

```
1 from exceptions import Empty
2
3 class LinkedList:
4
5     class _Node:
6         __slots__ = '_element', '_next'
7
8         def __init__(self, element, next):
9             self._element = element
10            self._next = next
11
12    def __init__(self):
13        self._head = None
14        self._tail = None
15        self._size = 0
16
17    def __len__(self):
18        return self._size
19    def is_empty(self):
20        return self._size == 0
21
22    def add_first(self, e):
23        newest = self._Node(e, None)
24        if self.is_empty():
25            self._head = newest
26            self._tail = newest
27        else:
28            newest._next = self._head
29            self._head = newest
30            self._size += 1
31
32    def add_last(self, e):
33        newest = self._Node(e, None)
34        if self.is_empty():
35            self._head = newest
36            self._tail = newest
37        else:
38            self._tail._next = newest
39            self._tail = newest
40            self._size += 1
41
42    def add_any(self, e, pos):
43        newest = self._Node(e, None)
44        thead = self._head
45        i = 1
46        while i < pos:
47            thead = thead._next
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48         i += 1
49         newest._next = thead._next
50         thead._next = newest
51         self._size += 1
52
53     def remove_first(self):
54         if self.is_empty():
55             raise Empty('Linked List Empty')
56         value = self._head._element
57         self._head = self._head._next
58         self._size -= 1
59         if self.is_empty():
60             self._tail = None
61         return value
62
63     def remove_last(self):
64         if self.is_empty():
65             raise Empty('Linked List Empty')
66         thead = self._head
67         i = 0
68         while i < len(self) - 2:
69             thead = thead._next
70             i += 1
71         self._tail = thead
72         thead = thead._next
73         value = thead._element
74         self._tail._next = None
75         self._size -= 1
76         return value
77
78     def remove_any(self, pos):
79         if self.is_empty():
80             raise Empty('Linked List Empty')
81         thead = self._head
82         i = 1
83         while i < pos-1:
84             thead = thead._next
85             i += 1
86         value = thead._next._element
87         thead._next = thead._next._next
88         self._size -= 1
89         return value
90
91     def display(self):
92         thead = self._head
93         while thead:
94             print(thead._element, end='-->')

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```
95         thread = thread._next
96     print()
97
98
99 L = LinkedList()
100 L.add_last(10)
101 L.add_last(20)
102 L.add_last(30)
103 L.add_last(40)
104 L.display()
105 print('Deleted: ', L.remove_first())
106 L.display()
107 L.add_first(70)
108 L.display()
109 print('Deleted: ', L.remove_last())
110 L.display()
111 L.add_any(100,2)
112 L.display()
113 L.remove_any(2)
114 L.display()
115
116
117
118
119
120
121
122
123
124
```