Swap Nodes in Pairs

In this problem, we must swap nodes (not values) and maintain the linked list structure; the approach is iterative with a dummy node.

Key Idea:
- Use a dummy node before head to simplify pointer manipulation.
- For each pair:
  - Let first and second be the two nodes to swap.
  - Rearrange pointers: prev → second → first → next.
- Move prev to first (new position after swap) and continue.

Steps:
1. Create a dummy node and point it to head.
2. Use a pointer prev initialized to dummy.
3. While there are at least two nodes to swap:
   - Identify first = prev → next and second = first → next.
   - Perform the swap:
     ```
     prev->next = second;
     first->next = second->next;
     second->next = first;
     ```
   - Move prev to first.
4. Return dummy → next as new head.

Time Complexity:
- $O(n)$ (one pass through the list)
- $O(1)$ extra space.