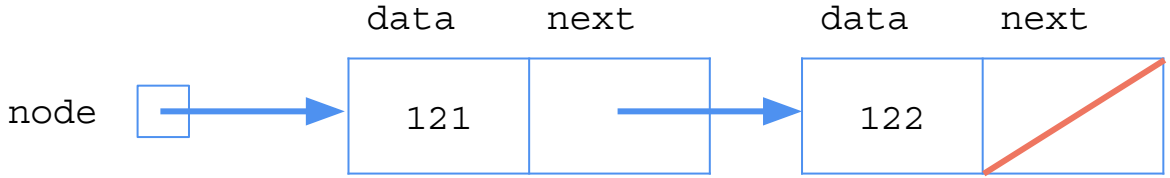
Lesson 7

Linked Lists

Linked Nodes So Far

- Small sequences of nodes connected together
- Using the `ListNode` class
- Traversals over these sequences with `while` loops



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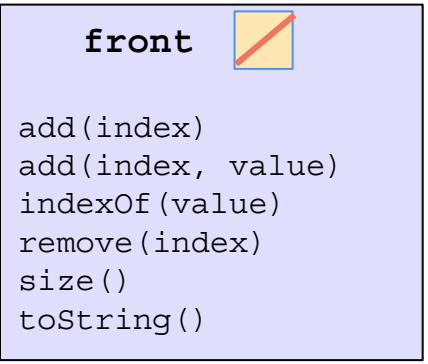
`LinkedIntList`



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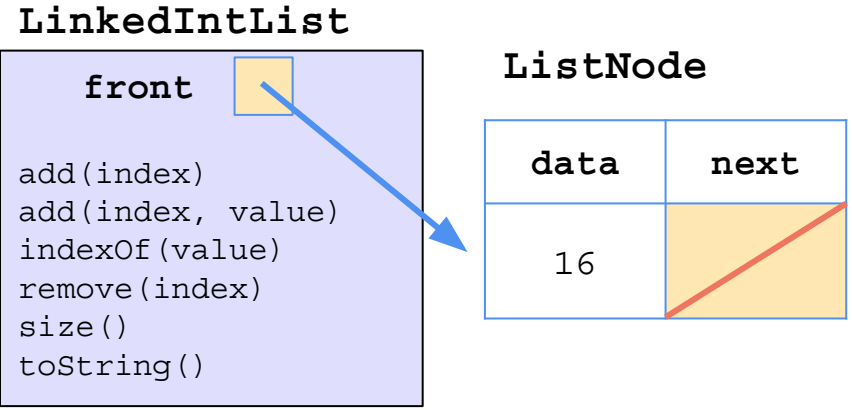

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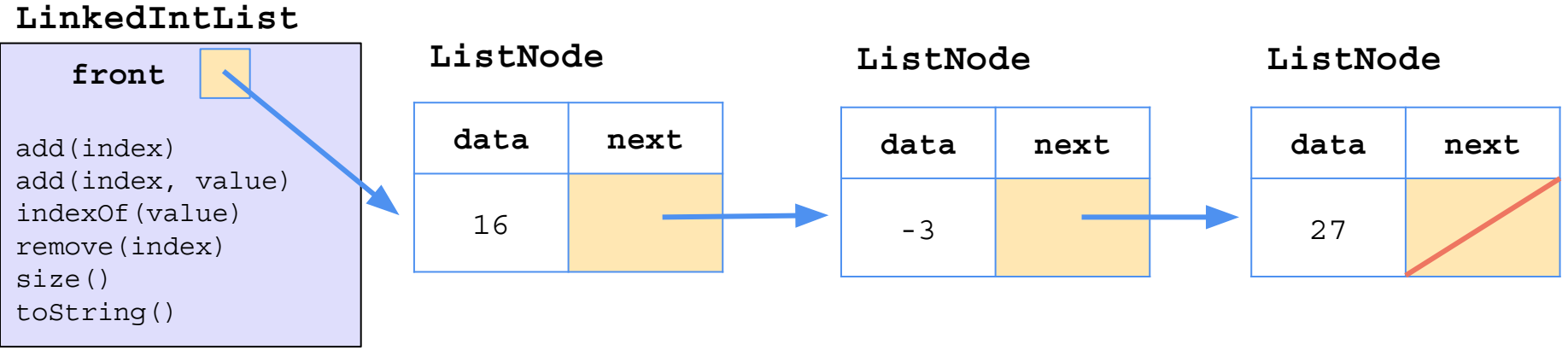

printList Revisited

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public class LinkedIntList {

    private ListNode front;
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We're losing the `front` of our list!

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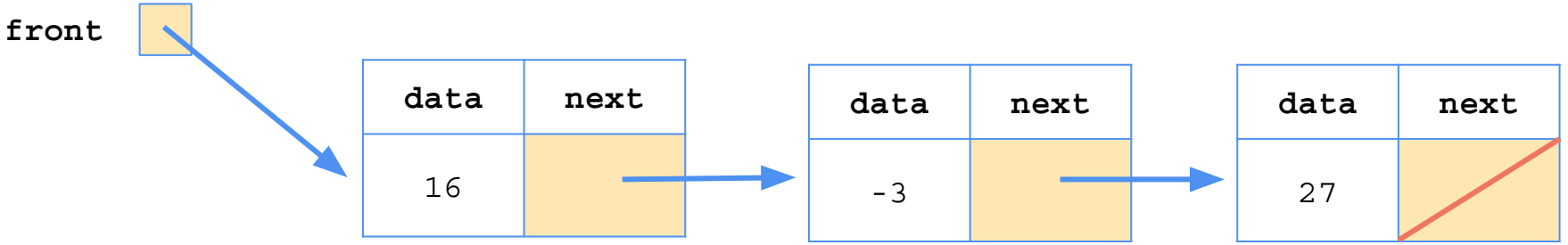

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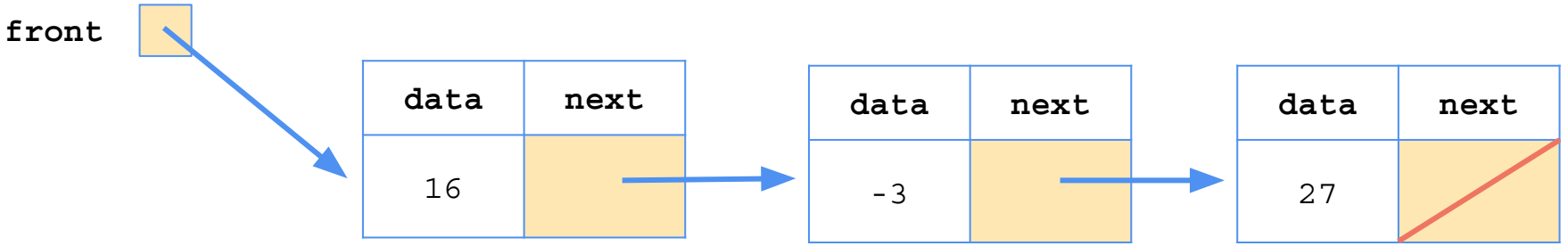

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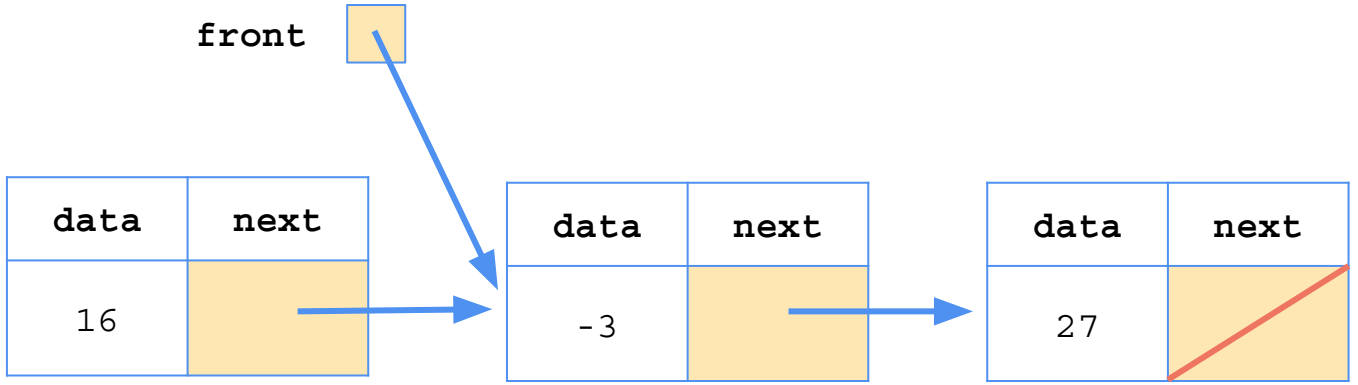

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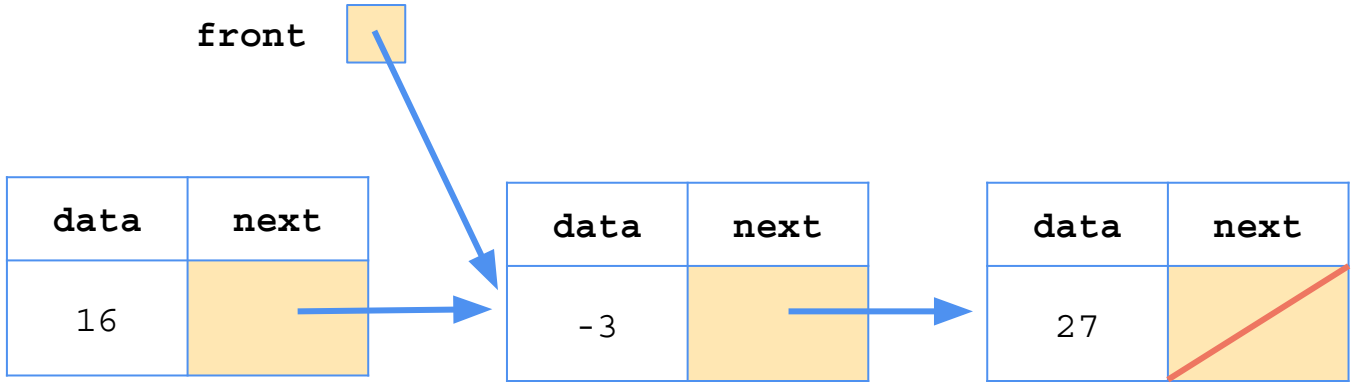

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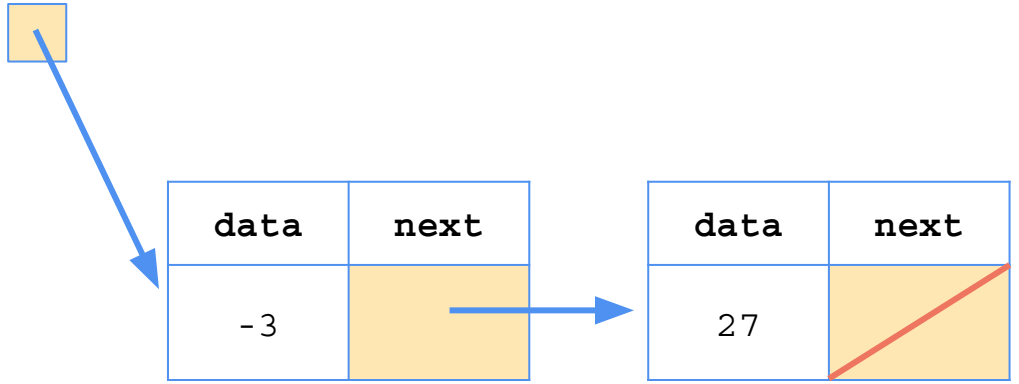

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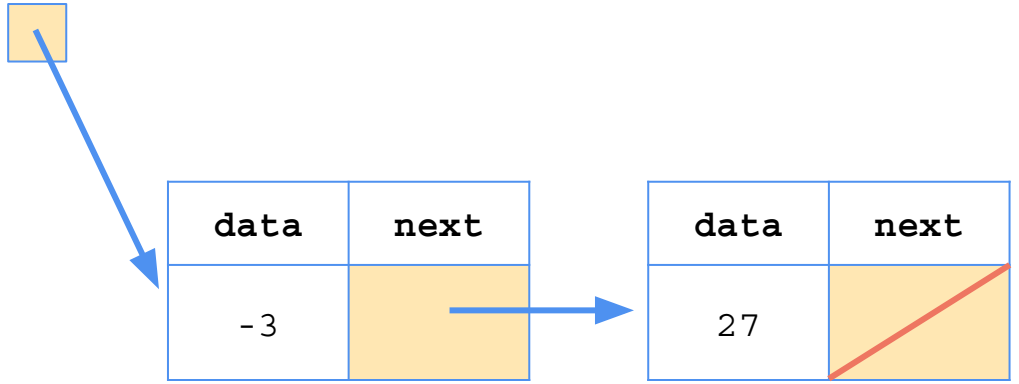

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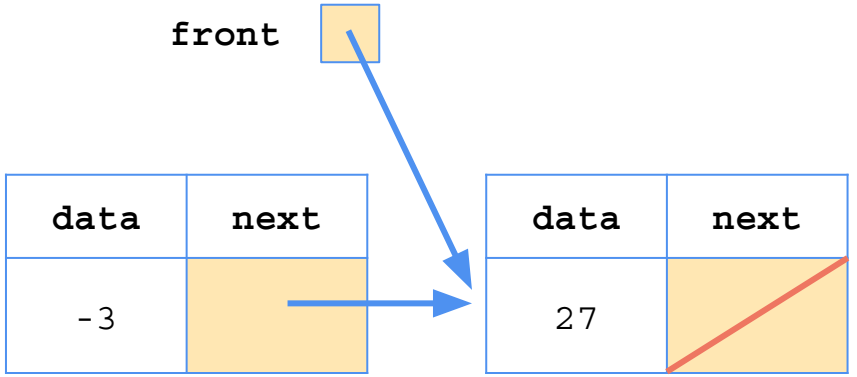

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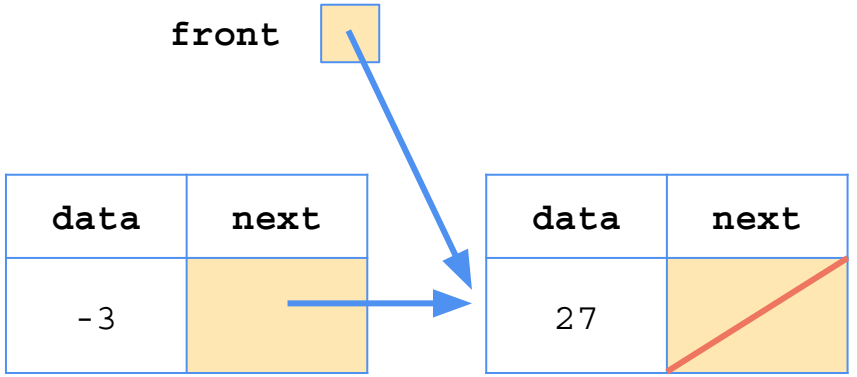

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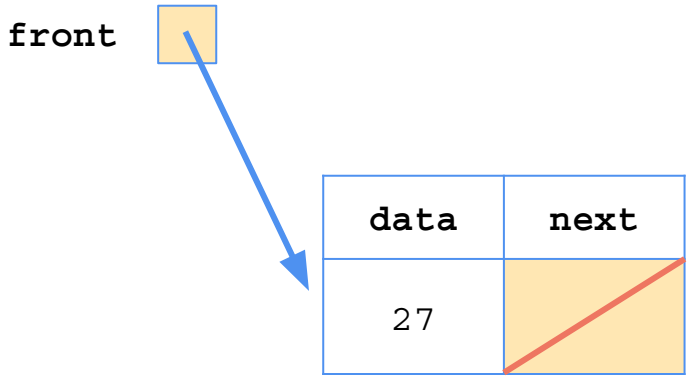

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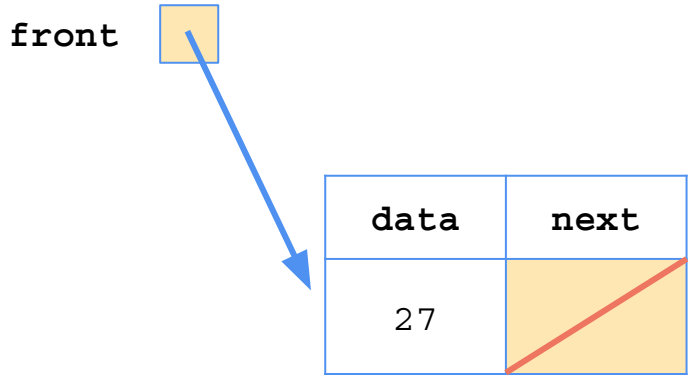

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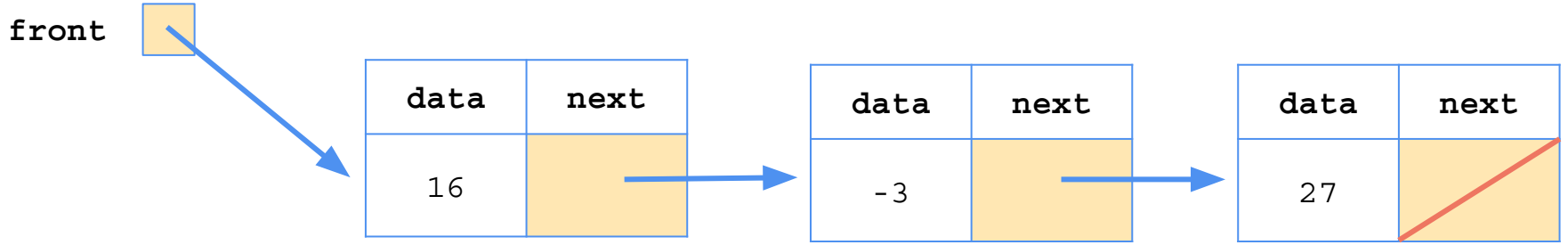

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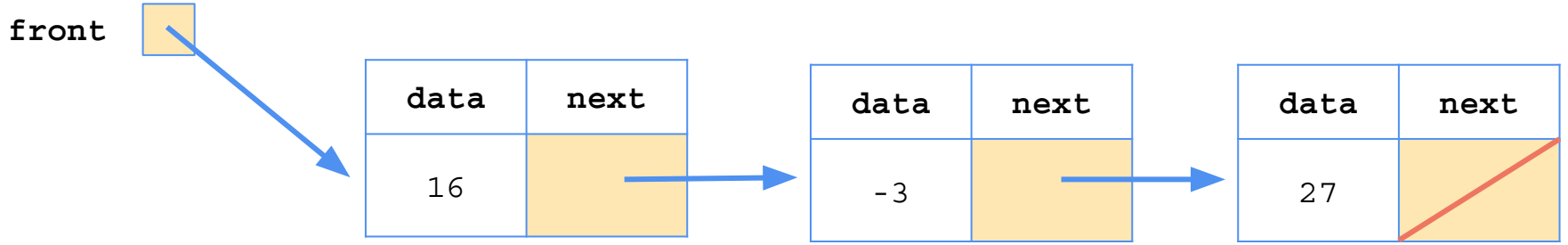

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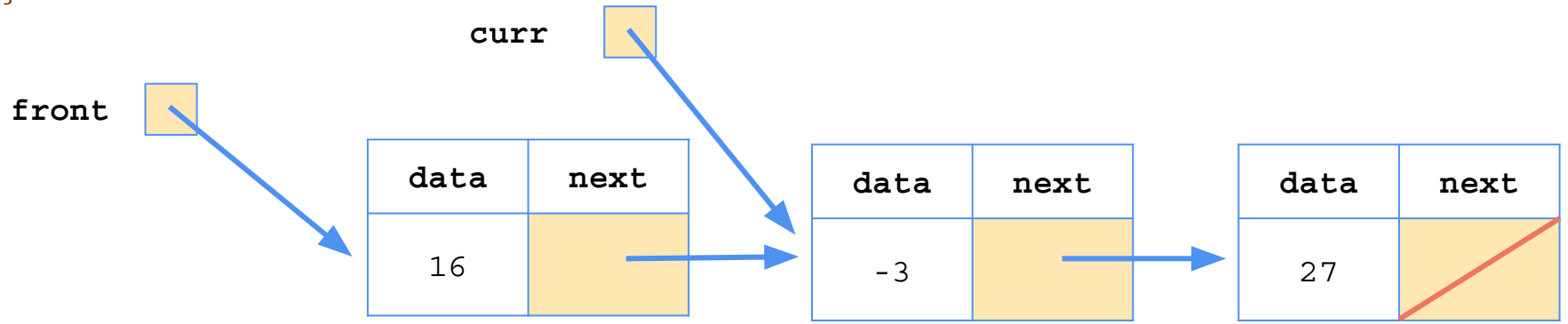

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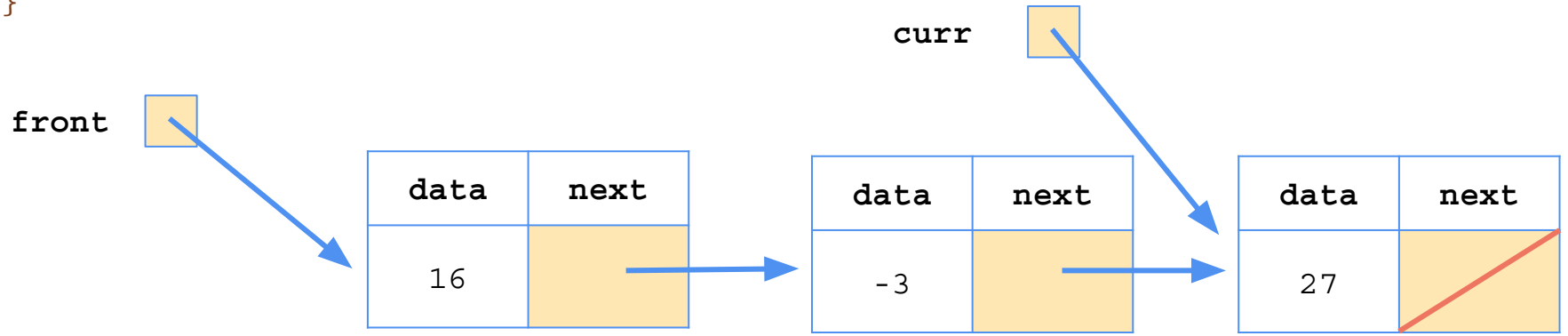

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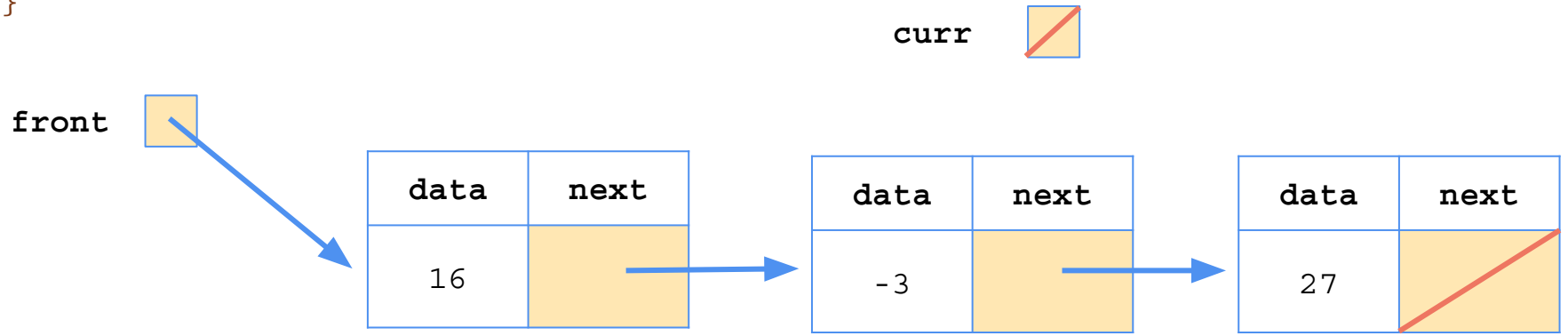

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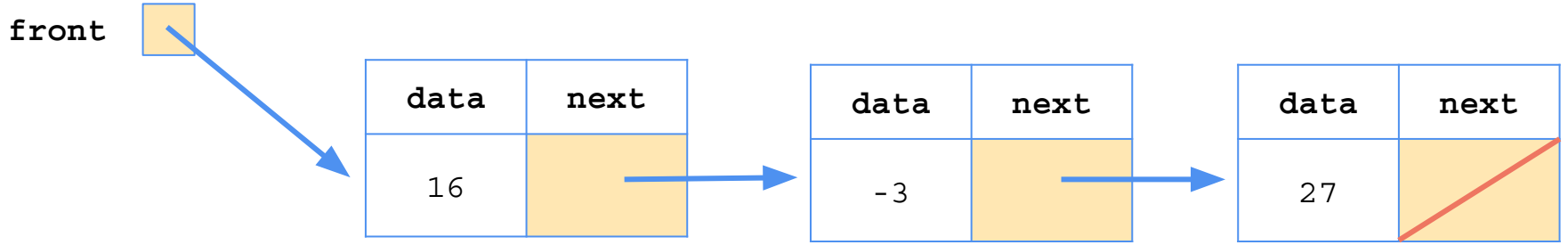
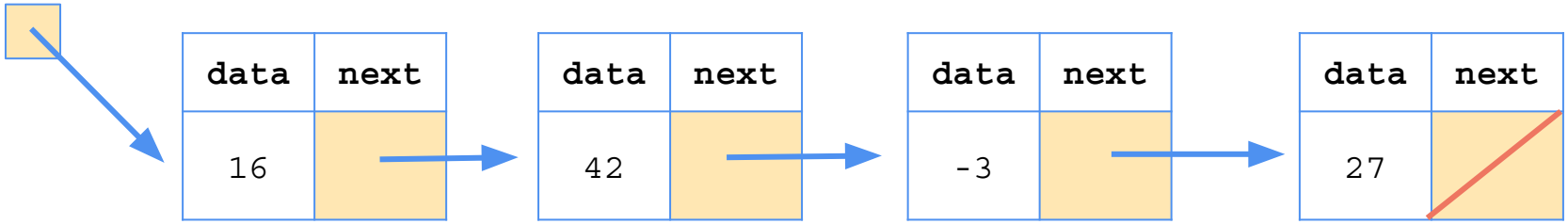


`remove(int value)` Visualization

⚠️ Without “Stopping One Early” ⚠️

```
public void remove(int value) {
    if (front != null) {
        // ... front case
        else {
            ListNode curr = front;
            while (curr != null && curr.data != value) {
                curr = curr.next;
            }
            if (curr != null) {
                curr = curr.next;
                size--;
            }
        }
    }
}
```

Client calls `list.remove(-3)`



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    if (front != null) {
        // ... front case
        else {
            ListNode curr = front;
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                curr = curr.next;
            }
            if (curr != null) {
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                size--;
            }
        }
    }
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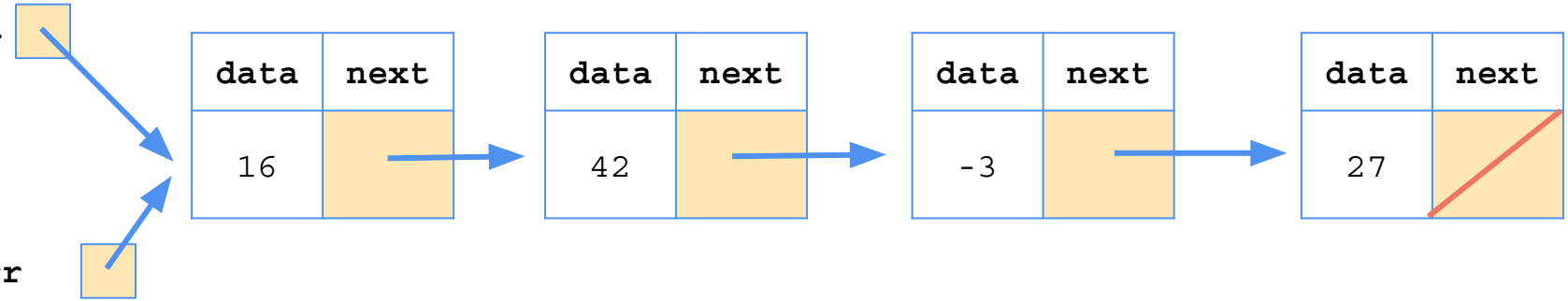
Client calls `list.remove(-3)`



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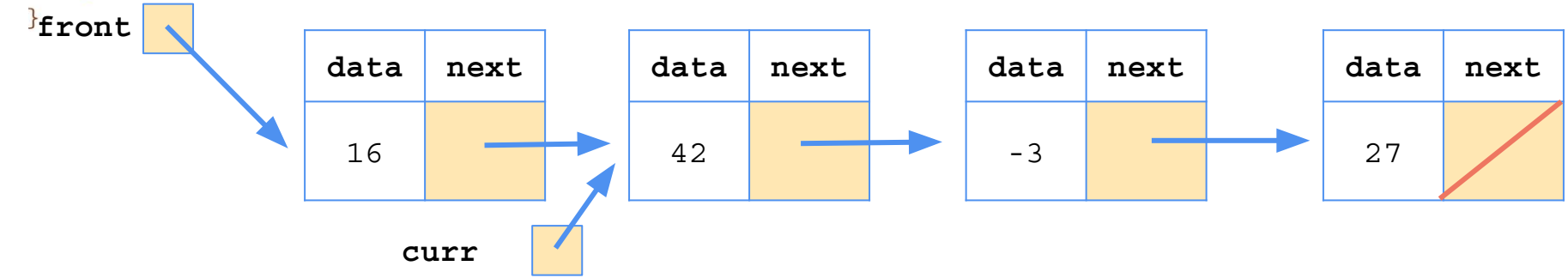

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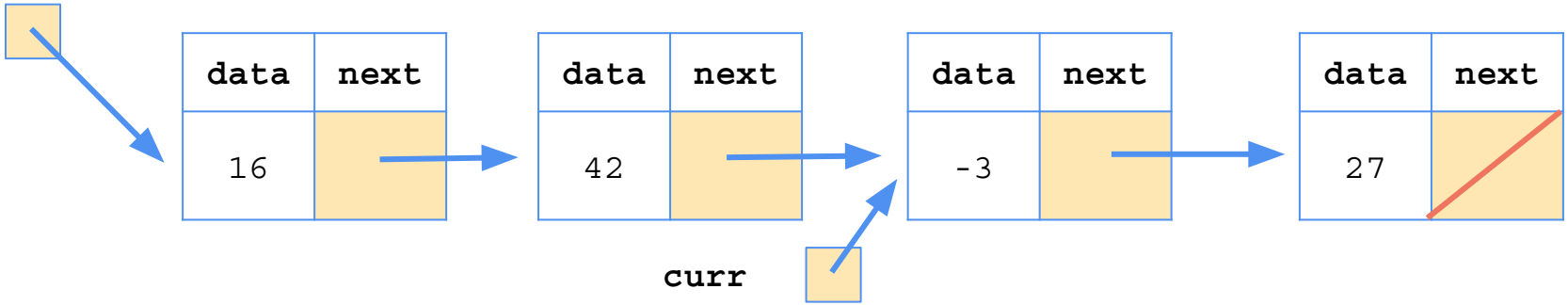

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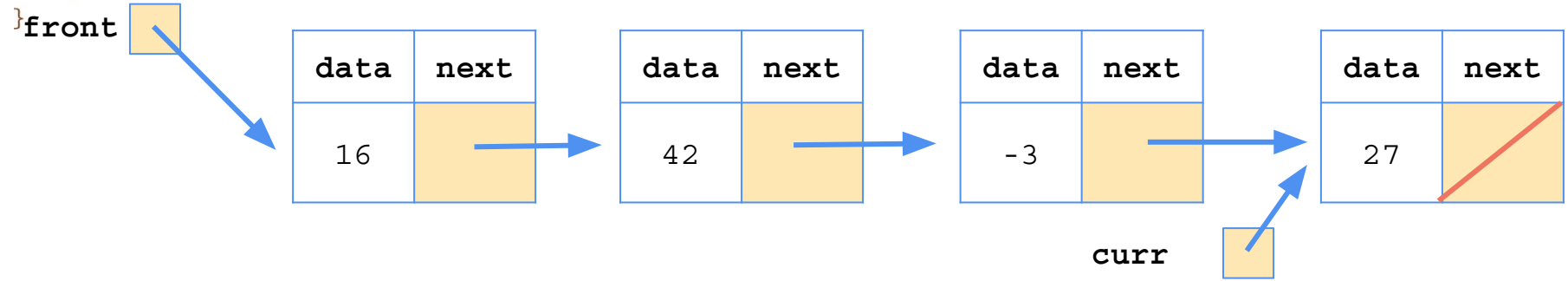

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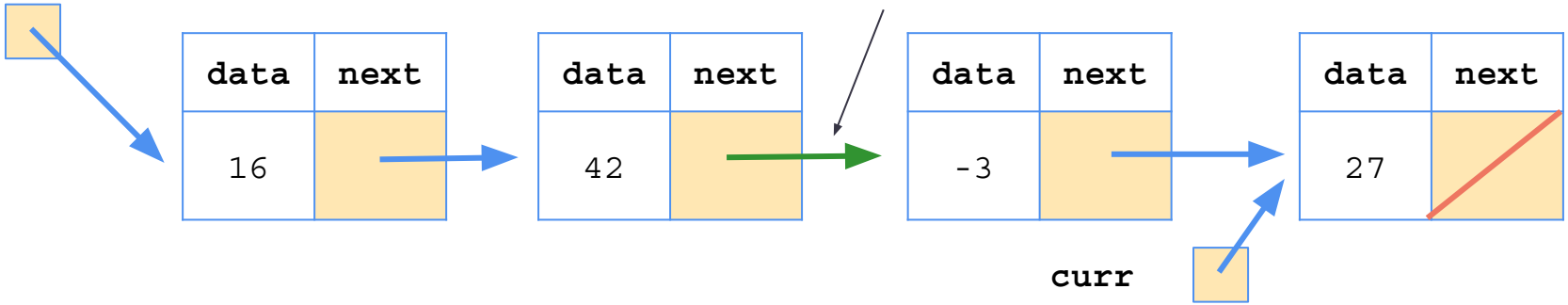

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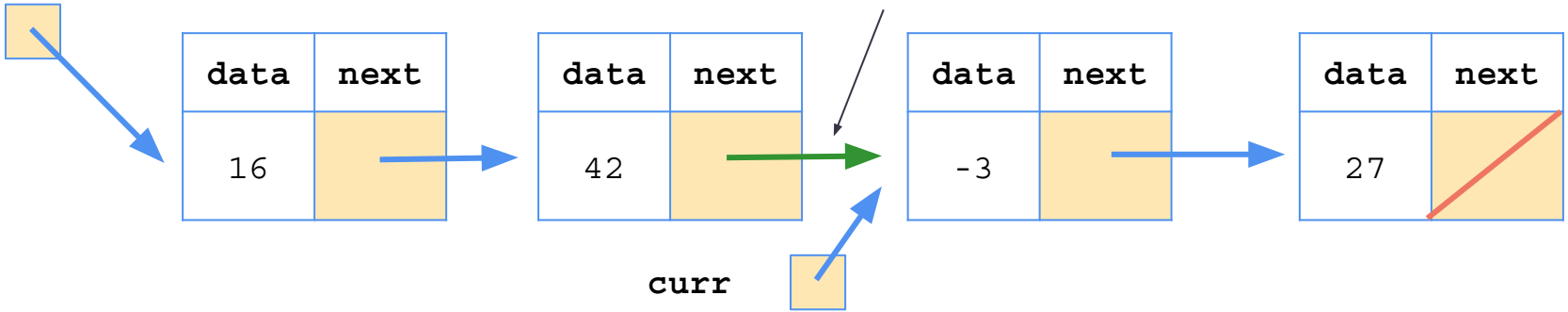

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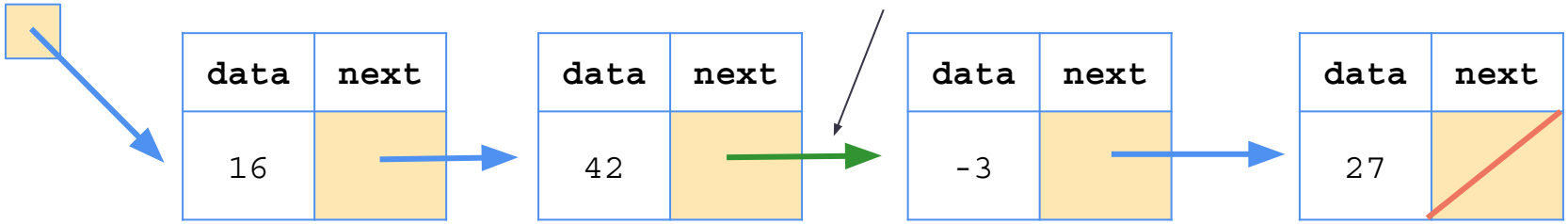

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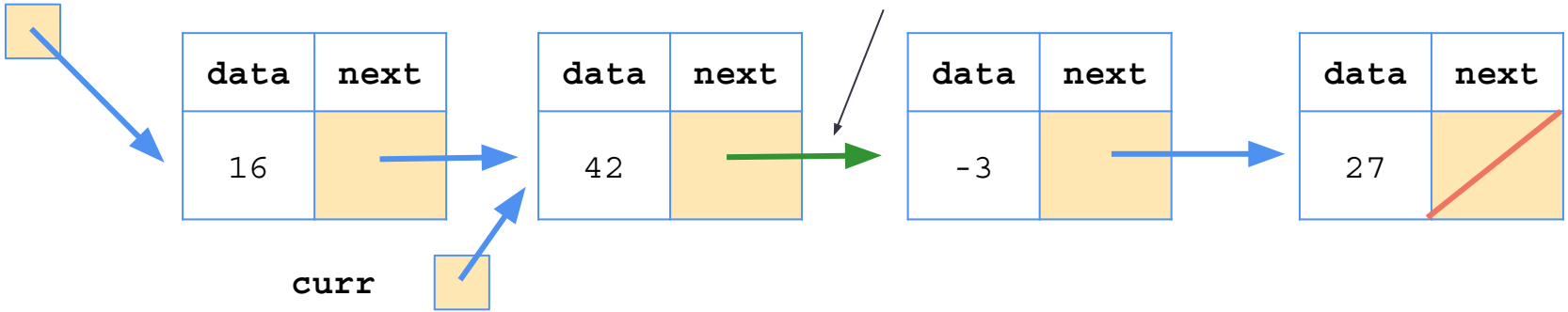

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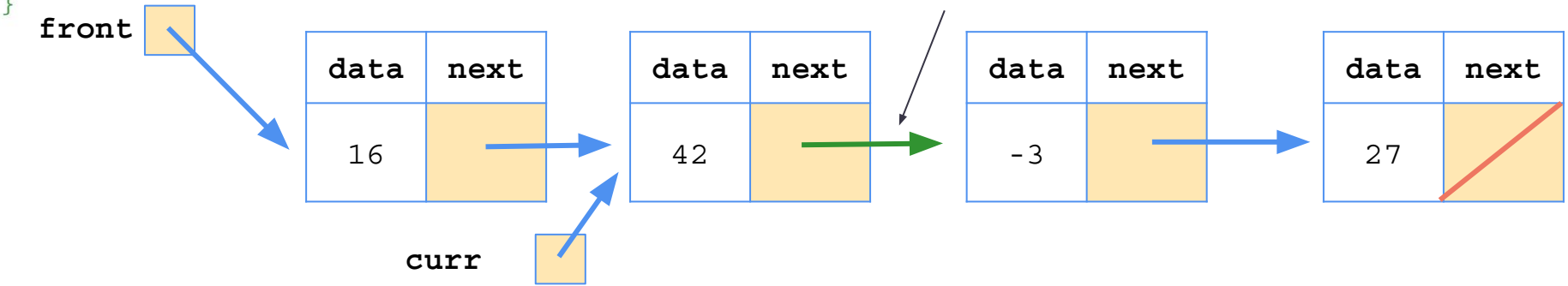

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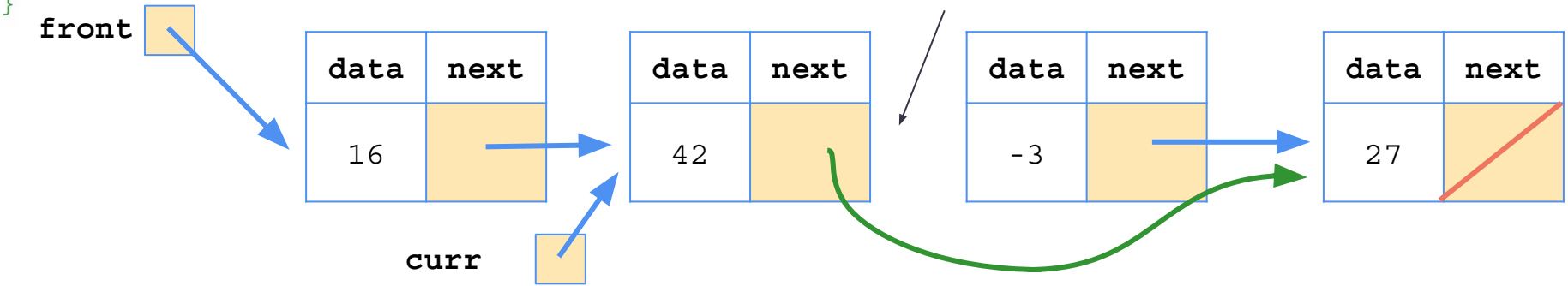

Changing a list

- There are only two ways to change a linked list:
  - Change the value of `front` (modify the front of the list)
  - Change the value of `<node>.next` (modify middle or end of list to point somewhere else)
- Implications:
  - To add in the middle, need a reference to the *previous* node
  - Front is often a special case