Not on Midterm 2

61A Lecture 24

Friday, October 22

Sets

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One more built-in Python container type

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- Set literals are enclosed in braces

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>>> s
{1, 2, 3, 4}
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>>> 3 in s
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>>> s = {3, 2, 1, 4, 4}
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>>> 3 in s
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>>> s.union({1, 5})
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>>> 3 in s
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>>> s.union({1, 5})
{1, 2, 3, 4, 5}
>>> s.intersection({6, 5, 4, 3})
{3, 4}
```

Implementing Sets

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The interface for sets

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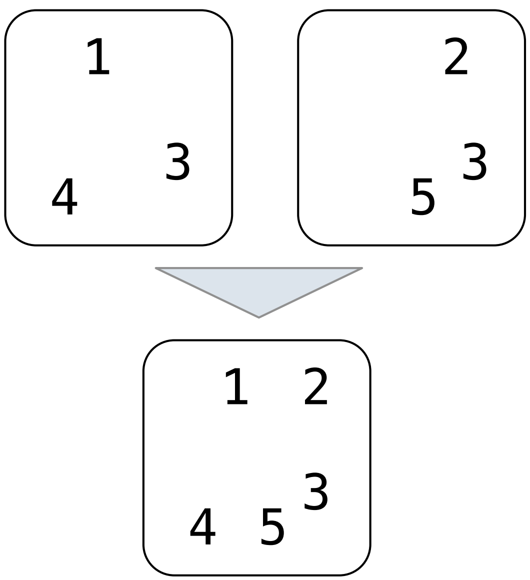

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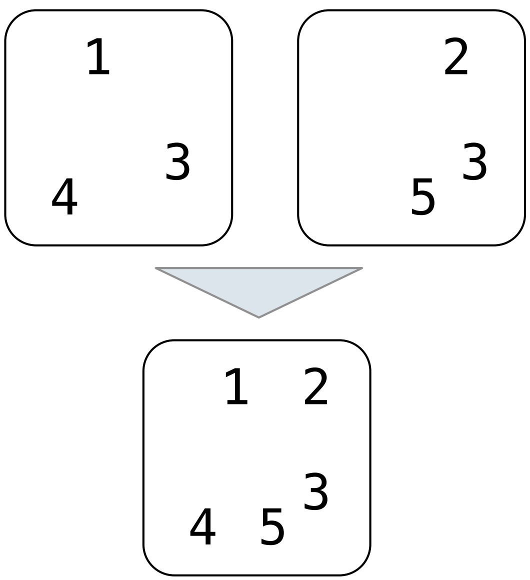

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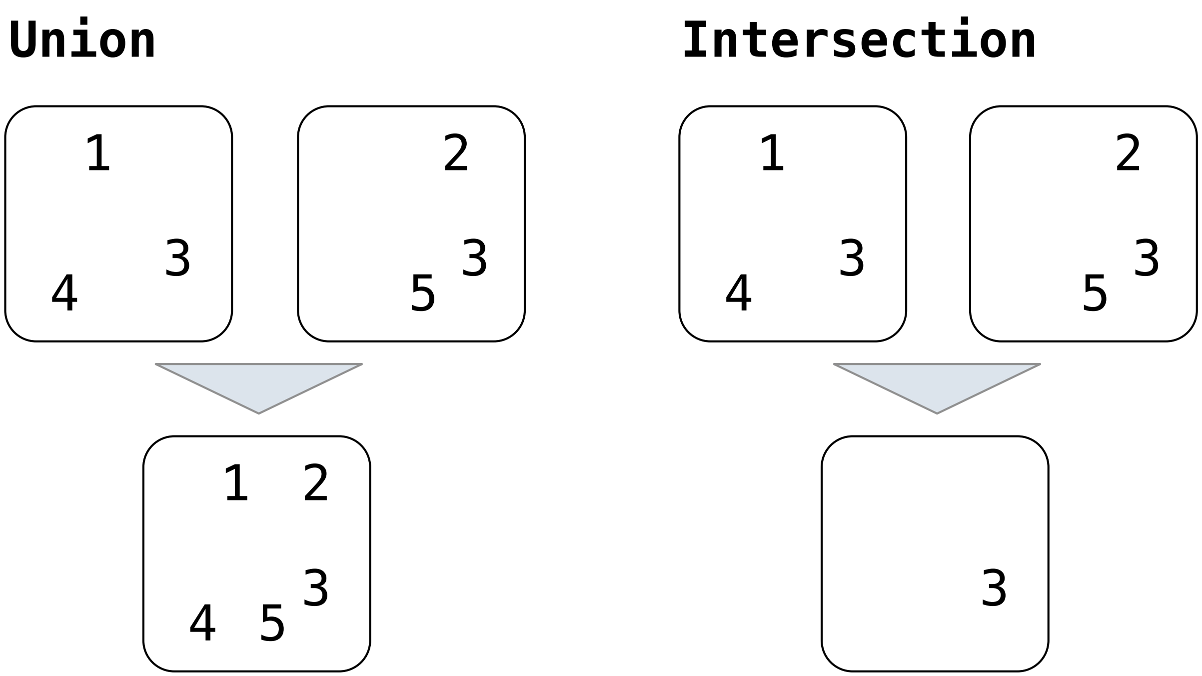

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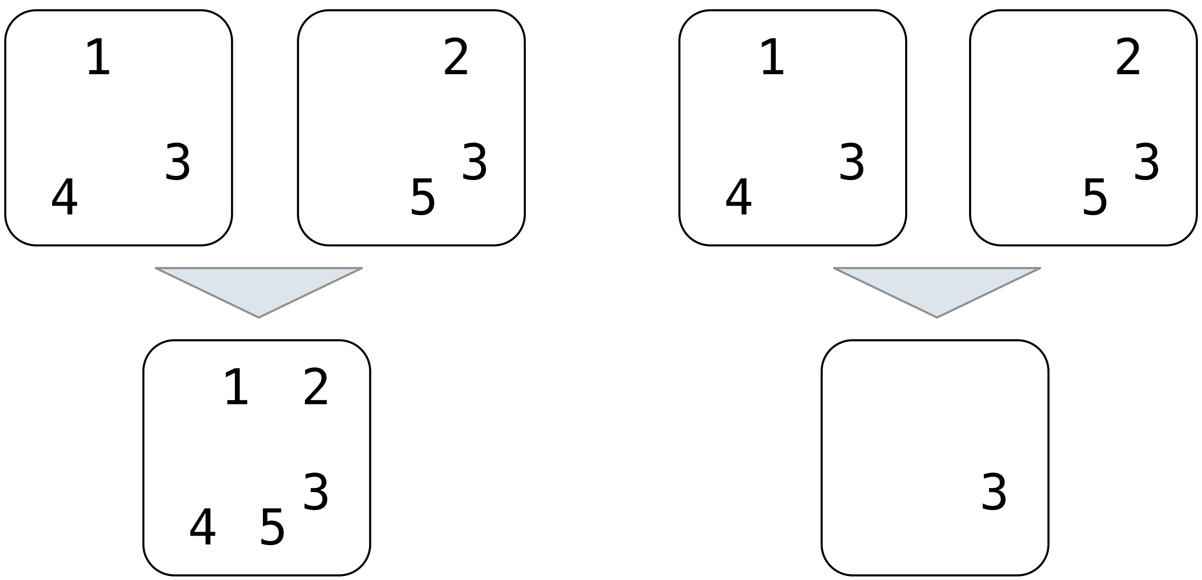
Union **Intersection**



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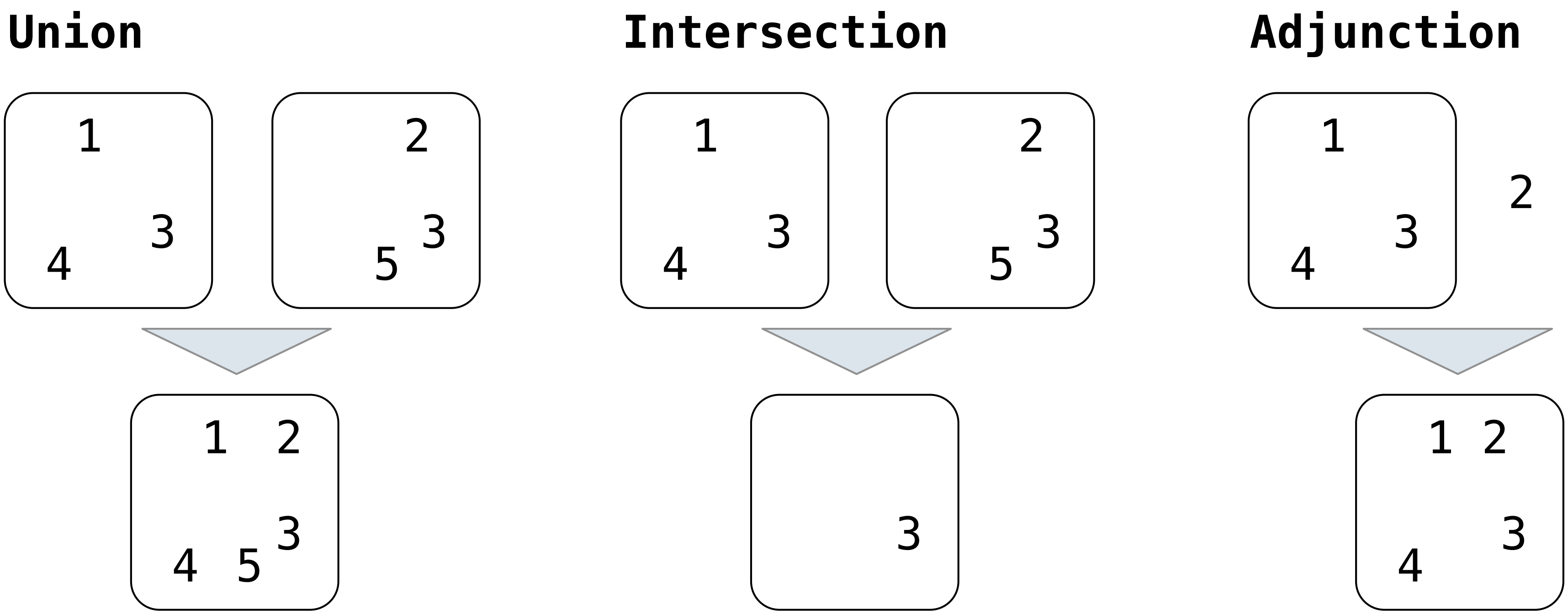

Sets as Unordered Sequences

Proposal 1: A set is represented by a recursive list that contains no duplicate items

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Demo

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Demo

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def adjoin_set(s, v):
    if set_contains(s, v):
        return s
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Sets as Unordered Sequences

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def adjoin_set(s, v):
    if set_contains(s, v):
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def intersect_set(set1, set2):
    f = lambda v: set_contains(set2, v)
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def adjoin_set(s, v):
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def intersect_set(set1, set2):
    f = lambda v: set_contains(set2, v)
    return filter_rlist(set1, f)
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def union_set(set1, set2):
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def union_set(set1, set2):
    f = lambda v: not set_contains(set2, v)
    set1_not_set2 = filter_rlist(set1, f)
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Demo

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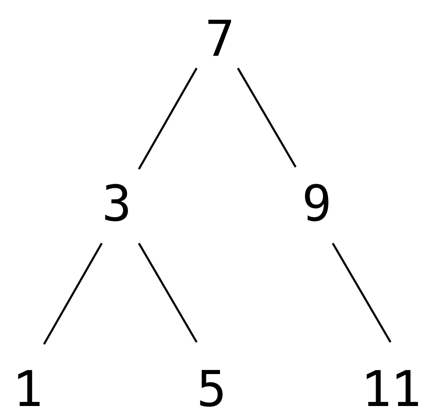

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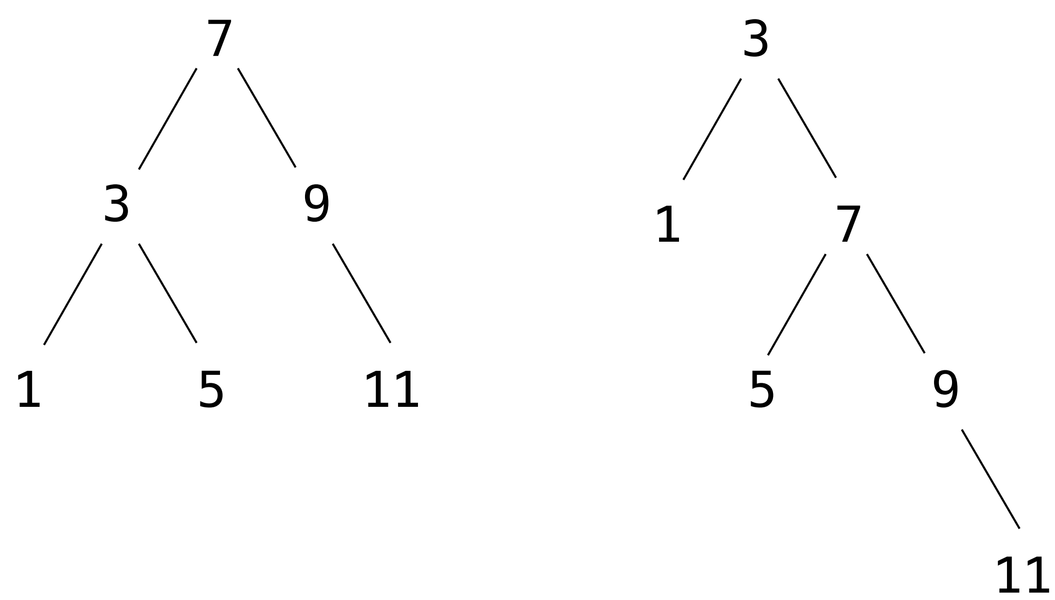

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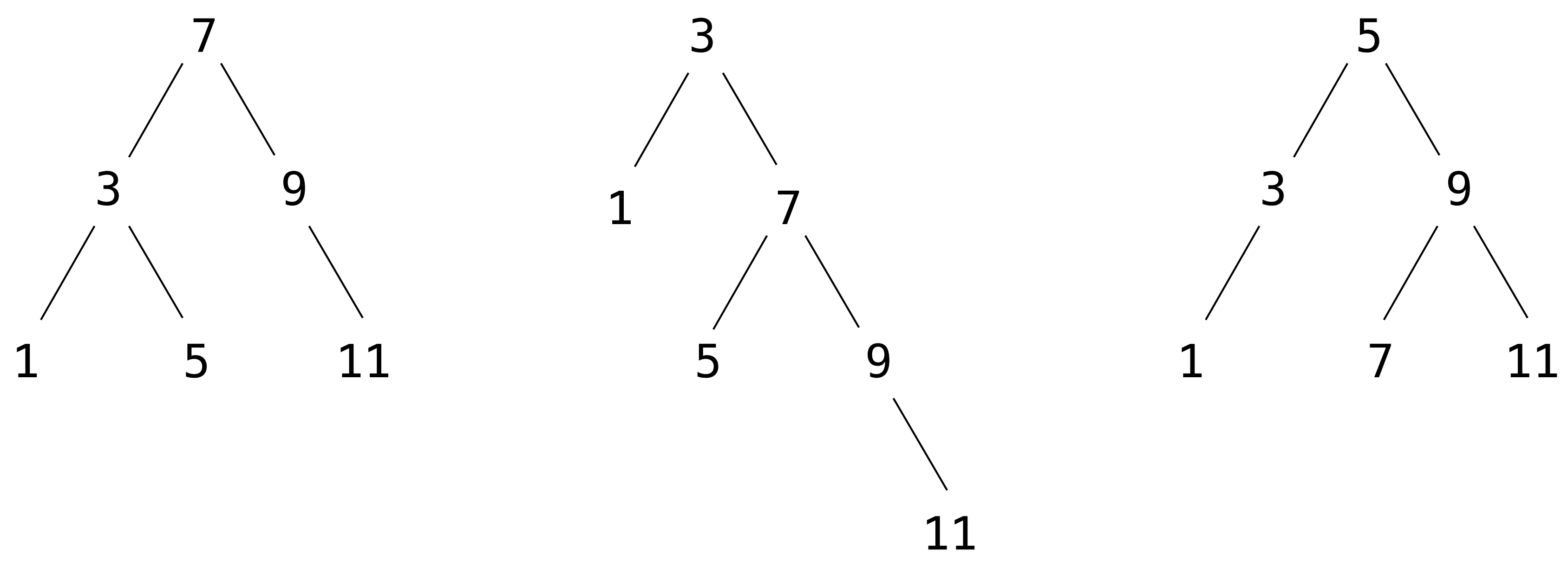

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```
def set_contains3(s, v):
    if s is None:
        return False
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Membership in Tree Sets

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def set_contains3(s, v):
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def set_contains3(s, v):
    if s is None:
        return False
    elif s.entry == v:
        return True
    elif s.entry < v:
        return set_contains3(s.right, v)
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    if s is None:
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    elif s.entry == v:
        return True
    elif s.entry < v:
        return set_contains3(s.right, v)
    elif s.entry > v:
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Membership in Tree Sets

Set membership tests traverse the tree

- The element is either in the left or right sub-branch
- By focusing on one branch, we reduce the set by about half

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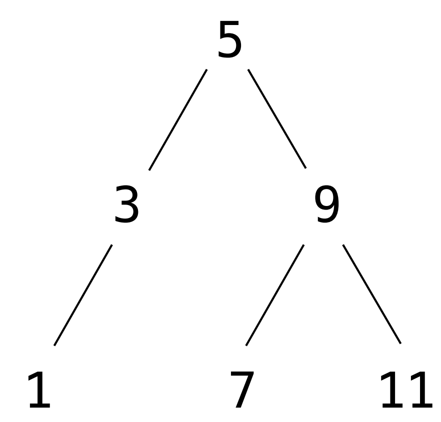

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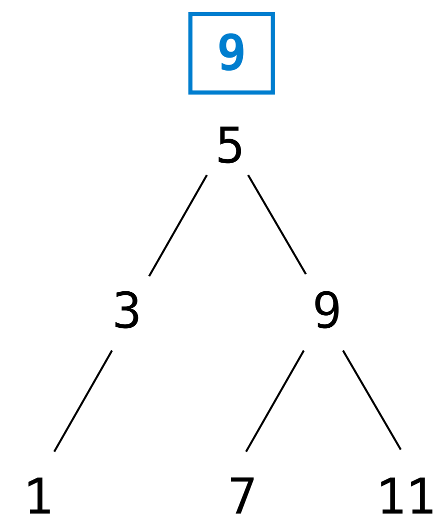

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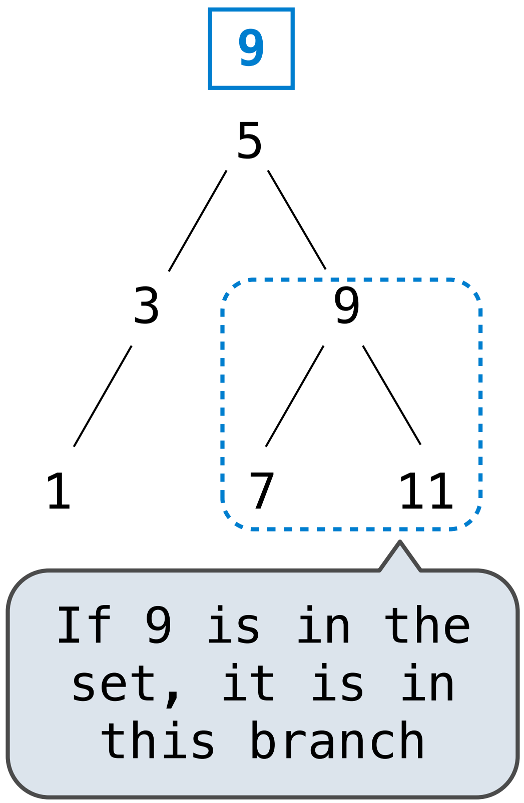

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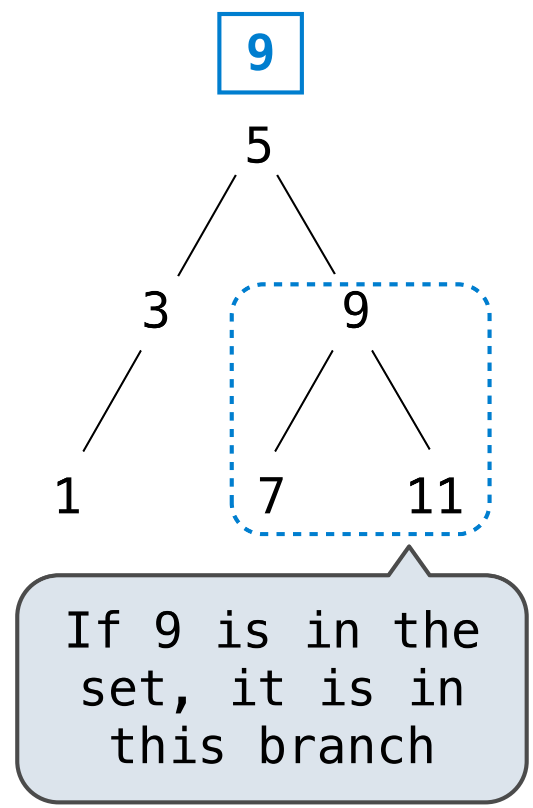
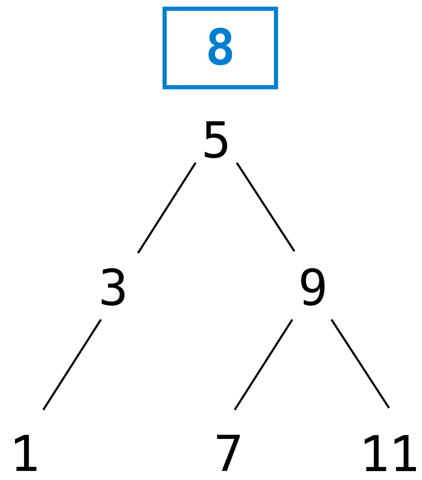


Order of growth?

Adjoining to a Tree Set

Adjoining to a Tree Set



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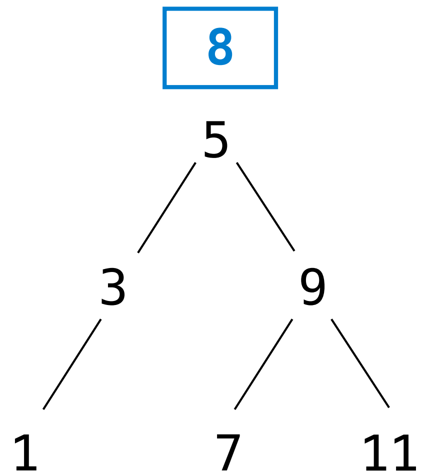
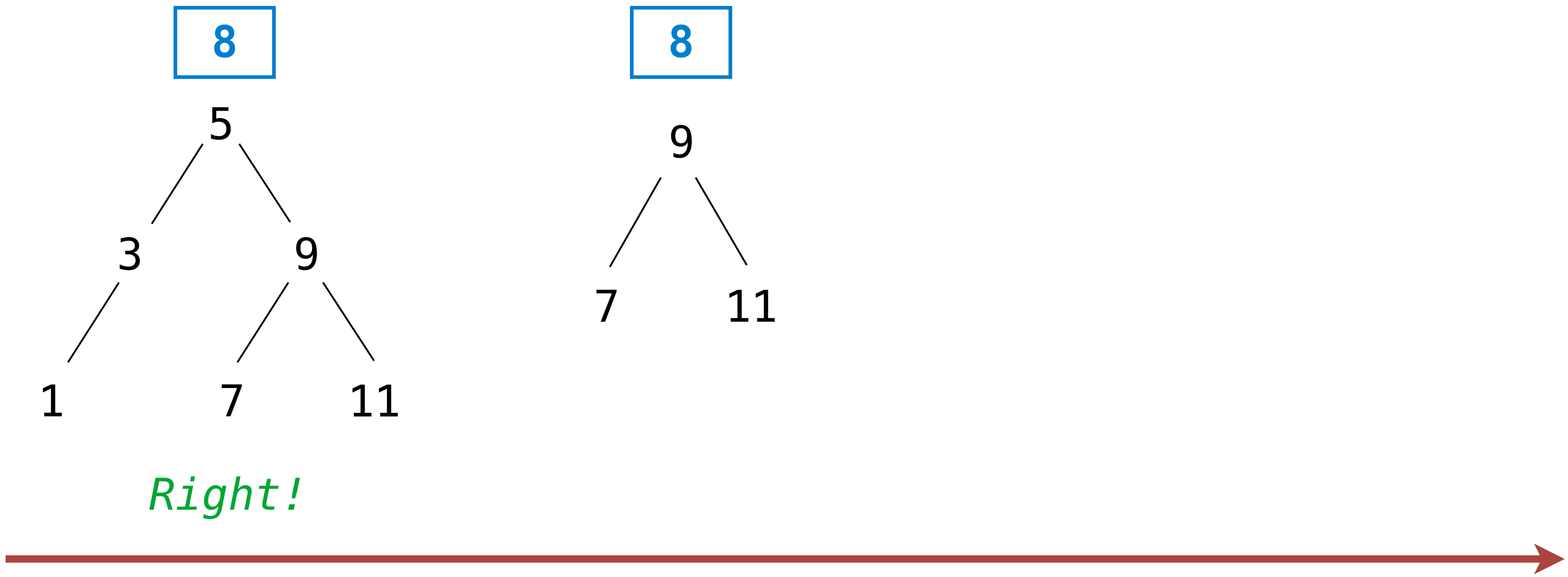


Right!

Adjoining to a Tree Set

Adjoining to a Tree Set



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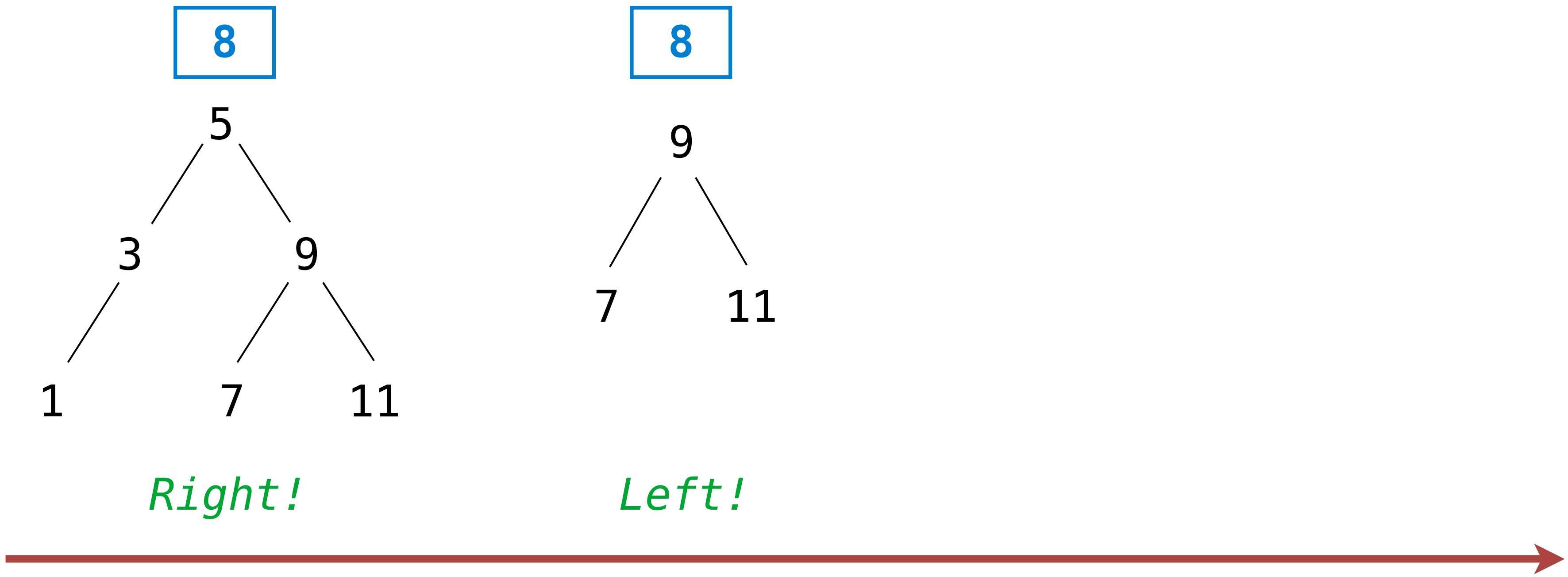

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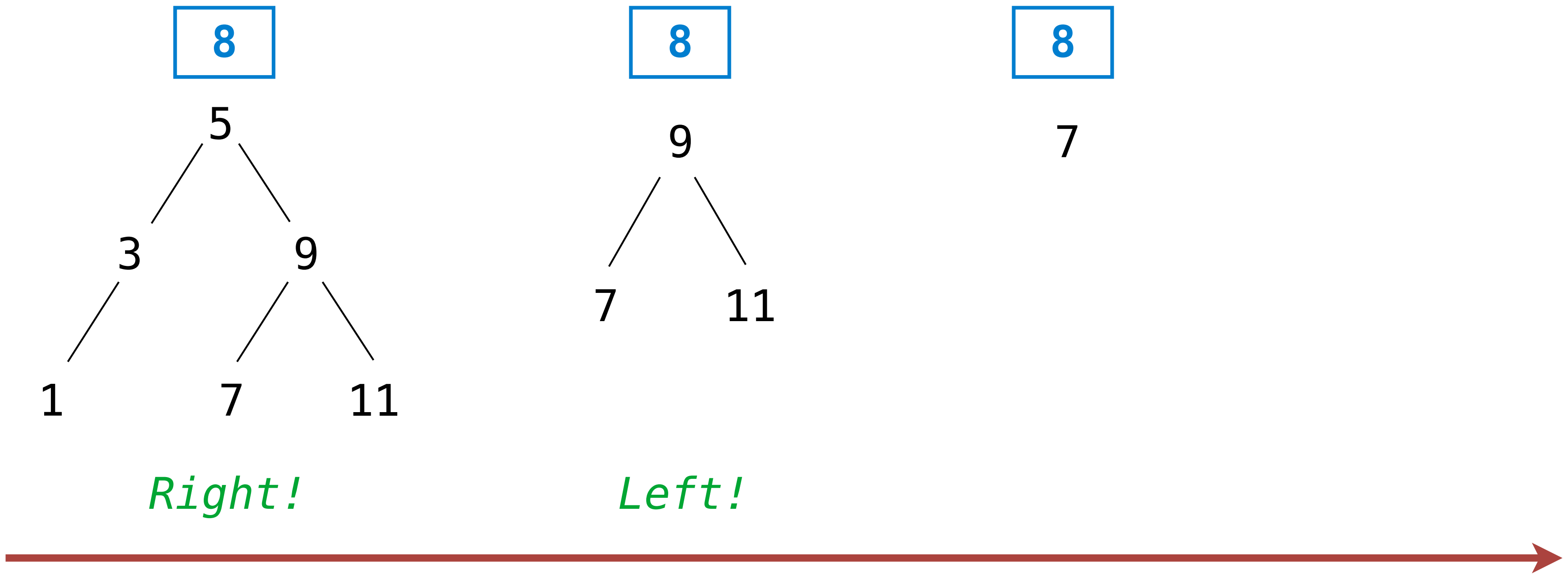

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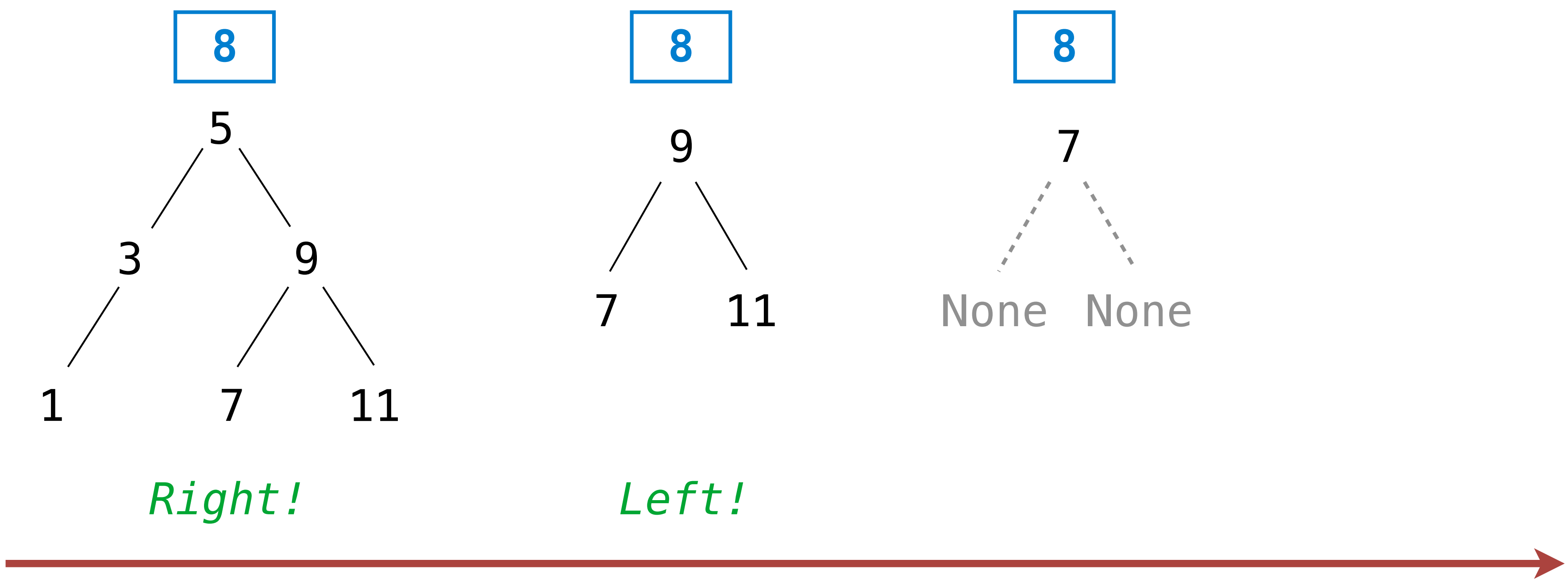

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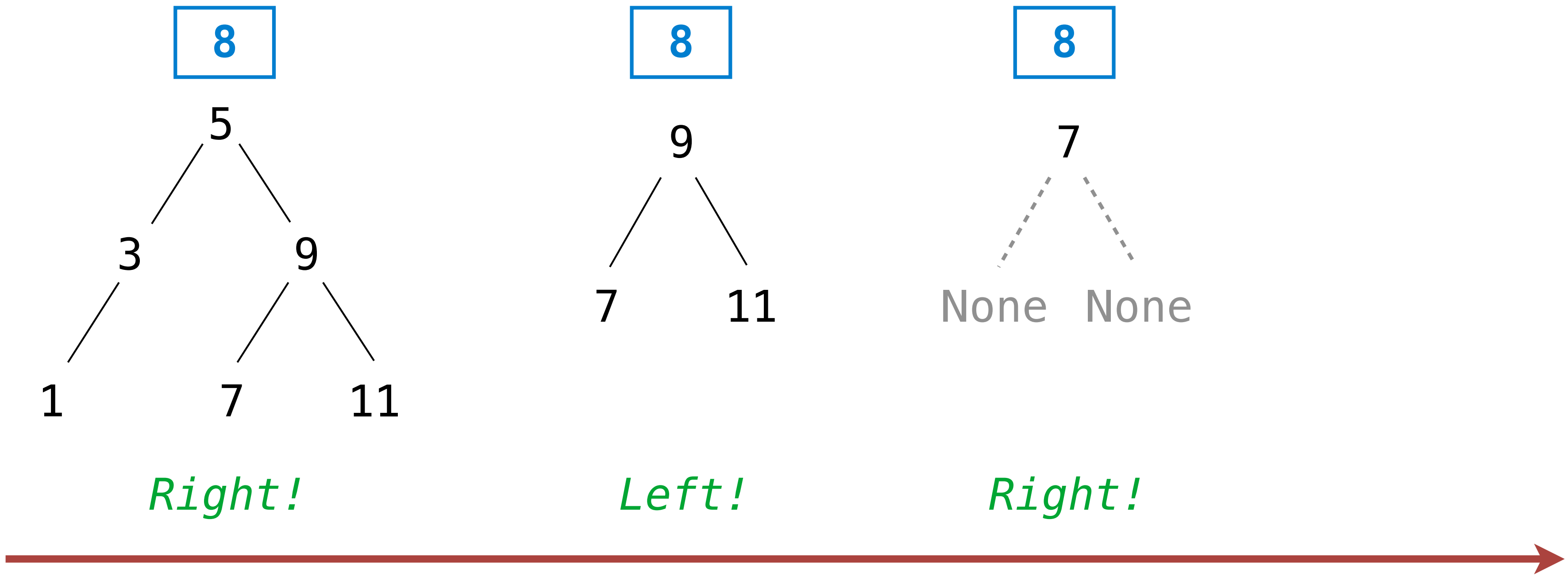

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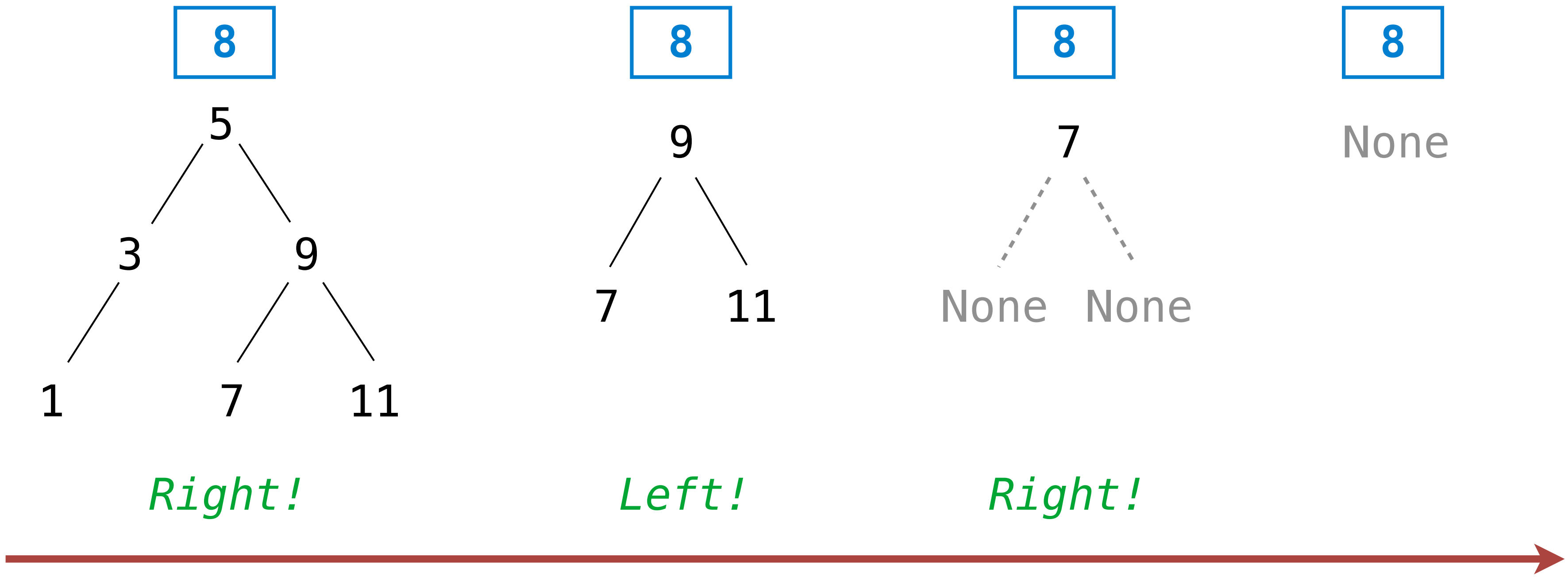

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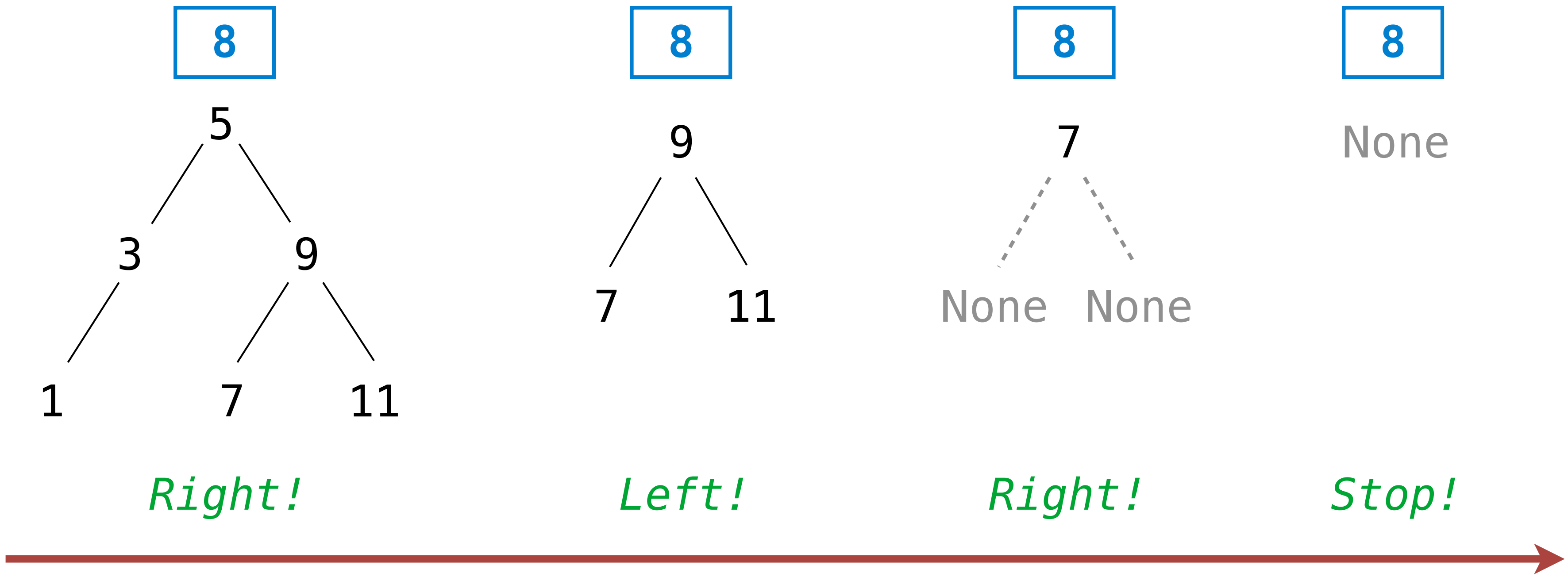

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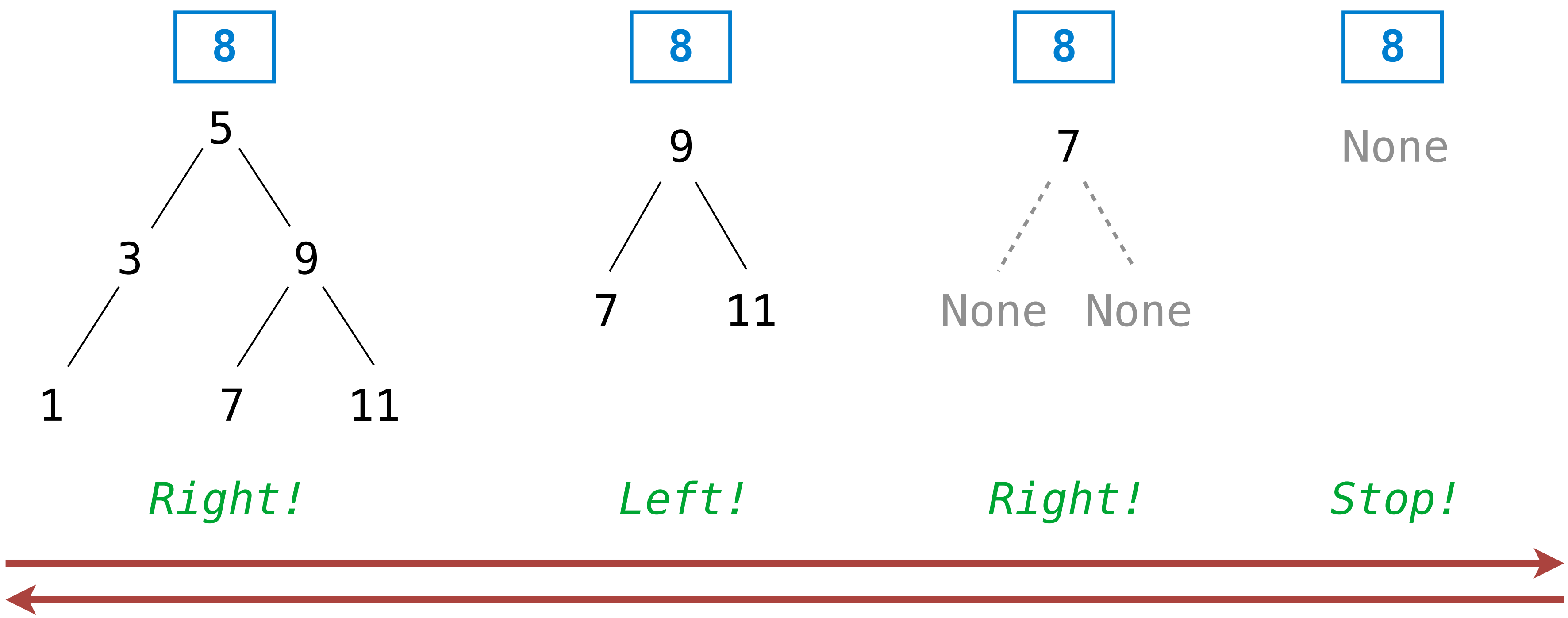

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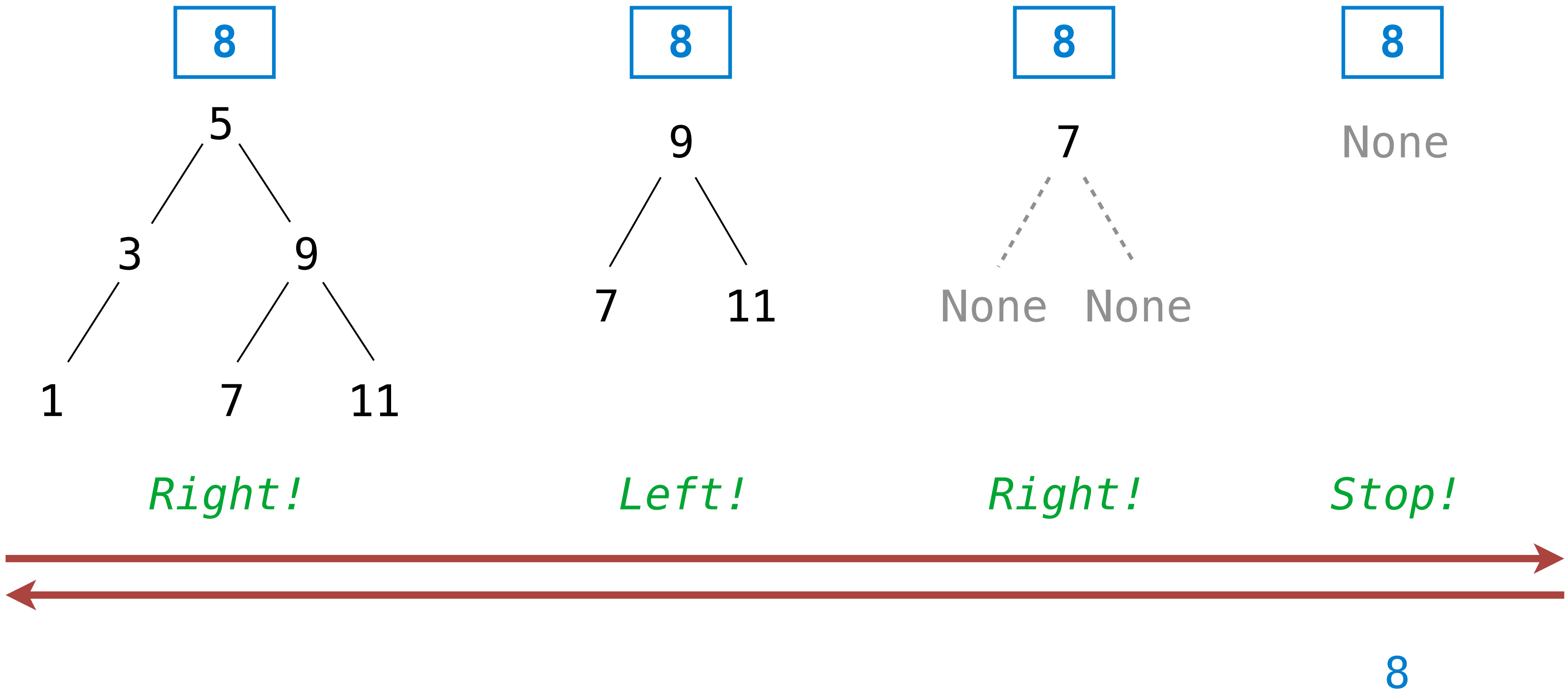

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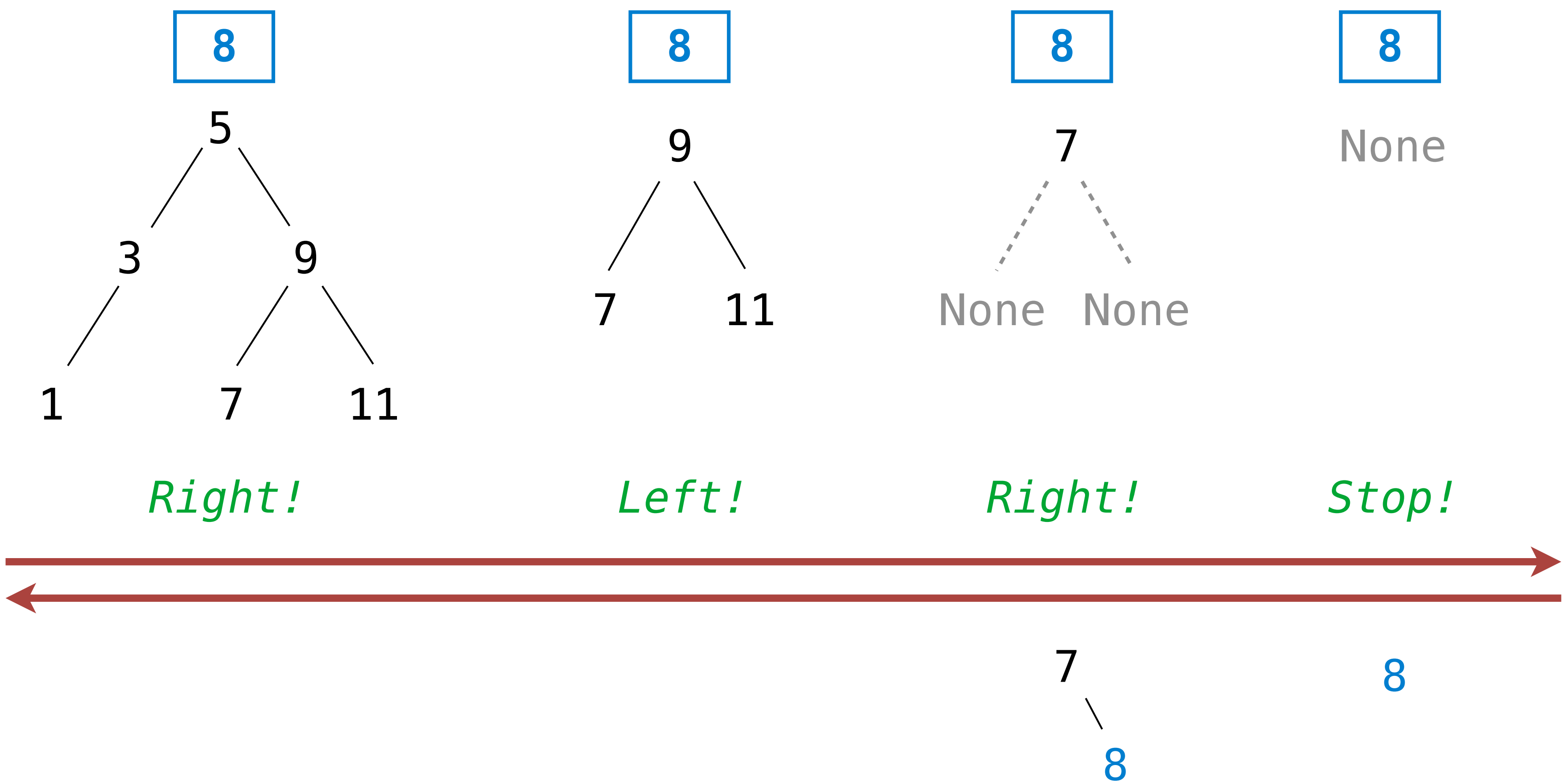

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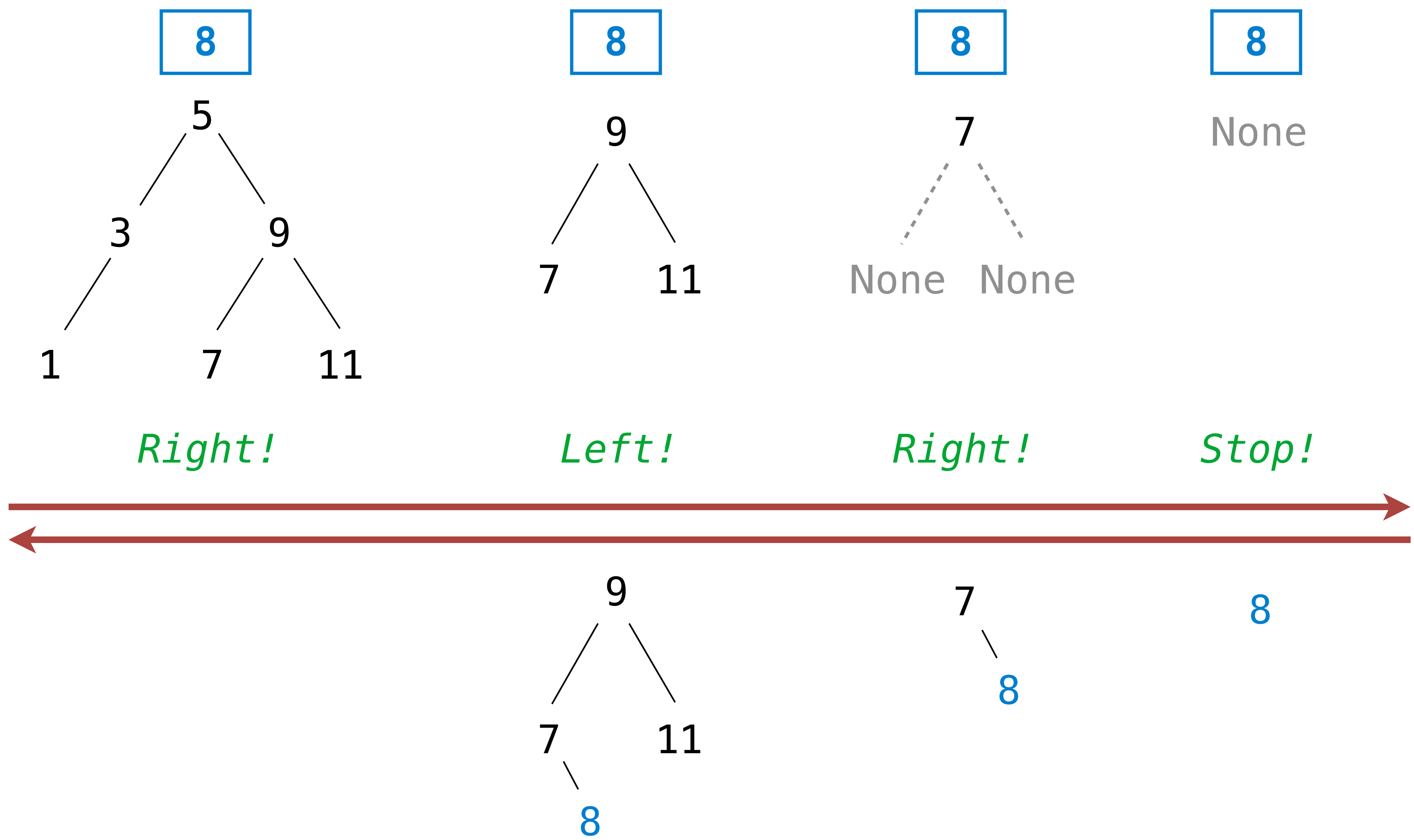

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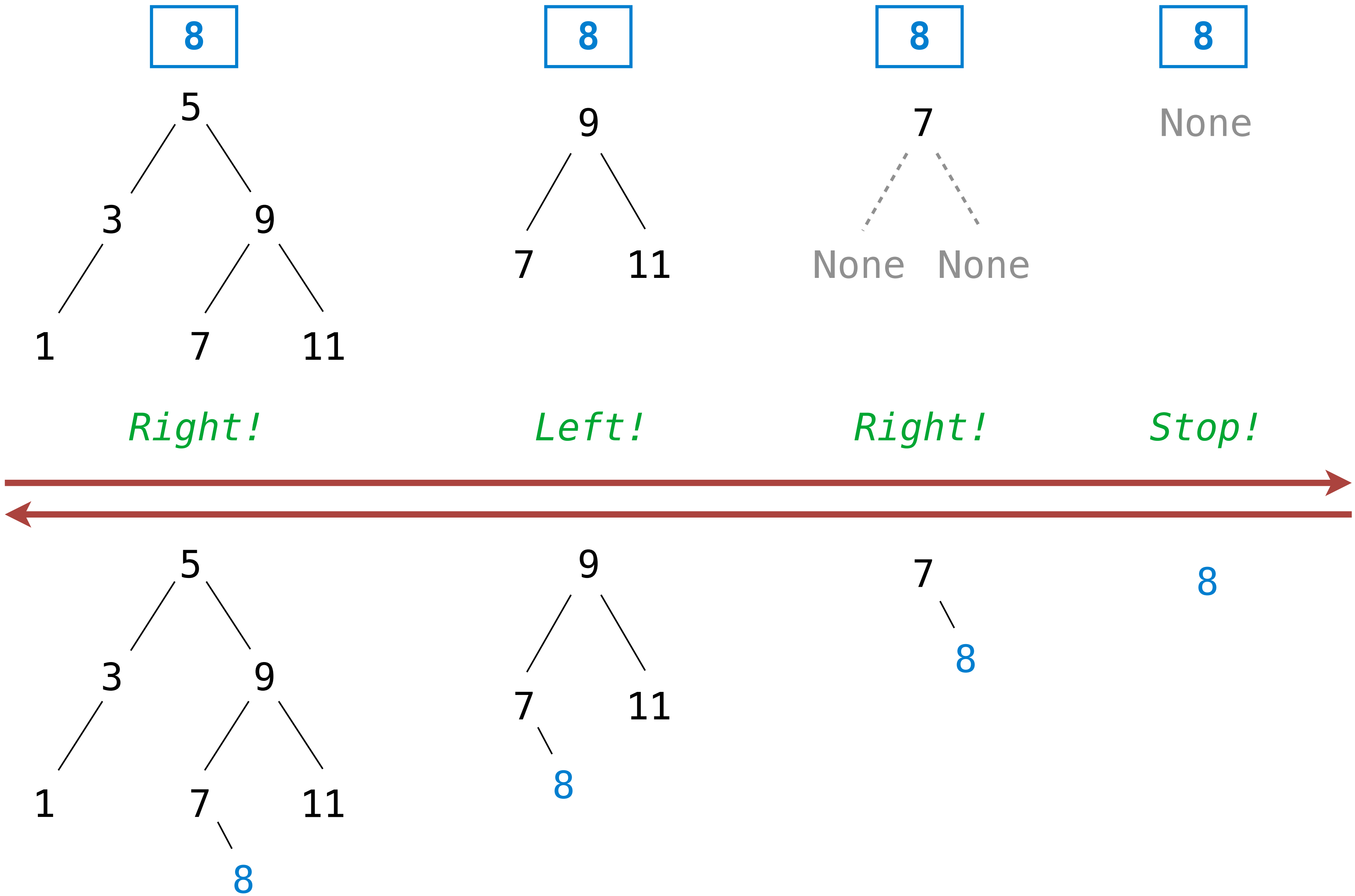

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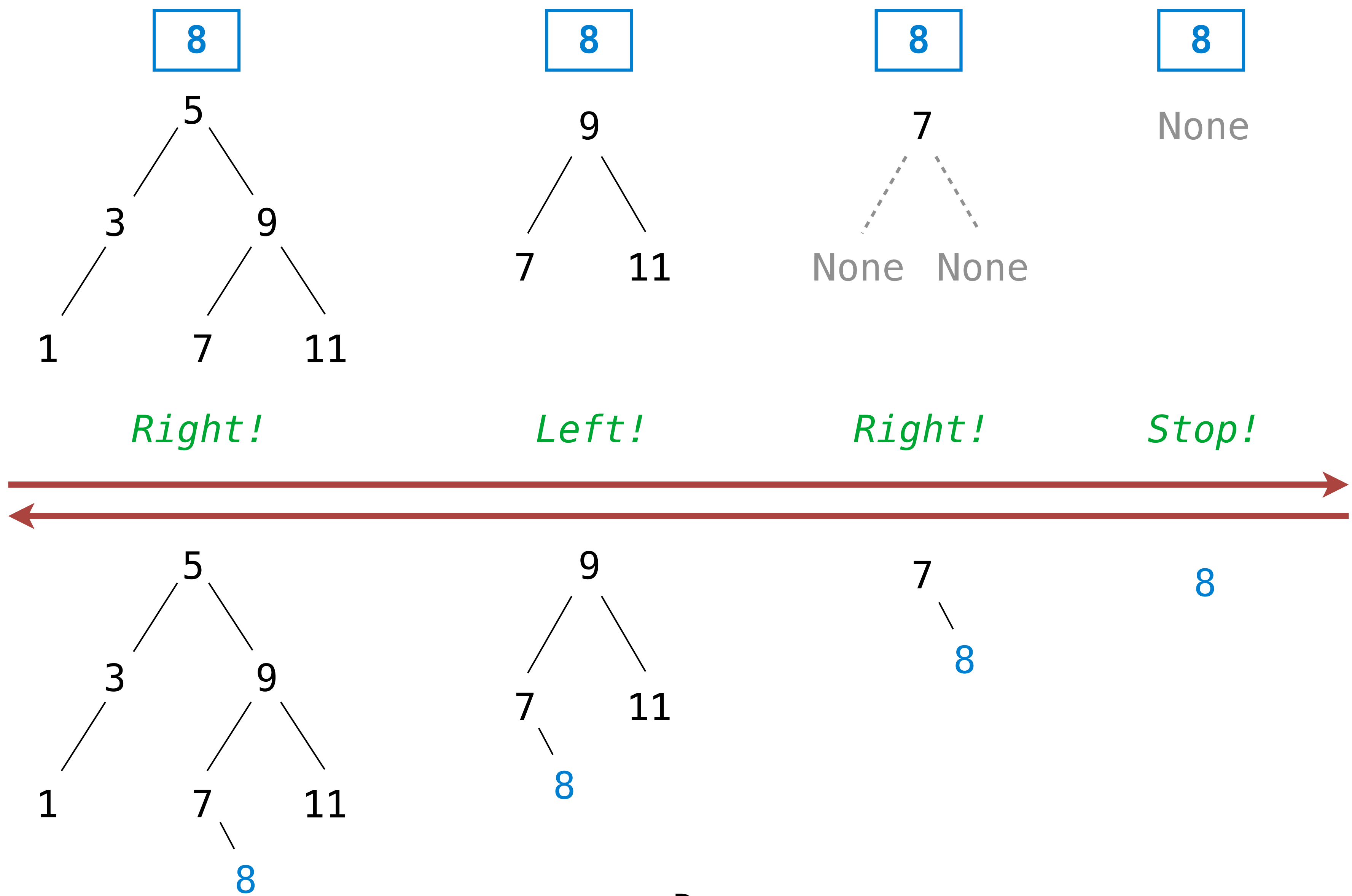

Demo

What Did I Leave Out?

What Did I Leave Out?

```
Sets as ordered sequences:
```

What Did I Leave Out?

Sets as ordered sequences:

- Adjoining an element to a set

What Did I Leave Out?

Sets as ordered sequences:

- Adjoining an element to a set
- Union of two sets

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Sets as binary trees:

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That's homework 8!

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No lecture on Wednesday

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Good luck!