



GCE AS

B500U20-1



MONDAY, 22 MAY 2023 – AFTERNOON

COMPUTER SCIENCE – AS component 2
Practical Programming to Solve Problems

2 hours 15 minutes

B500U201
01

INSTRUCTIONS TO CANDIDATES

Answer **ALL** of questions 1, 2, 3, 4 and 5.

You will need to record all of your answers to questions 1, 2, 3 and 4 in a **single** word-processed document.

Answer only **ONE** section of question 5. This is the section which requires you to use the Integrated Development Environment (IDE) of your chosen programming language.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

The total number of marks available is 60.

You will need a computer with an installed functional copy of the Integrated Development Environment (IDE) appropriate to your chosen programming language and word processing software.

A calculator is allowed in this examination.

Remember to save your work regularly.

Scenario

SpringZone Trampoline Park



SpringZone Trampoline Park (SpringZone) is a medium sized, independent company which offers indoor trampolining for children. A booking requires authorisation from a responsible adult. **SpringZone** is required to store details of all adults who make bookings, and details of the children for whom they're responsible, in order to comply with health and safety requirements.

The manager of **SpringZone** has decided to commission a new computerised system to store details such as first name, surname and contact details.

The main relationships of the system are:

- An adult may be linked to many children.
- A child is always linked to at least one adult.

You have been commissioned to develop a prototype computer system.

1. **SpringZone** would like to create an entity relationship diagram for the main relationships in the system. Referring to the scenario, create an entity relationship diagram for the system. Clearly indicate any primary or foreign keys. [8]

2. **SpringZone** has decided to store adults' details in a database table. Referring to the scenario, copy and complete the following data structure table. [5]

Fieldname	Key field (Yes/No)	Data Type	Field Length	Validation

3. **SpringZone** customers (adults) provide a completed registration form to the receptionist. The receptionist provides a confirmation receipt to the customer. The receptionist also forwards a copy of the registration form to the health and safety officer. The health and safety officer provides an acknowledgement receipt to the receptionist.

Represent the system described above in an appropriate diagrammatic form showing the flow of data. [7]

4. (a) **SpringZone** stores the prices for booking time within the trampoline park in an array. The prices are calculated depending on how busy the time of year traditionally is for bookings. **SpringZone** uses an algorithm to populate the array. The algorithm also provides a discount for longer bookings. (For parties etc.)

```

1  costArray[5,2] is real {array to use}
2  bookingLength is integer
3  timeOfYear is integer
4  bookingPrice is real
5
6  output "Please enter time of year:"
7  input timeOfYear
8
9  for i = 0 to 5
10   costArray [i,0] = i + 1
11   costArray [i,1] = (i * 0.1) * timeOfYear
12 next i
13
14 output "Please enter the booking length:"
15 input bookingLength
16
17 bookingPrice = costArray[bookingLength,1]
18
19 discount = bookingLength * 0.1
20
21 output "Discount applied:"
22 output discount
23
24 bookingPrice = bookingPrice - discount
25
26 output "Cost for booking is:"
27 output bookingPrice
28

```

Copy and complete the table to show the outputs of the algorithm with the input
timeOfYear = 2

[8]

bookingLength:	discount:	bookingPrice:
1		
2		
3		
4		

(b) Each **SpringZone** customer (adult) is to be given a unique five-digit account number. This consists of a four-digit code and a check digit. To calculate the check digit an algorithm follows the following steps:

- Input the four-digit code one digit at a time.
- The four digits are added together to produce a single or double-digit number.
- The check digit is either:
 - the single digit produced, for example, 2124 gives the check digit 9
 - the last digit of the double-digit number produced, for example, 2546 gives 17, so the check digit is 7.

Using a recognised convention, design an algorithm to calculate the check digit. Your algorithm should be written using self-documenting identifiers. [8]

5. Select the programming language of your choice from section (a), (b) or (c) and answer **all** questions in your chosen section.

(a) **Visual Basic**

SpringZone wants a computer system to be developed using **Visual Basic** that will be used to:

- Store adult details.
 - Recall and count specific adult details.
- (i) Open the file **SpringZone**.
- Read through the code and familiarise yourself with its contents.
 - The file contains incomplete code, which is intended to allow **SpringZone** to store adult details in a file called “adultdetails.txt”.

Complete this code.

[8]

Remember to save the changes made to the file *SpringZone*.

- (ii) Create a new form that will allow **SpringZone** to:

- Input child details.
- Store the details on disk in a text file called child.txt.
- Confirm storage of the details.
- Retrieve specified details from disk.
- Navigate between the adult data entry form/program and this new form/program.

[12]

Save your work as *children*.

- (iii) Using the internal facility of the IDE, add annotation to your code from question 5(a)(ii) that would clearly explain your program to another software developer. [4]

Save your annotations in the same file as in 5(a)(ii) above.

(b) **Java**

SpringZone wants a computer system to be developed using **Java** that will be used to:

- Store adult details.
 - Recall and count specific adult details.
- (i) Open the file **SpringZone**
- Read through the code and familiarise yourself with its contents.
 - The file contains incomplete code, which is intended to allow **SpringZone** to store adult details in a file called “adultdetails.txt”.

Complete this code.

[8]

Remember to save the changes made to the file *SpringZone*.

- (ii) Create a new form that will allow **SpringZone** to:

- Input child details.
- Store the details on disk in a text file called child.txt.
- Confirm storage of the details.
- Retrieve specified details from disk.
- Navigate between the adult data entry form/program and this new form/program.

[12]

Save your work as *children*.

- (iii) Using the internal facility of the IDE, add annotation to your code from question 5(b)(ii) that would clearly explain your program to another software developer. [4]

Save your annotations in the same file as in 5(b)(ii) above.

(c) **Python**

SpringZone wants a computer system to be developed using **Python** that will be used to:

- Store adult details.
 - Recall and count specific adult details.
- (i) Open the file **SpringZone**
- Read through the code and familiarise yourself with its contents.
 - The file contains incomplete code, which is intended to allow **SpringZone** to store adult details in a file called “adultdetails.txt”.

Complete this code.

[8]

Remember to save the changes made to the file *SpringZone*.

- (ii) Create a new form that will allow **SpringZone** to:

- Input child details.
- Store the details on disk in a text file called child.txt.
- Confirm storage of the details.
- Retrieve specified details from disk.
- Navigate between the adult data entry form/program and this new form/program.

[12]

Save your work as *children*.

- (iii) Using the internal facility of the IDE, add annotation to your code from question 5(c)(ii) that would clearly explain your program to another software developer. [4]

Save your annotations in the same file as in 5(c)(ii) above.

END OF PAPER