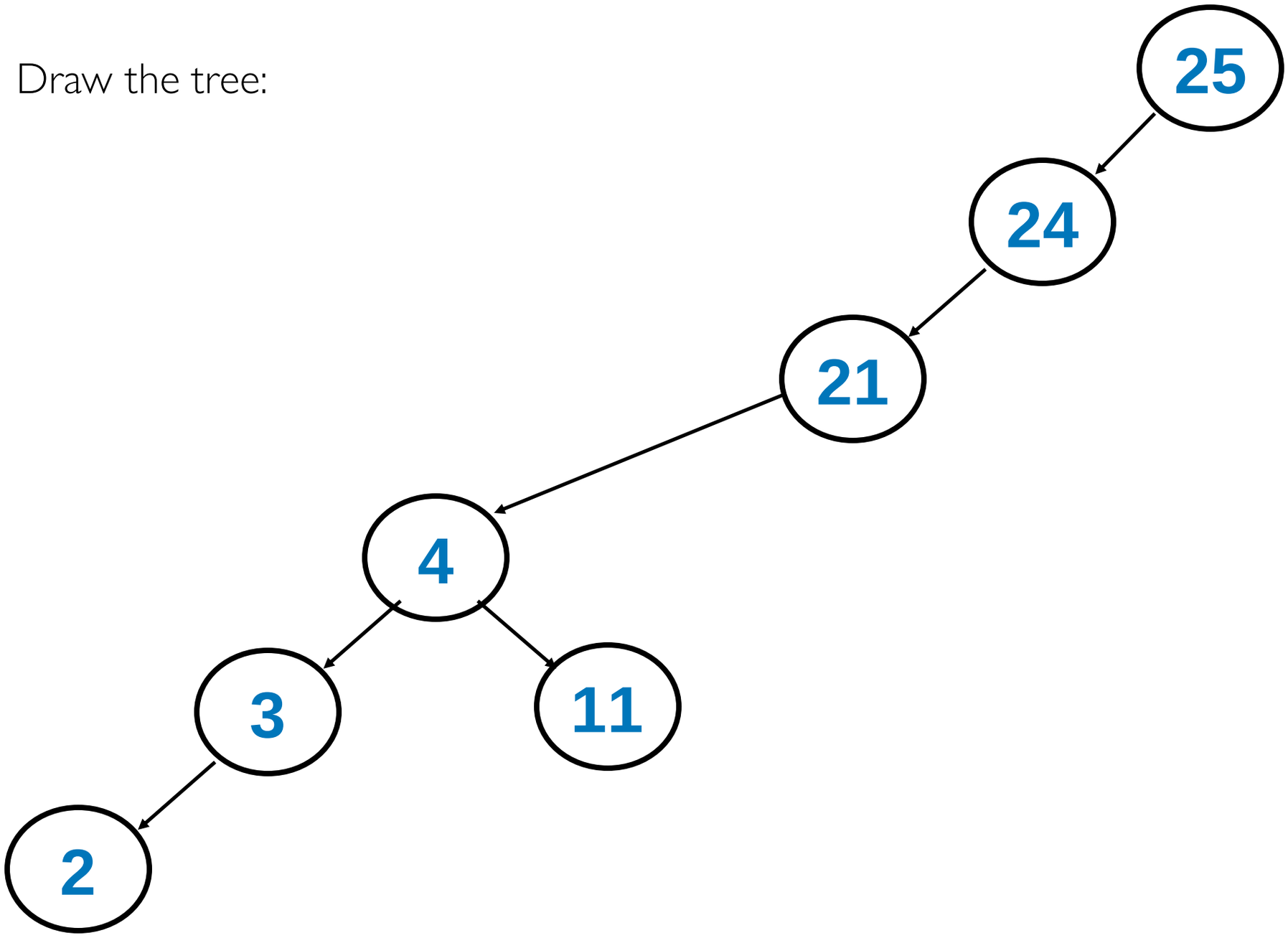
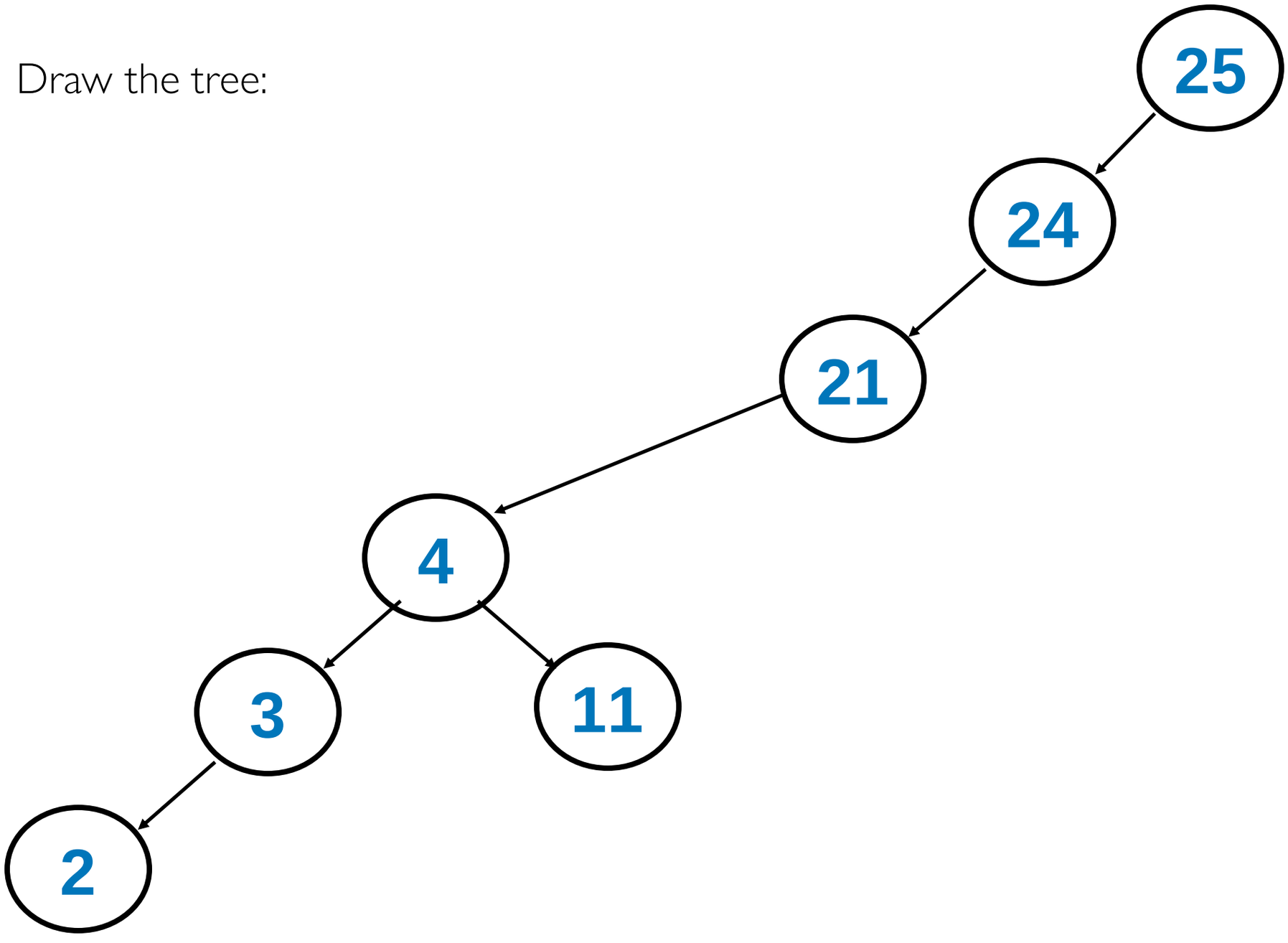


BST: example 3

would have probably been more balanced if insert order randomized

Assume this insertion order for a BST: 25, 24, 21, 4, 3, 2, 11

Draw the tree:



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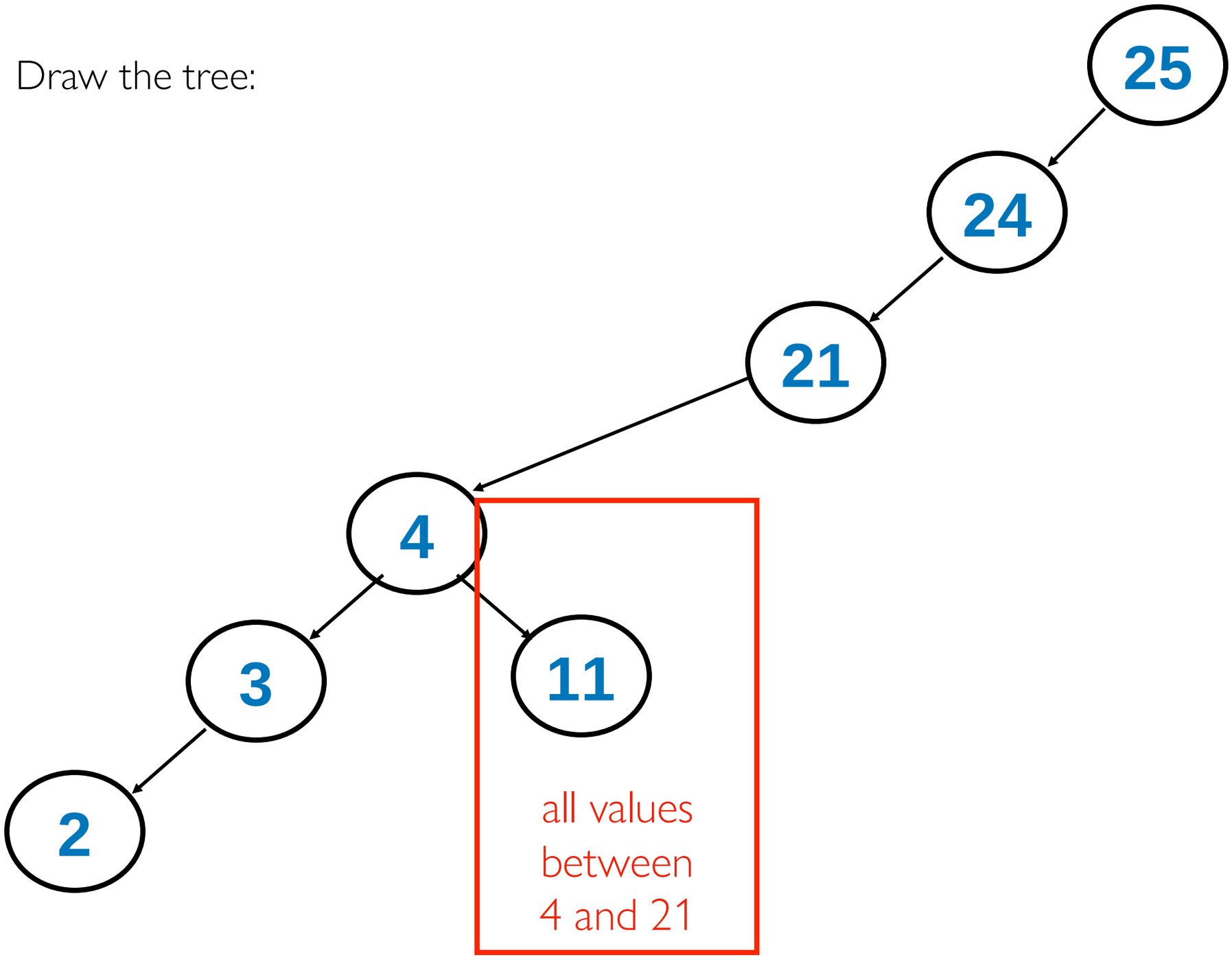
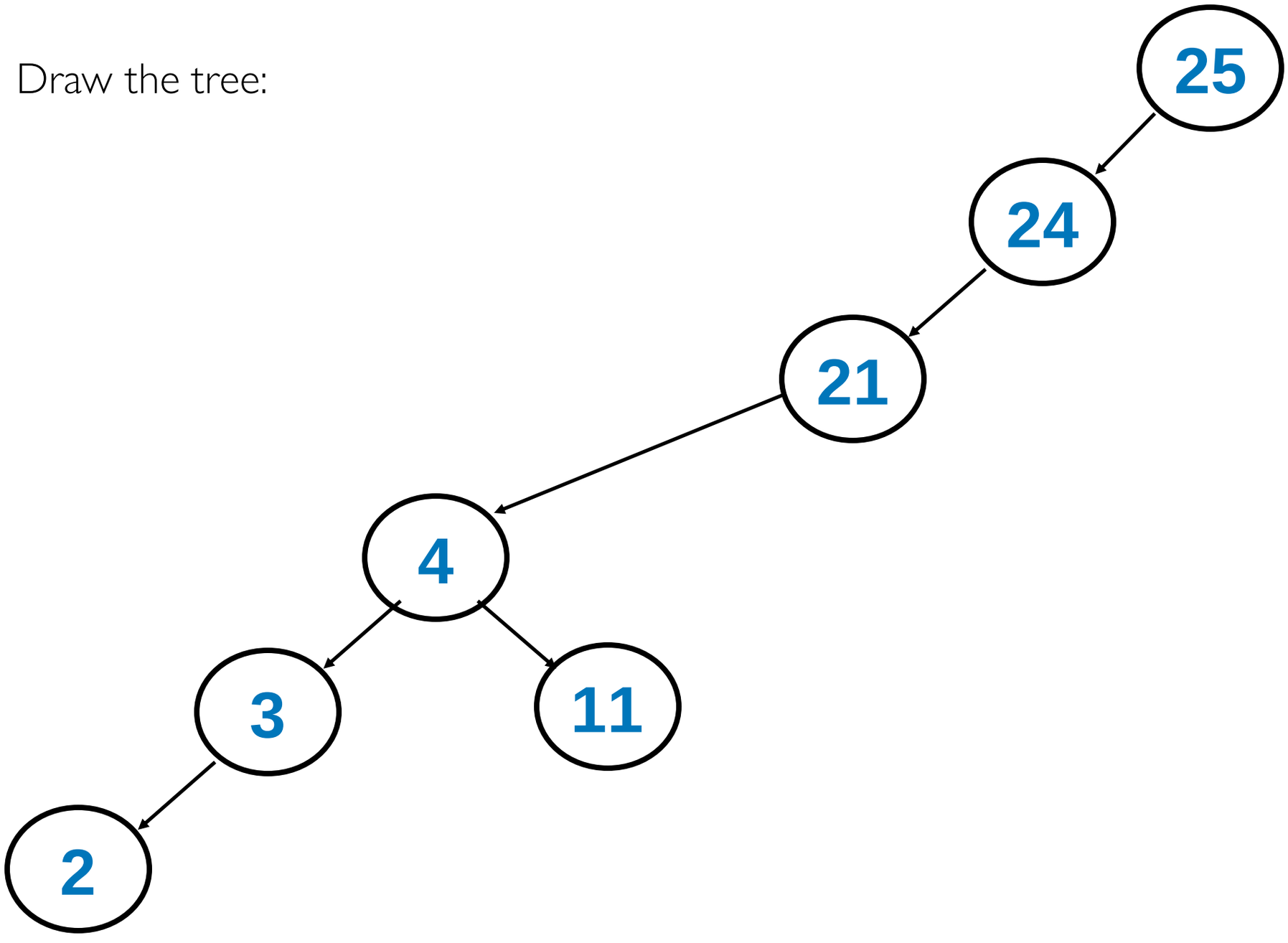


BST: example 3

Which nodes will be checked if we're searching for 22?

Draw the tree:



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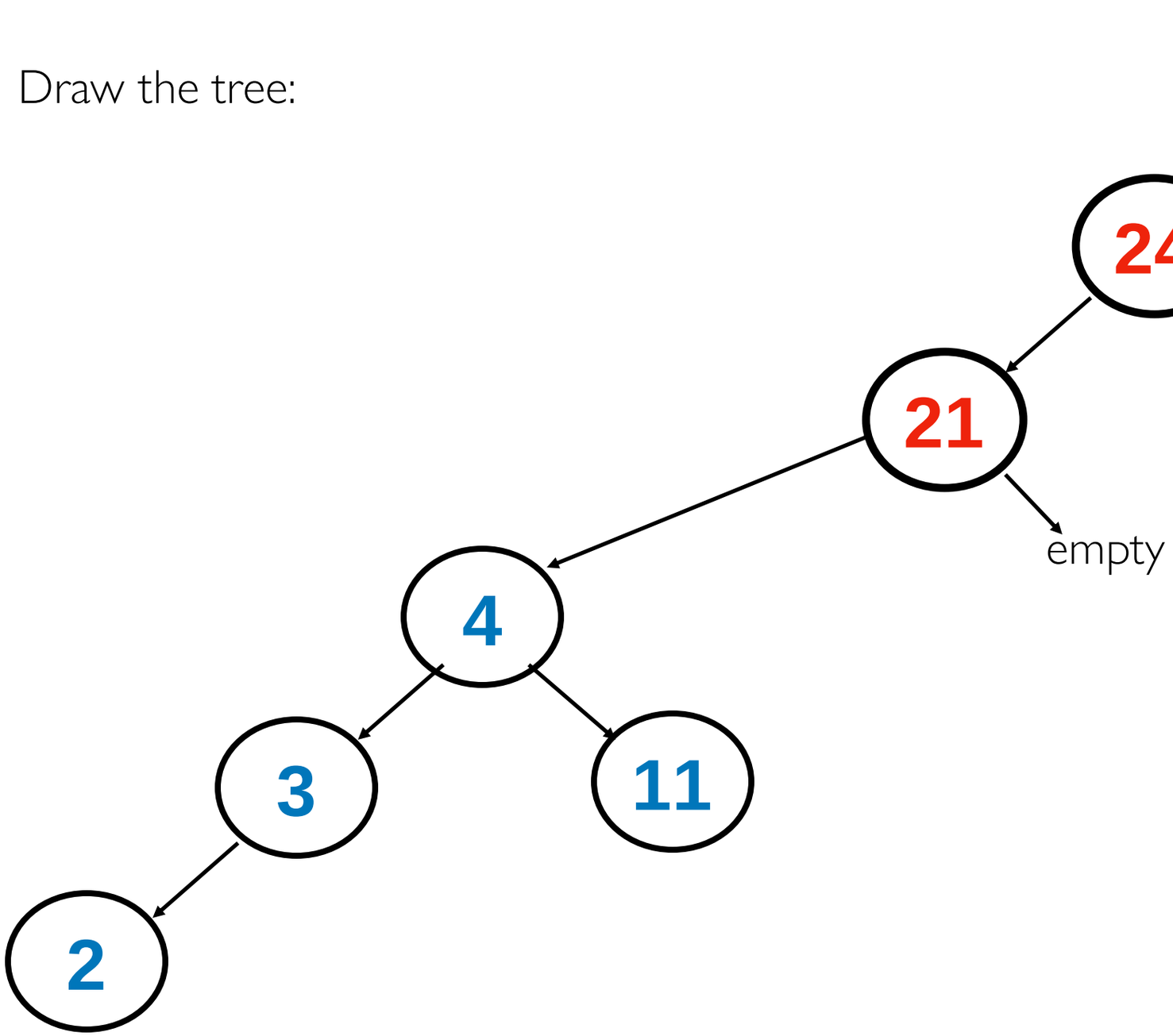

Balanced BST

BST: example 3

Write down an insertion order that will produce a balanced tree...

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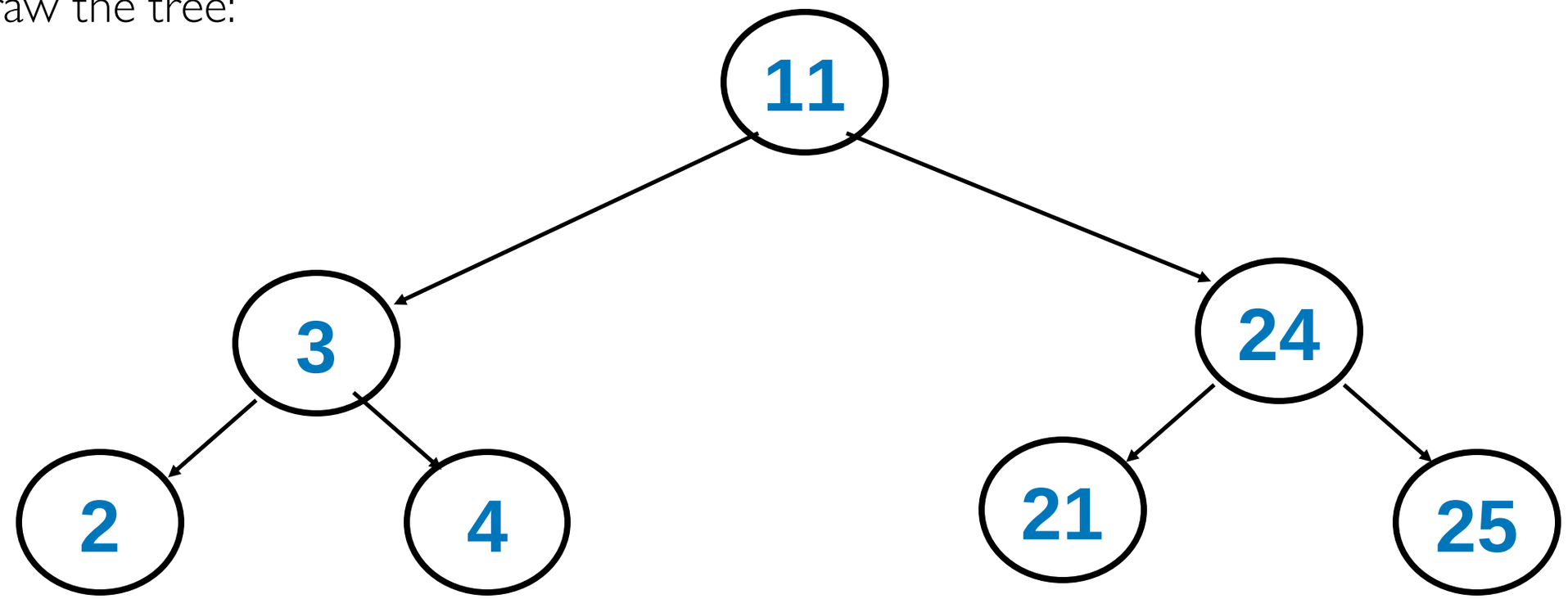

BST: example 4

Write down an insertion order that will produce a balanced tree...

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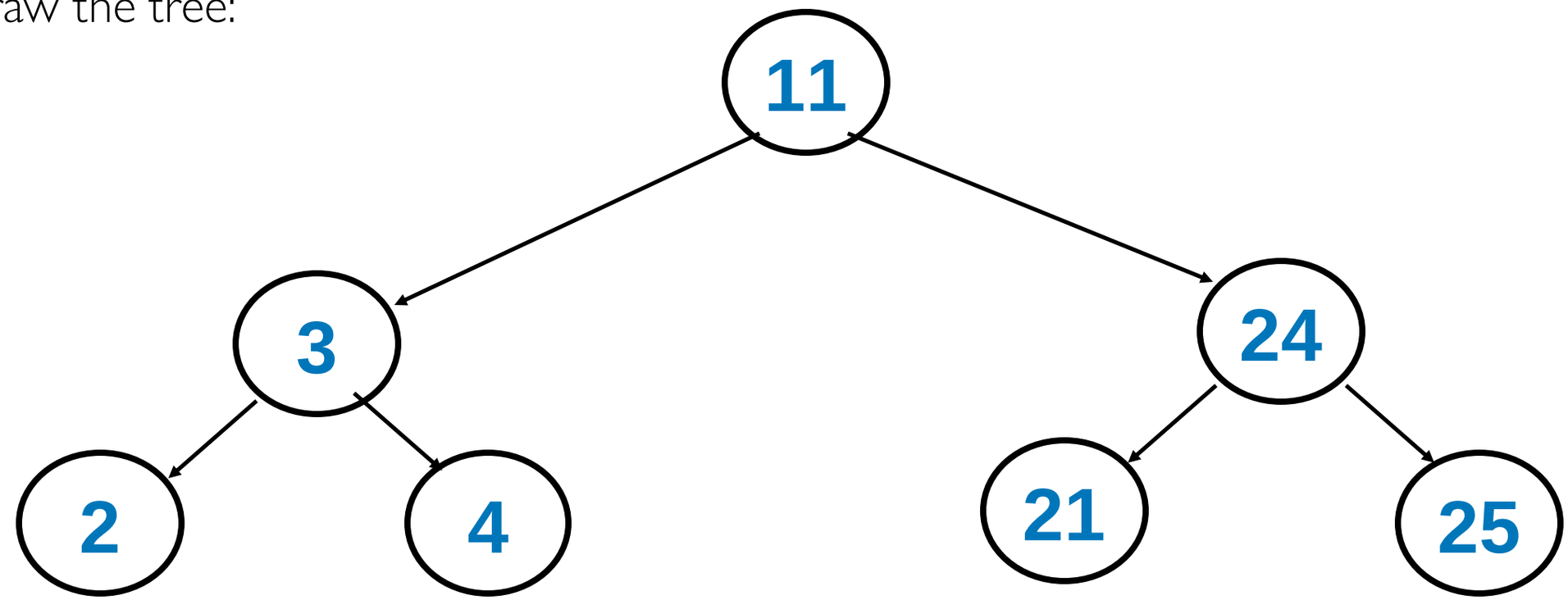

One possible order of insertion: 11, 3, 24, 2, 4, 21, 25

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BST: example 4

Write down an insertion order that will produce a balanced tree...

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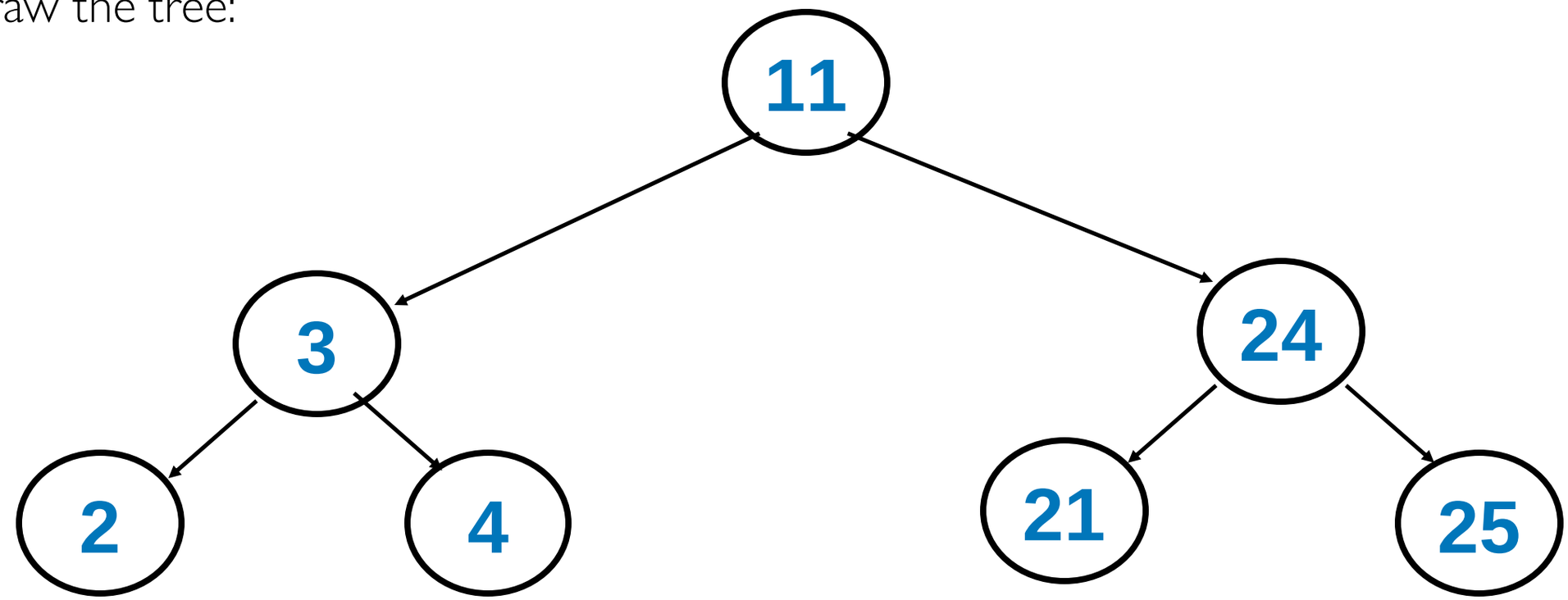

One possible order of insertion: 11, 3, 24, 2, 4, 21, 25

More orders of insertion can be obtained by switching the order of insertion of nodes that are at the same level. In this example, nodes 3 and 24 are at the same level, and the nodes 2, 4, 21 and 25 are at the same level. Therefore, there can be more than one order of insertion to obtain a balanced BST.