



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2015

Centre Number

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Candidate Number

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Software Systems Development

Unit AS1:

Introduction to Object Oriented Development



A1S11

[A1S11]

WEDNESDAY 20 MAY, AFTERNOON

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the space provided in this question paper.

Answer **all six** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

ADVICE TO CANDIDATES

You are advised to take account of the marks for each part question in allocating the available examination time.

For Examiner's use only			
Question	Marks available	Marks	Remark
1	12		
2	23		
3	21		
4	14		
5	18		
6	12		
Total	100		

1 True object-oriented programming requires objects to support three qualities: **encapsulation, inheritance and polymorphism**. With regard to an object-oriented programming environment, provide definitions of each of these terms.

(i) Encapsulation

(ii) Inheritance

(iii) Polymorphism

[12]

Examiner Only	
Marks	Remark

- 2 (a) Methods are the basic building blocks of structured software solutions and are widely used in object-oriented programs.

Give three advantages of their use.

(i) _____

(ii) _____

(iii) _____

_____ [3]

Examiner Only	
Marks	Remark

(b) A carpenter makes and sells a variety of garden sheds. Two sizes are constructed, **standard and deluxe**. The deluxe size costs 50% more than the standard size.

Sheds are available in the styles shown in the table below.

STYLE	COST(£) – excluding VAT standard size
S – square	120.00
R – rectangle	139.99
I – igloo	215.00
C – castle	349.99

Write a method, **findCost**, which passes two valid parameters and returns the **cost** of a shed. Apply VAT at a rate of 20%.

Parameters passed to the method :

- **style** of type char;
- **size** of type int (1- standard, 2 - deluxe).

Examiner Only	
Marks	Remark

[10]

Examiner Only	
Marks	Remark

[10]

Examiner Only	
Marks	Remark

3 A Credit Union offers loans to its existing customers. The base rate of interest is calculated according to the amount of the loan as shown below.

Loan amount (£)	Base Interest Rate %
up to 50000 inclusive	5.00
over 50000 and up to 150000 inclusive	5.25
over 150000	6.05

Note: If the customer requires the loan for 7 or more years the rate is reduced by 0.5%.

(a) Complete the design of the class called **Loan** shown below.

Ensure the creation of the:

- constructor method with fields;
- **GET** and **SET** (Properties / Methods) for the field **amount** only;
- **method** to determine the **actual rate** of interest charged to the customer.

```
class Loan{
    private    String    loanCode;
    private    double   amount;
    private    int      noOfYears;

    public Loan(){
        loanCode = null;
        amount = 0.0;
        noOfYears = 0;
    }
}
```

// field constructor

[4]

Examiner Only	
Marks	Remark

(b) In the class method **main()**, write the code that will instantiate an object named **aLoan** of type **Loan** and output the relevant actual rate of interest which applies to that object.

Assume the following variables have been declared and assigned values.

```
String    loanCode;  
double   amount;  
int      noOfYears;  
double   actualRate = 0.0;
```

(i) **Instantiate** the object **aLoan**

[3]

(ii) **Output actual rate of interest**

[2]

Examiner Only	
Marks	Remark

- 4 (a) It is important to ensure that software systems are robust and that users can recover from inadvertently causing a system crash. Exception Handling is a feature provided in object-oriented programming that allows errors to be trapped and caught or thrown.

Name one Exception that could be trapped when developing applications.

_____ [1]

- (b) Exception Handling makes use of **try / catch** blocks. Define the general structure of the try / catch block. Give a brief description of the purpose of each section.

_____ [5]

Examiner Only	
Marks	Remark

(c) With reference to the class Loan described in Q3:

```
class Loan{
    private String loanCode;
    private double amount;
    private int noOfYears;
```

A customised Exception has been designed for the class Loan as shown below.

Java

```
class LoanException extends Exception{
    //constructor
    public LoanException(String message)
    {
        super(message);
    }
}
```

C#

```
class LoanException : Exception{
    //constructor
    public LoanException(String message)
        : base(message)
    { }
}
```

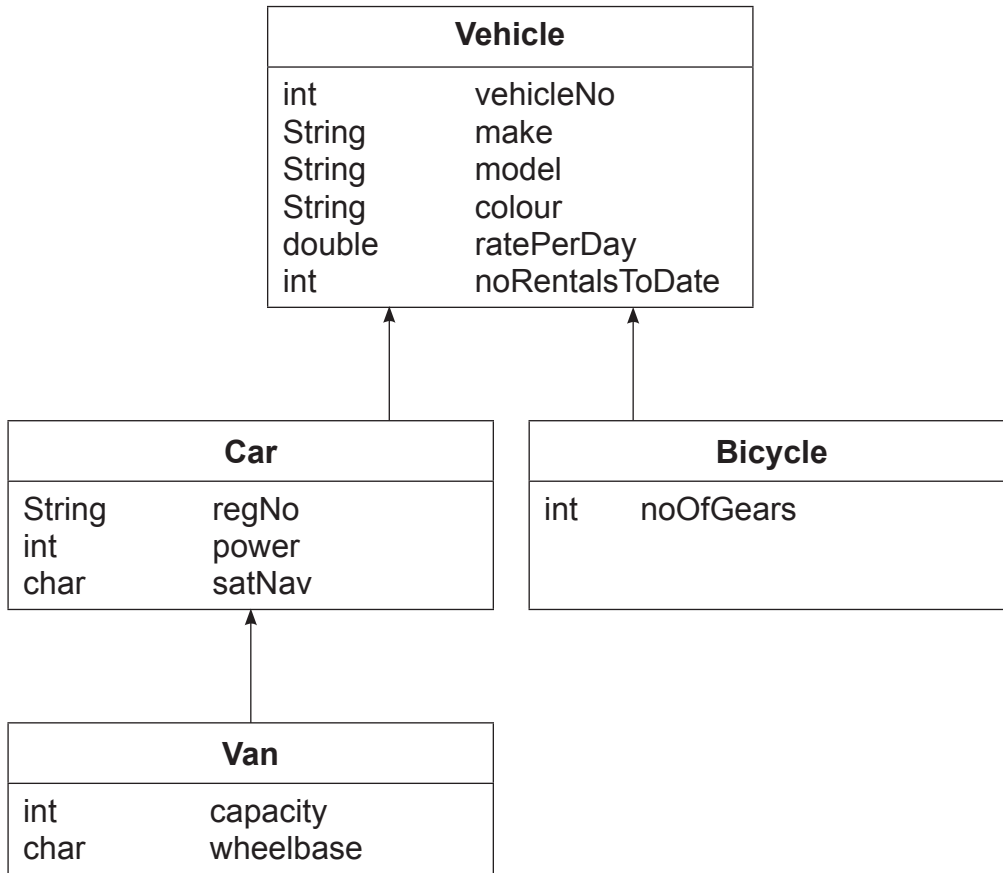
Write the **SET** (Property / Method) for the class Loan which will validate that the loan code has the format of two characters followed by six digits. Throw a LoanException if an invalid code is detected.

- The valid characters are CA, CI and MA.
- The digits must be in the range 100000 to 199999.

Examiner Only	
Marks	Remark

5 Green Rentals has a variety of vehicles for rent. As part of the vehicle rental system a data structure is required to allow details of cars, vans and bicycles to be handled.

Inheritance diagram for Green Rentals.



Assume the class **Vehicle** has been designed with the:

- field definitions;
- default and field constructors;
- GET and SET (Properties / Methods);
- toString() method.

Examiner Only	
Marks	Remark

(a) What modifier should be included in the class header, **class Vehicle**, to ensure that an object of type Vehicle **cannot** be instantiated?

[1]

(b) Write the code for a method, **calc_Income**, in the Vehicle class that will return the income from rentals to date.

Income is calculated as ratePerDay multiplied by noRentalsToDate

[3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(d) The income for a car or van is affected by the availability of a navigation system. This is indicated by the character code held in the field satNav. Green Rentals offers two types of navigation system that increase the ratePerDay charge by the percentage shown in the table below.

satNav code	% ratePerDay increase
A – not available	0
B – standard	4.0
C – deluxe	7.5

(i) Write the modified method, **calc_Income**, for the Car class that will calculate the appropriate income based on the satNav code.

(ii) Which object-oriented programming term is used to describe this modified method.

6 Green Rentals has 150 vehicles for rental.

(a) Define an array, **vehicleArray**, to hold the details of the vehicles.

[2]

(b) Populate `vehicleArray[0]` with sample details of a car.

[2]

(c) Write the code which will output the total income for Green Rentals.

[8]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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