SUSTech Southern University of Science and Technology

CS111，C Programming

Lab / Loop & Array

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Outline

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- Review
- Loop: Showcase, for
- Array: Showcase, Non-String
- Assignment

Review： Problem #1

What this code do ?

```
4   int A,B,C,a,b,c,i=0,j=0,k=0,x,aa,bb,cc;
5   scanf("%d-%d-%d",&a,&b,&c);
6   scanf("%d-%d-%d",&A,&B,&C);
7   if(A<a)
8   {
9       aa=A,bb=B,cc=C;
10      A=a,B=b,C=c;
11      a=aa,b=bb,c=cc;
12  }
13  else if(A==a)
14  {
15      if(B<b)
16      {
17          bb=B,cc=C;
18          B=b,C=c;
19          b=bb,c=cc;
20      }
21      else if(B==b)
22      {
23          if(C<c)
24          {
25              cc=C;
26              C=c;
27              c=cc;
28          }
29      }
30  }
```

Appendix, 变量的命名规范

规则：字母(a-z A-Z)、数字(0-9)、下划线(_)的组合；不能以数字开头；区分大小写

原则：Readable, Meaningful, Consistent

推荐命名法: 驼峰式 or 下划线

```
int myAge;
char myName[10];
float manHeight;
```

or

```
int my_age;
char my_name[10];
float man_height;
```

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Loop: Showcase, for

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打印：九九乘法表

```
1x1=1
2x1=2   2x2=4
3x1=3   3x2=6   3x3=9
4x1=4   4x2=8   4x3=12  4x4=16
5x1=5   5x2=10  5x3=15  5x4=20  5x5=25
6x1=6   6x2=12  6x3=18  6x4=24  6x5=30  6x6=36
7x1=7   7x2=14  7x3=21  7x4=28  7x5=35  7x6=42  7x7=49
8x1=8   8x2=16  8x3=24  8x4=32  8x5=40  8x6=48  8x7=56  8x8=64
9x1=9   9x2=18  9x3=27  9x4=36  9x5=45  9x6=54  9x7=63  9x8=72  9x9=81
```

Loop: Showcase, for

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打印：九九乘法表

```
5       for (int i = 1; i <= 9; i++) {
6           for (int j = 1; j <= i; j++) {
7               printf("%dx%d=%d\t", i, j, (i*j));
8           }
9           printf("\n");
10      }
```

思考：变量 i, j 的作用范围?

什么时候执行自增(i++, j++)

Loop: Showcase, for

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Write a program

- **Input: two 32-bits unsigned integers representing message (msg, ranging from 0 to 999,999) and a key**
- **Output： A four-letter(c3, c2, c1, c0) encrypted password (which only including a-z, A-Z)**

Algorithm details

- **Define four integer index variables i3, i2, i1, and i0, each corresponding to a letter in the password, with values ranging from 0 to 51, where:**
  - 0 through 25 map to lowercase letters a-z
  - 26 through 51 map to uppercase letters A-Z
- **Determine the integer indices for each letter using the following calculations in order:**
  - i0 = ((key++) + (msg % 32)) % 52
  - i1 = (2 * (key++) + (msg / 32 % 32)) % 52
  - i2 = (3 * (key++) + (msg / 1024 % 32)) % 52
  - i3 = (4 * (key++) + (msg / 32768 % 32)) % 52
- **Output the encrypted password with c3 being the first letter, and c0 being the last letter**

Loop: Showcase, for

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```
3 > char int2char(int l) {···
```

```
16      int i0 = (key++) + (msg % 32);
17      int i1 = 2 * (key++) + (msg / 32 % 32);
18      int i2 = 3 * (key++) + (msg / 1024 % 32);
19      int i3 = 4 * (key++) + (msg / 32768 % 32);
20
21      char c0 = int2char(i0);
22      char c1 = int2char(i1);
23      char c2 = int2char(i2);
24      char c3 = int2char(i3);
25      printf("%c%c%c%c\n", c3, c2, c1, c0);
```

痛点：int2char(..) 运算写了4次

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Array: Showcase, as unsorted List

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Input: 10 integer numbers, and save them into an array

```
5       int arr[10];
6       for (int i = 0; i < 10; i++) {
7           scanf("%d", &arr);
8       }
```

Bug ?

Array: Showcase, as unsorted List

Input: 10 integer numbers, and save them into an array

```
5     int arr[10];
6     for (int i = 0; i < 10; i++) {
7         scanf("%d", &arr[i]);
8     }
9
10    for (int i = 0; i < 10; i++) {
11        printf("%d\t", arr[i]);
12    }
13    printf("\n");
```

```
10
1
9
2
8
3
7
4
6
5
10      1       9       2       8       3       7       4       6       5
```

Array: Showcase, as unsorted List

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Input: ?? integer numbers, and save them into an array

When #number not sure

before programming?

Array: Showcase, as unsorted List

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Input: ?? integer numbers, and save them into an array

```c
#define MAX_LEN 100

int main()
{
    int arr[MAX_LEN];
    int len = 0;
    printf("plz input size of array: ");
    scanf("%d", &len);
    for (int i = 0; i < len; i++) {
        scanf("%d", &arr[i]);
    }
    for (int i = 0; i < len; i++) {
        printf("%d\t", arr[i]);
    }
    printf("\n");
    return 0;
}
```

Any improvement ?

Array: is a continuous memory space

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Input: 10 integer numbers, and save them into an array

```
17      for (int i = 0; i < len; i++) {
18          scanf("%d", &arr[i]);
19      }
20      printf("arr: %u (%x) \n", arr, arr);
21      for (int i = 0; i < len; i++) {
22          // printf("%d\t", arr[i]);
23          printf("%u (%x) [%d] = %d\n", &arr[i], &arr[i], i, arr[i]);
24      }
```

```
plz input size of array: 10
1 2 3 4 5 6 7 8 9 10
arr: 6421632 (61fc80)
```

Array: Showcase, as sorted List

Input: 10 integer numbers, and save them into an array

Output: sorted array (from max to min)

Let’s coding together ?

How about: Selection Sort

Array: Showcase, as 'Dictionary'

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```
3   int daysOfMonth(int m, int leapYear) {
4       int daysDict[] = {
5           31, 28, 31, 30, 31, 30, // 1 ~ 6
6           31, 31, 30, 31, 30, 31  // 7 ~ 12
7       };
8       if (m <= 0 || m >= 13) {
9           return 0;
10      }
11      if (m == 2 && leapYear > 0) {
12          return 29;
13      }
14      return daysDict[m-1];
15  }
```

Index as key of dictionary

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Assignment 1) 输入10个整数，输出：最少值、最大值，重复输入次数

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Given 10 integers, please find out:

- The minimum value among them.
- The maximum value among them.
- The number of repetitive integers among them. If one integer repeats exactly x times, then $x - 1$ of them are considered repetitive.

```
1 2 3 4 5 6 7 1 1 1
1 7 3
```

Assignment 2)

输入17张扑克牌，输出捋牌结果（斗地主）

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In a poker card set, there are totally 54 cards:

- Heart `A`, `2`, `3`, `4`, `5`, `6`, `7`, `8`, `9`, `10`, `J`, `Q`, `K` (denoted by 1 ~ 13)
- Diamond `A`, `2`, `3`, `4`, `5`, `6`, `7`, `8`, `9`, `10`, `J`, `Q`, `K` (denoted by 14 ~ 26)
- Spade `A`, `2`, `3`, `4`, `5`, `6`, `7`, `8`, `9`, `10`, `J`, `Q`, `K` (denoted by 27 ~ 39)
- Club `A`, `2`, `3`, `4`, `5`, `6`, `7`, `8`, `9`, `10`, `J`, `Q`, `K` (denoted by 40 ~ 52)
- Little Joker (denoted by 53)
- Big Joker (denoted by 54)

Your will get a hand of 17 cards from the card set. Please sort them in non-ascending order. The order of cards is:

```
Big Joker > Little Joker > 2 > A > K > Q > J > 10 > 9 > 8 > ... > 4 > 3
```

Suit (花色) is ignored when ordering cards.

Assignment 2)

输入17张扑克牌，输出捋牌结果（斗地主）

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Input

The input includes a single line consisting of 17 unique integers in the range $[1, 54]$, representing the 17 cards in your hand.

Output

```
1 2 3 4 5 6 7 8 9 10 11 12 13 14 54 53 23
G g 2 AA K Q J 1010 9 8 7 6 5 4 3
```

Print the sorted cards in a single line

- For Big Joker, print `G`
- For Little Joker, print `g`
- For other cards, ignore their suit and print the index only.

For the same cards (ignoring suits), put no space between them. That is to say, we want `QQ JJJ 101010 9 888` instead of `Q Q J J J 10 10 10 9 8 8 8`.

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THANK YOU