Task 1: software design and development

Problem description

A research organisation currently gathers and stores data on the salaries paid to the chief executive officers (CEOs) of the top 100 technology companies in the country. They want a program to help them use this data effectively.

Purpose

A CSV file stores the following data about the 100 companies:

- company name
- number of employees
- salary paid to CEO

This data will be read into parallel arrays.

The program will allow the user to enter the name of a company to find and display the difference between that company's CEO's salary and the highest paid CEO of all 100 companies.

The program will also find the highest number of employees employed by a single company, and the number of companies who employ within 10% of that figure.

Examples of the program outputs are shown below.

```
Enter the name of the company you would like to check:

Goldman
GameGo company has the highest paid CEO.
The Goldman CEO earns £222 817 less than the highest paid CEO.
```

```
The highest number of employees employed by a single company is 888.
11 companies employ within 10% of 888.
```

Assumptions

- the external file is current and updated regularly

Task 1: software design and development (part A)

1a Using the problem description, identify the missing functional requirements of the program.

(2 marks)

Input(s) ♦ Read the company name, number of employees and CEO salary from the file.
Process(es) ♦ Find the highest CEO salary. ♦ Search for the CEO salary for chosen company. ♦ Find the highest number of employees employed by a single company. ♦ Calculate how many companies employ within 10% of the highest number of employees.
Output(s) ♦ Display the name of the chosen company, the name of the company with the highest CEO salary and the difference between the two salaries or display "Company not found". ♦ Display the number of companies who employ within 10% of the highest number of employees.

♦ Check your answers carefully, as you cannot return to part A after you hand it in.
♦ When you are ready, hand part A to your teacher or lecturer and collect part B.

Candidate name_____ Candidate number_____

Task 1: software design and development (part B)

Your teacher or lecturer will provide you with a CSV file called 'companies.csv'.

The file has data for 100 companies.

Each line of the CSV file stores the company name, the number of employees and the CEO salary as shown below:

```
Fidelity,319,582235
iShares,853,523579
Aviragen,548,636367
Aviragen Therapeutics,501,630486
Southern,269,369821
Southern First,141, 791140
Southern First Bancshares,623, 304523
Goldman,440,850580
Nuveen,599,834853
…
```

Program top level design (pseudocode)

A top level design for the main steps of the program is shown below.

Steps 2 and 3 will call the same function to return the position of the highest value.

1	Read from file into parallel arrays.	OUT: company(), numEmployees(), ceoSalary()
2	Find and display the difference between the chosen company's CEO salary and the highest CEO salary.	IN: company(), ceoSalary()
3	Find and display the highest number of employees employed by a single company, and the number of companies who employ within 10% of that figure.	IN: numEmployees()

1b Using a recognised design technique, design a function called `findMaxPos` that will return the **position** of the highest value in an array. This function will be used in steps 2 and 3 of the program.

(4 marks)

- Check your answers carefully, as you cannot return to part B after you hand it in.
- When you are ready, hand part A to your teacher or lecturer and collect part C.

Candidate name_____ Candidate number_____

Task 1: software design and development (part C)

A top level design for the main steps of the program (with partial refinements) is shown below.

1	Read from file into parallel arrays.	OUT: company(), numEmployees(), ceoSalary()
2	Find and display the difference between the chosen company's CEO salary and the highest CEO salary.	IN: company(), ceoSalary()
3	Find and display the highest number of employees employed by a single company, and the number of companies who employ within 10% of that figure.	IN: numEmployees()

Refinements

```
2.1     Ask user to enter the name of chosen company
2.2     Set found to false
2.3     Call findMaxPos function to return the position of highest CEO salary
2.4     Loop for company array
2.5         If current company is the chosen company
2.6             Set found to true
2.7             Set position to current index
2.8         End if
2.9     End loop
2.10    If chosen company name is in list
2.11        Subtract and store chosen company's CEO salary from highest CEO salary
2.12        Display message containing name of company with highest CEO salary, name
            of chosen company, and difference in salaries
2.13    Else
2.14        Display "Company not found"
2.15    End if
```

```
3.1     Call findMaxPos function to return position of highest number of employees
3.2     Set count to 0
3.3     Loop for numEmployees array
3.4         If current employees is greater than or equal to maximum employees*0.9
3.5             Set count to count + 1
3.6         End If
3.7     End Loop
3.8     Display message showing number of companies that employ within 10% of the
        highest number of employees
```

1c Using the problem description and design, implement the program in a language of your choice.

You should:

- use a single function to find and return the position of the highest CEO salary, and the position of highest number of employees
- use procedures to:
  - read data from the 'companies.csv' file to parallel arrays
  - find and display the difference between the chosen company's CEO salary and the highest CEO salary
  - find and display the highest number of employees employed by a single company, and the number of companies who employ within 10% of that figure.
- test your program by using the chosen company Goldman

(15 marks)

Print evidence of:

- your program code
- program outputs from 1(c)

Include your name and candidate number on all evidence.

1d Step 2 of the program is tested with the following sample test data.

```
Grap,724,375000
Ver,163,1031000
Meto,728,816000
TelTo,252, 1031000
Selop,555,842000
Sever,307,569000
Lehar,805,564000
EastA,401,320000
```

(i) The refinement at 2.12 is shown below:

2.12 Display message containing name of company with highest CEO salary, name of chosen company, and difference in salaries.

Explain why the output from the refinements provided for step 2 would be incorrect if the sample test data was used with Selop as a chosen input.

(1 mark)

(ii) Describe the additional refinements that would be required before step 2.12 to ensure that the correct company name(s) are found.

(2 marks)

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1e Evaluate the efficiency of your own program, with reference to the use of the `findMaxPos` function.

(1 mark)

Candidate name_____ Candidate number_____