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//polynomial addition using linked list
#include <stdio.h>
#include <stdlib.h>
struct poly
{
   int coeff;
   int exp;
   struct poly *link;
}
*p1,*p2,*p3,*p3head=NULL,*poly1,*poly2,*poly3,*head,*temp,*ptr,
*ptr1,*disp;
struct poly * createpoly();
struct poly * addpoly(struct poly *a,struct poly *b);
void main()
{
   poly1=(struct poly *)malloc(sizeof(struct poly));
   poly2=(struct poly *)malloc(sizeof(struct poly));
   poly3=(struct poly *)malloc(sizeof(struct poly));

   printf("Polynomial 1\n");
   poly1=createpoly();
   disp=poly1;
   printf("Polynomial 1 : ");
   while(disp->link!=NULL)
   {
      printf("%dx^%d+",disp->coeff,disp->exp);
      disp=disp->link;
   }
   printf("%dx^%d\n",disp->coeff,disp->exp);

   printf("Polynomial 2\n");
   poly2=createpoly();

   disp=poly2;
   printf("Polynomial 2 : ");
   while(disp->link!=NULL)
   {
      printf("%dx^%d+",disp->coeff,disp->exp);
      disp=disp->link;
   }
   printf("%dx^%d\n",disp->coeff,disp->exp);

   poly3=addpoly(poly1,poly2);
   printf("Resultant polynomial is : ");
   disp=poly3;
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   while(disp->link!=NULL)
   {
      printf("%dx^%d+",disp->coeff,disp->exp);
      disp=disp->link;
   }
   printf("%dx^%d\n",disp->coeff,disp->exp);
}
struct poly * createpoly()
{
   int i,n,c,e;
   head=NULL;
   printf("Enter number of terms\n");
   scanf("%d",&n);
   for(i=1;i<=n;i++)
   {
      printf("Enter coefficient and exponent\n");
      scanf("%d%d",&c,&e);
      temp=(struct poly *)malloc(sizeof(struct poly));
      temp->coeff=c;
      temp->exp=e;
      temp->link=NULL;
      if(head==NULL)
      {
         head=ptr=temp;
      }
      else
      {
         ptr->link=temp;
         ptr=temp;
      }
   }
   return head;
}
struct poly * addpoly(struct poly * a,struct poly * b)
{
   p1=a;
   p2=b;
   while(p1!=NULL&&p2!=NULL)
   {
      p3=(struct poly *)malloc(sizeof(struct poly));
      if((p1->exp)==(p2->exp))
      {
         p3->coeff=p1->coeff+p2->coeff;
         p3->exp=p1->exp;
         p1=p1->link;
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        p2=p2->link;
        p3->link=NULL;
    }
    else if((p1->exp)>(p2->exp))
    {
        p3->coeff=p1->coeff;
        p3->exp=p1->exp;
        p1=p1->link;
        p3->link=NULL;
    }
    else
    {
        p3->coeff=p2->coeff;
        p3->exp=p2->exp;
        p2=p2->link;
        p3->link=NULL;
    }
    if(p3head==NULL)
    {
        p3head=ptr1=p3;
    }
    else
    {
        ptr1->link=p3;
        ptr1=p3;
    }
}
while(p1!=NULL)
{
    p3->coeff=p1->coeff;
    p3->exp=p1->exp;
    p1=p1->link;
    p3->link=NULL;
    if(p3head==NULL)
    {
        p3head=ptr1=p3;
    }
    else
    {
        ptr1->link=p3;
        ptr1=p3;
    }
}
while(p2!=NULL)
{
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        p3->coeff=p2->coeff;
        p3->exp=p2->exp;
        p2=p2->link;
        p3->link=NULL;
        if(p3head==NULL)
        {
            p3head=ptr1=p3;
        }
        else
        {
            ptr1->link=p3;
            ptr1=p3;
        }
    }
    return p3head;
}
/*sample output
Polynomial 1
Enter number of terms
3
Enter coefficient and exponent
5 3
Enter coefficient and exponent
3 2
Enter coefficient and exponent
2 0
Polynomial 1 : 5x^3+3x^2+2x^0
Polynomial 2
Enter number of terms
2
Enter coefficient and exponent
2 3
Enter coefficient and exponent
3 0
Polynomial 2 : 2x^3+3x^0
Resultant polynomial is : 7x^3+3x^2+5x^0
*/
```