Q→1

```
for(i=0; i<n; i++)
    for (j=0; j<i; j++)
        Stmt;
```

Soln

	i	j	No. of times executed.
initial	0	0 (X)	0
	1	0 ✓	1
		1 (X)	
	2	0 ✓	2
		1 ✓	
		2 X	
	3	0 ⎫	
		1 ⎬ ✓	3
		2 ⎭	
		3 X	

This process continues upto n

$$1 + 2 + 3 + \ldots\ldots + n$$

$$= \frac{n(n+1)}{2}$$

$$f(n) = \frac{n^2+1}{2} = O(n^2)$$

Q-2

$$3n^2 + 2$$

= complexity $O(n^2)$

Q→3 $T[n] = T[n-1] + 1$

$$T(n) \begin{cases} 1 & \text{if } n \geq 0 \\ T(n-1)+1 & n > 0 \end{cases}$$

$T(n) = T(n-1) + 1$

Substitute $T(n-1)$

$\therefore T(n) = T(n-1) + 1$

$\therefore T(n-1) = T(n-2) + 1$

$\therefore T(n-2) = T(n-3) + 1$

$T[n] = [T(n-2)+1] + 1$

$T[n] = T[n-2] + 2$

if Substitute again

$T[n] = [T(n-3)+1] + 2$

$T[n] = T[n-3] + 3$

⋮

continues for k times:

$T[n] = T(n-k) + k$ (Assume $n-k=0$)

$\therefore$

$T[n] = T(n-n) + n$

$T(0) + n$

$T[n] = 1 + n$ is the time

Since $1+n$ belongs to the linear class $O(n)$ that is why it is called $O(n)$.

(4) $f(n) = 10.000$

complexity $O(1)$

⇓

Constant time.

(5) $f(n) = n!$

$n! \Rightarrow n(n-1)(n-2)$ ------ ~

```
Factorial (int n)
{
  if (n == 0 || n == 1) { ⇒ O(1)
    return 1;
  return n * factorial (n-1); } Individual it will take O(1)
```

complexity $O(n)$

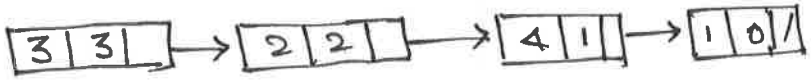
Q→2 $P_1 = 3n^3 + 2n^2 + 4n + 1$

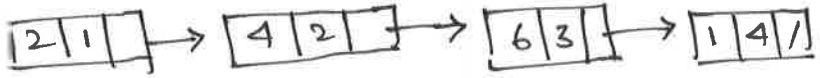
$P_2 = 2n + 4n^2 + 6n^3 + n^4$

Polynomial Multiplication using Linked list

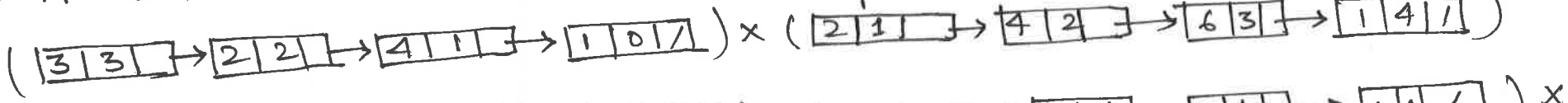
LinkedList Node Structure

Coff	POWer	Pointer to Next Node

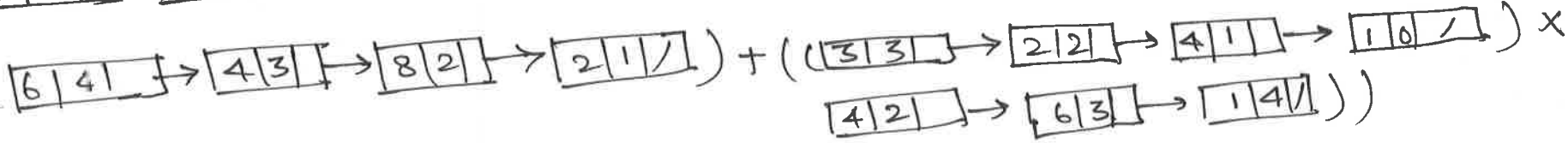
P_1 = 

P_2 = 

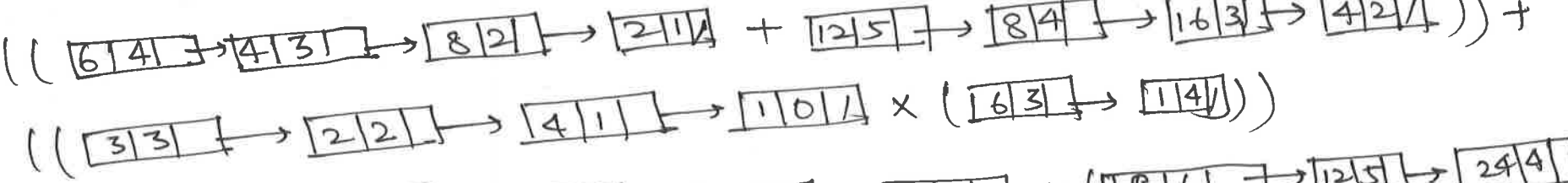
Step 1 $P_1 \times P_2 \Rightarrow$



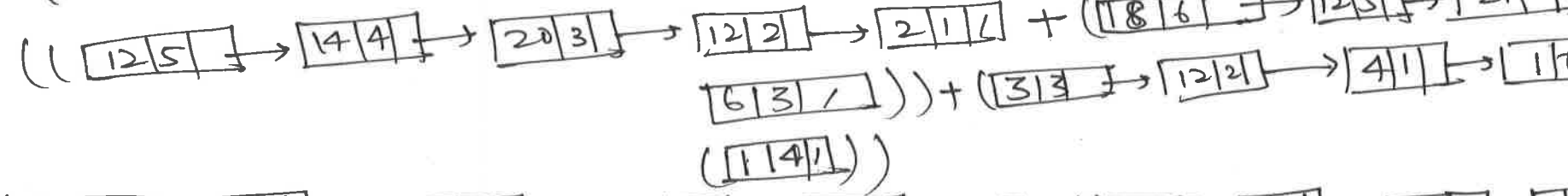
Step 2



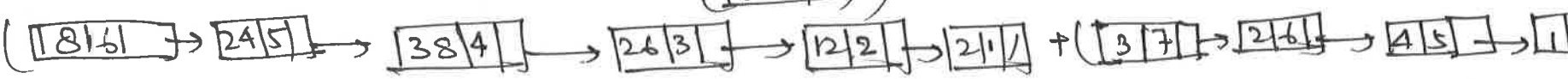
Step=3



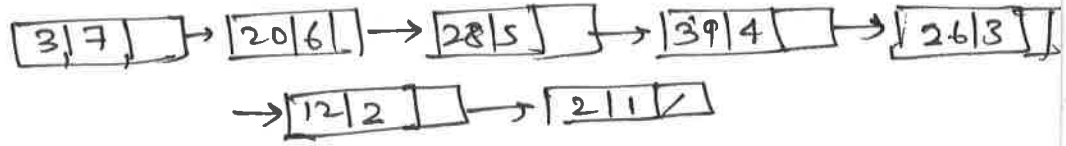
Step=4



Step=5



Final Result



$= 3n^7 + 20n^6 + 28n^5 + 39n^4 + 26n^3 + 12n^2 + 2n$ Ans

Question 3:

Initial Linked List	3->	19->	10->	1->	12->	20->	15->	9->	11->	18
Step 1	3->	19->	10->	1->	12->	20->	15->	9->	11->	18
Step 2	3->	10->	1->	12->	19->	15->	9->	11->	18->	20
Step 3	3->	1->	10->	12->	15->	9->	11->	18->	19->	20
Step 4	1->	3->	10->	12->	9->	11->	15->	18->	19->	20
Step 5	1->	3->	10->	9->	11->	12->	15->	18->	19->	20
Step 6	1->	3->	9->	10->	11->	12->	15->	18->	19->	20
Final Sorted Linked List	1->	3->	9->	10->	11->	12->	15->	18->	19->	20

No swap made