

Binary Search Trees

- Data Structure (Tree)
 - Binary Search

Data Structures

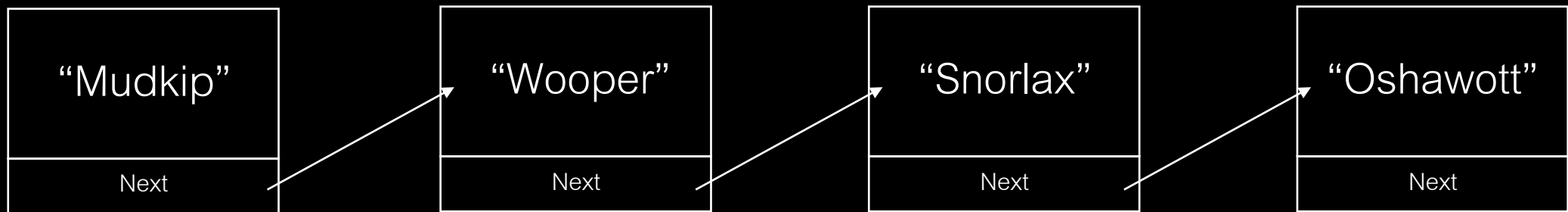
- Binary Search Trees are a type of data structure
- What are some data structures that we've gone over?

Data Structures

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- What are some data structures that we've gone over?
 - Linked Lists
 - Arrays

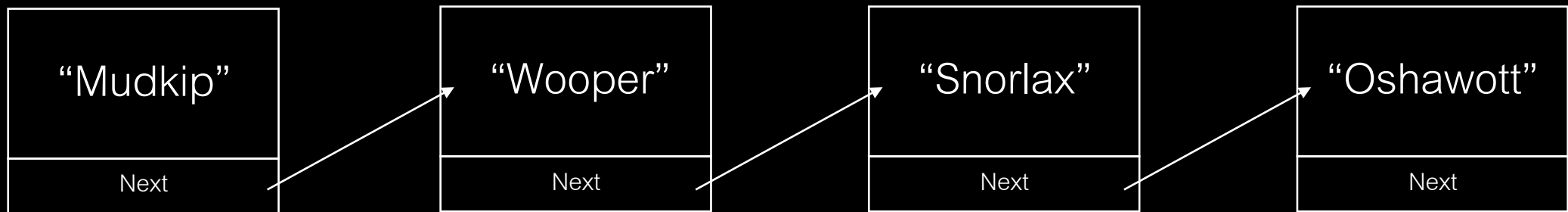
Data Structures

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 - Linked Lists
 - Arrays
- Linked List:



Data Structures

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 - Linked Lists
 - Arrays
- Linked List:



- At each memory address, there is a node containing a value and an address to the next node.

Binary Searching

- Recall when we used binary searching to search for an element in a list...
- Assume we're searching for the value 12...

5	10	12	23	40	50	62
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Binary Searching

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Binary Searching

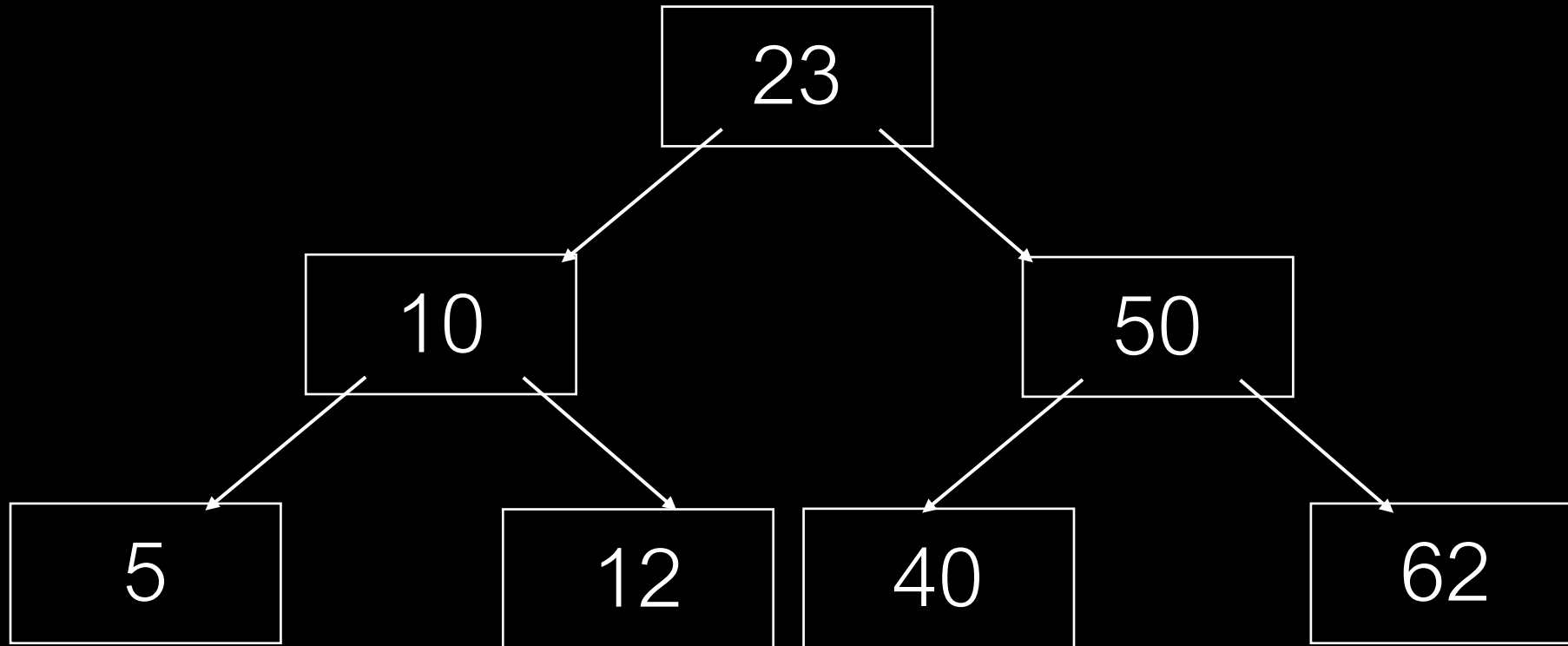
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Binary Search Tree

- Let's turn this list into a data structure!

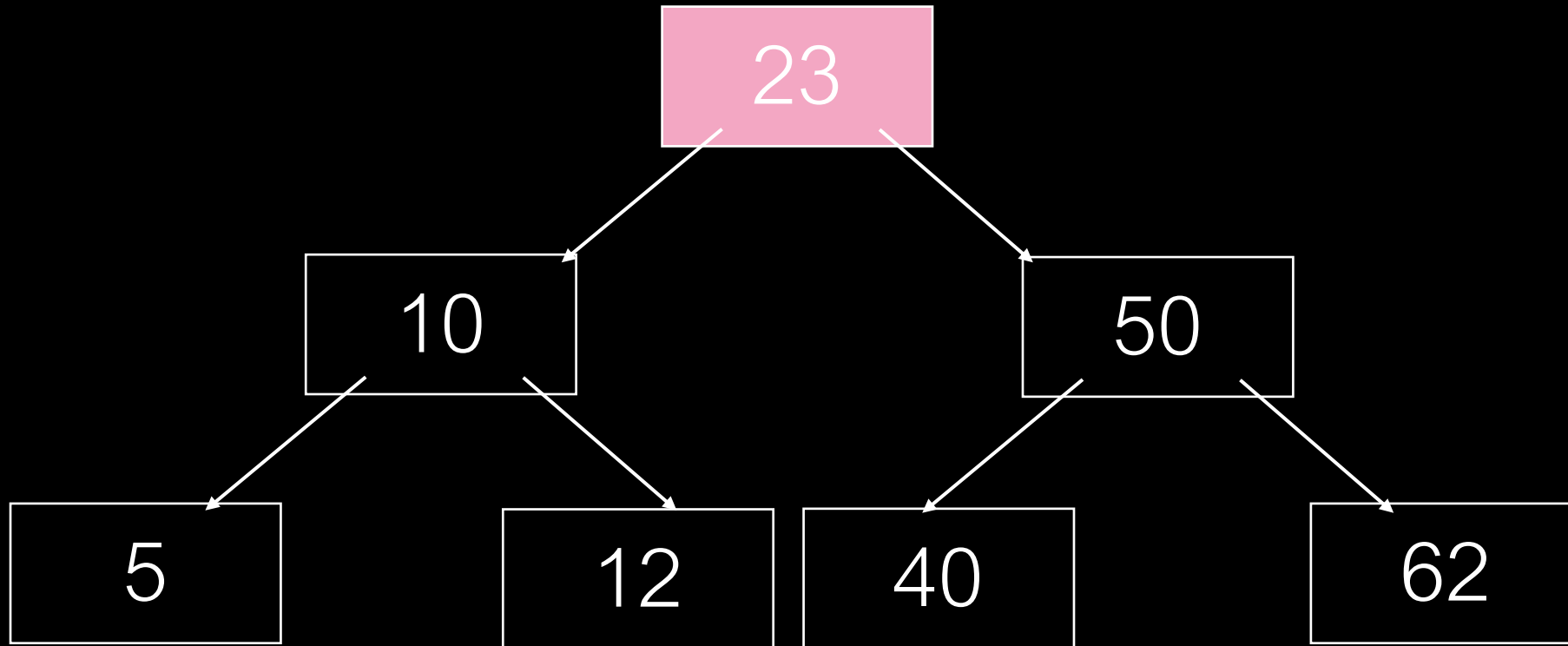
5	10	12	23	40	50	62
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Binary Search Tree

- Searching again...

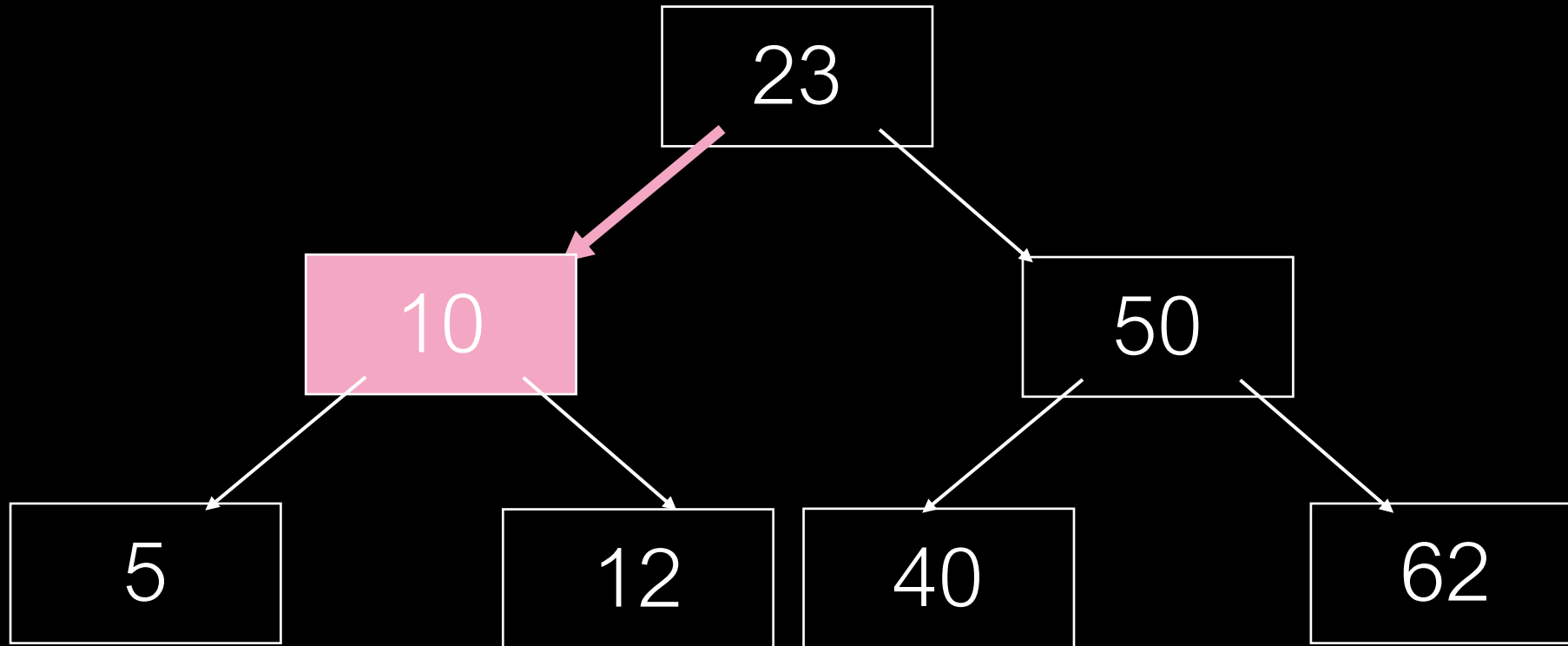
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Binary Search Tree

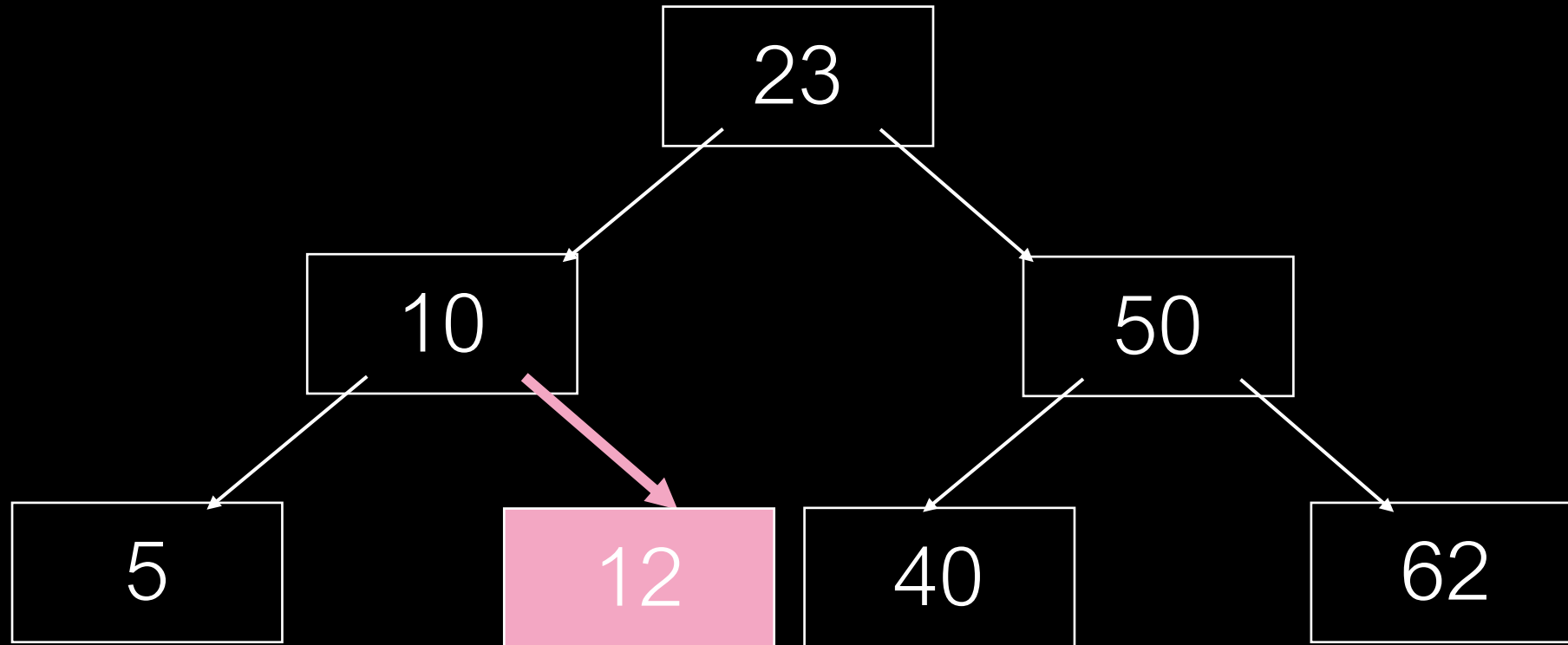
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5	10	12				
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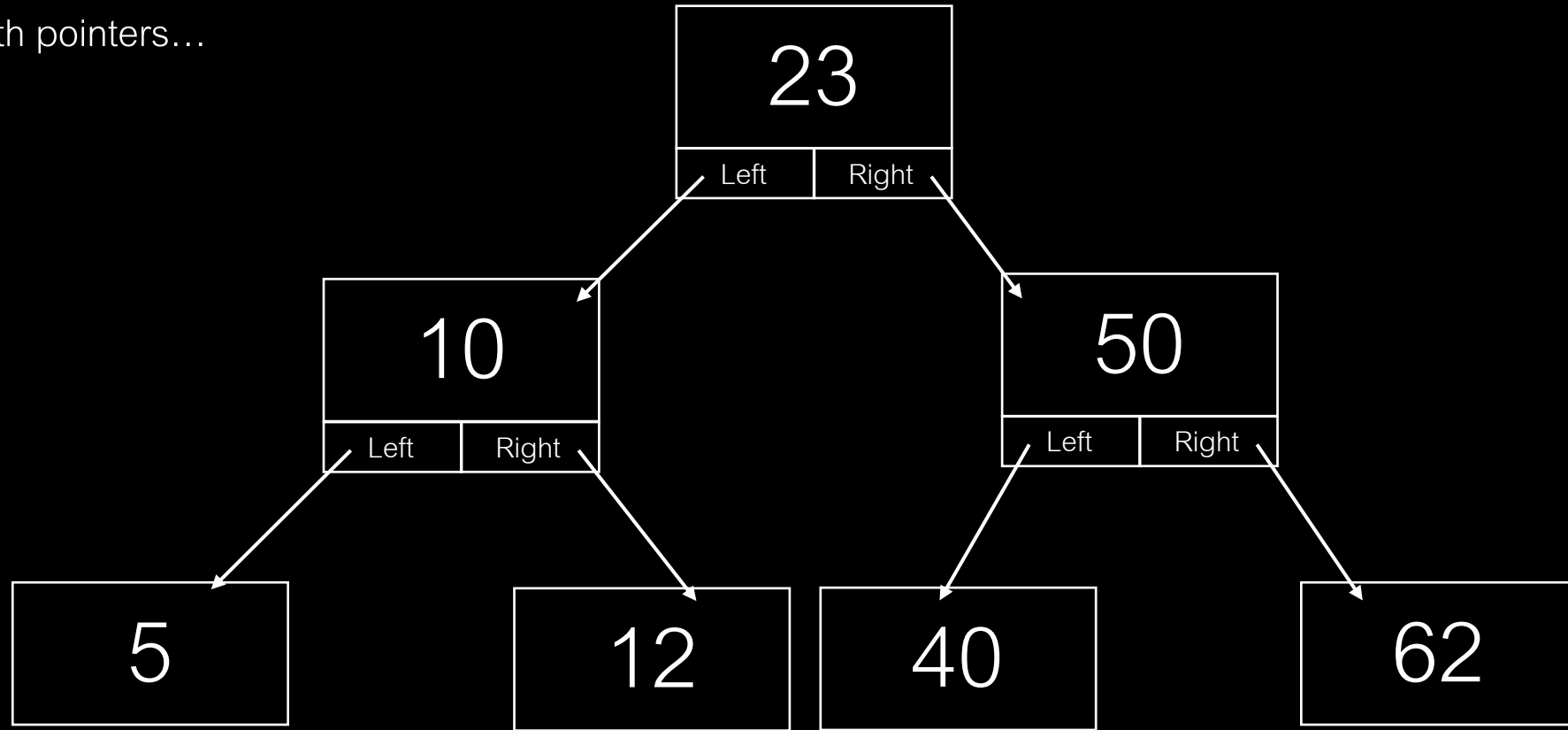
Binary Search Tree

- Searching again...



Binary Search Tree

- With pointers...



- At each memory address, there is a node containing a value, an address to the left child, and an address to the right child.

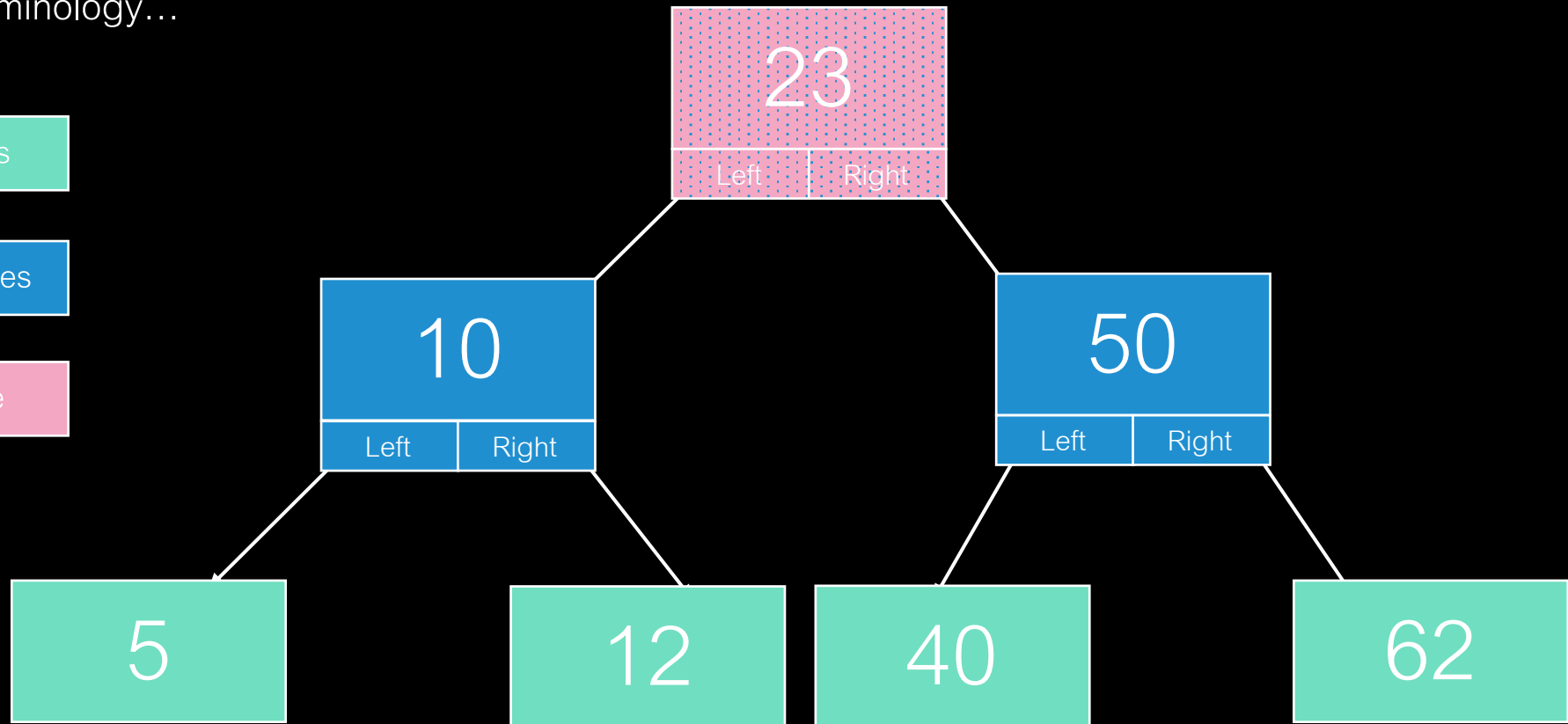
Binary Search Tree

- Some terminology...

Leaf Nodes

Internal Nodes

Root Node



Binary Search Tree – Insertion

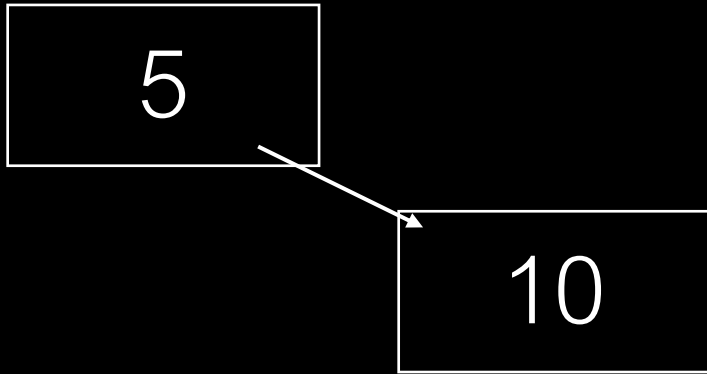
- Now to create a binary search tree one node at a time from these numbers... 5, 10, 30, 50



5

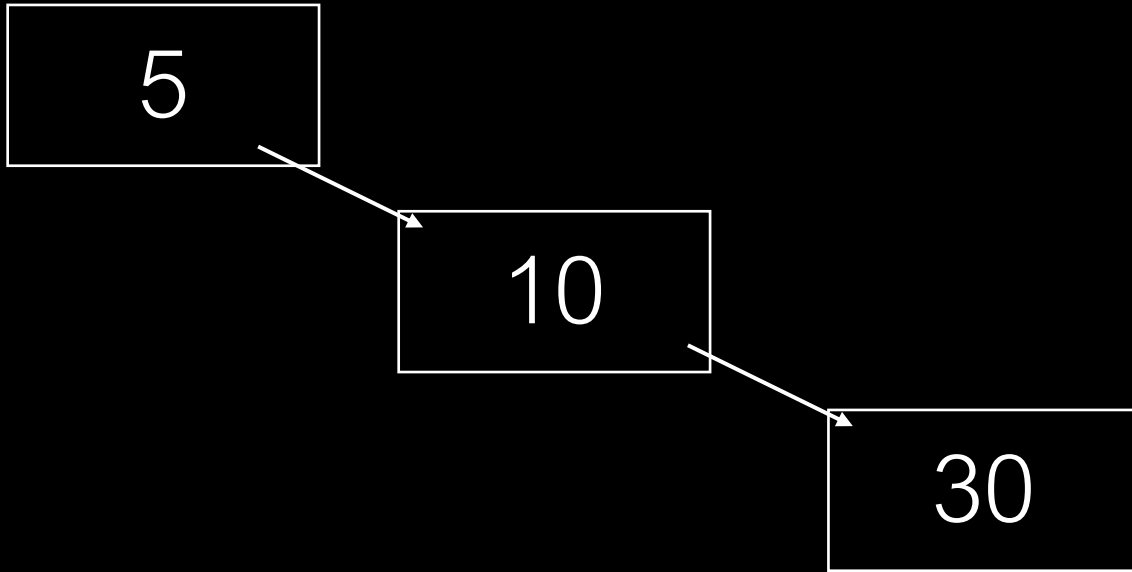
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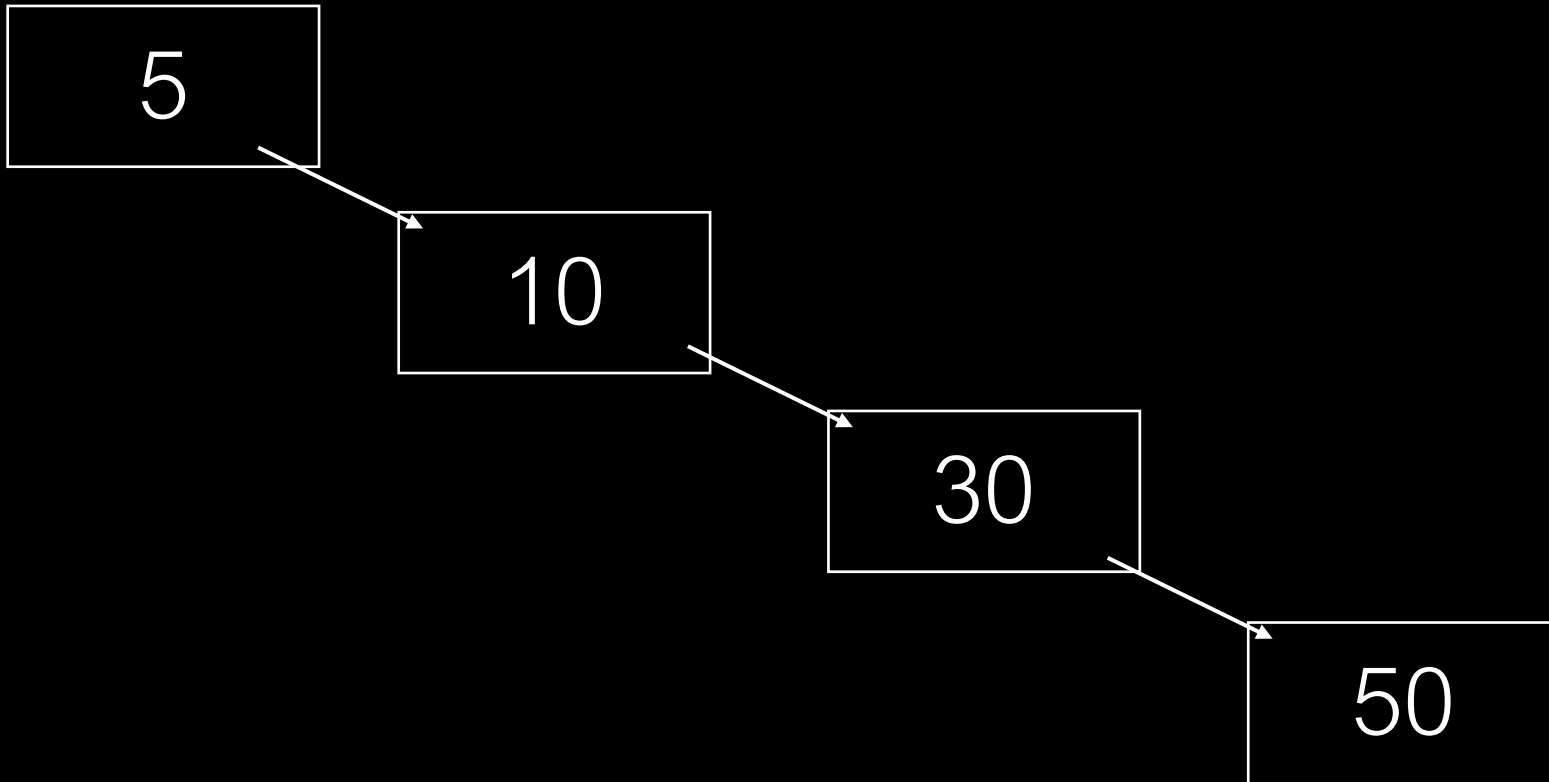
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Binary Search Tree – Insertion

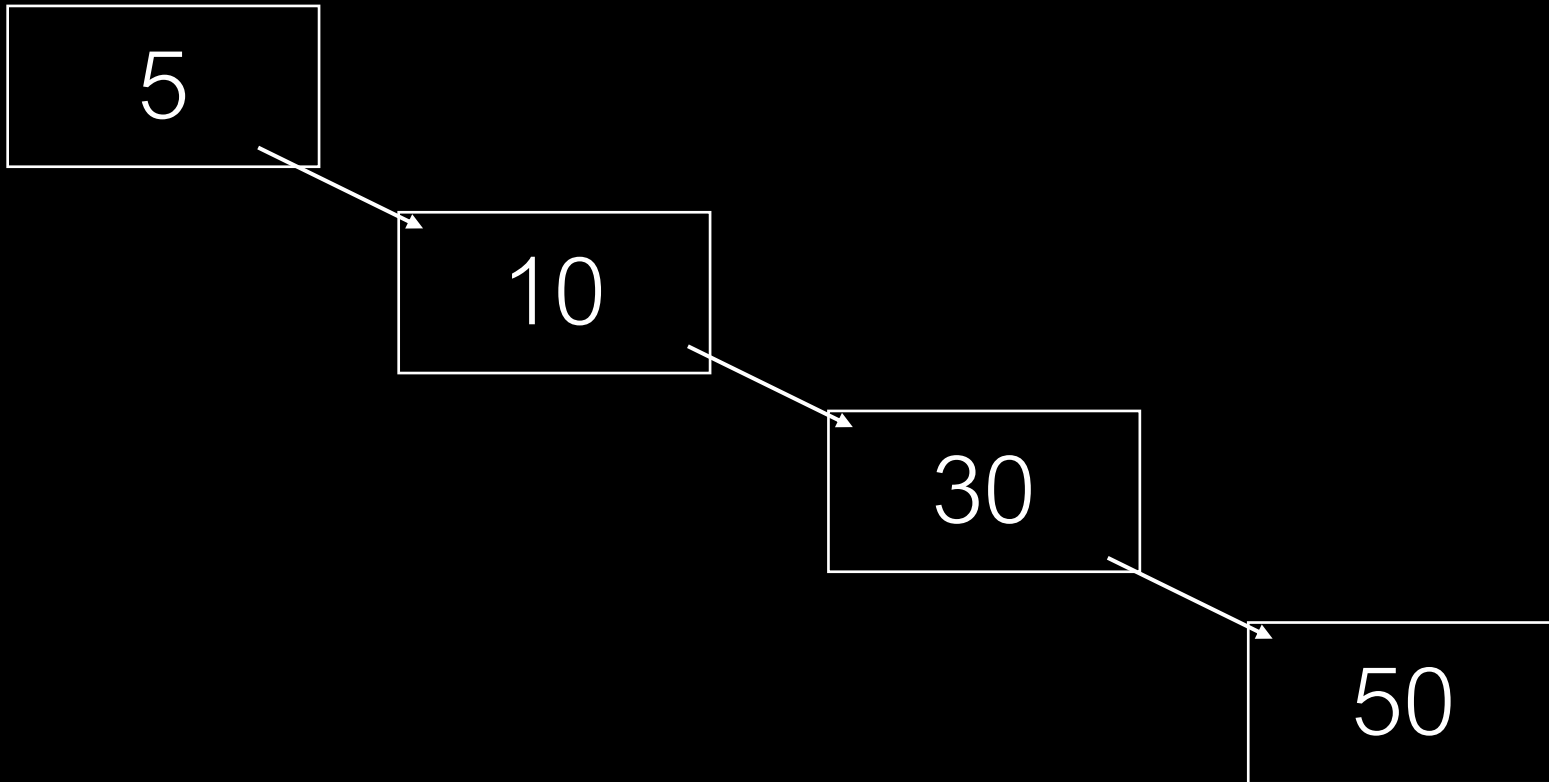
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- What data structure does this look like?

Binary Search Tree

- Let's search for 50...



Efficiency

Binary Search Tree

- Searching:

Efficiency

Binary Search Tree

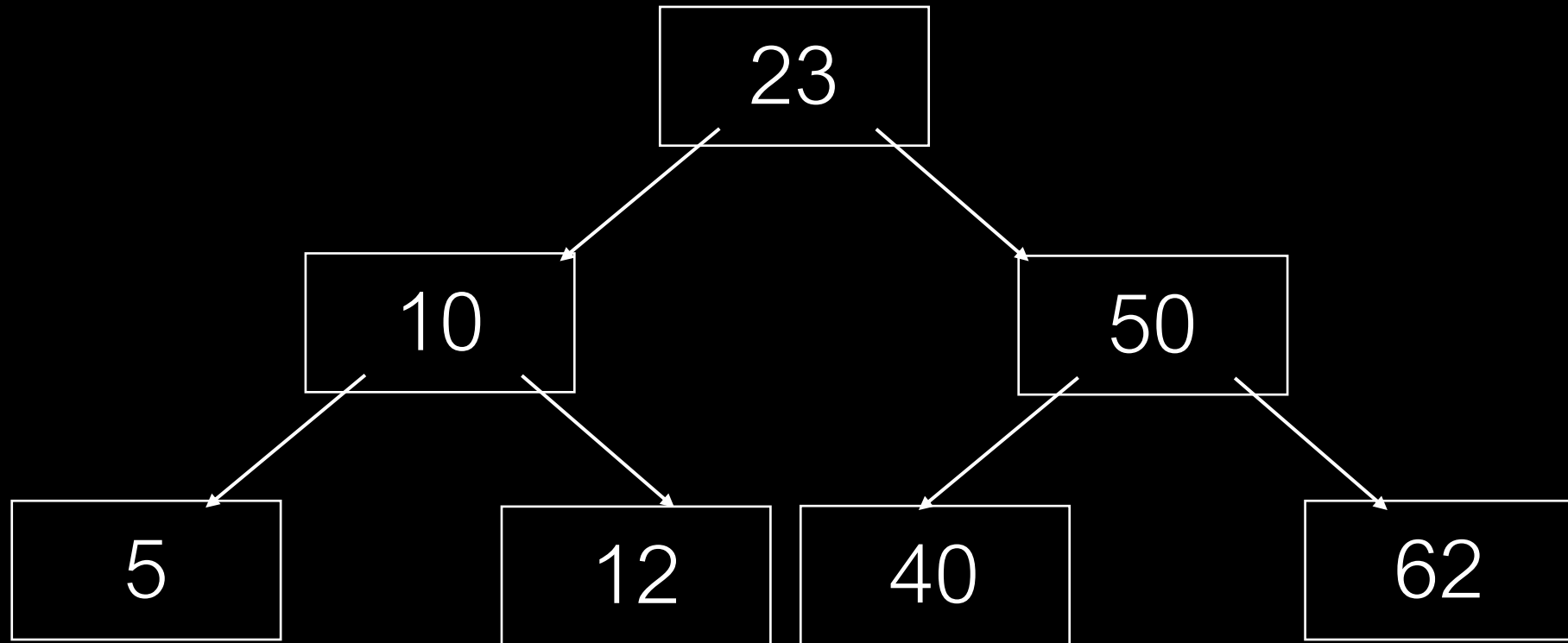
- Searching: $O(n)$
- Insertion/Deletion:

Efficiency

Binary Search Tree

- Searching: $O(n)$
- Insertion/Deletion: $O(n)$

Efficiency



Efficiency

Binary Search Tree

- Searching: $O(n)$
- Insertion/Deletion: $O(n)$

Balanced Binary Search Tree

- Searching:
- Insertion/Deletion:

Efficiency

Binary Search Tree

- Searching: $O(n)$
- Insertion/Deletion: $O(n)$

Balanced Binary Search Tree

- Searching: $O(\log n)$
- Insertion/Deletion: $O(\log n)$

Binary Search Trees