GCE AS

B500U20-1

S18-B500U20-1

COMPUTER SCIENCE – AS component 2
Practical Programming to Solve Problems

FRIDAY, 8 JUNE 2018 – MORNING

2 hours 15 minutes

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 **single** 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

StarLight Coffee Shop

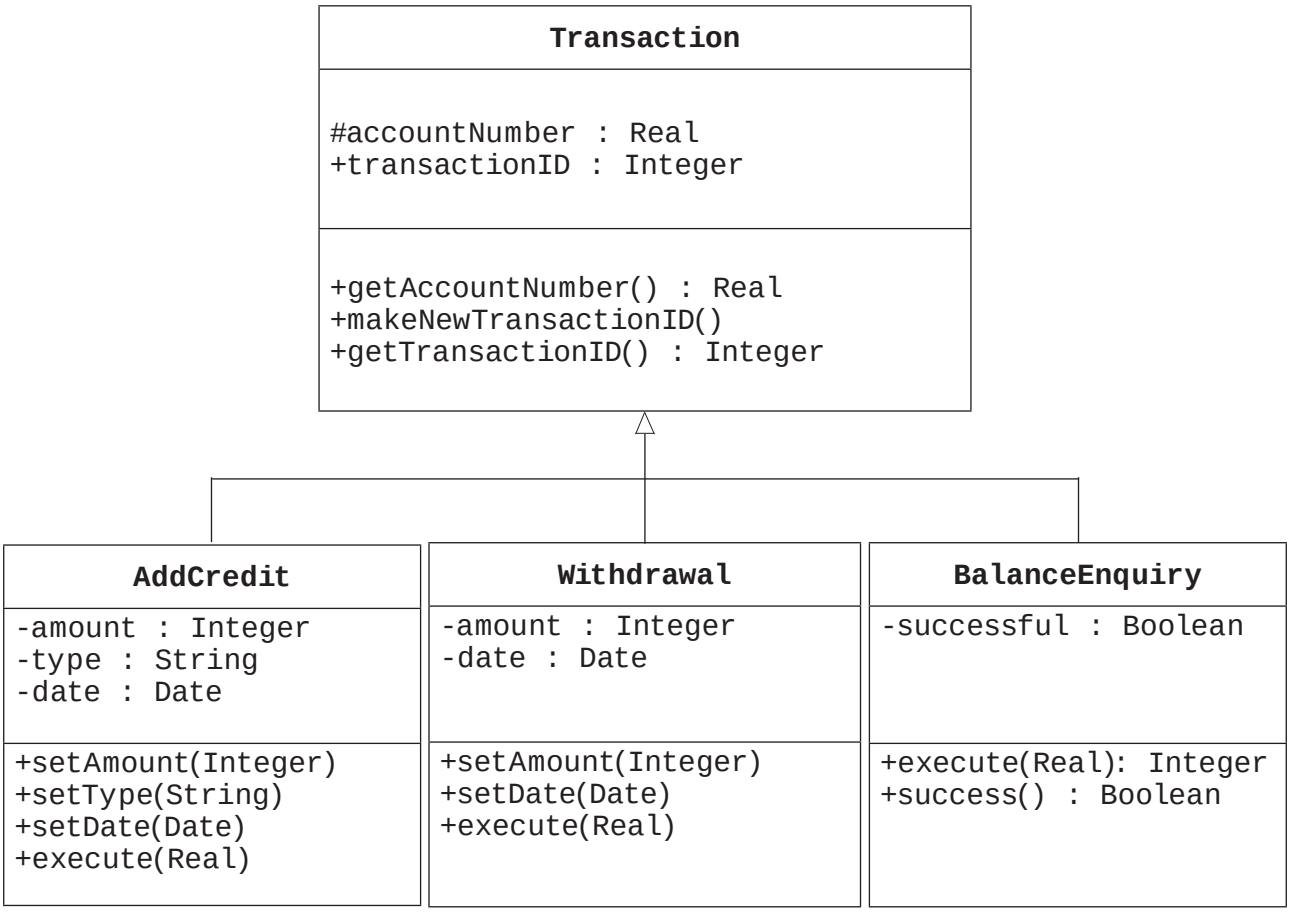
StarLight Coffee is a small independent retailer that sells coffee to take away or enjoy in its modern café setting.

The manager of **StarLight Coffee** has decided to start a loyalty scheme. The scheme will reward customers with loyalty points for purchases made. Customers who collect enough points will be able to trade these for cups of coffee.

The manager has decided to commission a new computerised system to record sales and manage the loyalty scheme. The system will need to store customers' details, such as customer account number, first name, surname, postcode and number of loyalty points collected.

You have been commissioned to develop the new computer system for **StarLight Coffee**.

1. The class diagram represents the relationships between some of the classes that **StarLight Coffee** will need for their customer loyalty scheme.



(a) State the name of an identifier for a subclass of `Transaction`. [1]

(b) The `execute` method always accepts a parameter.

(i) State the parameter data type for the method `execute`. [1]

(ii) One instance of `execute` returns a value. State the return data type for this `execute` method. [1]

(iii) State within which **subclass** the method `execute` returns a value. [1]

(c) State the name of the most appropriate identifier for a variable that is used to store the following:

(i) TRUE [1]

(ii) ”Coffee” [1]

(d) Explain the significance and implication of the + symbol in the attribute `+success() : Boolean` in the class `BalanceEnquiry`. [2]

(e) An object called `transaction1` is instantiated from the class `AddCredit`.

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 `Withdrawal`.

Applying the concept of inheritance, list **all** of the attributes that would be accessible within the object `transaction2`. [2]

(g) Explain why the attribute `accountNumber` is situated within the class `Transaction`. [2]

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

2. **StarLight Coffee** will need **a backup policy** and will need to consider different methods of backing up the customer data.

Explain the purpose of the backup policy and describe different methods **StarLight Coffee** could use for backing up its data. Your answer should include different secondary storage devices **StarLight Coffee** could use. [6]

Save your work for Question 2 in the word processed document named Answers.

3. **StarLight Coffee** have decided to incentivise the purchase of certain products by offering differing numbers of points for different products.

StarLight Coffee uses an array called `productPoints[]` to lookup the number of points for different products sold. Each product ID has a number of points per whole pound spent assigned to it. The algorithm below calculates and outputs data on the purchases.

```
1    productPoints[10,2] is real {array to use}
2    productID is integer
3    amountSpent is integer
4    numberOfPurchases is integer
5    subTotal is real
6    cTotal is real
7    set subTotal = 0
8    set cTotal = 0
9
10   for i = 0 to 9
11     productPoints[i,0] = i + 1
12     productPoints[i,1] = (i + 1) * 1.1
13   next i
14
15   output "Enter the number of purchases in this sale:"
16   input numberOfPurchases
17
18   for j = 1 to numberOfPurchases
19
20     output "Enter product ID"
21     input productID
22
23     output "Enter amount spent (£)"
24     input amountSpent
25
26     output "Points per product:"
27     output productPoints[productID, 1]
28
29     subTotal =  productPoints[productID, 1] * amountSpent
30
31     cTotal = cTotal + subTotal
32
33     output "Cumulative total:" + cTotal
34
35   next j
36
37   End
```

Copy and complete the table below showing the outputs of the algorithm for the inputs provided. When `numberOfPurchases` = 4 [8]

productID:	Amount spent (£):	Points per product:	Cumulative total:
3	3		
1	4		
4	2		
5	1		

Save your work for Question 3 in the word processed document named Answers.

4. **StarLight Coffee** has decided to award a 'pm bonus' to customers who purchase coffees during the afternoon.

Using a recognised convention, design an algorithm to help **StarLight Coffee** calculate 'pm bonus' awards.

The algorithm must allow a user to input a time in 24-hour format. The algorithm should:

- repeatedly accept an integer input called `currentFullTime`
- convert the time entered into the 12-hour format, followed by *am* or *pm*
- output if a bonus has been awarded
- if applicable, set a Boolean flag called `bonusAwarded` to `True`

For example:

If the user enters 0013, the program outputs: "12:13 AM No Bonus"
If the user enters 1834, the program outputs: "6:34 PM Bonus Awarded"

Your algorithm should be written in pseudo-code, using self-documenting identifiers. [12]

Save your work for Question 4 in the word processed document named Answers.

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**

StarLight Coffee wants a computer system to be developed using **Visual Basic** that meets the requirements outlined below**:**

- To store customer details
- To recall and count customers with specific details
- To calculate integer additions and subtractions in a simple calculator
- To store and recall calculations carried out on the calculator

(i) Open the file *coffeecustomer*
- Read through the code and familiarise yourself with its contents
- The file contains incomplete code, which is intended to allow **StarLight Coffee** to store and count customers with specific details

Complete this code. [4]

Remember to save the changes made to the file *coffeecustomer*

(ii) Create a new program that will allow **StarLight Coffee** to:

- Input whole integer numbers 1 to 9
- Carry out the addition (+) operator
- Carry out the subtraction (-) operator
- Display the result of either addition or subtraction on screen
- Store the last calculation result on disk in a text file called *calcmemory*
- Confirm storage of the result on screen
- Retrieve the last calculation result from disk [12]

Save your work as *coffeecalculator*

(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**

StarLight Coffee wants a computer system to be developed using **Java** that meets the requirements outlined below:

- To store customer details
- To recall and count customers with specific details
- To calculate integer additions and subtractions in a simple calculator
- To store and recall calculations carried out on the calculator

(i) Open the file *coffeecustomer*
- Read through the code and familiarise yourself with its contents
- The file contains incomplete code, which is intended to allow **StarLight Coffee** to store and count customers with specific details

Complete this code. [4]

Remember to save the changes made to the file *coffeecustomers*

(ii) Create a new form that will allow **StarLight Coffee** to:

- Input whole integer numbers 1 to 9
- Carry out the addition (+) operator
- Carry out the subtraction (-) operator
- Display the result of either addition or subtraction on screen
- Store the last calculation result on disk in a text file called *calcmemory*
- Confirm storage of the result on screen
- Retrieve the last calculation result from disk [12]

Save your work as *coffeecalculator*

(iii) Using the internal facility of **Java**, 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**

StarLight Coffee wants a computer system to be developed using **Python** that meets the requirements outlined below:

- To store customer details
- To recall and count customers with specific details
- To calculate integer additions and subtractions in a simple calculator
- To store and recall calculations carried out on the calculator

(i) Open the file *coffeecustomer*
- Read through the code and familiarise yourself with its contents
- The file contains incomplete code, which is intended to allow **StarLight Coffee** to store and count customers with specific details

Complete this code. [4]

Remember to save the changes made to the file *coffeecustomer*

(ii) Create a new form that will allow **StarLight Coffee** to:

- Input whole integer numbers 1 to 9
- Carry out the addition (+) operator
- Carry out the subtraction (-) operator
- Display the result of either addition or subtraction on screen
- Store the last calculation result on disk in a text file called *calcmemory*
- Confirm storage of the result on screen
- Retrieve the last calculation result from disk [12]

Save your work as *coffeecalculator*

(iii) Using the internal facility of **Python**, 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.

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