class Solution:

def sortList(self, head: Optional[ListNode]) -> Optional[ListNode]:

if not head or not head.next:

return head

# Step 1: Split the list into halves

slow, fast = head, head.next

while fast and fast.next:

slow = slow.next

fast = fast.next.next

mid = slow.next

slow.next = None # break the list

left = self.sortList(head)

right = self.sortList(mid)

return self.merge(left, right)

def merge(self, l1, l2):

dummy = ListNode(0)

tail = dummy

while l1 and l2:

if l1.val < l2.val:

tail.next = l1

l1 = l1.next

else:

tail.next = l2

l2 = l2.next

tail = tail.next

tail.next = l1 or l2 # attach the remaining part

return dummy.next