



GCE AS – **NEW**

B500U20-1



COMPUTER SCIENCE – AS component 2 Practical Programming to Solve Problems

FRIDAY, 9 JUNE 2017 – MORNING

2 hours 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	12	
2.	5	
3.	8	
4.	15	
5.	20	
Total	60	

B500U201
01

INSTRUCTIONS TO CANDIDATES

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

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.

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

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.

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Scenario

Marble Garden Centre



Marble Garden Centre sells plants and gardening equipment to the public. The manager of **Marble Garden Centre** has decided to commission a new computerised system to store details about the centre's products.

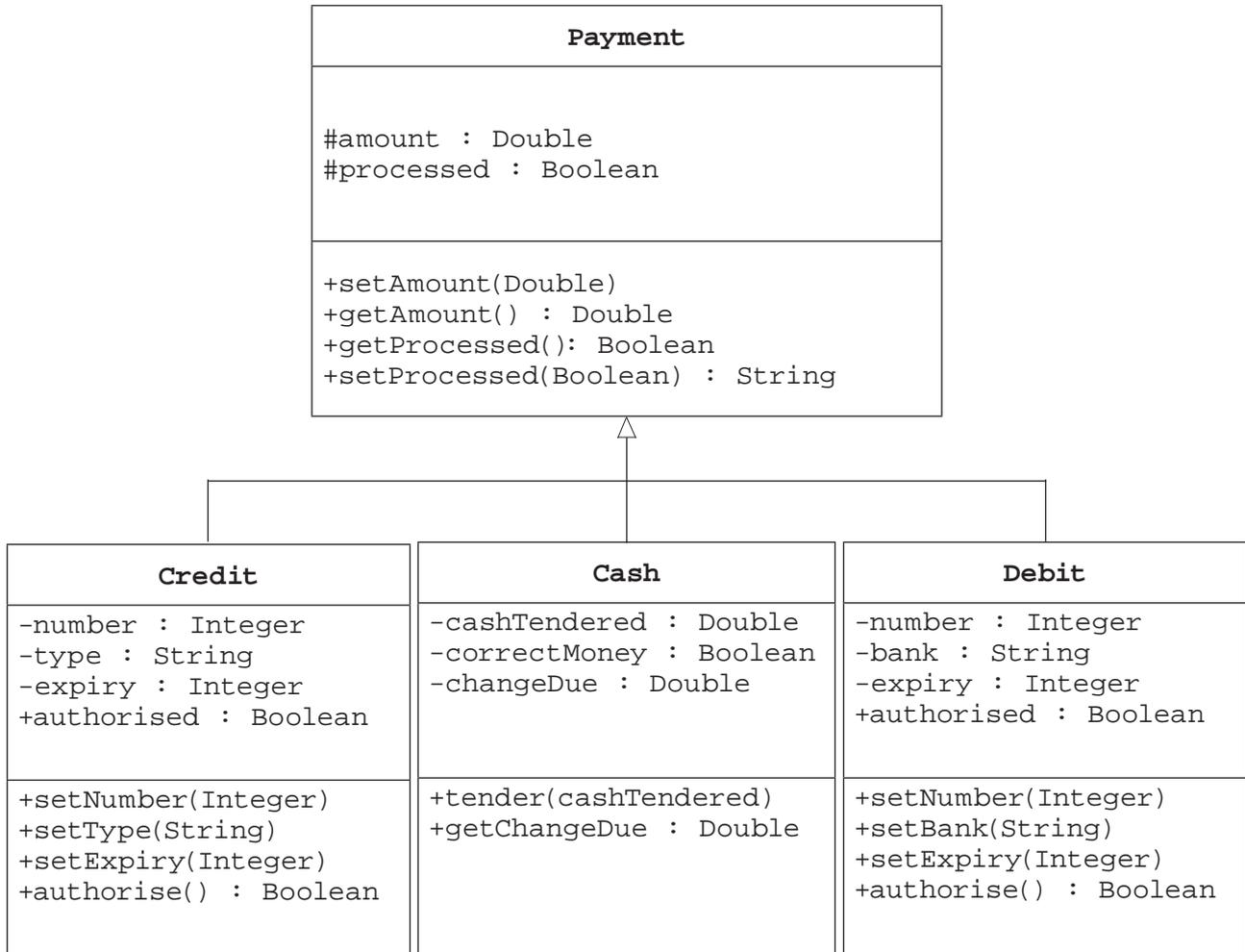
The garden centre would also like to start a customer loyalty programme and so would like to store customer details on the computerised system.

Marble Garden Centre already stores product details on an older system. These details include `productID`, `productLocation`, `productName`, `productDescription` and `productPrice`.

The garden centre intends to store customer details such as customer ID, first name, surname, postcode, date of birth and number of points collected.

You have been commissioned to develop a prototype computer system.

1. The following partially complete class diagram represents the relationships between some of the classes that **Marble Garden Centre** will need for their payment processing system.



- (a) State the name of an identifier for a subclass of `Payment`. [1]
- (b) State the return data type for the method `setProcessed`. [1]
- (c) State the name of the most appropriate identifier for a variable that is used to store the following:
- (i) `TRUE` [1]
 - (ii) `9.99` [1]
- (d) Explain the significance and implications of the `#` symbol in the attribute `#processed : Boolean` in the class `Payment`. [2]
- (e) An object called `transaction1` is instantiated from the class `Credit`.
Applying the concept of inheritance, list **all** of the methods that would be contained within the object `transaction1`. [2]
- (f) An object called `transaction2` is instantiated from the class `Cash`.
Applying the concept of inheritance, list **all** of the attributes that would be accessible within the object `transaction2`. [2]
- (g) Explain why the attribute `amount` is situated within the class `Payment`. [2]

Save your work for Question 1 as a word processed document named Question 1.

2. **Marble Garden Centre** has decided to store customer details in a database table. Copy and complete the following data structure table. [5]

Fieldname	Keyfield (Yes/No)	Data Type	Field Length	Possible Validation

Save your work for Question 2 as a word processed document named Question 2.

3. **Marble Garden Centre** is considering the best way to introduce the new computerised system. Describe two different methods of changeover available to the garden centre. Identify the most suitable method for this situation and give a reason.

Your answer should be related to the impact of these methods on customers and staff. [8]

Save your work for Question 3 as a word processed document named Question 3.

4. **Marble Garden Centre** tracks the growth of its plants carefully. They take measurements of the growth at regular intervals and enter the values into an algorithm. The algorithm outputs feedback on the measurements.

```

1   set cumulativeGrowth = 0
2   set count = 4
3   set currentReading = 1
4   set averageGrowth = 0
5
6   expectedGrowth = currentReading * 1.6
7
8   for i = 1 to count           {Begin a loop}
9     input currentReading
10
11    output "Expected Growth:" , expectedGrowth
12
13    cumulativeGrowth = cumulativeGrowth + currentReading
14    output "Cumulative Growth:" , cumulativeGrowth
15
16    averageGrowth = cumulativeGrowth / i
17    output "Average Growth:" , averageGrowth
18
19    if currentReading < expectedGrowth then
20      feedback = "Low Growth"
21      output "Feedback:" , feedback
22    end if
23
24    if currentReading > expectedGrowth then
25      feedback = "High Growth"
26      output "Feedback:" , feedback
27    end if
28
29    previousReading = currentReading
30    expectedGrowth = previousReading * 1.6
31
32  next i                       {next loop}
33
34  End

```

- (a) Copy and complete the table below showing the outputs of the algorithm for the inputs provided. Write your answers correct to one decimal place. [4]

currentReading	Expected Growth:	Cumulative Growth:	Average Growth:	Feedback:
2				
3				
5				
7				

- (b) Using a recognised convention, design an algorithm to help **Marble Garden Centre** control the temperature within one of its greenhouses.

The algorithm should repeatedly accept an input called `currentTemp`, the current temperature within the greenhouse in degrees Celsius ($^{\circ}\text{C}$).

The algorithm should attempt to maintain the temperature in the greenhouse between 20°C and 24°C .

- When the temperature rises above 24°C the algorithm should output “open the windows and deactivate heater”.
- When the temperature rises above 26°C the algorithm should output “activate fans”.
- When the temperature falls below 20°C the algorithm should output “de-activate fans and close windows”.
- When the temperature falls below 18°C the algorithm should output “activate heater”.

The algorithm should output the current temperature and average temperature each time a reading is taken.

If the temperature is above 50°C or below -20°C , the algorithm should output a message warning **Marble Garden Centre** that the temperature input is outside acceptable limits and terminate running.

Your algorithm should be written using self-documenting identifiers.

[11]

Save your work for Question 4 as a word processed document named Question 4.

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**

Marble Garden Centre wants a computer system to be developed using **Visual Basic** that meets the requirements outlined below:

- The ability to store customer details
 - The ability to search customer details
 - The ability to store product details
 - The ability to count the number of products in stock with particular attributes, e.g. the total number of “Roses” that are available.
- (i) Open the file product
- Read through the code and familiarise yourself with its contents
 - The file contains incomplete code, which is intended to save product details and return the number of items that match the search criteria entered.

Complete this code.

[4]

Remember to save the changes made to the file product

- (ii) Create a new form that will allow **Marble Garden Centre** to:

- Input customer details
- Validate customer details
- Store customer details on disc in a text file called customerdetails.txt
- Confirm storage of the details
- Retrieve specified customer details from disc.

[12]

Save your work as customerdetails

- (iii) Using the internal facility of Visual Basic, add annotated listings to your code from question 5(a)(ii) that would clearly explain the design of your program to another software developer.

[4]

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

(b) **Java**

Marble Garden Centre wants a computer system to be developed using **Java** that meets the requirements outlined below:

- The ability to store customer details
 - The ability to search customer details
 - The ability to store product details
 - The ability to count the number of products in stock with particular attributes, e.g. the total number of “Roses” that are available.
- (i) Open the file product
- Read through the code and familiarise yourself with its contents
 - The file contains incomplete code, which is intended to save product details and return the number of items that match the search criteria entered.

Complete this code.

[4]

Remember to save the changes made to the file product

- (ii) Create a new form that will allow **Marble Garden Centre** to:

- Input customer details
- Validate customer details
- Store customer details on disc in a text file called customerdetails.txt
- Confirm storage of the details
- Retrieve specified customer details from disc.

[12]

Save your work as customerdetails

- (iii) Using the internal facility of your chosen IDE, add annotated listings to your code from question 5(b)(ii) that would clearly explain the design of your program to another software developer.

[4]

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

(c) **Python**

Marble Garden Centre wants a computer system to be developed using **Python** that meets the requirements outlined below:

- The ability to store customer details
 - The ability to search customer details
 - The ability to store product details
 - The ability to count the number of products in stock with particular attributes, e.g. the total number of “Roses” that are available.
- (i) Open the file product
- Read through the code and familiarise yourself with its contents
 - The file contains incomplete code, which is intended to save product details and return the number of items that match the search criteria entered.

Complete this code.

[4]

Remember to save the changes made to the file product

- (ii) Create a new form that will allow **Marble Garden Centre** to:

- Input customer details
- Validate customer details
- Store customer details on disc in a text file called customerdetails.txt
- Confirm storage of the details
- Retrieve specified customer details from disc.

[12]

Save your work as customerdetails

- (iii) Using the internal facility of your chosen IDE, add annotated listings to your code from question 5(c)(ii) that would clearly explain the design of your program to another software developer.

[4]

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

END OF PAPER