Deadline : 02/16/2018 24:00

Part A

1.what is HashMap? Why we would prefer using hashMap but not array in some cases? Please explain it.**(2 scores).**

2. **[Step 1]** Use a hashMap and a for loop to store the element in the int array int[] A = [1,4,5,2,2,2,6,8,3,2,1]. **[Step 2]**Delete 6 and 8 in the hashMap. **[Step 3]**Return to boolean value that whether “4” in the map. Print the results in step 1 ,2 and 3;**(2 scores).**

3. Write a java function that adds all the digits of an integer until it is single digit. **(2 scores).**

i. function takes an integer as input and returns its sum of digits.

ii. for example input = 37, sum = 3+7 = 10, sum = 1+0 = 1. result = 1.

Here is the prototype you can work with

```
public int addDigits( int input){
*
*
*
}
```

4.You are playing the following Bulls and Cows game with your friend: You write down a number and ask your friend to guess what the number is. Each time your friend makes a guess, you provide a hint that indicates how many digits in said guess match your secret number exactly in both digit and position (called "bulls") and how many digits match the secret number but locate in the wrong position (called "cows"). Your friend will use successive guesses and hints to eventually derive the secret number.**(4 scores, if you can solve it in one for loop, you will get an extra 2 scores).**

For example:

Secret number: "1807"
Friend's guess: "7810"

Hint: 1 bull and 3 cows. (The bull is 8, the cows are 0, 1 and 7.)

Write a function to return a hint according to the secret number and friend's guess, use A to indicate the bulls and B to indicate the cows. In the above example, your function should return "1A3B".

Please note that both secret number and friend's guess may contain duplicate digits, for example:

Secret number: "1123"
Friend's guess: "0111"
In this case, the 1st 1 in friend's guess is a bull, the 2nd or 3rd 1 is a cow, and your function should return "1A1B".

You may assume that the secret number and your friend's guess only contain digits, and their lengths are always equal.

Ps: please pay attention to the situation that there are digits repeated. The lack of consideration about corner cases will lead to the loss of scores.

You need to run test case as follow:

Secret number: "1122"

`Friend's guess:"1222"`

Part B

1. Please explain what are DFS and BFS, what is the differences between them? **(2 scores).**
2. Write a java function to print all perfect number between 1 and n.**(2 scores).**

Perfect number is a positive integer which is equal to the sum of its proper positive divisors.

ii. For example: 6 is the first perfect number, Proper divisors of 6 are 1, 2, 3. Sum of its proper divisors = 1 + 2 + 3 = 6.

Here is the prototype you can work with

public void printPerfectNumbers(int n){

```
*

*

*

}
```

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Ps: please pay attention to the situation that there are digits repeated. The lack of consideration about corner cases will lead to the loss of scores.

You need to run test case as follow:

Secret number: "1122"

Friend's guess:"1222"

3.Given input that represent as a maze, write a program that finds a valid solution to the maze by outputting directional instructions from the start maker to the finish maker.**(4 scores)**

Maze character:

S - start F-finish +-open space @barrier

Output should be a string of commands to move through the maze from start to finish.

D = down, R = right, L = left, U = up;

```
Sample input 1:           Sample Onput 1:

S@@@                      DRRRD

++++

@@@F

Sample input 2:           Sample Onput 2:

@S@@@@@                   DRRRDDDDLLLD

@++++++@

@@+@+@@

@++@++@

@@@@+@@

@+++++@

@F@@@@@
```