



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2024

Centre Number

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Candidate Number

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# Software Systems Development

Unit AS 1

Introduction to Object  
Oriented Development



[SDV11]

\*SDV11\*

**FRIDAY 24 MAY, MORNING**

### TIME

2 hours.

### INSTRUCTIONS TO CANDIDATES

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

**You must answer the questions in the spaces provided.**

**Do not write outside the boxed area on each page or on blank pages.**

Complete in black ink only. **Do not write with a gel pen.**

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.

14306



\*20SDV1101\*

- 1 The following statements relating to an object-oriented environment are either true or false. Write the word **true** or **false** beside each statement in the table below.

| Statement   | True/False |
|---|------------|
| It is not possible to directly create an instance of an abstract class.   |            |
| Polymorphism facilitates the treatment of objects from various classes as instances of a shared base class.             |            |
| An interface in object-oriented programming provides a complete implementation of methods.                              |            |
| The primary purpose of encapsulation is to hide an object's internal members and show only essential functionalities.   |            |
| Method overloading allows you to define multiple methods in the same class with the same name but different parameters. |            |
| Encapsulation allows the functionality and data in a class to be randomly accessed by code outside the class.           |            |

[6]





2 A garden centre records all new plants on their system by entering a new six character code for each plant.

The code is made up as follows:

- the code starts with a #;
- followed by the first three letters of the plant name;
- followed by a number between 11 and 99 inclusive.

Write the method **PlantCode()** to indicate if a plant code is valid by returning true or false based on the input of the plant name and the plant code.

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[8]

[Turn over



- 3 A local cinema has six cinema screens, each showing various films throughout the week. A 2-dimensional array called **ScreenSales** has been designed to hold the sales data.

Each row of the array represents a cinema screen and each column represents the total number of full price and discounted price tickets sold for each cinema screen over one particular week.

The data is recorded over a weekly period and is reset to zero at the start of each week. A full price ticket costs £12 and a discounted ticket costs £5.50.

An example of the content of the array is shown below.

| Full price | Discounted price |
|------------|------------------|
| 245        | 200              |
| 254        | 243              |
| 300        | 167              |
| 500        | 164              |
| 176        | 265              |
| 198        | 300              |

- (a) Write the code to create the array **ScreenSales**.

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[3]









**(d)** The cinema has decided to expand and add an additional cinema screen, making a total of seven cinema screens.

Write the code to update the ScreenSales array to include seven cinema screens, ensuring all the current data is not lost. Sales for the new cinema screen must be set to zero for both full price and discounted price tickets.

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[5]

[Turn over

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\*20SDV1107\*

- 4 Solar Panels Belfast offers packages to supply and install solar panels for commercial businesses and private home owners. When a customer places an order, the order date is automatically set to today's date.

There are three package types available: Basic, Standard and Premium. Information about these packages is given below.

| Package Code | Package Name | Cost (excluding VAT) |
|--------------|--------------|----------------------|
| A            | Basic        | £4500                |
| B            | Standard     | £6900                |
| C            | Premium      | £10000               |

A class, **Order**, has been designed to hold data about an order.

```
public class Order{  
    private string customerName;  
    private bool businessCustomer;  
    private char packageCode;  
    private DateTime orderDate;
```

- (a) What principle of object oriented programming is used to ensure that class members can only be accessed from inside the class?

\_\_\_\_\_ [1]

- (b) Write the code for a parameterised / field constructor for the class Order.

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\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]





(c) Only orders placed by private home owners are charged VAT. VAT is calculated by increasing the package cost by 20%.

Write the class method **totalCost()** that will return the total amount for an order.

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[8]

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Solar Panels Belfast has a requirement to calculate the installation date based on a 4-month waiting period from the order date.

- (d) Write the class method called **InstallationDate()** that returns the installation date for an order.

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[4]





Solar Panels Belfast is expanding and is identifying areas where the company can supply and install solar panels.

The array **CurrentPostcodes** has been created to store the first part (outward code) of the postcodes in these areas. This part of the postcode identifies the area and district for delivery. Examples: BT24 or BT28

- (e) Write the method **checkPostcode()** that will check if a postcode passed to the method is covered by Solar Panels. The method should output a suitable message to the user.

*Assume that the client postcode is entered with a space after the outward code, eg. BT28 3RT or BT1 6FT*

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[7]

[Turn over



5 When developing software, basic testing techniques should be applied.

(a) Complete the following statements by inserting the appropriate words or phrases from the list given below.

- |              |                |             |              |
|--------------|----------------|-------------|--------------|
| constructors | format         | object      | range        |
| datatype     | initialisation | overloading | reused       |
| default      | lower          | parameters  | test data    |
| dependency   | methods        | presence    | upper        |
| failed       | modifiers      | properties  | verification |

In a program, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ should be tested to make sure they are properly defined. Methods used in a program can be tested and \_\_\_\_\_.

Validation of input data requires a number of different checks. Validation could include a \_\_\_\_\_ check to ensure that data has been entered. If data must be between an \_\_\_\_\_ and \_\_\_\_\_ limit a \_\_\_\_\_ check should be used. Sometimes data must follow a set pattern and a \_\_\_\_\_ check should be used in this case.

A test plan should be constructed for a piece of software to ensure testing has been conducted properly and so that \_\_\_\_\_ tests can be corrected.

[5]



(b) Complete the test plan below for a method – public static double calcWage(int hrs) which returns a wage using the following criteria:

- rate of pay for the first 35 hours worked is paid at £6.50;
- rate of pay for the next 8 hours additional is paid at 50% on top of the £6.50;
- rate of pay for any time over 42 hours is paid at double £6.50.

| Test number | Test data | Reason for test   | Expected outcome                | Outcome (description – only if different from expected) | Further development |
|-------------|-----------|---|---------------------------------|---|---------------------|
| 1           | hrs = ten | To ensure an integer is passed  | Error message appears on screen |   | none                |
| 2           |           | To check that a number below minimum value is not accepted  | Error message appears on screen | ✓   | none                |
| 3           | hrs = 25  | To check correct rate of pay is applied for valid hours up to and including 35  | Correct value appears on screen | Incorrect value appeared on screen                      |                     |
| 4           | hrs = 40  | To check correct rate of pay is applied for valid hours up to 35 and correct rate of pay for hours up to and including 42 |                                 | ✓   | none                |
| 5           | hrs = 44  |   | Correct value appears on screen | ✓   | none                |

[5]

[Turn over

14306



\*20SDV1113\*

- 6 Hillwalk Adventures is a centre that offers hillwalking experiences for customers. Each experience is rated as being at beginner, intermediate or experienced level and costs £25 per day. An optional pick up/drop off service is available at a cost of £8.

The centre also runs hill walking courses consisting of 2, 4, or 6 guided walks during which customers can learn about the local environment. The courses are charged at the hillwalking experience day cost, plus £15 for each set of 2 guided walks. A discount of 5% is applied if a customer buys 4 guided walks and 10% if they buy 6 guided walks. Discounts are applied automatically on completion of the booking.

Additionally, Hillwalk Adventures offers overnight mountain retreats. These are extended courses held at remote locations. The cost for the mountain retreat is £35 per night.

### Inheritance diagram for Hillwalk Adventures

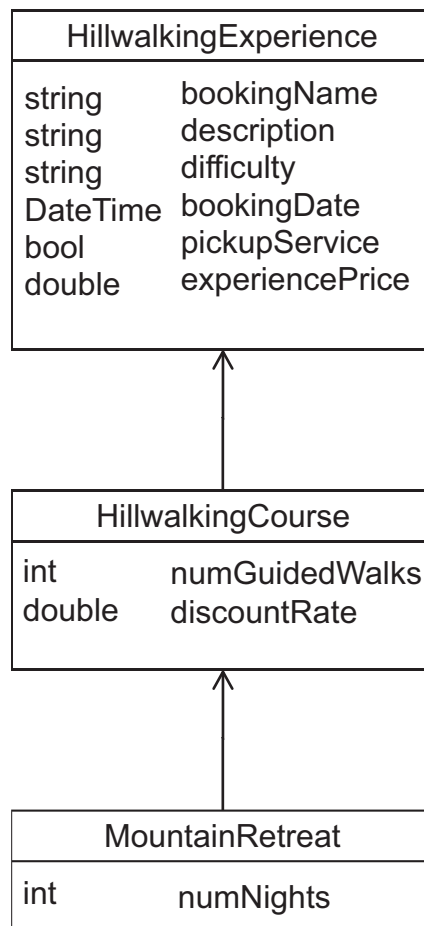


Fig. 1











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[11]

All classes in **Fig. 1** require a method called **CalculatePrice()**, to calculate the cost of each of the activities offered by Hillwalk Adventures.

(c) Write a method called **CalculatePrice()** for the class **HillwalkingExperience** to return the cost of the booking.

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[4]

(d) Write the method **CalculatePrice()** for the class **MountainRetreat** to return the cost of the booking.

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[4]

**[Turn over**



(e) Hillwalk Adventures is interested in increasing the experiences offered. To inform the decision making process, management requires statistical analysis on the current types of bookings. All booking experiences are stored in an array called **Experiences**.

Complete the following code for the method **BookingType()**.

The method should output the following:

- total number of bookings for each type of experience;
- the percentage of booking for each experience;
- the total income generated from all experiences.

*Assume the array is available globally.*

```
public void BookingType()  
{
```

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[11]

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**THIS IS THE END OF THE QUESTION PAPER**

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| <b>For Examiner's use only</b> |              |
|--------------------------------|--------------|
| <b>Question Number</b>         | <b>Marks</b> |
| 1                              |              |
| 2                              |              |
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**Examiner Number**

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