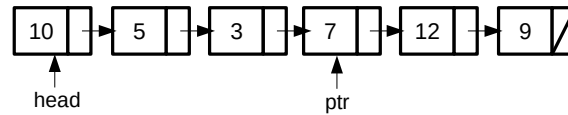


Q1: Given the following figure of linked structures with each node having two elements (int data, node* next):

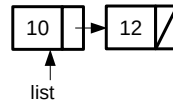
{10+10+10=30}



a. Write the result of the following statements. If you think there is an error in the statements, discuss it:

- i. `head->next->data`
- ii. `head->next->next == ptr`
- iii. `ptr->prev->data`
- iv. `ptr->next->next->next`
- v. `head->next->next->next->data == ptr`

b. Write a while loop which identifies even numbers in the linked list and creates another list (with new nodes) having all the even numbers. After running the while loop, we should have another list like shown below. The code should work even if the numbers are different.



c. Write a while loop which deletes every second node in the linked list. The code should work even if the numbers are different.

Q2: Algorithm A does a particular task in $2n^2$ steps. Algorithm B does the same task in $48n+104$ steps:

{2+2+4=8}

- a. What is the Big-O time complexity of each algorithm?
- b. Which algorithm is more efficient by Big-O standards?
- c. For what values of n , if any, would the “less efficient” algorithm execute more quickly than the “more efficient” algorithm?

Q3:

{4x3=12}

- a. What is the best case time complexity of insertion sort? What input sequence will be its best case?
- b. What is the worst case time complexity of selection sort? What input sequence will be its worst case?
- c. Give examples of algorithms having the following time complexities: $O(\log n)$, $O(n)$, $O(n^2)$, $O(n^3)$