

1st Mid-term Exam

C COMPUTER PROGRAMMING (I)

October 19, 2023

Exam rules

- Only Dev-C++ can be used for the exam.
 - If your codes cannot be compiled by Dev-C++, it is considered as syntax error.
 - Please write all your codes as a c source file named after your student ID.
 - If your codes cannot output the desired result, your points will be deducted.
 - Please check whether your codes can be compiled and output the desired result before submitting to National Sun Yat-sen Cyber University.
 - No reason for late submission.
 - It is forbidden to search for information during the exam.
 - The cheaters will get zero point.
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Please design a program to complete the following problems.

a. (20 points)

Roman numerals are represented by seven symbols: I, V, X, L, C, D and M.

Symbol	Value
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

For example, 2 is written as II in Roman numeral, just two one's added together. 12 is written as XII, which is simply X + II. The number 27 is written as XXVII, which is XX + V + II.

However, the numeral for four is not IIII. Instead, the number four is written as IV. Because the one is before the five we subtract it making four. The same principle applies to the number nine, which is written as IX.

There are six instances where subtraction is used:

- I can be placed before V and X to get IV (4) and IX (9).
- X can be placed before L and C to get XL (40) and XC (90).
- C can be placed before D and M to get CD (400) and CM (900).

Please let the user give an integer, convert it to a roman numeral.

Note:

- (1) $1 \leq \text{integer} \leq 3999$.
- (2) This question **only can use the switch statement** to do decision-making.
- (3) Go to next question if the user enters 0.

Sample output:

```
Please input an integer: -1
Wrong input, input again!

Please input an integer: 4000
Wrong input, input again!

Please input an integer: 2
Roman numeral: II

Please input an integer: 12
Roman numeral: XII

Please input an integer: 27
Roman numeral: XXVII

Please input an integer: 1234
Roman numeral: MCCXXXIV

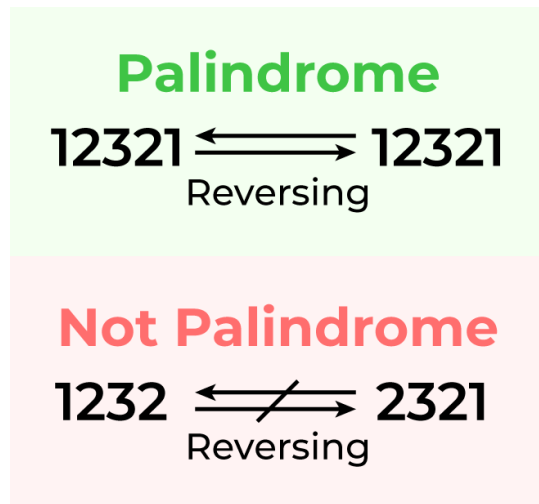
Please input an integer: 2468
Roman numeral: MMCDLXVIII

Please input an integer: 3999
Roman numeral: MMMCMXCIX

Please input an integer: 0
Go to next question
```

b. (20 points)

A palindromic number is a number that remains the same when its digits are reversed. For example, 12321 is a palindrome while 1232 is not. Because 12321 reads the same forward and backward.



Please let the user give an integer, determine whether it is a palindrome.

Note:

- (1) $1 \leq \text{integer} \leq 214748364$.
- (2) Go to next question if the user enters 0.

Sample output:

```
Please input an integer: -2
Wrong input, input again!

Please input an integer: 214748365
Wrong input, input again!

Please input an integer: 12321
12321 is palindrome.

Please input an integer: 1232
1232 is not palindrome.

Please input an integer: 0
Go to next question
```

c. (20 points)

A perpetual calendar is a calendar valid for many years, usually designed to look up the day of the week for a given date in the past or future.

October 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

Please let the user give a date consisting of year, month, and day, then find the day of the week of the following dates:

- **The first day of the given year**
- **The first day of the given month**
- **The given date**

Note:

- (1) The date is in the format yyyy/mm/dd. (Ex.2023/10/19)
- (2) The first day of the perpetual calendar is 0001/01/01.
- (3) Assume 0001/01/01 is Monday.
- (4) If a year has 366 days, it is called a leap year.
- (5) If the year is divisible by 4 and 400, but not by 100, it is a leap year.
- (6) Go to next question if the user enters 0/0/0.

Sample output:

```
Please input a date (yyyy/mm/dd): 2023/02/29
The date is wrong, input again!

Please input a date (yyyy/mm/dd): 2023/10/19

2023/01/01 is Sunday.
2023/10/01 is Sunday.
2023/10/19 is Thursday.

Please input a date (yyyy/mm/dd): 0/0/0
Go to next questuin
```

d. (20 points)

A base n system is a number system that uses n symbols to represent values. For example, the base 16 system uses the digits 0 through 9 with additional symbols: A, B, C, D, E, and F. These symbols represent the decimal values 10, 11, 12, 13, 14 and 15 respectively.

Symbol	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Value	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Please let the user give two integers M and N , use N symbols to represent M .

Note:

- (1) $1 \leq M \leq 65535$.
- (2) $2 \leq N \leq 16$.
- (3) The base 15 system uses 0 to 9 with A, B, C, D, and E to represent values.
- (4) The base 14 system uses 0 to 9 with A, B, C, and D to represent values.
- (5) The base 13 system uses 0 to 9 with A, B, and C to represent values.
- (6) The base 12 system uses 0 to 9 with A and B to represent values.
- (7) The base 11 system uses 0 to 9 with A to represent values.
- (8) Go to next question if the user enters (0,0).

Sample output:

```
Please enter a pair of integers (M,N) : (0,2)
Wrong input, input again!

Please enter a pair of integers (M,N) : (1,17)
Wrong input, input again!

Please enter a pair of integers (M,N) : (65526,16)
65526 in base 16 system is FFF6.

Please enter a pair of integers (M,N) : (33286,15)
33286 in base 15 system is 9CE1.

Please enter a pair of integers (M,N) : (0,0)
Go to next question
```

e. (20 points)

Please let the user give a string of length 4 and an integer N, calculate the value of the string in the base N system.

Note:

(1) $2 \leq N \leq 16$.

(2) Go to next question if the user enters (0000,0).

Sample output:

```
Please input a pair of string and integer: (1112,2)
Wrong input, input again!

Please input a pair of string and integer: (ABCD,10)
Wrong input, input again!

Please input a pair of string and integer: (FFF6,16)
FFF6 in base 16 is 65526.

Please input a pair of string and integer: (9CE1,15)
9CE1 in base 15 is 33286.

Please input a pair of string and integer: (0000,0)
Go to next question
```

f. (20 points)

Please let the user give a number, determine whether it is an integer or a floating-point number.

Note:

(1) $-99.999999 \leq \text{number} \leq 99.999999$.

(2) End the program if the user enters 0.

Sample output:

```
Please input a number: 11.123456
11.123456 is a float-point number.

Please input a number: -11.123456
-11.123456 is a float-point number.

Please input a number: 11.0
11 is an integer.

Please input a number: 11
11 is an integer.

Please input a number: 0

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Process exited after 2.286 seconds with return value 0
```