



RC.CODE.PYTHON

1 Basic information

1.1 Competition content

- A. The competition will comprehensively test the contestants' technical implementation ability based on Python software programming language, encourage innovation, cultivate practical skills, and problem-solving abilities.
- B. The competition are participated by individuals.
- C. The competition items are set with objective questions and programming questions.
- D. All groups in the competition participate in answering questions on the designated platform using a computer.
- E. The duration of each competition is 90 minutes.

1.2 Group setting

Programming event	programming language	Group division	Age requirement
Python programming	Python	Python - A	≤12 years old
	Python	Python - B	≤18 years old

1.3 Competition topic

Group	Single Choice Question	Programming Questions	Competition time
Python - A	5 questions totaling 300 points	5 questions, totaling 300 points	90 Min
Python - B	5 questions totaling 300 points	5 questions, totaling 300 points	90 Min

2 Rules and scores

2.1 Competition rules

- A. A. The competition requires contestants to use coding methods on the designated platform to complete the designated questions. During the answering process, it is prohibited to cut out the compiler or open other software and web pages. Otherwise, it will be considered cheating and the score will be cancelled.



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- B. Each contestant has only one chance to challenge, and those who fail to log in to the designated platform within the specified time will be considered as giving up the challenge.
- C. In the preparation stage, contestants must complete the answer preparation according to the designated platform's prescribed steps and independently operate to enter the formal answer.
- D. During the competition period, contestants are not allowed to leave the computer answering area.
- E. During the competition period, contestants are not allowed to plagiarize others, cheat, or directly contact other contestants' computers. If there is a violation, the contestant will receive 0 points.
- F. During the competition process, one is not allowed to seek help from others, interfere with other contestants' preparation and answering questions, or damage public equipment.
- G. During the competition period, no communication software may be opened on the computer. Any violation will result in 0 points for the contestant.
- H. During the competition period, contestants are not allowed to use communication, photography electronic devices such as mobile phones, phone watches, and external storage devices. Any violation will result in disqualification from the competition.
- I. The interpretation of these rules belongs to the RC Organizing Committee.

2.2 Competition score

According to the completion status of the questions, as well as the comprehensive evaluation of completion degree and time, the more questions completed, the higher the completion degree, and the shorter the time, the higher the score of the contestants.

3 Equipment requirements

- A. Bring your own computer, computer operating system: Mac OS, Windows 10 or above operating system; The browser should use Google Chrome (version 69.0 or above), Firefox, Internet Explorer 11 or above, and Chrome is recommended.
- B. Bring your own smartphone.

4 Outline requirements

4.1 Python - A requirements

- A. Input and Output:



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- a. Understand various Python development environments, proficient in using the IDLE development environment
- b. Master the use of basic input and output functions
- c. Understand the "input, process, output" program writing method
- B. Master the method of commenting
- C. Basic Data Types:
 - a. Concepts of strings, numerical values, and Boolean values
 - b. Representation methods of data types
 - c. Conversion methods between numerical types and string types
- D. Variables:
 - a. Basic concept and understanding of variables
 - b. Variable assignment and naming rules
 - c. Methods of using variables
- E. Conditional Statements:
 - a. Usage of if-else
 - b. Usage of if-elif-else
- F. Operators:
 - a. Representation and usage of comparison operators
 - b. Representation and usage of logical operators
- G. Loop Structures:
 - a. Usage of for loops
 - b. Usage of while loops
 - c. Loop control structure statements: break and continue
- H. Master the program indentation rules
- I. Master the concept and usage of random numbers
- J. Able to programmatically implement arithmetic operations and mixed arithmetic operations
- K. Master common operation methods for lists: creation, indexing, adding, deleting, searching, modifying, traversing, etc.
- L. Master the basic usage and operations of tuples
- M. Understand the functionality of the third-party library turtle, master simple usage methods

4.2 Python - B requirements

- A. Input and Output:
 - a. Understand various Python development environments, proficient in using the IDLE development environment
 - b. Master the use of basic input and output functions



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- c. Understand the "input, process, output" program writing method
- B. Master the method of commenting
- C. Basic Data Types:
 - a. Concepts of strings, numerical values, and Boolean values
 - b. Representation methods of data types
 - c. Conversion methods between numerical types and string types
- D. Variables:
 - a. Basic concept and understanding of variables
 - b. Variable assignment and naming rules
 - c. Methods of using variables
- E. Conditional Statements:
 - a. Usage of if-else
 - b. Usage of if-elif-else
- F. Operators:
 - a. Representation and usage of comparison operators
 - b. Representation and usage of logical operators
- G. Loop Structures:
 - a. Usage of for loops
 - b. Usage of while loops
 - c. Loop control structure statements: break and continue
- H. Master the program indentation rules
- I. Master the concept and usage of random numbers
- J. Able to programmatically implement arithmetic operations and mixed arithmetic operations
- K. Master common operation methods for lists: creation, indexing, adding, deleting, searching, modifying, traversing, etc.
- L. Master the basic usage and operations of tuples
- M. Understand the functionality of the third-party library turtle, master simple usage methods
- N. Master file operations and data formatting
- O. Master data visualization operations
- P. Understand the concepts of classes and objects, initially master the use of classes and objects
- Q. Master basic SQLite database programming
- R. Master simple GUI design using tkinter
- S. Functions:
 - a. Understand concepts such as functions and procedures, function parameters, function return values, variable scope, etc.



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- b. Able to create simple custom functions
 - c. Master the definition and calling methods of functions
 - d. Master parameter definition and the definition and use of return values
- T. Algorithms and Data Structures:
- a. Understand the concept of algorithms, master the characteristics of parsing, enumeration, sorting, and search algorithms
 - b. Understand the concepts of algorithm performance and efficiency, initially recognize methods for optimizing algorithm efficiency
 - c. Master divide-and-conquer algorithms and recursive algorithms
 - d. Master the creation and common operation methods of dictionaries and sets
 - e. Master the representation and read/write methods of two-dimensional data
 - f. Master the usage of list comprehensions, generator expressions, sequence unpacking, and slicing
- U. Data Processing:
- a. Master the representation and read/write methods of one-dimensional data
 - b. Master the representation and read/write methods of two-dimensional data
 - c. Master the read/write methods for CSV format files
- V. Advanced Features:
- a. Master string escape characters and the format() formatting method
 - b. Understand the basic concepts of encoding and number systems, able to perform number system conversions
 - c. Understand program exception handling: try-except structure statements
 - d. Master the functionality and usage of common standard libraries
- W. Master the concept and basic usage of the range type
- X. Use different algorithms to solve various common problems
- Y. Master the nested application of dictionaries and lists

5 RC.CODE.Python Sample question example

【Python - A 】 Sample question example

一、 Multiple choice questions (20 points each)

1、 In computers, which two digits are used in the binary number system? ()

A、 0 和 1

B、 0 和 2



- C、1 和 2
- D、1 和 10

Answer A

2、 If the tuple $y = ('A' , 'B' , 'C' , 'D')$, then the statement that can return the element 'A' is ()

- A、 $y[-3]$
- B、 $y[1]$
- C、 $y[0]$
- D、 $y[4]$

Answer C

3、 Initially $x = 5$, the value after $x // 2 + x**2$ operation is ()

- A、 26.5
- B、 26
- C、 27.5
- D、 27

Answer D

4、 The final print result of the following program ()

```
l = [ 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 ]  
print ( l [ 2 : 4 ] )
```

- A、 [2 , 3]
- B、 [1 , 2 , 3 , 4]
- C、 [3 , 4]
- D、 [2 , 3 , 4]

Answer C

5、 Execute the following program and the print result is ()

```
L = []  
for letter in 'Python':  
    if letter == 'n':  
        continue  
    L.append(letter)  
print(L)
```



- A、 []
- B、 ['P' , 'y' , 't' , 'h']
- C、 ['P' , 'y' , 't' , 'h' , 'o']
- D、 ['o' , 'n']

Answer C

二、 Programming questions (total score 300 points)

1、 Programming Question 1 (40 point)

Programming Implementation:

Given a lowercase letter, output its corresponding uppercase letter.

Input description:

Input a lowercase letter

Output description:

Output the uppercase letter corresponding to the lowercase letter

Sample input:

a

Sample output:

A

Scoring Criteria:

10 point: correctly output a set of data;

10 point: correctly output two sets of data;

10 point: correctly output three sets of data;

10 point: correctly output four sets of data;

2、 Programming Question 2 (40 point)

Programming Implementation:

Enter a positive integer N ($4 < N < 40$), and then print out N rows and N columns of asterisks (*).

Input description:

Enter a positive integer N

**Output description:**

Print out N rows and N columns of "*"

Sample input:

5

Sample output:

```
*****  
*****  
*****  
*****  
*****
```

Scoring Criteria:

10 point: correctly output a set of data;

10 point: correctly output two sets of data;

10 point: correctly output three sets of data;

10 point: correctly output four sets of data;

3. Programming Question 3 (60 point)**Programming Implementation:**

Given a positive integer N, and M different positive integers. Then combine any two numbers from the M positive integers, and find the sum of each combination. How many combinations of M positive integers have the sum exactly equal to N. For example: positive integer N is 6, M is 5, and the 5 different positive integers are 1, 2, 3, 4, and 5.

There are 10 combinations of any two numbers: 1+2, 1+3, 1+4, 1+5, 2+3, 2+4, 2+5, 3+4, 3+5, 4+5

There are 2 combinations whose sum is exactly equal to 6: 1+5, 2+4

Input description:

Enter a positive integer N in the first line

Enter M different positive integers in the second line, and the positive integers are separated by an English comma

Output description:

Output how many combinations of M different positive integers have the sum exactly equal to N

**Sample input:**

5

1,2,3,4,5

Sample output:

2

Scoring Criteria:

15 point: correctly output a set of data;

15 point: correctly output two sets of data;

15point: correctly output three sets of data;

15 point: correctly output four sets of data.

4、 Programming Question 4 (60 point)**Programming Implementation**

N children stand in a circle ($N \leq 60$) and are numbered in order (numbered 1 to N). Then the child numbered 1 starts to count continuously. When the number reported contains 3 or is a multiple of 3, the child cannot report the number but reports "pass" (for example, 3, 6, 13, 31 are all reported "pass").

In a game, the children were having a lot of fun. Suddenly, one child found that there was an error in the number reported before, and the children behind were still reporting. Please help the children find out the number of the child who reported the error for the first time.

For example: There are 3 children, numbered 1, 2, and 3. The child numbered 1 reports 1, the child numbered 2 reports 2, the child numbered 3 reports "pass", the child numbered 1 reports 4, the child numbered 2 reports 5, the child numbered 3 reports 6, and the child numbered 1 reports 7; at this time, the child who reported the error for the first time is numbered 3. (Because the child number 3 should have reported "passed", but reported "6", and "6" is a multiple of 3)

Input description:

In the first line, enter a positive integer N, which represents the number of children

In the second line, enter a set of incorrect reporting sequences ("0" represents a number containing 3 or a multiple of 3), and the sequence elements are separated



by an English comma

Output description:

Output the number of the child who reported the error for the first time

Sample input:

3

1,2,0,4,5,6,7

Sample output:

3

Scoring Criteria:

15 point: correctly output a set of data;

15 point: correctly output two sets of data;

15point: correctly output three sets of data;

15 point: correctly output four sets of data.

5. Programming Question 5 (100 point)

Programming Implementation:

The pony needs to carry N items from one side of the river to the other side, with 1 to 3 items carried each time. How many ways are there for the pony to carry all N items?

For example: $N=3$, there are 4 ways to carry all 3 items:

Solution 1: Carry 1 item the first time, 1 item the second time, and 1 item the third time;

Solution 2: Carry 1 item the first time, 2 items the second time;

Solution 3: Carry 2 items the first time, 1 item the second time;

Solution 4: Carry 3 items at a time.

Input description:

Input a positive integer N, representing the number of items to be carried

Output description:

Output how many ways are there to carry all N items

Sample input:

3

Sample output:

4



Scoring Criteria:

25 point: correctly output a set of data;

25 point: correctly output two sets of data;

25point: correctly output three sets of data;

25 point: correctly output four sets of data.

【Python - B】 Sample question example

1. Multiple choice questions (20 points each)

2. Which of the following expressions returns True? ()

- A、 $3 != 3$
- B、 $5 > 4 > 3$
- C、 $8 \% 2 == 1$
- D、 True and False

Answer B

2. Which of the following descriptions of the function is correct? ()

- A. The function definition must be at the beginning of the program
- B. After the function is defined, it must be called to execute
- C. The function body and the keyword def must be left-aligned
- D. After the function is defined, its program can be automatically executed

Answer B

3. What does the following function determine? ()

```
def is_prime(num):  
    for i in range(2, num):  
        if num % i == 0:  
            return False  
    return True
```

- A. Addition calculation
- B. Determine prime number
- C. Loop index
- D. Sorted list

Answer B



4、 When the following expressions traverse the dictionary `d`, the variable `x` represents the dictionary value. ()

- A、 for `x` in `d`:
- B、 for `x` in `d.keys()`:
- C、 for `x` in `d.items()`:
- D、 for `x` in `d.values()`:

Answer D

5、 Given `t = ("bian", "cheng", "sai")`, the output of executing `t[::-1]` is ()

- A、 ("sai" , "cheng" , "bian")
- B、 ["sai" , "cheng" , "bian"]
- C、 { "sai" , "cheng" , "bian" }
- D、 运行报错

Answer A

二、 Programming questions (total score 300 points)

1、 Programming Question 1 (40 point)

Programming Implementation:

Input the length and width of a rectangle and output the area of the rectangle.

Input description:

Input the length and width of a rectangle (separated by a comma)

Output description:

Output the area of the rectangle

Sample input:

3 4

Sample output:

12

Scoring Criteria:

10 point: correctly output a set of data;

10 point: correctly output two sets of data;

10 point: correctly output three sets of data;

10 point: correctly output four sets of data.



2、 Programming Question 2 (40 point)

Programming Implementation:

Given a four-digit positive integer, output it in reverse order.

Input description:

Input a four-digit positive integer whose single digit is not "0"

Output description:

Output this positive integer in reverse order

Sample input:

1234

Sample output:

4321

Scoring Criteria:

10 point: correctly output a set of data;

10 point: correctly output two sets of data;

10 point: correctly output three sets of data;

10 point: correctly output four sets of data.

3、 Programming Question 3 (60 point)

Programming Implementation:

There are N positive integers. Now arrange them in different ways. After each arrangement, a calculation is performed according to the following rules. For example, different arrangements will result in different results.

Calculation rules:

First time: multiply the first number by the second number by the third number, and record the result as M(1);

Second time: multiply the second number by the third number by the fourth number, and record the result as M(2);

Third time: multiply the third number by the fourth number by the fifth number, and record the result as M(3);

N-2nd time: multiply the N-2nd number by the N-1st number by the Nth number, and record the result as M(N-2).

Finally, calculate the value of $M(1)+M(2)+M(3)+\dots+M(N-2)$.

Find an arrangement that maximizes this value.

For example: N=4, 4 positive integers are 1, 2, 3, 4, then there are 24 ways of



arrangement:

When the arrangement is 1, 3, 4, 2, calculate twice according to the rule:

$1*3*4=12$, $3*4*2=24$; product addition: $12+24=36$

This sorting method is that the maximum value of all product additions is 36.

Input description:

Input N positive integers ($3 \leq N$), separated by a comma

Output description:

Find the arrangement with the largest value of all product additions, and output the value

Sample input:

1,2,3,4

Sample output:

36

Scoring Criteria:

15 point: correctly output a set of data;

15 point: correctly output two sets of data;

15point: correctly output three sets of data;

15 point: correctly output four sets of data.

4、 Programming Question 4 (60 point)

Programming Implementation:

Given a row of black balls with numbers (numbers from 0 to 9), and a row of white balls with numbers (numbers from 0 to 9), now select K balls from the two rows and arrange them in a row, so that the number formed by the new row of K balls is the largest.

For example:

The original order of the black balls is:

②⑤③

The original order of the white balls is:

⑥②④①

K is 3;

Select 3 balls from the two rows and arrange them in⑥⑤④。 The maximum number that can be formed is 654.

**Input description:**

In the first line, enter a group of positive integers, representing black balls. Each positive integer ranges from 0 to 9, and the positive integers are separated by a comma.

In the second line, enter a group of positive integers, representing white balls. Each positive integer ranges from 0 to 9, and the positive integers are separated by a comma.

In the third line, enter a positive integer K (K is less than or equal to the total number of all balls), indicating that K balls are selected from all balls.

Output description:

Output an integer, indicating the maximum number formed after selecting K balls as required.

Sample input:

2,5,3

6,2,4,1

3

Sample output:

654

Scoring Criteria:

15 point: correctly output a set of data;

15 point: correctly output two sets of data;

15point: correctly output three sets of data;

15 point: correctly output four sets of data.

5. Programming Question 5 (100 point)**Programming Implementation:****Problem Description**

You are a courier responsible for delivering packages between stations in a region. There are a total of N delivery stations in the area, and each station has M delivery routes to choose from. After selecting the i -th route, you will go directly from the current station s to station $s + a_i$ (specifically, if $s + a_i \geq N$, it means you have completed the delivery task). Additionally, when you successfully leave station s , you will earn c_s points (which can be used to redeem rewards). At the beginning of the delivery, you are at station 0. What is the maximum number



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of points you can earn when completing the delivery task?

Input description:

The first line contains two integers N, M , representing the number of delivery stations and the number of delivery routes at each station, respectively.

The next line contains M integers separated by single spaces: a_0, a_1, \dots, a_{M-1} , guaranteed that $1 \leq a_i \leq N$.

The next line contains N integers separated by single spaces: c_0, c_1, \dots, c_{N-1} , guaranteed that $|c_i| \leq 10^5$.

Output description:

A single integer representing the maximum number of points you can earn when completing the delivery task.

Sample Input:

```
6 2
2 3
1 0 30 100 30 30
```

Sample Output:

```
131
```

Scoring Criteria:

25 point: correctly output a set of data;

25 point: correctly output two sets of data;

25point: correctly output three sets of data;

25 point: correctly output four sets of data.