7. An app uses three selected letters from a user's password to help identify a user when logging in. An example is shown below.

> Please enter the letters requested from your password. For example, if your password was "London" and you are asked for letters 1, 3 and 5 then you should enter L, n, o

Letter 1	Letter 3	Letter 5
*	*	*

The top-level design for this part of the program is shown below.

1. Ask user for username and find password.

2. Generate three random positions within length of password.

3. Ask user for letters at generated random positions and check for a match.

(a) Complete the table below to show the missing data flow in steps 2 and 3. **2**

Step	IN/OUT	Data Flow
1	IN	
	OUT	password
2	IN	
	OUT	randPos1, randPos2, randPos3
3	IN	
	OUT	valid

(b) By considering the data flow in part (a), explain why it would be appropriate to make use of a function rather than a procedure for step 3. **1**

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[Turn over

7. (continued)

(c) Explain why the programmer refers to the data flow in the top-level design when implementing the code for the program.

1

7. (continued)

(d) The code for step 2 is shown below.

```
...
Line 45  PROCEDURE getLetters (STRING word, INTEGER first,
         INTEGER second, INTEGER third)
Line 46    DECLARE wordLength AS INTEGER INITIALLY length(word)
Line 47    SET first TO <random number from 1 to wordLength>
Line 48    SET second TO <random number from 1 to wordLength>
Line 49    SET third TO <random number from 1 to wordLength>
Line 50  END PROCEDURE
...
Line 60  getLetters(password,randPos1,randPos2,randPos3)
...
```

(i) Formal and actual parameters are used in the code above.

Identify one formal parameter and its **associated** actual parameter. **2**

Formal parameter _____

Actual parameter _____

(ii) State the scope of the variable wordLength. **1**

_____

_____

(iii) During testing it was found that users were asked for duplicate letters, for example asking for letters 1, 1 and 7 of their password.

Describe how the procedure could be altered to ensure three different letters are requested from the user. **2**

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[Turn over

7. (continued)

(e) Users log into the app and details are transferred securely.

Describe the role of public and private keys when transferring secure data.

2