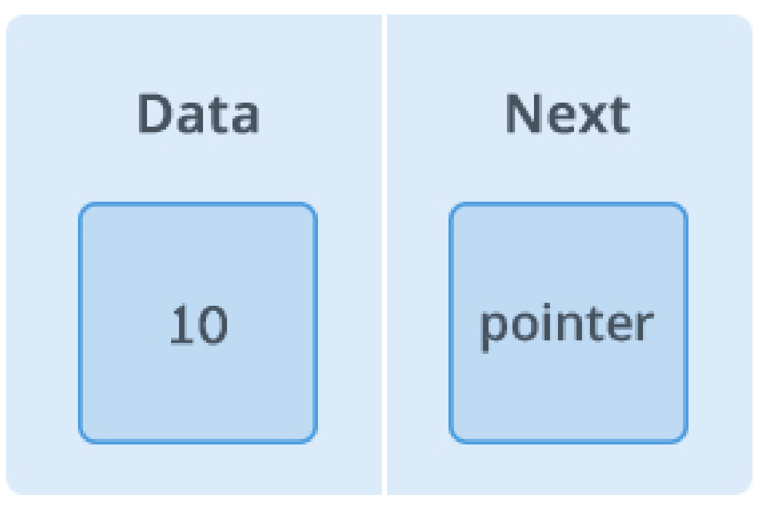
Singly Linked List

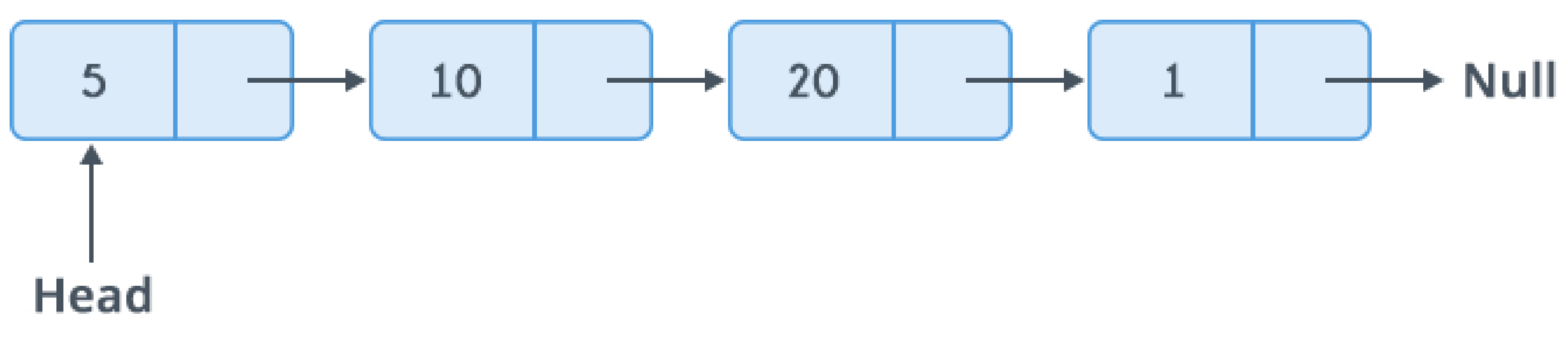
A **linked list** is a way to store a collection of elements. Like an array these can be character or integers. Each element in a linked list is stored in the form of a **node**.

Node:



A node is a collection of two sub-elements or parts. A **data** part that stores the element and a **next** part that stores the link to the next node.

Linked List:



A linked list is formed when many such nodes are linked together to form a chain. Each node points to the next node present in the order. The first node is always used as a reference to traverse the list and is called **HEAD**. The last node points to **NULL**.

Declaring a Linked list :

In C language, a linked list can be implemented using structure and pointers .

```
struct LinkedList{
    int data;
    struct LinkedList *next;
 };
```

The above definition is used to create every node in the list. The **data** field stores the element and the **next** is a pointer to store the address of the next node.

Noticed something unusual with next?

In place of a data type, **struct LinkedList** is written before next. That's because its a **self-referencing pointer**. It means a pointer that points to whatever it is a part of. Here **next** is a part of a node and it will point to the next node.

Creating a Node:

Let's define a data type of `struct LinkedList`to make code cleaner.

```
typedef struct LinkedList *node; //Define node as pointer of data type struct
LinkedList

node createNode(){
    node temp; // declare a node
    temp = (node)malloc(sizeof(struct LinkedList)); // allocate memory using malloc()
    temp->next = NULL;// make next point to NULL
    return temp;//return the new node
}
```

> **typedef** is used to define a data type in C.
>
> **malloc()** is used to dynamically allocate a single block of memory in C, it is available in the header file `stdlib.h`.
>
> **sizeof()** is used to determine size in bytes of an element in C. Here it is used to determine size of each node and sent as a parameter to `malloc`.

The above code will create a node with data as value and next pointing to NULL.

Let's see how to **add a node to the linked list**:

```
node addNode(node head, int value){
    node temp,p;// declare two nodes temp and p
    temp = createNode();//createNode will return a new node with data = value and next
pointing to NULL.
    temp->data = value; // add element's value to data part of node
    if(head == NULL){
        head = temp;     //when linked list is empty
    }
    else{
        p  = head;//assign head to p
        while(p->next != NULL){
            p = p->next;//traverse the list until p is the last node.The last node
always points to NULL.
        }
        p->next = temp;//Point the previous last node to the new node created.
    }
    return head;
}
```

Here the new node will always be added after the last node. This is known as **inserting a node at the rear end**.

> **Food for thought**
>
> This type of linked list is known as **simple or singly linked list**. A simple linked list can be traversed in only one direction from **head** to the last node.
>
> The last node is checked by the condition :
>
> ```
> p->next = NULL;
> ```
>
> Here -> is used to access **next** sub element of node p. **NULL** denotes no node exists after the current node , i.e. its the end of the list.

Traversing the list:

The linked list can be traversed in a while loop by using the **head** node as a starting reference:

```
node p;
p = head;
while(p != NULL){
    p = p->next;
}
```

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