作业 9

必做题

第一题

程序代码：

注 1：两个函数代表了两种算法，******处代表选择其一填入

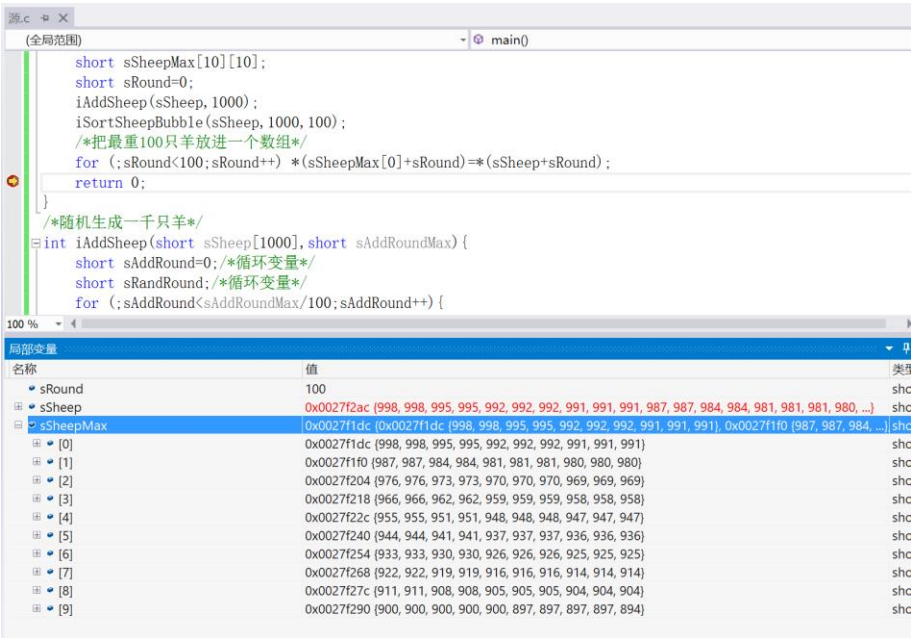
注 2：为了调试窗口显示方便，把 100 只羊单独列成二维数组，每十个一组显示

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
#include <math.h>
int iAddSheep(short sSheep[1000],short);
int iSortSheepBubble(short sSheep[1000],short,short);
int iSortSheepSelect(short sSheep[1000],short,short);
int main(){
    short sSheep[1000];
    short sSheepMax[10][10];
    short sRound=0;
    iAddSheep(sSheep,1000);
    iSortSheep******(sSheep,1000,100);
    /*把最重100只羊放进一个数组*/
    for (;sRound<100;sRound++) *(sSheepMax[0]+sRound)=*(sSheep+sRound);
    return 0;
}
/*随机生成一千只羊*/
int iAddSheep(short sSheep[1000],short sAddRoundMax){
    short sAddRound=0;/*循环变量*/
    short sRandRound;/*循环变量*/
    for (;sAddRound<sAddRoundMax/100;sAddRound++){
        for (sRandRound=0;sRandRound<(rand()%1000+10000);sRandRound++){
            srand(time(0));
            printf(" ");
        }
        for (sRandRound=0;sRandRound<100;sRandRound++){
            srand(time(0)+sRandRound*10000);
            *(sSheep+sAddRound*100+sRandRound)=rand()%999+1;
        }
    }
    return 0;
}
/*冒泡排序选出最大100只*/
int iSortSheepBubble(short sSheep[1000],short sLength, short sSelect){
    short sRoundFinish, sRoundPosition;
    for (sRoundFinish=0;sRoundFinish<sSelect;sRoundFinish++){
        for (sRoundPosition=sLength-
```

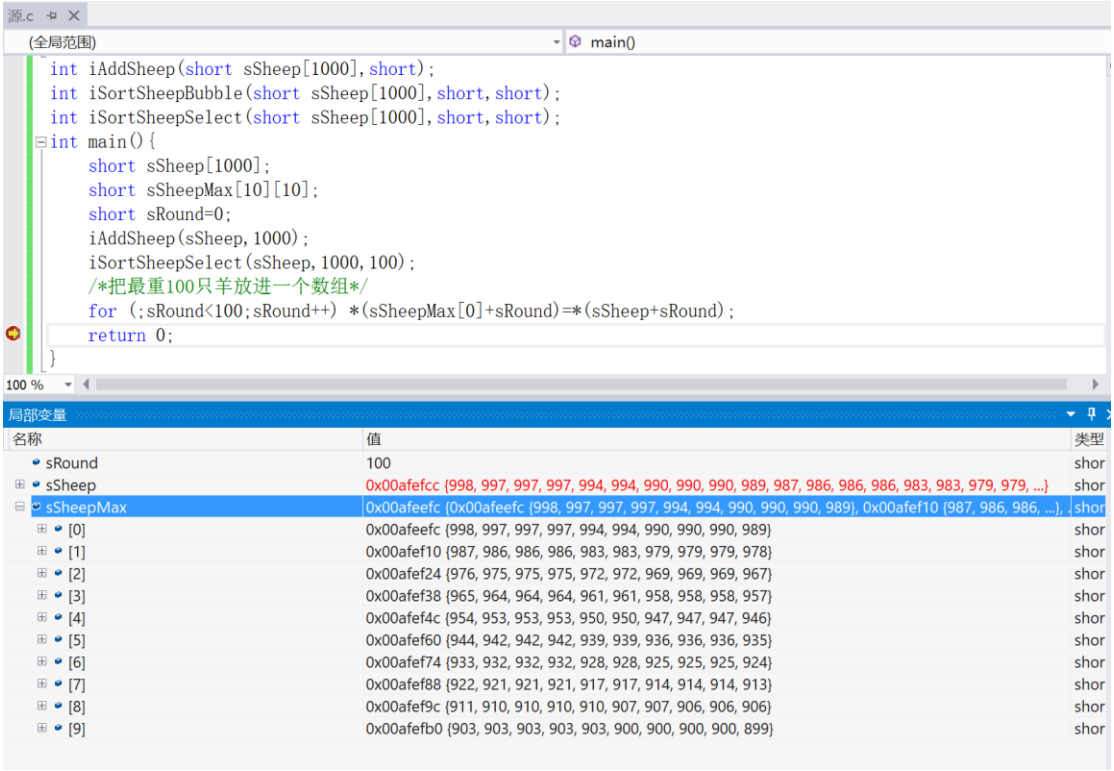
```
2;sRoundPosition>=sRoundFinish;sRoundPosition--){
            if (*(sSheep+sRoundPosition)<*(sSheep+sRoundPosition+1)){/*交换*/
                short sTemp=*(sSheep+sRoundPosition);
                *(sSheep+sRoundPosition)=*(sSheep+sRoundPosition+1);
                *(sSheep+sRoundPosition+1)=sTemp;
            }
        }
    }
    return 0;
}
/*选择排序选出最大100只*/
int iSortSheepSelect(short sSheep[1000],short sLength, short sSelect){
    short sRoundFinish, sRoundPosition;
    for (sRoundFinish=0;sRoundFinish<sSelect;sRoundFinish++){
        for
(sRoundPosition=sRoundFinish+1;sRoundPosition<sLength;sRoundPosition++){
            if (*(sSheep+sRoundFinish)<*(sSheep+sRoundPosition)){/*交换*/
                short sTemp=*(sSheep+sRoundFinish);
                *(sSheep+sRoundFinish)=*(sSheep+sRoundPosition);
                *(sSheep+sRoundPosition)=sTemp;
            }
        }
    }
    return 0;
}
```

运行结果截图：

法 1——冒泡



法 2——选择



第二题

程序代码：（被注释掉的函数是可以进行对象输入的部分，题目要求初始化定义，故注释掉）

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
/*矩阵及其参量定义*/
double
rMat[128][128]={{1.1161,0.1254,0.1397,0.1490},{0.1582,1.1675,0.1768,0.1871},{0.
2368,0.2471,0.2568,1.2671},{0.1968,0.2071,1.2168,0.2271}};
short sRow=4,sColumn=4;
/*向量定义*/
double rConst[128]={1.5471,1.6471,1.8471,1.7471};
double rSolution[128];
/*行处理进展静态变量*/
short sRowsNotNull;/*一次消元过程首列非零的行数*/
short sSolve=1;/*是否有唯一解*/
short sNull=0;/*零空间维数*/
/*定义函数*/
char cfInput(void);/*矩阵和向量输入保存*/
char cSwitch(short);/*单列对换变换*/
char cGauss(short);/*单列倍加变换*/
char cPLDU(void);/*求阶梯形矩阵并判断解的情况*/
char cBack(short);/*单次回代*/
char cBackTotal(void);/*完成回代*/
```

```
char cfOutput(void);/*输出结果*/
/*主函数*/
char main(){
    //cfInput();/*输入矩阵和向量*/
    cPLDU();/*化为阶梯型，输出非唯一解情形*/
    if (sSolve==1){/*有解情形*/
        cBackTotal();/*回代法*/
        cfOutput();/*输出唯一解*/
    }
    system("pause");
    return 0;
}
/*矩阵和向量输入保存*/
char cfInput(){
    short sRowRound,sColumnRound;/*循环变量*/
    printf("请输入矩阵的行(列)数：");
    scanf("%hd",&sRow);
    sColumn=sRow;
    /*矩阵输入*/
    printf("请输入矩阵，同行用\\t隔开，异行用\\n隔开：\n");
    for (sRowRound=0;sRowRound<sRow;sRowRound++){
        for (sColumnRound=0;sColumnRound<sColumn;sColumnRound++)
scanf("%lf",&rMat[sRowRound][sColumnRound]);
    }
    /*向量输入*/
    printf("请输入向量，用空格或制表符隔开：\n");
    for (sRowRound=0;sRowRound<sRow;sRowRound++)
scanf("%lf",&rConst[sRowRound]);
    return 0;
}
/*判断行交换的必要性并进行行交换*/
char cSwitch(short sColumnTested){
    short sRowAbove=0,sRowBelow=0;/*非零区行数和零区行数指示变量*/
    short sSwitchRound,sColumnCopyRound;/*循环变量*/
    sRowsNotNull=0;
    if (sColumnTested>=sColumn){/*由于先前平移行数大于列数，列数超限*/
        sRowsNotNull=1;
        return 0;
    }
    else{/*分首列是否为0向下平移*/
        for (sSwitchRound=sColumnTested;sSwitchRound<sRow;sSwitchRound++){
            if (fabs(rMat[sSwitchRound][sColumnTested])<1e-9){/*首项为零行向下
平移两倍*/
                /*矩阵操作*/
```

```
                for
(sColumnCopyRound=sColumnTested;sColumnCopyRound<sColumn;sColumnCopyRound++){

    rMat[sRowBelow+2*sRow][sColumnCopyRound]=rMat[sSwitchRound][sColumnCopyRoun
d];
                }
                /*向量操作*/
                rConst[sRowBelow+2*sRow]=rConst[sSwitchRound];
                sRowBelow++;/*首项零行多一个*/
            }
            else {/*首项非零行向下平移一倍*/
                /*矩阵操作*/
                for
(sColumnCopyRound=sColumnTested;sColumnCopyRound<sColumn;sColumnCopyRound++){

    rMat[sRowAbove+sRow][sColumnCopyRound]=rMat[sSwitchRound][sColumnCopyRound]
;
                }
                /*向量操作*/
                rConst[sRowAbove+sRow]=rConst[sSwitchRound];
                sRowAbove++;/*首项非零行多一个*/
                sRowsNotNull++;/*需要处理的非零行数增加*/
            }
        }
        /*回填补齐*/
        for (sSwitchRound=0;sSwitchRound<sRowsNotNull;sSwitchRound++){/*首项非
零行填在上面*/
            /*矩阵操作*/
            for
(sColumnCopyRound=sColumnTested;sColumnCopyRound<sColumn;sColumnCopyRound++){

    rMat[sColumnTested+sSwitchRound][sColumnCopyRound]=rMat[sSwitchRound+sRow][
sColumnCopyRound];
            }
            /*向量操作*/
            rConst[sColumnTested+sSwitchRound]=rConst[sSwitchRound+sRow];
        }
        for (sSwitchRound=0;sSwitchRound+sRowsNotNull<sRow;sSwitchRound++){/*首
项为零行填在下面*/
            /*矩阵操作*/
            for
(sColumnCopyRound=sColumnTested;sColumnCopyRound<sColumn;sColumnCopyRound++){

    rMat[sColumnTested+sSwitchRound+sRowsNotNull][sColumnCopyRound]=rMat[sSwitc
```

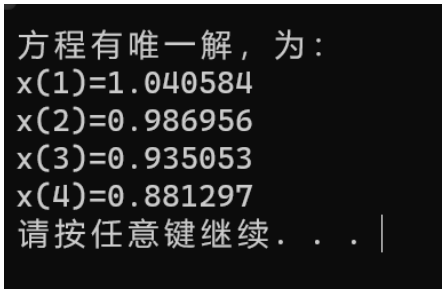
```
hRound+2*sRow][sColumnCopyRound];
            }
            /*向量操作*/

    rConst[sColumnTested+sSwitchRound+sRowsNotNull]=rConst[sSwitchRound+2*sRow]
;
        }
        return 0;
    }
}
/*一步高斯消元*/
char cGauss(short sRowStart){
    cSwitch(sRowStart);
    if (sRowsNotNull==0){/*不满秩*/
        short sMoveRow=sRow-1;/*行循环变量*/
        short sMoveColumn;/*列循环变量*/
        for (;sMoveRow>=sRowStart;sMoveRow--){/*向下平移使主元还在对角线上*/
            /*矩阵操作*/
            for (sMoveColumn=sRowStart+1;sMoveColumn<sColumn;sMoveColumn++){
                rMat[sMoveRow+1][sMoveColumn]=rMat[sMoveRow][sMoveColumn];
            }
            /*向量操作*/
            rConst[sMoveRow+1]=rConst[sMoveRow];
        }
        sRow++;/*扩大行数*/
        sSolve=0;/*解不唯一*/
        sNull++;/*缺一个主元零空间维数加一*/
        return 0;
    }
    else {/*暂时满秩*/
        double rOne=rMat[sRowStart][sRowStart];/*归一基准值*/
        short sGaussRowRound,sGaussColumnRound;/*循环变量*/
        /*归一化*/
        /*矩阵操作*/
        for
(sGaussColumnRound=sRowStart;sGaussColumnRound<sColumn;sGaussColumnRound++){
            rMat[sRowStart][sGaussColumnRound]/=rOne;
        }
        /*向量操作*/
        rConst[sRowStart]/=rOne;
        /*加减消元*/
        for
(sGaussRowRound=sRowStart+1;sGaussRowRound<sRowStart+sRowsNotNull;sGaussRowRoun
d++){
```

```
            double
rRowConstK=rMat[sGaussRowRound][sRowStart]/rMat[sRowStart][sRowStart];/*倍加比
例系数*/
            /*矩阵操作*/
            for
(sGaussColumnRound=sRowStart;sGaussColumnRound<sColumn;sGaussColumnRound++){
                rMat[sGaussRowRound][sGaussColumnRound]-
=rMat[sRowStart][sGaussColumnRound]*rRowConstK;
            }
            /*向量操作*/
            rConst[sGaussRowRound]-=rConst[sRowStart]*rRowConstK;
        }
    }
    return 0;
}
/*化为上三角全过程*/
char cPLDU(){
    short sPLDURound=(short)0;/*循环变量*/
    short sFlagNull=0;/*判断增广列是否为主列的指标，0否*/
    for (sPLDURound=0;sPLDURound<sRow;sPLDURound++) cGauss(sPLDURound);/*进行高
斯消元化为阶梯型*/
    if (fabs(rMat[sRow-1][sColumn-1])<1e-9){/*原矩阵不满秩*/
        for (sPLDURound=sRow-1;sPLDURound>=sRow-sNull;sPLDURound--){
            if (fabs(rConst[sPLDURound])>1e-9) {/*增广列出现主元*/
                sFlagNull++;
                break;
            }
        }
        if (sFlagNull==0) printf("方程有无穷组解，零空间维数为%hd。
\n",sNull);/*增广列非主列*/
        else printf("方程无解。\n");/*增广列为主列*/
    }
    return 0;
}
/*单次回代法*/
char cBack(short sPosition){
    short sRoundBack=sRow-1;/*循环变量*/
    double rResultP=rConst[sPosition];/*输出结果变量初始化*/
    for (;sRoundBack>sPosition;sRoundBack--){/*逐列回代*/
        rResultP-=rMat[sPosition][sRoundBack]*rSolution[sRoundBack];
    }
    rSolution[sPosition]=rResultP;/*解向量赋值*/
    return 0;
}
```

```c
/*回代法求唯一解汇总*/
char cBackTotal(){
    short sRoundBT=sRow-1;/*循环变量*/
    for (;sRoundBT>=0;sRoundBT--) cBack(sRoundBT);/*逐行回代*/
    return 0;
}
/*输出唯一解*/
char cfOutput(){
    short sRoundOutput=0;/*循环变量*/
    printf("方程有唯一解，为：\n");
    /*逐行输出解向量*/
    for (;sRoundOutput<sRow;sRoundOutput++)
printf("x(%hd)=%lf\n",sRoundOutput+1,rSolution[sRoundOutput]);
    return 0;
}
```

运行结果截图：



第三题

思路：穷举遍历找到结果

程序代码：

```c
#include <stdio.h>
#include <stdlib.h>
#define TOTAL_HEAD 15
#define TOTAL_FEET 40
int main(){
    int iChicken=0;
    int iRabbit;
    int iFeet;
    for (;iChicken<=15;iChicken++){
        iRabbit=TOTAL_HEAD-iChicken;
        iFeet=2*iChicken+4*iRabbit;
        if (iFeet==TOTAL_FEET){
            printf("鸡有%d只，兔有%d只。\n",iChicken,iRabbit);
            break;
        }
    }
    system("pause");
```

```
    return 0;
}
```

运行结果：

```
鸡有10只，兔有5只。
请按任意键继续. . .
```

选做题

第一题

程序代码：

```
#include <stdio.h>
#include <stdlib.h>
int iCalculate(int);
int iInclude(int);
int iSaver[100000];/*各次结果保存*/
/*主函数*/
int main(){
    int iTest;/*测试数*/
    int iRound=0;/*循环变量*/
    printf("请输入被测整数：");
    scanf("%d",&iTest);
    for (;1;iRound++){
        if (iTest==1){
            printf("1");
            break;
        }
        else if (iInclude(iTest)){
            printf("0");
            break;
        }
        iSaver[iRound]=iTest;
        iTest=iCalculate(iTest);
    }
    system("pause");
    return 0;
}
/*计算各位平方和*/
int iCalculate(int iNum){
    int iResult=0;/*存储结果*/
    while (iNum>0){
        iResult+=(iNum%10)*(iNum%10);/*某位平方*/
        iNum/=10;
    }
    return iResult;
```

```
}
/*判断数是否在数组中*/
int iInclude(int iNum){
    int iIncludeRound=0;/*循环变量*/
    int iIncludeFlag=0;/*标志，1为在里面*/
    for (;iSaver[iIncludeRound]!=0;iIncludeRound++){
        if (iNum==iSaver[iIncludeRound]){/*相等*/
            iIncludeFlag=1;
            break;
        }
    }
    return iIncludeFlag;
}
```

运行结果：

```
请输入被测整数: 201004
0请按任意键继续. . .
```

第二题

答案：10,9,8,7,6,1,2,3,4,5

第三题

程序代码：

```
#include<stdio.h>
#include<stdlib.h>
short sID[18];/*身份证号转变*/
short sWeight[17]={7,9,10,5,8,4,2,1,6,3,7,9,10,5,8,4,2};/*权重*/
int main(){
    int iRound=0;/*循环变量*/
    int iResult=0;/*求解末位结果*/
    printf("请输入身份证号：");
    for (;iRound<18;iRound++) sID[iRound]=getchar()-48;
    if (sID[17]=='X'-48) sID[17]=10;
    for (iRound=0;iRound<17;iRound++) iResult+=sID[iRound]*sWeight[iRound];/*计
算加权乘法*/
    iResult=(12-iResult%11)%11;/*计算余数*/
    /*输出结果*/
    if (iResult==sID[17]) printf("合法。\n");
    else if (iResult==10) printf("非法，正确校验位是X。\n");
    else printf("非法，正确校验位是%hd。\n",iResult);
    system("pause");
    return 0;
}
```

运行结果：

```
请输入身份证号: 110109202002172254
非法，正确校验位是7。
请按任意键继续. . .
```