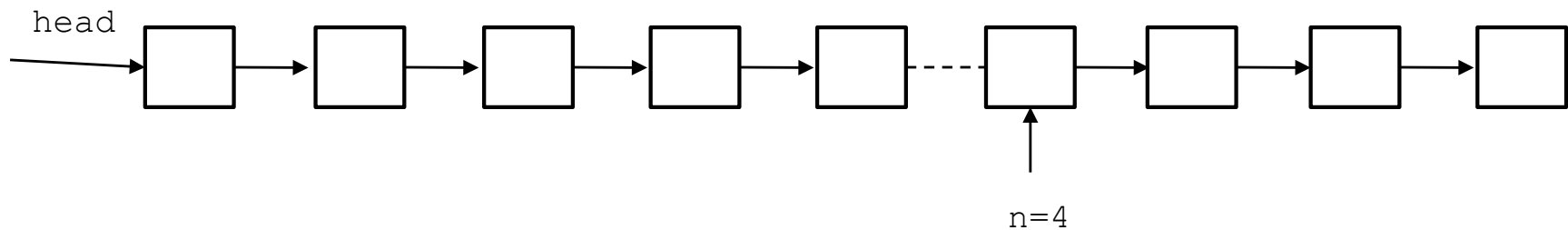


CMSC 132: Object-Oriented Programming II

Linked List Examples

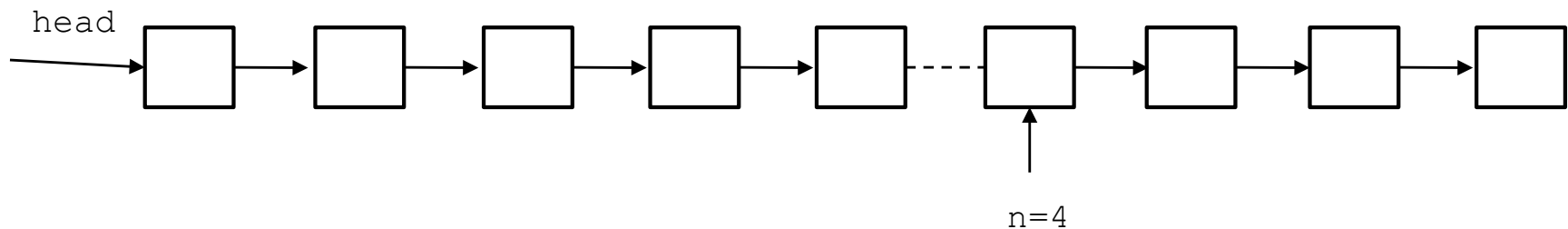
Example 1

Use only one iteration, find n'th node from the end of a Linked List



Example 1

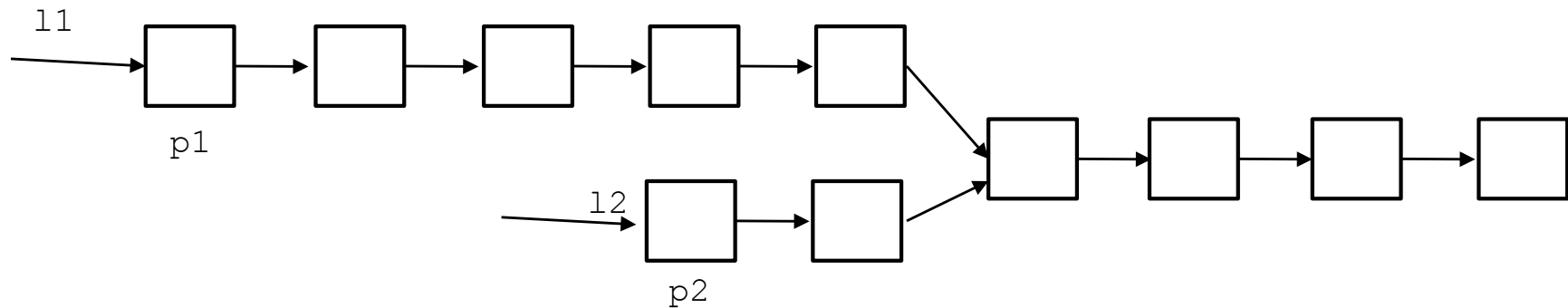
Use only one iteration, find n'th node from the end of a Linked List



- Two pointers $p1 = \text{head}$; $p2 = \text{head}$
- First move $p1$ to n nodes from head.
- Now move both pointers one by one until $p1$ reaches end.
- $P2$ stops at target

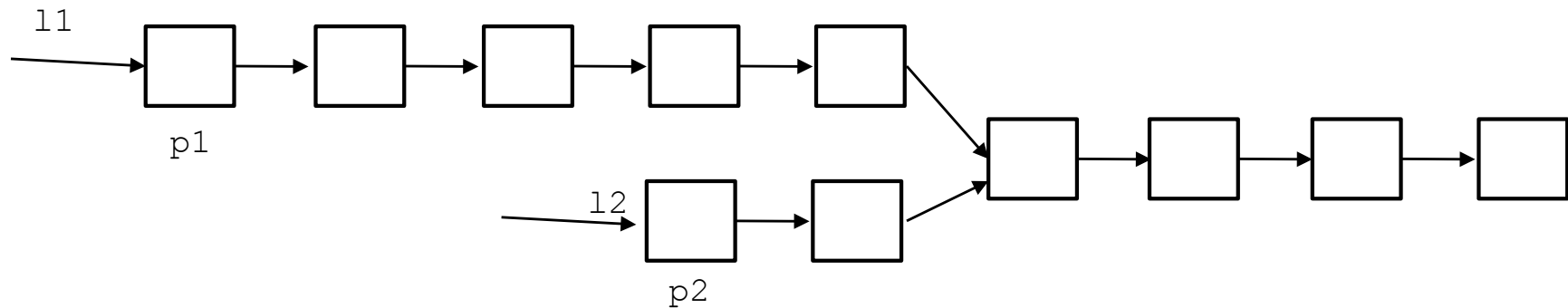
Example 2

Find the intersection point of two Linked Lists



Example 2

Find the intersection point of two Linked Lists



```
n1 = length(l1)
```

```
n2 = length(l2)
```

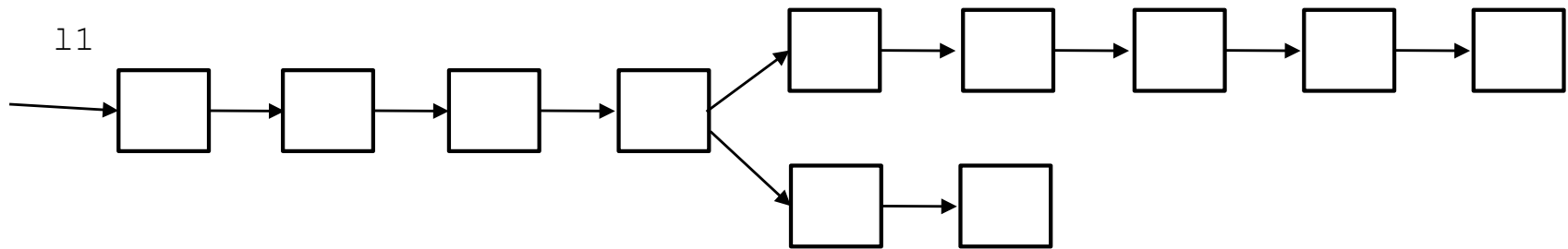
```
d = l1 - l2
```

```
Move p1 d times
```

```
Move both p1 and p2 until they meet
```

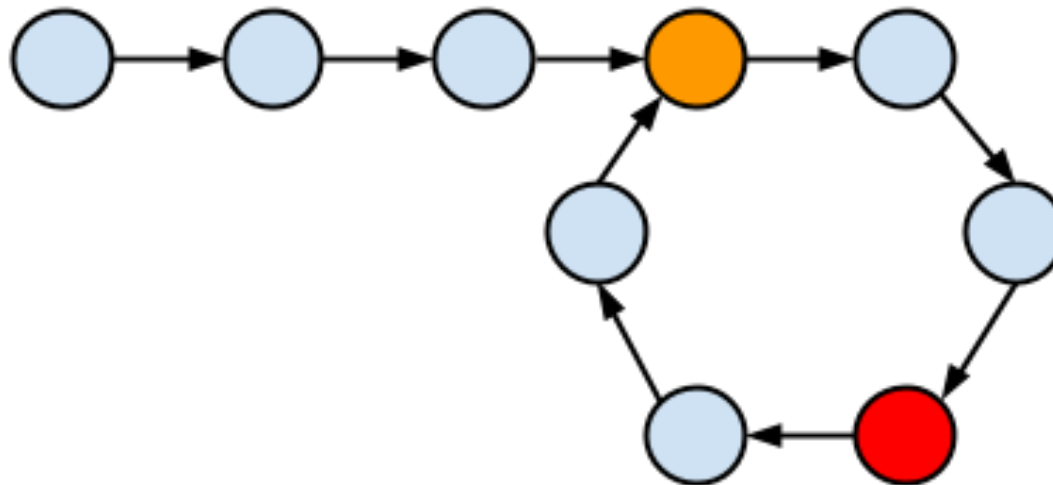
Example 3:

Find the split point of two Linked Lists



Example 4:

Detect if there is a cycle in a Singly Linked List

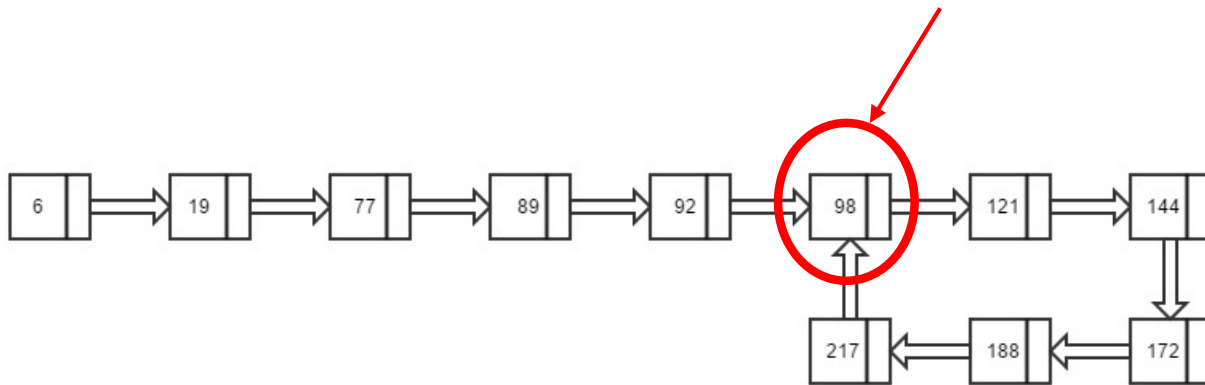


Example 4:

```
boolean hasLoop(Node first) {
    if(first == null) return false;
    Node slow, fast; // create two references.
    slow = fast = first;
    while(true) {
        slow = slow.next;           // 1 hop.
        if(fast.next != null)
            fast = fast.next.next; // 2 hops.
        else
            return false; // next node null => no loop.
        if(slow == null || fast == null) // if either hits null, no
loop.
            return false;
        if(slow == fast) // if the two ever meet...we must have a
loop.
            return true;
    }
}
```


Example 5:

Remove the cycle in a Singly Linked List



Example 6:

Clone a linked list with next and random pointer

