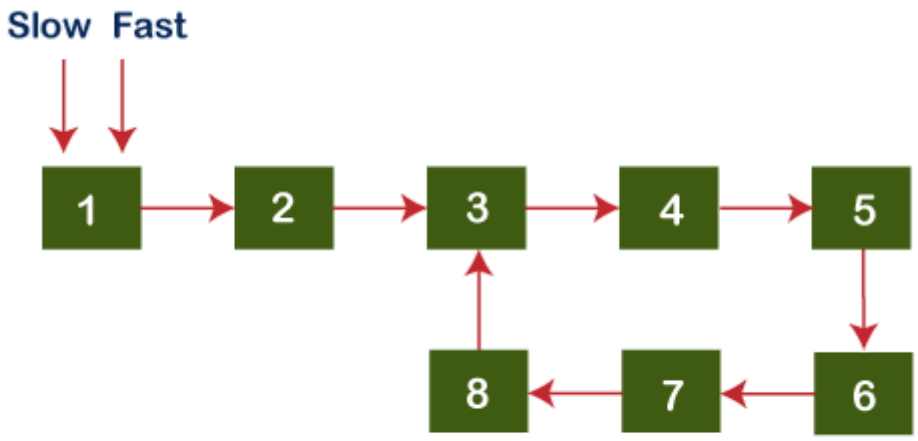
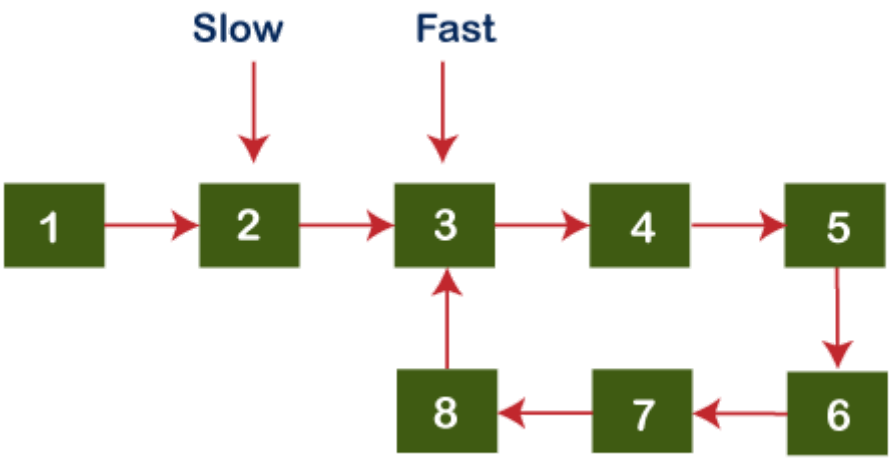
Remove the loop in a Linked List

In this topic, we will learn how to remove the loop from the linked list. Till now, we have learnt how to detect and start of the loop by using **Floyd's** algorithm. The **Floyd's** algorithm will also be used to remove the loop from the linked list.

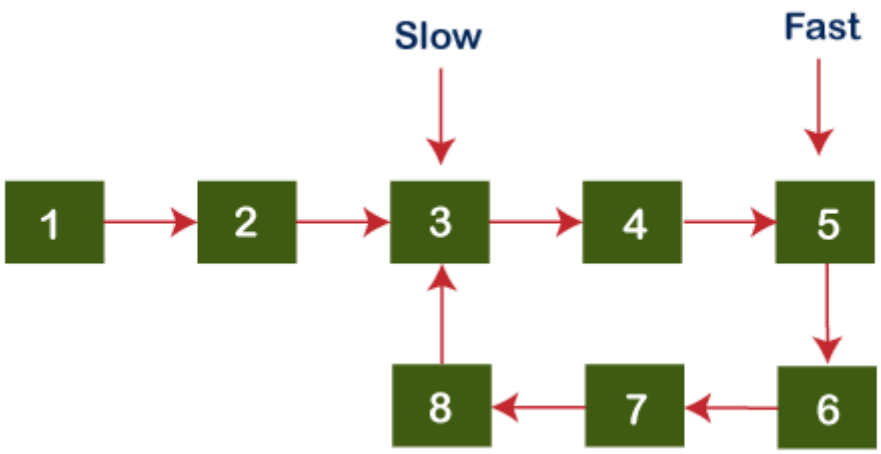
Let's understand through an example.



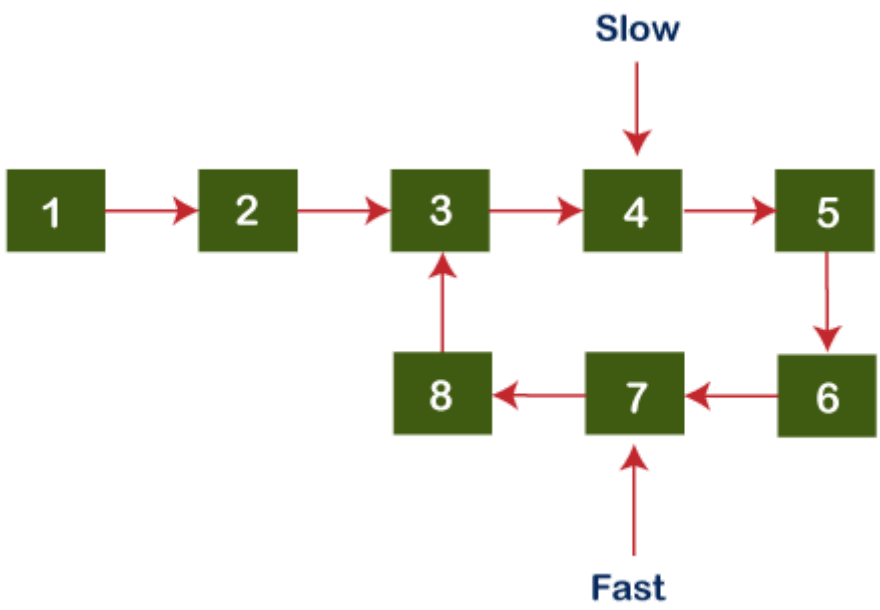
As we know that slow pointer increments by one and fast pointer increments by two. In the above example, initially, both slow and fast pointer point to the first node, i.e., node 1. The slow pointer gets incremented by one, and fast pointer gets incremented by two, and slow and fast pointers point to nodes 2 and 3, respectively, as shown as below:



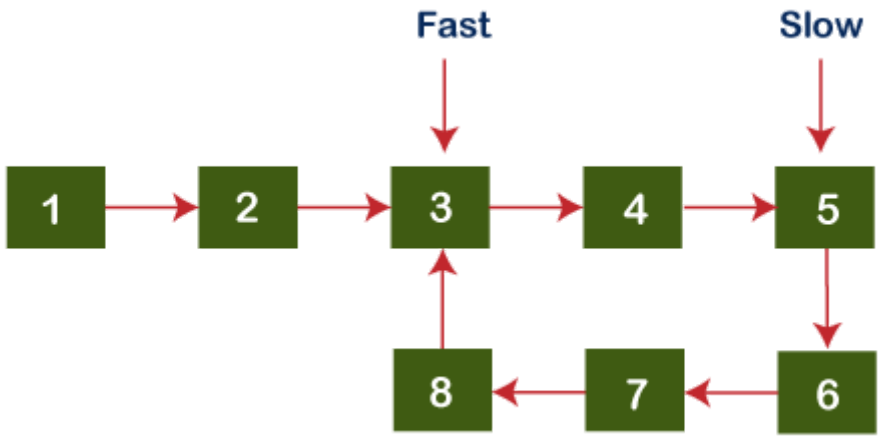
Since both the pointers do not point to the same node, we will increment both fast and slow pointers again. Now, slow pointer points to the node 3 while the fast pointer points to node 5 shown as below:



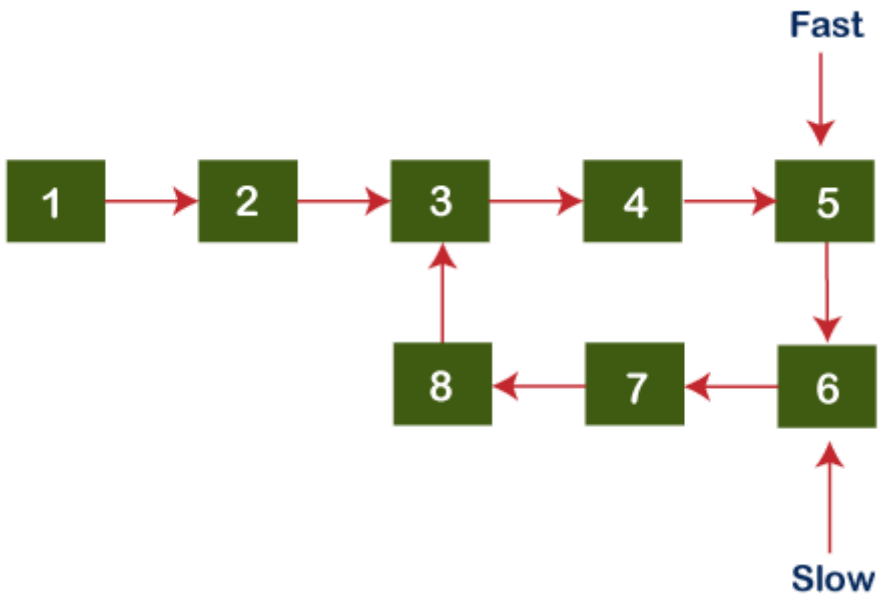
Since both the pointers do not point to the same node, we will increment both fast and slow pointers again. Now, the slow pointer points to node 4 while the fast pointer points to node 7 shown as below:



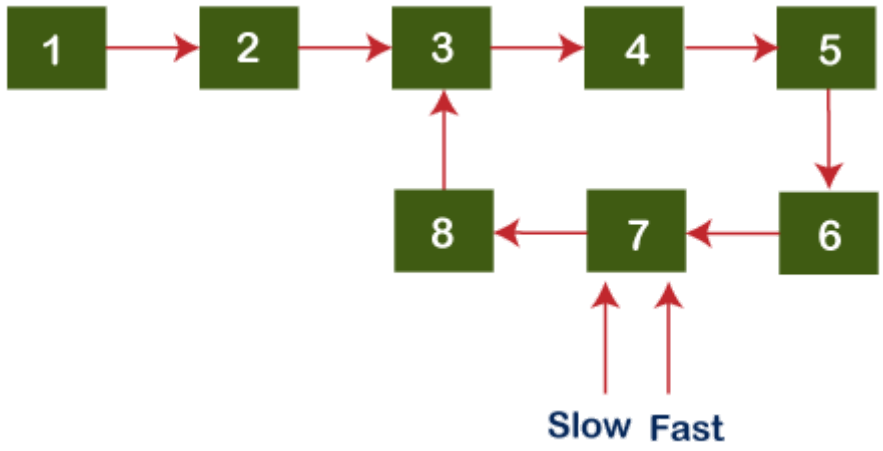
Since both the pointers do not point to the same node, we will increment both fast and slow pointers again. Now, the slow pointer points to node 5, and the fast pointer points to node 3 shown as below:



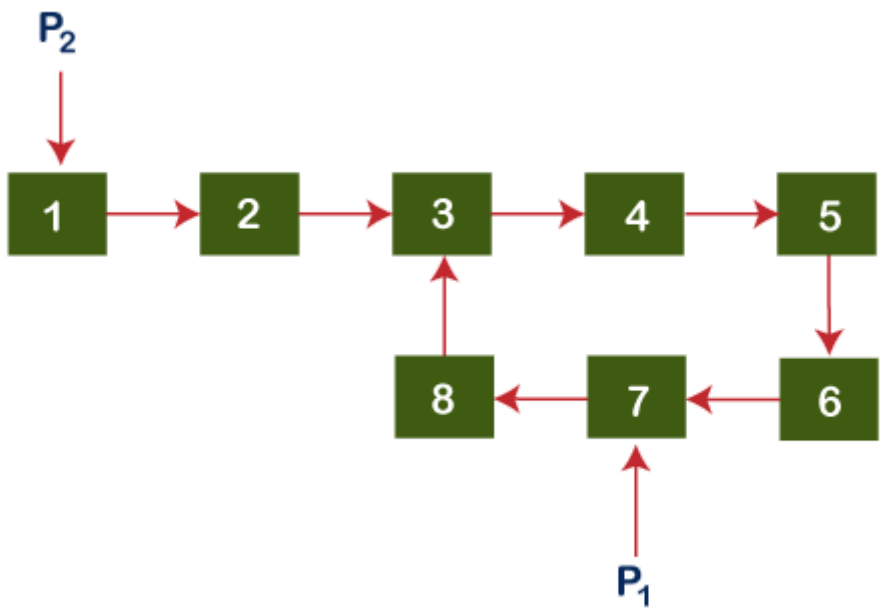
Since both the pointers do not point to the same node, we will increment both fast and slow pointers again. Now, slow pointer points to node 6 while the fast pointer points to the node 5 shown as below:



Again, both the pointers (slow and fast) are not pointing to the same node, so we will increment both fast and slow pointers again. Now, the slow pointer points to node 7, and the fast pointer also points to node 7 shown as below:



As we can observe in the above example both slow and fast pointers meet at node 7. We create one pointer named p_1 that points to the node 7 where both the pointers meet, and we also create one more pointer named p_2 that points to the first node as shown in the below figure:



To remove the loop, we will define the following logic:

```
while(p1.next!= p2.next)
{
P1 = P1.next;
P2 = P2.next;
}
P1.next = NULL;
```

The above logic is defined to remove a loop from the linked list. The while loop will execute till the p1.next is not equal to p2.next. When p1.next is equal to p2.next, the control will come out of the while loop, and we set the p1.next equal to Null. This statement breaks the link, which is creating the loop in the linked list.

Implementation of removing a loop in C

```
// C program to remove a loop from the linked list
#include <stdio.h>
#include <stdlib.h>
// creating a structure of a node
struct node
{
    int data;
    struct node *next;
};
struct node *head;
// creating a node in a linked list..
struct node* create_node(int value)
{
   // creating a temp variable of type node..
   struct node *temp = (struct node*)malloc(sizeof(struct node));
        temp->data = value;
        temp->next = NULL;
        return temp;



}
// detecting a node that creates a loop in the linked list..
int detect_loop(struct node *ptr)
{
   struct node *fast; // declaration of fast pointer of type node..
   struct node *slow; // declaration of slow pointer of type node..
   fast = slow = ptr;
   while (slow && fast && fast->next)
```

```
      slow = slow->next;
      fast = fast->next->next;
   // checking whether slow is equal to fast or not.
   if(slow==fast)
      {
         removeloop(slow, head); // calling removeloop() function.
         return 1;
      }
   }
}

// Removing a loop from the linked list..
void removeloop(struct node *slow, struct node *head)
{
   struct node *p1;
   struct node *p2;
   p1 = slow;
   p2 = head;

// while loop will execute till the p1.next is not equal to p2.next..
while(p1->next!=p2->next)
   {
      p1 = p1->next;
      p2 = p2->next;
   }
   p1->next = NULL;

}
// display the linked list..
void display(struct node *temp)
{
  while (temp !=NULL)
   {
      printf("%d, ", temp->data);
      >next;
```

```
}
int main()
{
    head = create_node(12);
    head->next = create_node(20);
    head->next->next = create_node(35);
    head->next->next->next = create_node(40);
    head->next->next->next->next = create_node(15);
   /* Create a loop for testing */
    head->next->next->next->next->next = head->next->next;
    detect_loop(head);
    display(head);
   return 0;
}
```

Output

```
12, 20, 35, 40, 15,

...Program finished with exit code 0
Press ENTER to exit console.
```

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