Experiment 11: Users create data types themselves

1. Purpose of the experiment

(1) Master the definition and use of structural type variables

(2) Master the concept and use of structure type array

(3) Understand the concept and operation method of linked list

2. Experiment content

(1) There are five students, and the data of each student includes student number, name, and grades of three courses. Input five student data from the keyboard, and output the total average score of three courses, as well as the data of the student with the highest score (including student number, name, grades of three courses, and average score).

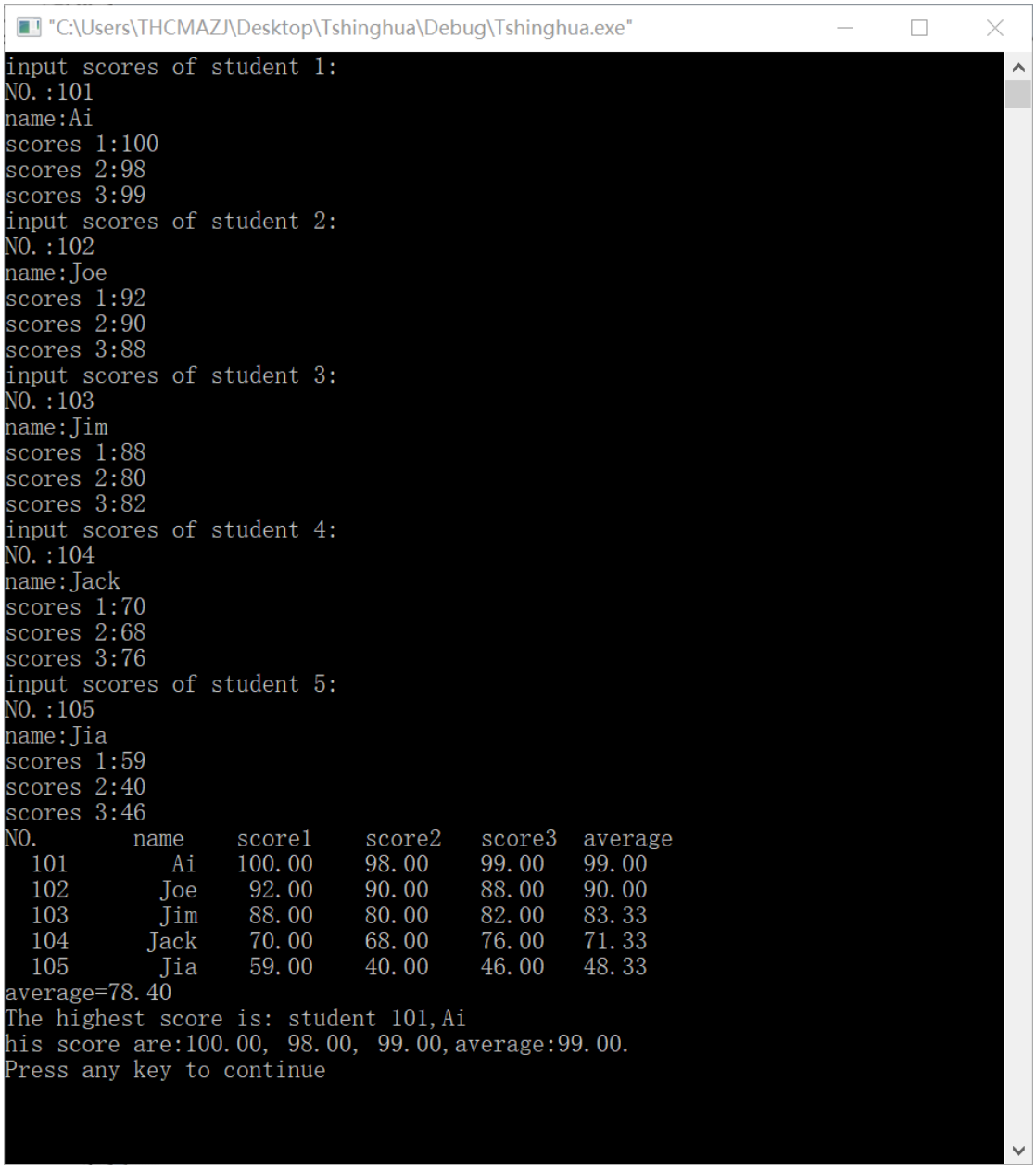
Code:

```
#include <stdio.h>
#define N 5
struct student
{
    char num[6];
    char name[8];
    float score[3];
    float avr;
}stu[N];

int main()
{
    int i,j,maxi;
    float sum,max,average;
    for(i=0;i<N;i++)
    {
        printf("input scores of student %d:\n",i+1);
        printf("NO.:");
        scanf("%s",stu[i].num);
        printf("name:");
        scanf("%s",stu[i].name);
        for(j=0;j<3;j++)
        {
            printf("scores %d:",j+1);
            scanf("%f",&stu[i].score[j]);
        }
    }
    average=0;
    max=0;
    maxi=0;
    for(i=0;i<N;i++)
    {
```

```
            sum=0;
            for(j=0;j<3;j++)
                sum+=stu[i].score[j];
            stu[i].avr=sum/3.0;
            average+=stu[i].avr;
            if(sum>max)
            {
                max=sum;
                maxi=i;
            }
        }
        average/=N;

        printf("NO.          name       score1      score2      score3    average\n");
        for(i=0;i<N;i++)
        {
            printf("%5s%10s",stu[i].num,stu[i].name);
            for(j=0;j<3;j++)
                printf("%9.2f",stu[i].score[j]);
            printf("%8.2f\n",stu[i].avr);
        }
        printf("average=%5.2f\n",average);
        printf("The highest score is: student %s,%s\n",stu[maxi].num,stu[maxi].name);
        printf("his score are:%6.2f,%6.2f,%6.2f,average:%5.2f.\n",
            stu[maxi].score[0],stu[maxi].score[1],stu[maxi].score[2],stu[maxi].avr);
        return 0;
}
```



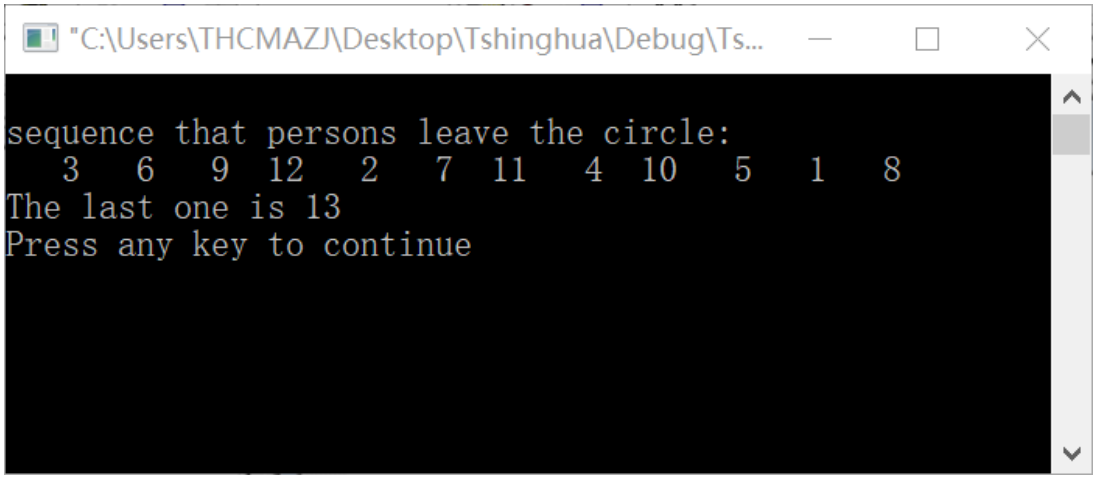
（2）13 people form a circle, and report the number 1, 2, and 3 in order from the first person. Those who report to "3" exit the circle, and find out the original serial number of the last person left in the circle. It is required to use linked list

Code:

```
#include <stdio.h>
#define N 13
struct person
{
```

```
    int number;
    int nextp;
}link[N+1];

int main()
{
    int i,count,h;
    for(i=1;i<=N;i++)
    {
        if(i==N)
            link[i].nextp=1;
        else
            link[i].nextp=i+1;
        link[i].number=i;
    }
    printf("\n");
    count=0;
    h=N;
    printf("sequence that persons leave the circle:\n");
    while (count<N-1)
    {
        i=0;
        while(i!=3)
        {
            h=link[h].nextp;
            if(link[h].number)
                i++;
        }
        printf("%4d",link[h].number);
        link[h].number=0;
        count++;
    }
    printf("\nThe last one is");
    for(i=1;i<=N;i++)
        if(link[i].number)
            printf("%3d",link[i].number);
    printf("\n");
    return 0;
}
```



（3）Create a linked list. Each node includes student number, name, gender and age. Enter an age. If the age contained in the node in the linked list is equal to this age, the node will be deleted.

Code:

```
#include <stdio.h>
#include <malloc.h>
#define LEN sizeof(struct student)
struct student
{
    char num[6];
    char name[8];
    char sex[2];
    int age;
    struct student*next;
}stu[10];

int main()
{
    struct student *p,*pt,*head;
    int i,length,iage,flag=1;
    int find=0;
    while(flag==1)
    {
        printf("input length of list(<10):");
        scanf("%d",&length);
        if(length<10);
        flag=0;
    }

    for(i=0;i<length;i++)
    {
```

```
        p=(struct student *)malloc(LEN);
        if(i==0)
            head=pt=p;
        else
            pt->next=p;
        pt=p;
        printf("NO:");
        scanf("%s",p->num);
        printf("name:");
        scanf("%s",p->name);
        printf("sex:");
        scanf("%s",p->sex);
        printf("age:");
        scanf("%d",&p->age);
}
p->next=NULL;
p=head;
printf("\nNO.name sex age\n");
while (p!=NULL)
{
        printf("%4s%8s%6s%6d\n",p->num,p->name,p->sex,p->age);
        p=p->next;
}

printf("input age:");
scanf("%d",&iage);
pt=head;
p=pt;
if(pt->age==iage)
{
        p=pt->next;
        head=pt=p;
        find=1;
}
else
        pt=pt->next;
while(pt!=NULL)
{
        if(pt->age==iage)
        {p->next=pt->next;
        find=1;
        }
        else
        p=pt;
```

```
            pt=pt->next;
        }
        if(!find)
            printf("not found %d.",iage);

        p=head;
        printf("\n NO.name sex age\n");
        while(p!=NULL)
        {
            printf("%4s%8s",p->num,p->name);
            printf("%6s%6d\n",p->sex,p->age);
            p=p->next;
        }
        return 0;
}
```