Task 1: software design and development (part A)

Problem description

During the month of September, West Fife Walkers asked their walkers to enter sightings of different Scottish mammals into an existing app. When the user selects the 'add sighting' button, the app checks the data is valid and either:

♦ adds the valid sighting as a new line in a single text file stored on a server

or

♦ responds with an error stating the inputs are missing or invalid
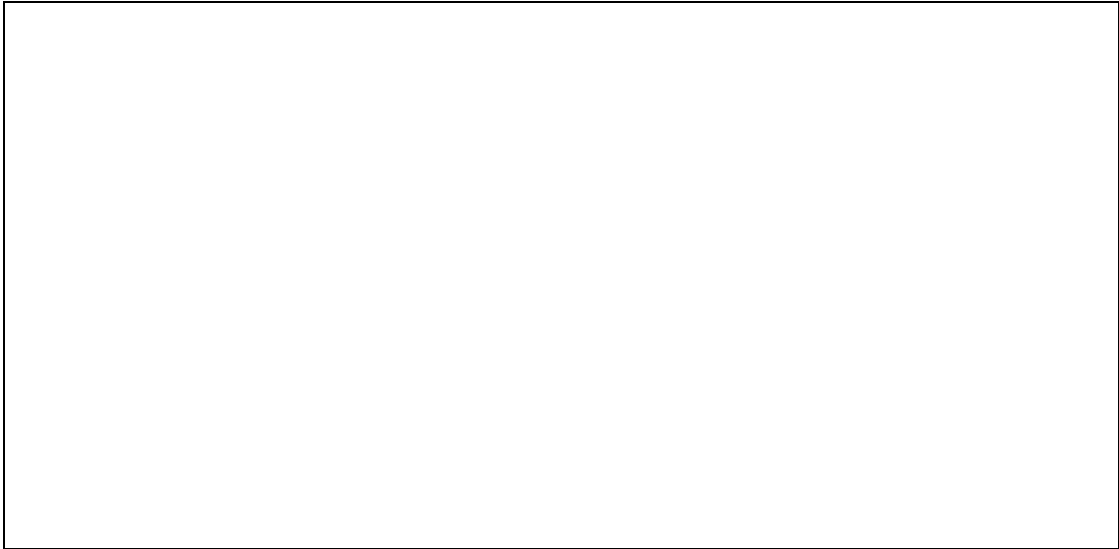
The app's user interface is shown below.

Purpose

A program is now required to analyse the data stored in the text file. The program should:

♦ display the age of the oldest person to add a sighting
♦ display the dates of sightings of a chosen mammal in a particular town
♦ count and display the number of sightings for each date in the text file.

1a   State two assumptions that can be made about the data in the text file.

(2 marks)

Candidate name_____ Candidate number_____

1b Your teacher or lecturer will provide you with a text file called 'mammals.txt'.

♦ The text file has data for 200 sightings in September
♦ Each line of the text file stores the nearest town to the sighting, the name of the mammal seen, the date of sighting and the age of the walker, as shown below:

```
Saline,Rabbit,01/09/21,79
Culross,Squirrel,01/09/21,42
Dunfermline,Hedgehog,01/09/21,55
Kincardine,Rabbit,01/09/21,41
Dunfermline,Squirrel,01/09/21,89
Crossford,Squirrel,01/09/21,24
Culross,Squirrel,03/09/21,94
Saline,Squirrel,03/09/21,28
…
```

♦ The sightings in the text file are sorted in order of date from 01/09/21 to 30/09/21.

A top-level design for the main steps of the sightings program is shown below. Data read from the text file is stored in an array of records in the program.

Program top-level design (pseudocode)

1	Read from text file into sightings array of records	OUT: sightings(town,mammal,date,age)
2	Find and display the age of the oldest walker in the sightings data	IN: sightings(town,mammal,date,age)
3	Find and display the dates of sightings of a chosen mammal in a particular town	IN: sightings(town,mammal,date,age)
4	Count and display the number of sightings for each date in the text file	IN: sightings(town,mammal,date,age)

Refinements for step 3 of the design are shown below.

3.1	Ask user to enter town
3.2	Call a function to return a string input that starts with an upper-case character
3.3	Ask user to enter mammal
3.4	Call a function to return a string input that starts with an upper-case character
3.5	Display "The dates of sightings were:"
3.6	Start loop for each sighting in array of records
3.7	If sighting matches entered town and mammal then
3.8	Display date
3.9	End if
3.10	End loop

Steps 3.1 and 3.3 indicate that the user enters a string. These two inputs will be compared with the file data in step 3.7.

The town and mammal values stored in the text file all start with an upper-case character. If the user enters a string starting with a lower-case character a logic error will occur as the comparison at step 3.7 will not find a match.

Using a design technique of your choice, design the function that could be used in both steps 3.2 and 3.4 to convert the user's inputs to strings that start with an upper-case character.

(4 marks)

Candidate name_____ Candidate number_____

- ♦ 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.

Task 1: software design and development (part B)

A top-level design for the main steps and partial refinements of the sightings program is shown below. Data read from the text file is stored in an array of records in the program.

Program top-level design (pseudocode)

1	Read from text file into sightings array of records	OUT: sightings(town,mammal,date,age)
2	Find and display the age of the oldest walker in the sightings data	IN: sightings(town,mammal,date,age)
3	Find and display the dates of sightings of a chosen mammal in a particular town	IN: sightings(town,mammal,date,age)
4	Count and display the number of sightings for each date in the text file	IN: sightings(town,mammal,date,age)

Refinements

3.1   Ask user to enter town
3.2   Call a function to return a string input that starts with an upper-case character
3.3   Ask user to enter mammal
3.4   Call a function to return a string input that starts with an upper-case character
3.5   Display "The dates of sightings were:"
3.6   Start loop for each sighting in array of records
3.7   If sighting matches entered town and mammal then
3.8   Display date
3.9   End if
3.10 End loop

Refinement of function for steps 3.2 and 3.4

Set firstChar to ASCII value of first character in string
If the firstChar is between 97 and 122 then
     Set firstChar to firstChar –32
     Set string to concatenation of the new first character and the remaining string
End if
Return the string

4.1   Set dayToCount to first date in sightings array
4.2   Set count to 1
4.3   Start loop from second record to end of sightings array
4.4   If date in current record is the same as dayToCount then
4.5   Add 1 to count
4.6   Else
4.7   Display dayToCount and count
4.8   Set dayToCount to date in current record
4.9   Set count to 1
4.10   End if
4.11 End loop
4.12 Display dayToCount and count

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

- ♦   use a procedure to:
  - — read data from the file to an array of records
  - — find and display the age of oldest walker
  - — find and display dates of sightings
  - — count and display sightings for each date in the file
- ♦   use a function to validate upper-case characters
- ♦   be maintainable and modular
- ♦   follow the design and the refinements provided

(15 marks)

Print evidence of:

- ♦   your completed program code
- ♦   your output showing the number of sightings for each date in the text file.

Include your name and candidate number on all evidence.