UCS1302:
DATA STRUCTURES

Application of linked list

Polynomial addition

Session Meta Data

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Revision History

Revision Date	Details	Version no.
22 September 2017	1. New SSN template applied	1.2

Session Objectives

- To learn about applications of linked list

Session Outcomes

- At the end of this session, participants will be able to
  - Understand the applications of linked list

Agenda

- Applications of linked list
- Polynomial addition

Application of linked list

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Applications of linked list

- Polynomial addition

Polynomial

- The manipulation of symbolic polynomials, has a classic example of list processing.
- In general, we want to represent the polynomial:

$$A(x) = a_{m-1}x^{e_{m-1}} + \cdots + a_0 x^{e_0}$$

Where the a_i are nonzero coefficients and the e_i are nonnegative integer exponents such that

$e_{m-1} > e_{m-2} > \ldots > e_1 > e_0 \geqq 0$.

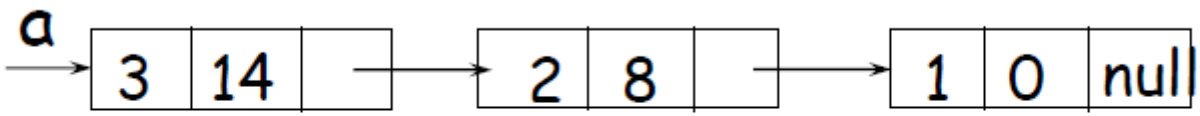
- We will represent each term as a node containing coefficient and exponent fields, as well as a pointer to the next term.

Example

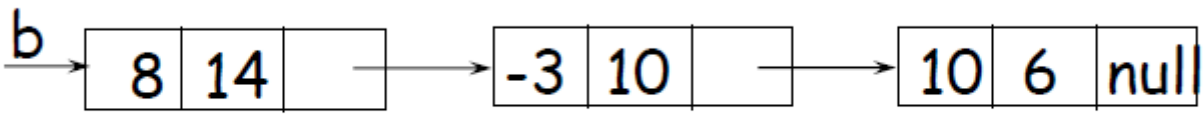
coef	expon	link

Representation of Node

$$a = 3x^{14} + 2x^{8} + 1$$



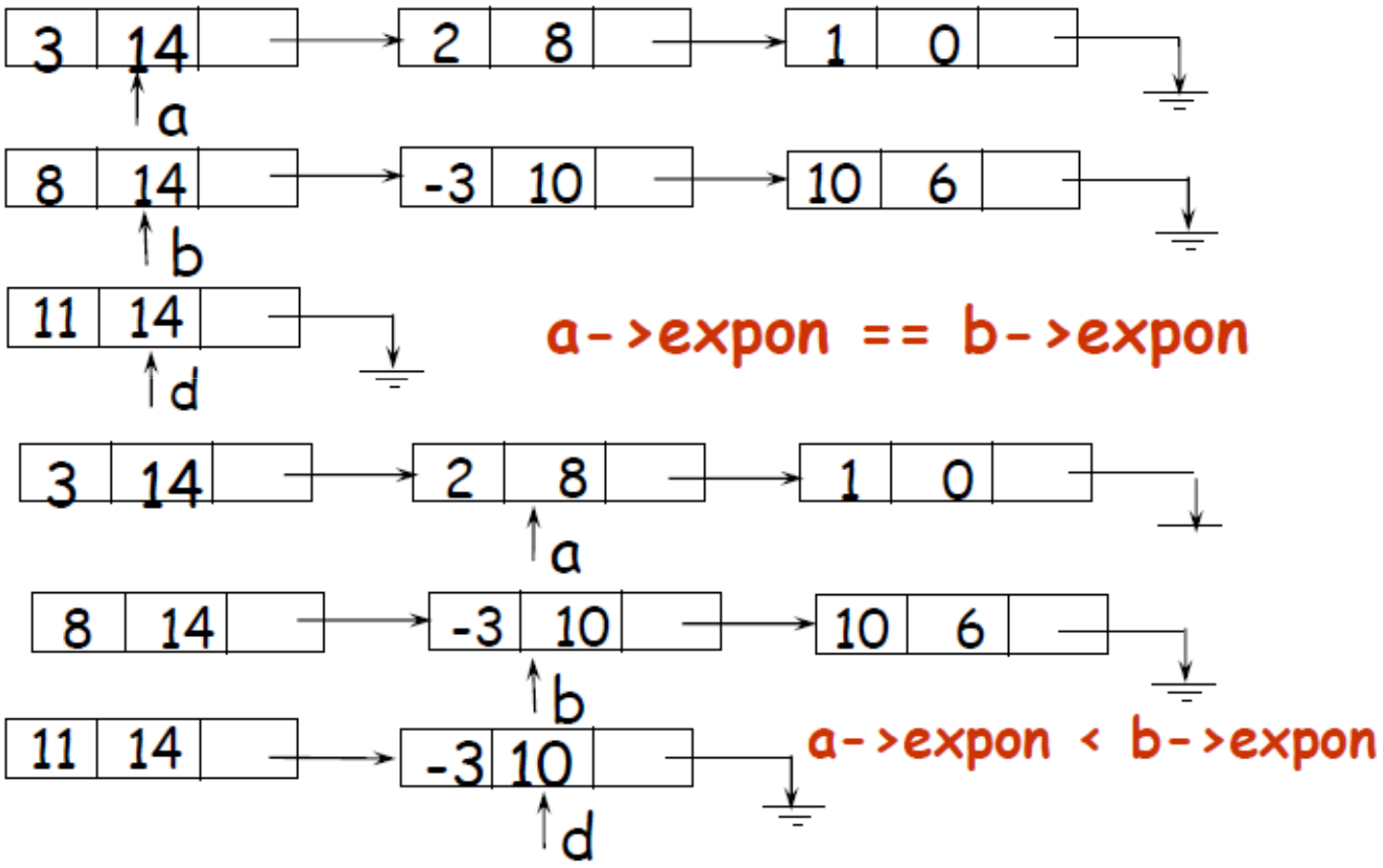
$$b = 8x^{14} - 3x^{10} + 10x^{6}$$



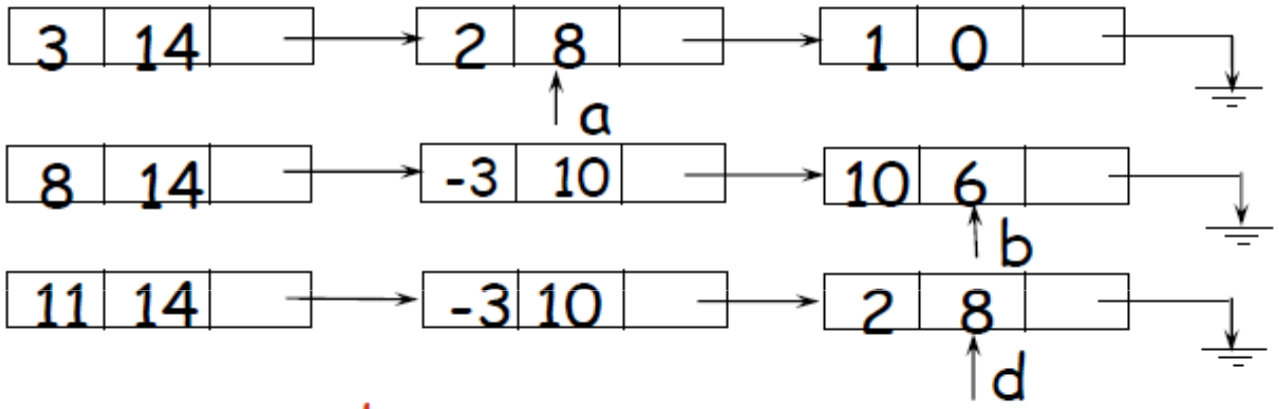
Algorithm for adding two polynomials in linked lists

```
Add_Polynomial( list p, list q )
    set p, q to point to the two first nodes (no headers)
    initialize a linked list r for a zero polynomial
    while p != null and q != null
        if p.exp > q.exp
            create a node storing p.coeff and p.exp
             insert at the end of list r
             advance p
        else if q.exp > p.exp
             create a node storing q.coeff and q.exp
              insert at the end of list r
              advance q
        else if p.exp == q.exp
            if p.coeff + q.coeff != 0
                create a node storing p.coeff + q.coeff and p.exp
                insert at the end of list r
                advance p, q
    end while
    if p != null
          copy the remaining terms of p to end of r
    else if q != null
          copy the remaining terms of q to end of r
```

Polynomial addition

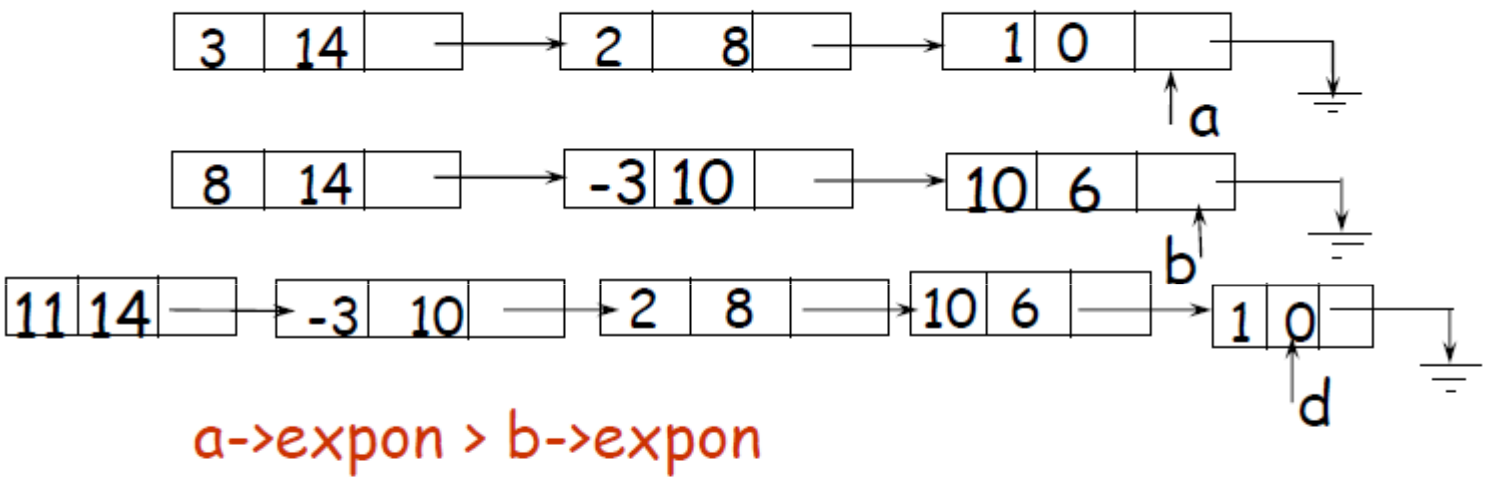


Polynomial addition



a->expon > b->expon

Polynomial addition



a->expon > b->expon

Summary

- Polynomial addition