

# Linked List

Online Tutorial of Academic Support Club at IUT

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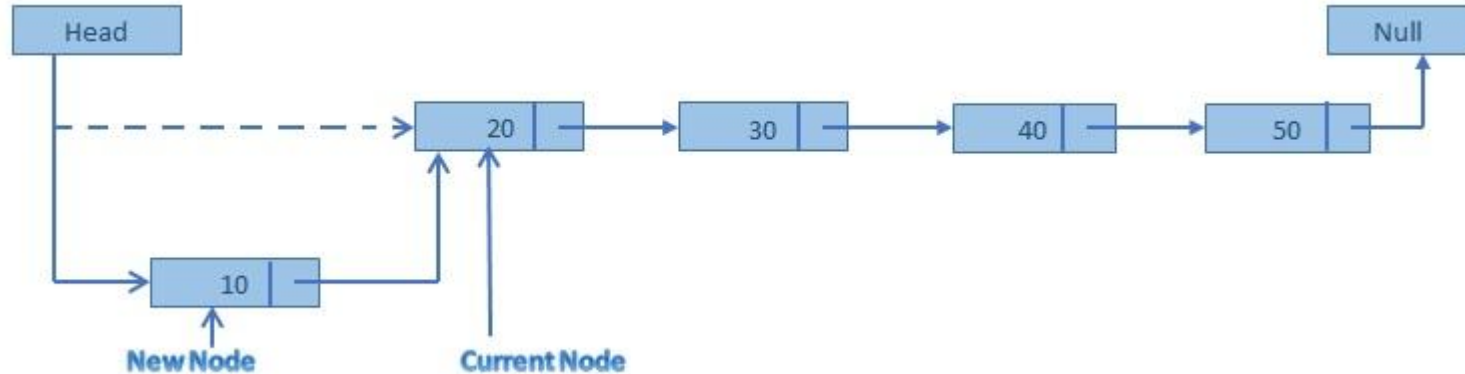
# Main operations

Insert & Delete:

- at the beginning.
- between two nodes.
- at the end.

Next we will analyze these operations firstly in Singly- and then in Doubly Linked List.

# Singly Linked List: Insert at the beginning

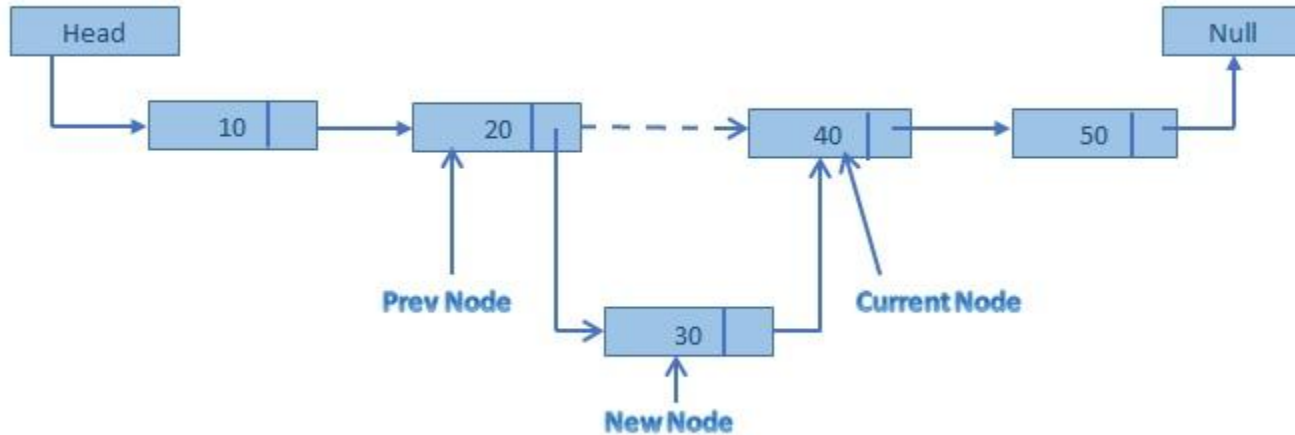


Step 1: Set **NewNode**→next to **Current**

Step 2: Update **Head** to **NewNode**

Cost of operation:  $O(1)$

## Insert between two nodes

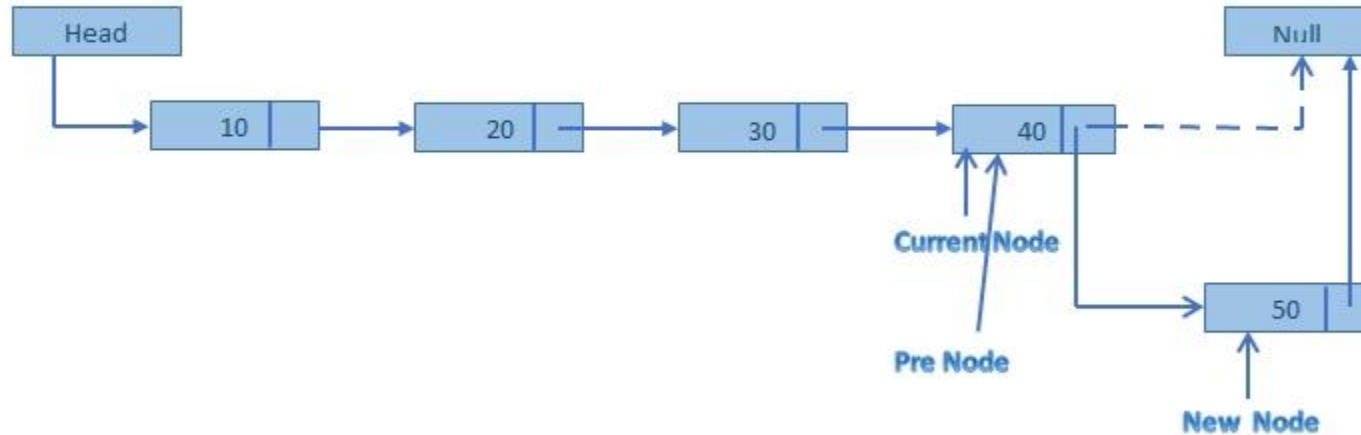


Step 1: Set **NewNode**→**next** to **Current**.

Step 2: Set **PrevNode**→**next** to **NewNode**

Cost of operation:  $O(n)$

## Insert at end

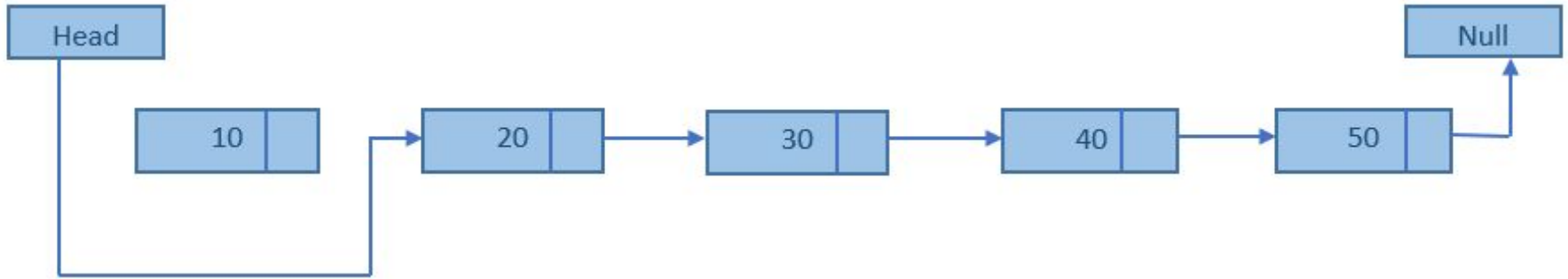


Step 1: Set **CurrentNode**→**next** (reach it with loop) to **NewNode**

Step 2: Set **NewNode**→**next** to NULL

Cost of operation:  $O(n)$

## Delete at the beginning



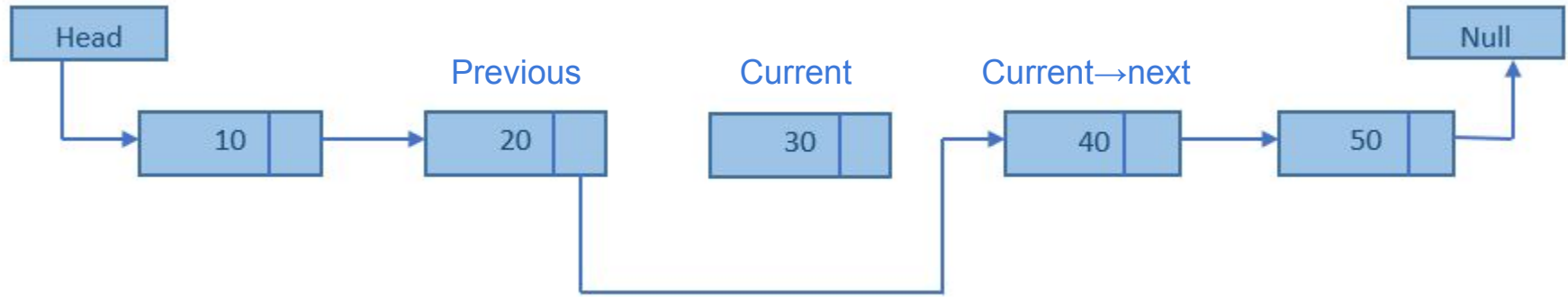
Step 1: Store initial **Head** in **temp** ptr

Step 2: Update **Head** to **Head**→**next**

Step 3: Delete **temp**

Cost of operation:  $O(1)$

# Delete between two nodes



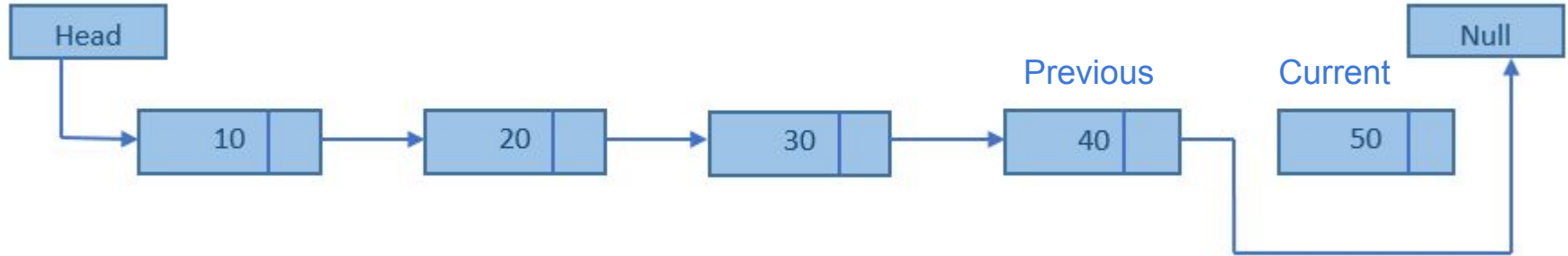
Step 1: Store **Current** in **temp** ptr

Step 2: Set **Previous**→**next** to **Current**→**next**

Step 3: Delete **temp**

Cost of operation:  $O(n)$

# Delete at End



Step 1: Store **Current** in **temp** ptr

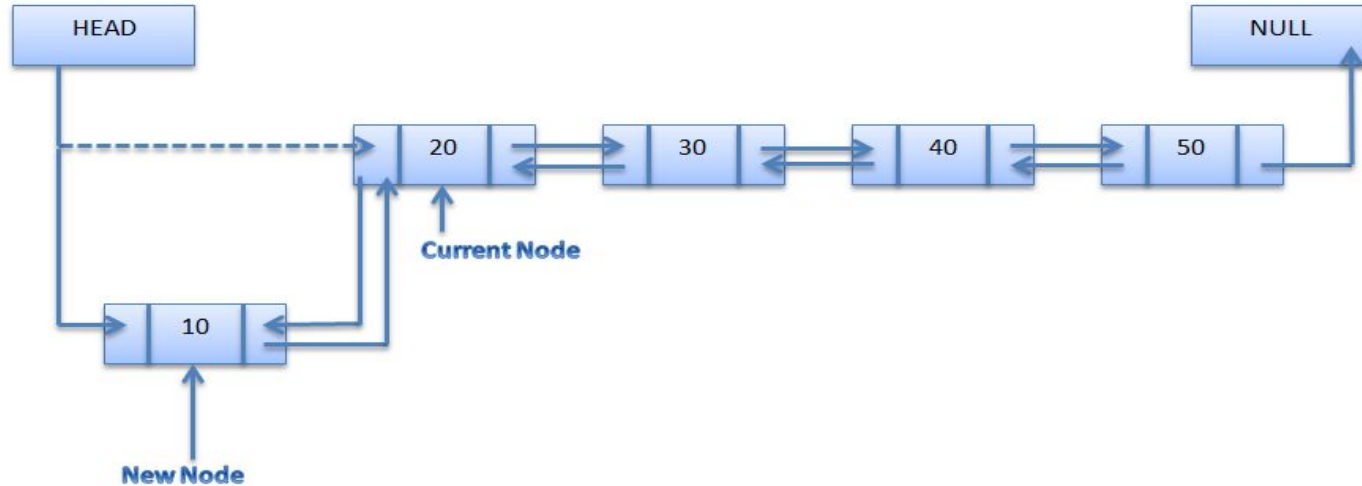
Step 2: Set **Previous**→**next** to Null

Step 3: Delete **temp**

Cost of operation:  $O(n)$



# Doubly Linked List: insert at the beginning



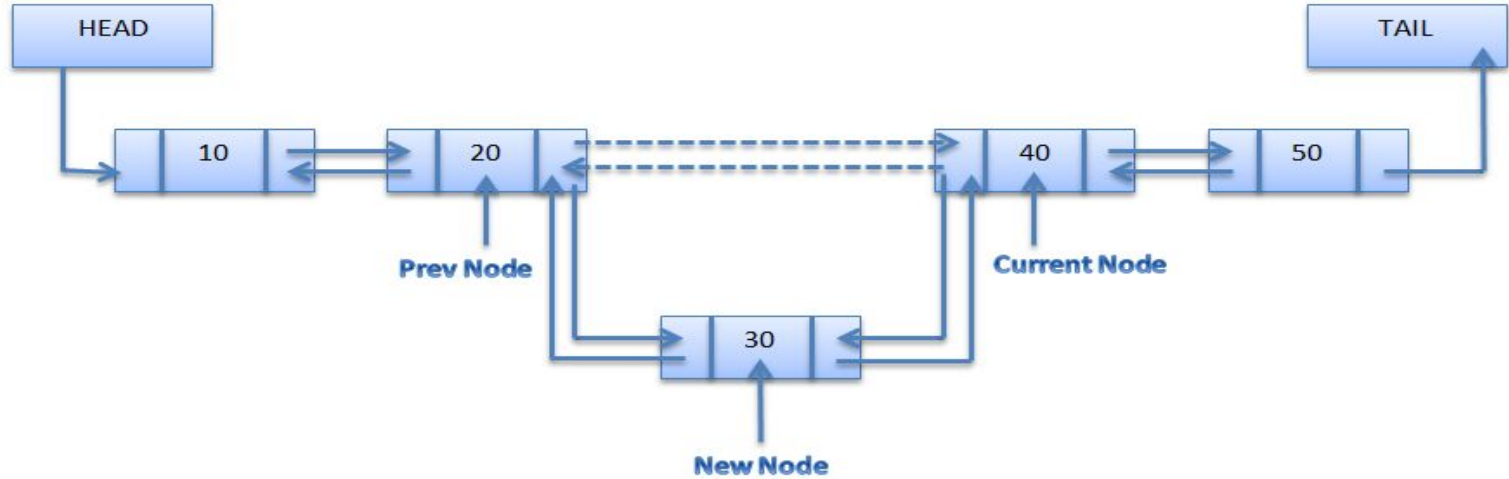
Step 1: Set **Current**→**prev** to **NewNode**

Step 2: Set **NewNode**→**next** to **Current**

Step 3: Update **Head** to **NewNode**

Cost of operation:  $O(1)$

## Insert between two nodes



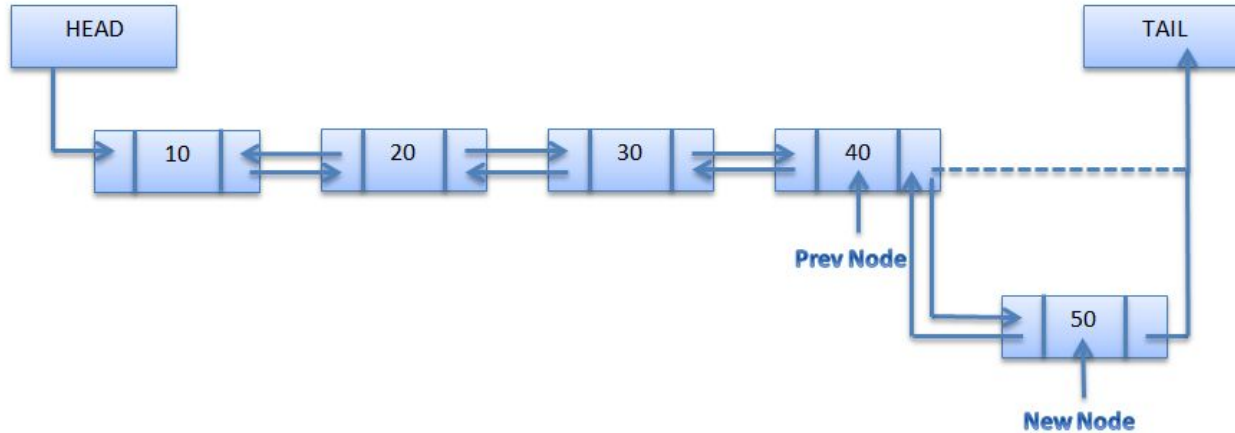
Step 1: Set **NewNode**→next to **Current** & **NewNode**→prev to **Prev**

Step 2: Update **Prev**→next to **NewNode**

Step 3: Update **Current**→prev to **NewNode**

Cost of operation:  $O(n)$

# Insert at end



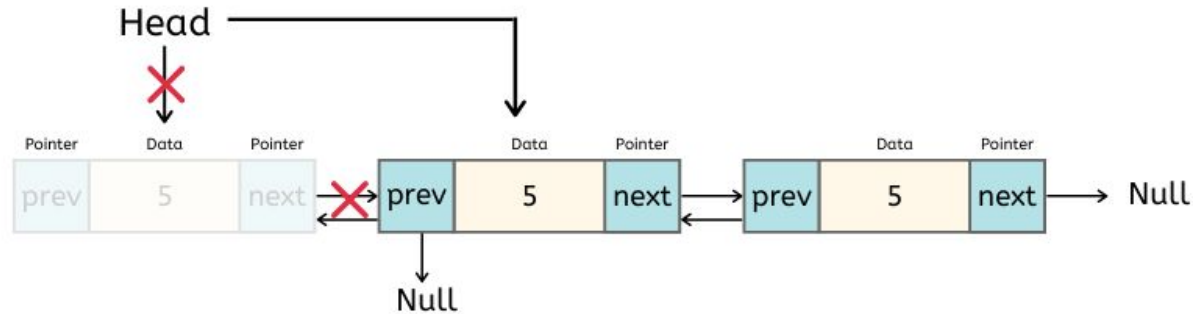
Step 1: Set **NewNode**→**next** to **NULL** (Tail is NULL in our case)

Step 2: Set **NewNode**→**prev** to **Prev**

Step 3: Update **Prev**→**next** to **NewNode**

Cost of operation:  $O(n)$

# Delete at the beginning



Step 1: Set **initial Head** to **temp** ptr

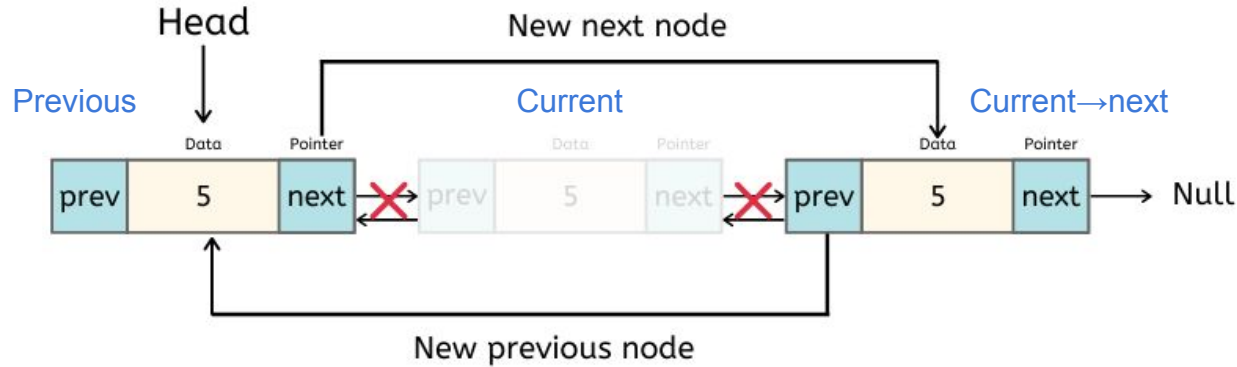
Step 2: Update **Head** to **Head**→**next**

Step 3: Set **Head**→**next** to NULL

Step 4: delete **temp**

Cost of operation:  $O(1)$

# Delete between two nodes



Step 1: Set **Current** to **temp** ptr

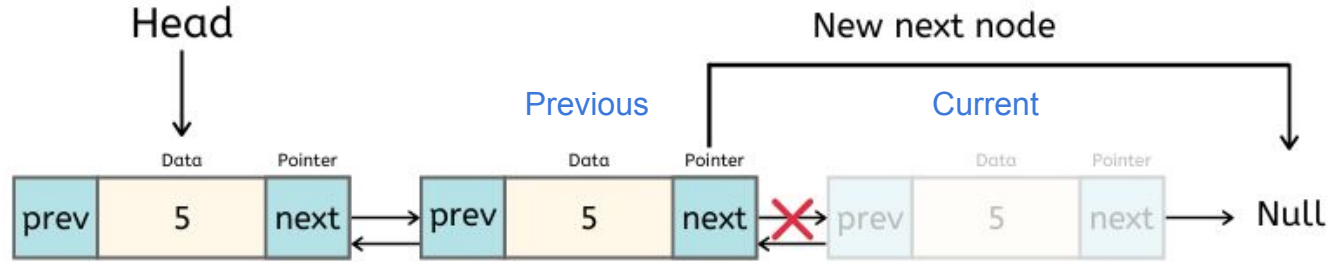
Step 2: Update Prev→next to Current→next

Step 3: Update (**Current**→**next**) →**prev** to **Prev**

Step 4: Delete **temp**

Cost of operation:  $O(n)$

# Delete at end



Step 1: Update **Previous**→**next** to NULL

Step 2: Set **Current** to **temp** ptr

Step 3: Delete **temp**

Cost of operation:  $O(n)$

# Useful Links

- Readings
  - [What's a Linked List, Anyway? \[Part 1\]](#)
  - [What's a Linked List, Anyway? \[Part 2\]](#)
- Videos
  - [Singly-linked lists](#), University of California San Diego
  - [Doubly linked lists](#), University of California San Diego

# References

- Photos illustrating Singly Linked List insert & delete: [scanfree.com](https://scanfree.com)
- Photos illustrating Doubly Linked List insert & delete: [prepinsta.com](https://prepinsta.com)