

## GCE Software Systems Development Specimen Assessment Material

For first teaching from September 2013

For first award of AS Level in Summer 2014

For first award of A Level in Summer 2015

Subject Code: 0610

# software systems development



# Foreword

CCEA has developed new applied specifications which comply with criteria for GCE qualifications. The specimen assessment materials accompanying new specifications are provided to give centres guidance on the structure and character of the planned assessments in advance of the first assessment. It is intended that the specimen assessment materials contained in this booklet will help teachers and students to understand, as fully as possible, the markers' expectations of candidates' responses to the types of tasks and questions set at GCE level. These specimen assessment materials should be used in conjunction with CCEA's GCE Software Systems Development specification.

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# GCE Software Systems Development

## Specimen Assessment Materials

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Subject Code	0610
QAN AS Level	600/8570/8
QAN A2 Level	600/8569/1
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**SPECIMEN PAPERS**  
**DIVIDER FRONT**

**SPECIMEN PAPERS**  
**DIVIDER BACK**





ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2014

Centre Number

71	
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Candidate Number

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## Software Systems Development

### Unit AS 1

### Introduction to Object Oriented Development

[CODE]

### SPECIMEN PAPER

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#### 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 spaces provided in this question paper.  
Answer **all** 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.

Quality of written communication will be assessed in **questions 2(a), 3(c) and 5(b)(iv)**.

For Examiner's  
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	

<b>Total Marks</b>	
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Answer **all** questions

- 1 Complete the following definitions within an Object Oriented Programming environment by inserting the appropriate term.

(a) *Encapsulation* means that a group of \_\_\_\_\_ properties, methods, and other members are treated as a \_\_\_\_\_ unit or object.

(b) *Inheritance* describes the ability to create \_\_\_\_\_ classes based on an \_\_\_\_\_ class with its \_\_\_\_\_ and \_\_\_\_\_.

[6]

- The quality of written communication is assessed in this question.*

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

Version 2: 8 May 2014

- (b) Using the given primitive data values, **double discount** and **double cost**, determine the output from the pseudocode below:

```
set cost = 200
if (cost less than 200)
    discount = cost * 0.1
else
    discount = cost * 0.25
endif
output discount
```

discount = \_\_\_\_\_

[1]

- (c) The call statement below is made to a function **void swap (int, int)** with the following data:

```
int x = 45 and y = 50
```

```
swap (arguments: x , y)
output x and y
```

```
void swap (parameters: int a, int b )
    int temp
    temp = a
    a = b
    b = temp
end function
```

The output is x = 45 and y = 50

- (i) Explain why the output is **not** x = 50 and y = 45.

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[2]

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**3 (a)** With reference to classes, analyse how the following modifiers facilitate the key object oriented concept of **data encapsulation**.

- [illegible]

Version 2: 8 May 2014

- (b) Object Oriented programming languages rely on the concept of inheritance.

Define inheritance in this context **and** give **two** advantages of the concept.

**Inheritance**

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**Advantage 1**

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**Advantage 2**

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[4]

- The quality of written communication is assessed in this question.*

[6]

## 4

Write the program code as required for the **two** methods given in (a) and (b).

(a) `int enterQtyStock(int min, int max)`

which will allow the user to enter a quantity of stock and validate it in the range min to max eg 10 to 50.

Your answer should include:

- Data declaration
- Prompt/Input statements
- Check for range
- Check for illegal characters/no entry
- Control of error message
- Return of quantity of stock

[illegible]





- (c) Write the code for the call statements to these methods in the class method **main( )** assuming the following variables have been declared:

```
int    qtyStock;  
String stockCode;
```

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[3]

5 An array is used to store a list of numbers as shown below:

6	21	17	11	76	9	2	91	13	42
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(a) Write the program code which will create **and** populate an array called **nums**, of type integer with this data.

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[4]

- (b) Consider the following code for the array **and** justify your answers to the questions below:

```
search (parameters: array nums, numRequired)

    loop x from 0 to size of array

        if ( nums[x] == numRequired )
            return x
        end loop
    return - 1
end function
```

- (i) What value is returned if numRequired is 11? \_\_\_\_\_ [1]

**Justification**

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[2]

- (ii) What value is returned if numRequired is 50? \_\_\_\_\_ [1]

**Justification**

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[2]

- (iii) Comment on why this arrangement would not be effective for a large array of numbers **and** indicate which changes you would recommend to improve the efficiency.

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[4]

- (iv) Discuss using a suitable example how the code derived from the pseudocode given above could be amended to enhance the search for the modified array in (iii).

*The quality of written communication is assessed in this question.*

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[6]

6 A record shop stocks music albums. Each album has the following attributes:

- Stock No (integer 1000 – 9000 )
- Name of recording artist (text 2-30 characters)
- Name of album (text 1- 30 characters)
- Price
- Quantity in stock

(a) Write the program code, that could be included in a class **Album**, to represent the following:

(i) Attributes defined.

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[5]

(ii) A default constructor for the Album object, which does **not** take any parameters.

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[2]

- (iii) A constructor for the Album object, which processes album information i.e. defines an album with specific details.

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[2]

- (iv) Get and set methods for the Stock No, and Name of album.

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[4]

- (v) A method **increaseStock(int)** to alter the stock levels whenever there has been a delivery.

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[2]

**(b)** For the class TestAlbum, write the sections of program code to:

- (i)** Create an instance **alb** of the class Album, using the default constructor written in your answer to part (a)(ii), on the previous page.

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[1]

- (ii)** Prompt the user to input the data for an album **and** use the set methods to set the attributes for the objects.  
(No validation required).

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[6]



(iii) For a delivery assume the following data has been input:

album No		into	albumNoDel
the quantity delivered	into	qtyDel	

Write code to call the method **increaseStock(int)** to increment the quantity in stock of the relevant album, alb, or display an appropriate error message.

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[3]

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

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## A2 2 IMPLEMENTING SOLUTIONS – ASSESSMENT CRITERIA AND MARK BANDS

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>AO1</b>	<b>Marks ([1]–[2])</b>  Candidate demonstrates basic knowledge and understanding of project management techniques. This is evidenced by the provision of a basic project plan outlining some tasks, resources and timescales using a suitable method.	<b>Marks ([3]–[5])</b>  Candidate demonstrates satisfactory knowledge and understanding of project management techniques. This is evidenced by the provision of a satisfactory project plan containing relevant tasks, resources and timescales using a suitable method.	<b>Marks ([6]–[8])</b>  Candidate demonstrates good knowledge and understanding of project management techniques. This is evidenced by the provision of a detailed project plan showing most of the necessary tasks, resources and timescales using suitable software.	<b>Marks ([9]–[10])</b>  Candidate demonstrates excellent knowledge and understanding of project management techniques. This is evidenced by the provision of a comprehensive project plan showing the full range of tasks, resources and timescales using relevant software.	<b>10 marks available</b>
	Candidate demonstrates basic knowledge and understanding of the need to adopt a suitable approach to the solution. This is evidenced by the identification of a possible approach to the solution.	Candidate demonstrates satisfactory knowledge and understanding of the need to adopt a suitable approach to the solution. This is evidenced by the identification of some approaches to the solution.	Candidate demonstrates good understanding of the need to adopt a suitable approach to the solution. This is evidenced by the clear identification of a range of approaches to the solution.	Candidate demonstrates excellent knowledge and understanding of the need to adopt a suitable approach to the solution. This is evidenced by the clear identification of a range of approaches to the solution.	

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>AO1 (cont.)</b>	<p>Candidate demonstrates basic knowledge and understanding of User Requirements. This is evidenced by the provision of a basic unstructured list of possible requirements. The User Requirements list may not relate appropriately to the outcome of research of the problem.</p>	<p>Candidate demonstrates satisfactory knowledge and understanding of User Requirements. This is evidenced by the provision of a User Requirements specification that is structured and contains some of the necessary elements. The User Requirements specification relates to the outcomes of research of the problem.</p>	<p>Candidate demonstrates good knowledge and understanding of User Requirements. This is evidenced by the provision of a detailed User Requirements specification that is properly structured and contains all necessary elements. The User Requirements specification will relate clearly to the outcomes of research of the problem.</p>	<p>Candidate demonstrates excellent knowledge and understanding of User Requirements. This is evidenced by the provision of a comprehensive User Requirements specification that is very well structured and contains all necessary elements. The User Requirements specification will relate explicitly to the outcomes of research of the problem.</p>	
	<p>Candidate demonstrates basic knowledge and understanding of a documented design. This is evidenced by the production of a basic design specification that makes some reference to the solution in terms of a suitable data model, structure, input specifications, processes, output specifications, screen designs and report specifications.</p>	<p>Candidate demonstrates satisfactory knowledge and understanding of a documented design. This is evidenced by the production of a satisfactory design specification that refers appropriately to a suitable data model, structure, input specifications, processes, output specifications, screen designs and report specifications.</p>	<p>Candidate demonstrates good knowledge and understanding of a documented design. This is evidenced by the production of a detailed design specification that includes a viable data model, structure, input specifications, processes, output specifications, screen designs and report specifications.</p>	<p>Candidate demonstrates excellent knowledge and understanding of a documented design. This is evidenced by the production of a highly detailed design specification that includes a valid data model, structure, input specifications, processes, output specifications, screen designs and report specifications.</p>	

	The design shows limited evidence of testing.	The design shows some evidence of testing.	The design shows detailed evidence of testing.	The design shows comprehensive evidence of testing.	
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Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
AO2	<b>Marks ([1]-[6])</b>  Candidate demonstrates basic application of knowledge and skills to the solution of the problem using a RDMS.	<b>Marks ([7]-[12])</b>  Candidate demonstrates satisfactory application of knowledge and skills to the solution of the problem using a RDMS.	<b>Marks ([13]-[18])</b>  Candidate demonstrates good application of knowledge and skills to the solution of the problem using a RDMS.	<b>Marks ([19]-[24])</b>  Candidate demonstrates excellent application of knowledge and skills to the solution of the problem using a RDMS.	<b>24 marks available</b>
	This is evidenced by a limited solution to the specified problem with a basic interface for using the application.	This is evidenced by a working solution to the specified problem that has a suitable user interface.	This is evidenced by a well-structured working solution to the specified problem that has a user friendly interface.	This is evidenced by a comprehensive working solution to the specified problem that has a good quality, user friendly user interface.	
	Candidate demonstrates basic application of knowledge and skills regarding the development and implementation of a solution to a single table using a suitable software tool.	Candidate demonstrates satisfactory application of knowledge and skills regarding the development of a solution to a working single table showing the ability to: add: delete: display and generate at least one working report.	Candidate demonstrates good application of knowledge and skills regarding the development of a working solution to multiply tables showing the ability to: add: delete: update and display related data from multiple tables. Candidate generates a report of related data demonstrating manipulation of data reported to a high standard.	Candidate demonstrates excellent knowledge and skills regarding the development of a solution to multiple tables showing the ability to: add: delete: update and display comprehensive related data from multiple tables. Candidate generates a report of related data demonstrating manipulation of data reported to a very high standard.	

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>AO2 (cont.)</b>	Candidate demonstrates basic application of knowledge and skills of the solution. This is evidenced by the production of a CD or alternative electronic media containing the code to create and populate the supporting database; the code used to develop the solution; and an instructional user guide.	Candidate demonstrates satisfactory application of knowledge and skills of the solution. This is evidenced by the production of a CD or alternative electronic media containing the code to create and populate the supporting database; the code used to develop the solution; and a useful instructional user guide.	Candidate demonstrates good application of knowledge and skills of the solution. This is evidenced by the production of a CD or alternative media containing the code to create and populate the supporting database; the code used to develop the solution; and a detailed instructional user guide.	Candidate demonstrates excellent application of knowledge and skills of the solution. This is evidenced by the production of a CD or alternative electronic media containing the code to create and populate the supporting database; the code used to develop the solution; and a highly detailed instructional user guide.	
	Candidate demonstrates basic application of knowledge and skills to the testing of the solution. This is evidenced by the production of a basic test plan.	Candidate demonstrates satisfactory application of knowledge and skills to the testing of the solution. This is evidenced by the production of a test plan and some representative sample test outcomes.	Candidate demonstrates good application of knowledge and skills to the testing of the solution. This is evidenced by the production of a detailed test plan and a range of representative sample test outcomes.	Candidate demonstrates excellent application of knowledge and skills to the testing of the solution. This is evidenced by the production of a comprehensive test plan and a detailed range of representative sample test outcomes.	

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>AO3</b>	<b>Marks ([1]–[4])</b>  Candidate demonstrates basic analysis and evaluation skills. This is evidenced by limited reference to the project plan, the tasks completed, the resources and the timescales.	<b>Marks ([5]–[8])</b>  Candidate demonstrates satisfactory analysis and evaluation skills. This is evidenced by relevant reference to the project plan, the tasks completed, the resources and the timescales.	<b>Marks ([9]–[12])</b>  Candidate demonstrates good analysis and evaluation skills. This is evidenced by detailed reference to the relationship between the tasks, resources and timescales contained in the project plan and refers to the impact of change.	<b>Marks ([13]–[16])</b>  Candidate demonstrates excellent analysis and evaluation skills. This is evidenced by highly detailed reference to the tasks, resources and timescales contained in the project plan. Candidate explains the impact of change on the project plan and the completion of the project.	<b>16 marks available</b>
	Candidate makes basic reference to the user requirements.	Candidate makes some reference to the user requirements and evaluates how they have been achieved.	Candidate makes detailed reference to the user requirements and clearly evaluates how they have been achieved.	Candidate makes very detailed reference to the user requirements and comprehensively evaluates how they have been fulfilled.	
	Candidate demonstrates basic analysis and evaluation of the range of possible approaches to the solution of the problem as well as a basic justification and explanation of the selected approach.	Candidate demonstrates satisfactory analysis and evaluation of the range of possible approaches to the solution of the problem as well as a justification and explanation of the selected approach.	Candidate demonstrates good analysis and evaluation of the range of possible approaches to the solution of the problem as well as a detailed justification and explanation of the selected approach.	Candidate demonstrates excellent analysis and evaluation of the range of possible approaches to the solution of the problem as well as a thorough justification and explanation of the selected approach.	



Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>A03 (cont.)</b>	Candidate provides basic evaluation of test procedures.	Candidate provides satisfactory evaluation of test procedures.	Candidate provides good evaluation of test procedures.	Candidate provides excellent evaluation of test procedures.	
	Candidate provides limited evaluative comment regarding the solution to the problem.	Candidate provides satisfactory evaluative comment regarding the solution to the problem.	Candidate provides good evaluative comment regarding the solution to the problem.	Candidate provides excellent evaluative comment regarding the solution to the problem.	
	Candidate demonstrates basic application of analysis and evaluation of the solution evidenced by the provision of a podcast.	Candidate demonstrates satisfactory application of analysis and evaluation of the solution evidenced by the provision of a podcast.	Candidate demonstrates good application of analysis and evaluation of the solution evidenced by the provision of a podcast.	Candidate demonstrates excellent application of analysis and evaluation of the solution evidenced by the provision of a podcast.	
	Candidate makes limited evaluative comment regarding their own performance throughout the development.	Candidate makes satisfactory evaluative comment regarding their own performance throughout the development.	Candidate makes detailed evaluative comment regarding their own performance throughout the development.	Candidate makes very detailed evaluative comment regarding their own performance.	
	Relevant material is poorly organised and presented with a lack of clarity and coherence.	Relevant material is sufficiently organised and presented with some clarity and coherence.	Relevant material is well organised and presented with a competent degree of clarity and coherence.	Relevant material is succinct, well organised and presented with a high degree of clarity and coherence.	

<b>Assessment Objective</b>	<b>Level 1 Basic</b>	<b>Level 2 Satisfactory</b>	<b>Level 3 Good</b>	<b>Level 4 Excellent</b>	<b>Total</b>
<b>A03 (cont.)</b>	Use of specialist vocabulary and spelling, punctuation and grammar is basic.	Use of specialist vocabulary and spelling, punctuation and grammar is satisfactory.	Use of specialist vocabulary and spelling, punctuation and grammar is good.	Use of specialist vocabulary and spelling, punctuation and grammar is excellent.	
<b>Total Marks Available</b>					<b>(50)</b>

**[0] is awarded for a response not worthy of credit.**



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2015**

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## **Software Systems Development**

Unit A2 1

Systems Approaches and Database Concepts

**Case Study**

**[CODE]**

**SPECIMEN**

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# **Pre-release Case Study**

### **Instructions to Candidates:**

The A21 Systems Approaches and Database Concepts examination is based on this pre-release Case Study.

You should familiarise yourself with the content of this pre-release Case Study.

You should not take this pre-release Case Study or any associated material into the examination with you.

A clean copy of this pre-release Case Study will be provided along with the question paper.

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**You must use this clean copy of the Case Study in the examination and not your own annotated copy.**

## **PerfectPrice**

The Price family has been in the retail trade for at least three generations. The business started as a corner shop owned by William Price, grandfather of the current owner Charlie Price. The success of the original shop was due to a number of factors. It provided a local service to the community, it stocked a good range of products at fairly competitive prices and customers always felt known and valued. Another feature of the shop was that it allowed customers to operate small credit accounts, once they were established as regular customers. As the business passed from father to son, these principles were upheld.

When Charlie took over the business from his father John in 1998, he realised that having a well stocked local shop was invaluable to people who needed the accessibility of somewhere near to their homes. He was also aware that many people did not want to use or travel to large supermarkets. Charlie relocated the shop to larger, better equipped premises and extended the product range based on local demand.

Being an astute business man, Charlie also began to see the possibility for expansion. With his brother Ed he researched other similar residential areas to determine the likely demand for the type of outlet he could provide. In 2005, he established a second shop in a suburb three miles from the current shop and in 2007 a third shop on the other side of town. Along with these developments based on his research, Charlie invested in two mobile shops that had particular routes worked out in rural areas with fewer retail resources. Charlie named the business PerfectPrice and made his brother Ed a partner. Profits have increased year on year and the business appears to be thriving.

When there was just one shop, all the procedures associated with its management were just about manageable. Charlie had a reasonably clear picture of his stock and ordering system, his profit, the money owed by customers availing of his credit facility, and his accounts. However, now that the business has grown considerably, the management of all of these things has become a serious problem. There are now 22 staff, employed to run the shops and vans, as well as a secretary and 4 cleaning staff. During opening hours throughout the week each shop has the following staff on rotas: a manager, store, counter and cleaning staff. The manager is responsible for the day to day running of the shop. The manager must report to Charlie and must oversee all staff schedules, money reconciliation and stock issues.

The manager must provide Charlie with daily details of staff hours worked as well as stock reports and till receipt summaries. This information is not always ready when it is required. The secretary must record all of the information and present it in a suitable format for Charlie. There is considerable pressure on the secretary to have everything ready when required. When any of the managers or the secretary are off sick, or on holiday, the work cannot be done and the system breaks down.

When there was just one shop, Charlie operated a very simple manual stock control system which he tried to extend to the new outlets and vans. This simply involved counting items in the storeroom and going to the Cash and Carry once a week to restock, or sending orders to other wholesalers and awaiting delivery.

When stock items were counted by the storeroom staff, the current totals were recorded in a notebook along with the date. Following this procedure Charlie would review the situation and either go to the Cash and Carry or see that order forms were created for the wholesalers. Charlie took on the ordering process himself. The order forms, designed by the secretary, were simple documents bearing the PerfectPrice name and logo and a basic layout for recording the date of the order and writing the item name, brief description and quantity required. Sometimes, because of the sheer volume of work, some orders were not placed at all.

As soon as new stock arrived, storeroom staff attempted to get it unpacked immediately to get shelves replenished. They were supposed to check that the delivery notes and the stock delivered matched correctly, but when they were busy this was not always done and it was assumed that the deliveries were accurate. Delivery notes were stored in a box file in no particular order. The secretary was meant to check delivery notes with the order made and update the notebook by crossing off the order. This frequently did not happen so, even if the amount delivered matched the delivery note, there was no guarantee that the delivery matched the original order. Sometimes when Charlie tried to check the notebook, the details of the original order were obscured because of the way it was crossed out.

Sometimes, when the full amount of a stock item was not delivered immediately, it either went unnoticed or, when the outstanding amount was supplied, there was confusion as to whether it was part of a new order or a mistake of some sort. The system was never totally accurate as on many occasions items were missed or totals were inaccurate.

These issues had a follow through impact on subsequent invoices and payments. The secretary was supposed to check invoices against orders and deliveries before payments could be issued. This was a tedious task and on many occasions discrepancies arose. This meant 'stock outs' and disputes over invoice amounts.

While these problems were manageable on a small scale, once the original shop expanded and the other two shops opened along with the mobile facilities, the whole stock system got out of control.

The mobile shops simply replenished their stock from whichever of the three outlets they were closest to at the end of the day. The van drivers were supposed to do a stock check on the van at the end of each day and record their requirements on a van stock request form which they gave in to their chosen outlet. While this might have worked, if it had been managed properly, what really happened was that the van driver, keen to finish his work and be ready for the morning, might not record his own stock position and simply pick up items from the outlet, leaving minimal information instead of adjusting the record for that day in the stock notebook.

As each new facility became available, Charlie thought he could extend the same procedures to each one and then centralise the overall ordering system on a weekly basis. It was his intention to collect all order requests and generate overall orders for the Cash and Carry and the wholesalers. He wanted to make one attempt at reordering each week and allocate the deliveries and update the records himself. He wanted to remain totally in charge of the whole process himself, so that he would know exactly what was going on.

This has become totally out of control and is beginning to impact on the business especially when items are out of stock. Order requirements are frequently confused between outlets and vans and many customers are very dissatisfied with the service provided because basic items might not be available. The counter staff are continually dealing with dissatisfied customers and are placed in a very difficult position, because they have no information regarding the stock position, as they have no way of knowing when an item of stock is unavailable or when it is likely to be delivered.

In addition, Charlie is now struggling to maintain his credit facility to customers. The customer base has increased significantly and he has had difficulty moving from his single operation to a multiple system, where sometimes payments are not recorded accurately and customers may not be reliable. The secretary is responsible for administering this system.

The original system in place simply recorded the customer name and address along with the dates and purchase value of the goods in the Customer Notebook. The Customer Notebook was checked daily and after two weeks the secretary would write out reminder notices and decline further credit if the amount outstanding exceeded £50. He now realises that many customers are in arrears and that he has not made them aware of their situation because he does not know himself.

Charlie did try to fix the situation by designing a range of forms to improve his record keeping for stock, orders and deliveries and customer records. He tried to get the manager in each shop and the delivery men to complete them as necessary. The system did not work efficiently however, as the forms were sometimes inaccurate, illegible, mislaid in transit and sometimes not completed at all. The movement of forms between premises was also problematic and delays frequently occurred in processing the orders.

Charlie and the secretary are frequently at odds with each other and there have been some unpleasant exchanges. He considers that she should be much more efficient and he does not fully appreciate the volume of work involved, especially now there are three outlets and two mobile vans. Recently the managers have complained as well about several matters including the fact that the procedures for restocking the vans are totally inappropriate and it is becoming very difficult to provide Charlie with all the information he needs.

It is becoming very difficult for Charlie to keep up with everything. He is aware that he must find a way of sorting out these problems before there is any further impact on the business. He believed he could develop a good manual system but has finally realised that this is not going to work. Charlie is prepared to pay for proper advice and realises that he now needs to bring his systems up to date with available technology. This will involve a significant investment but he wants the best possible outcomes.



**ADVANCED**  
**General Certificate of Education**  
**2015**

Centre Number

71

Candidate Number

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# **Software Systems Development**

## **Unit A2 1**

### **Systems Approaches and Database Concepts**

**[CODE]**

#### **SPECIMEN PAPER**

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**TIME**

2 hours

**INSTRUCTIONS TO CANDIDATES**

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

This paper is accompanied by a Pre-release Case Study. You must **not** use your own annotated copy of this Case Study.

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

Answer **all** 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. Quality of written communication will be assessed in **questions 3(b), 5(b) and 8(c)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
<b>Total Marks</b>	

Answer **all** questions

Charlie has decided to call upon the services of the consultancy firm SolveIT Solutions to assist him in finding solutions to his problems. SolveIT Solutions is a new company with modern ideas and have approached the situation with very clear ideas, positive thinking and up to date strategies. They have suggested a range of approaches to help Charlie.

- 1 The Systems Analysts at SolveIT Solutions are keen to involve Charlie and his staff in determining the correct way forward. They have started by asking PerfectPrice to identify users of the system, what their role is and why they might want to have a new system.

Complete the table below.

USER	ROLE AS USER OF THE CURRENT SYSTEM	WHY THIS USER MIGHT WANT A NEW SYSTEM
Charlie	[1]	[1]
[1]	[1]	This user might want a new system to relieve the pressure of work and maintain accurate information relating to delivery notes, orders and invoices.
[1]	This user uses the current system to manage staff schedules, money reconciliation and stock issues.	[1]

[6]



- 2 SolveIT Solutions offer a range of approaches to the solution of business problems. They have considered the possibility of using a methodology called Dynamic Systems Development Method (DSDM) in the development process. The analyst in charge has explained some key features of this methodology to Charlie and the managers in PerfectPrice. He wants to make sure they understand the principles he has explained and has asked them the following questions.

- (a) Complete the following table to show which of the following statements are true or false.

STATEMENT	TRUE/FALSE
In DSDM, user involvement is not encouraged.	
Products are delivered frequently throughout the development.	
Iterative development is encouraged throughout the development process.	
Changes during the development process are not reversible.	
Testing occurs at the end of the development process.	

[5]

- (b) An important feature of DSDM is a timebox.

Define what is meant by the term timebox.

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[1]

- (c)** In DSDM, the acronym MoSCoW is used to define the priorities of assigned requirements.

Discuss the term MoSCoW in the context of PerfectPrice.

[illegible]

- 3 (a)** SolveIT Solutions have experience in a range of methodologies and wish to highlight some characteristics of the Waterfall and Agile approaches to Charlie and Ed.

Complete the following table by inserting (✓) in the correct column to identify the approach which matches the characteristic.

Characteristics	Waterfall	Agile
Changing requirements are acceptable even late in the development cycle.		
The software product is built using a linear approach.		
The project can be assessed throughout the development lifecycle.		
Every phase of the project must be completed before the next can commence.		
Software is tested at the end of the development process.		

[5]

(Continue on next page)

- (b)** The analysts at SolveIT Solutions are keen to use an Agile method called SCRUM in the development process. They want to explain certain aspects of the methodology to Charlie and Ed.
- Discuss the application of an Agile method called Scrum to PerfectPrice including particular reference to the following:

Discuss the application of an Agile method called Scrum to PerfectPrice including particular reference to the following:

- The Scrum Team
- The Daily Scrum Meeting

*The quality of written communication is assessed in this question.*

[illegible]

- 4 The Systems Analysts at SolveIT Solutions have explained to Charlie and Ed that they must try to identify requirements of any proposed new system to assist the development process.

(a) What is a functional requirement? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [1]

(b) Give **two** examples of functional requirements at PerfectPrice.

(i) \_\_\_\_\_ [1]

(ii) \_\_\_\_\_ [1]

(c) What is a non-functional requirement? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [1]

(d) Give **two** examples of non-functional requirements at PerfectPrice.

(i) \_\_\_\_\_ [1]

(ii) \_\_\_\_\_ [1]

5 The analysts at SolveIT Solutions have indicated that any software developed will be completely error free as a result of thorough testing throughout the development lifecycle.

(a) Explain **one** possible consequence to PerfectPrice if the Software is **not** error free.

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[2]

(b) Discuss the types of testing that might be carried out on a system during its development. Your answer should include reference to the people likely to be involved **and** the phase of development being considered.

*The quality of written communication is assessed in this question.*

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[6]

- (c) A test plan is needed to test data within any new system. A possible structure of an ORDER table for a new system is shown below.

Field	Data type	Description	Required
Order Number	Number	This is the primary key and should consist of four digits	Yes
Shop name	Text	This should be a valid facility name	Yes
Supplier	Text	This should be a valid supplier name and exist in the supplier table	Yes
Date	Date/Time	A valid date which is less than or equal to today's date	Yes
Invoice total	Currency	This should be automatically calculated and be a total of the individual items ordered. The total should amount to more than £50	Yes

The table below shows orders which have been rejected by the new system.

Complete the table by giving a reason for the rejection of each order.

Order Number	Shop name	Supplier	Date	Invoice total	Reason for rejection
1001	Perfect Price	Makro	1/12/2012	£1000.00	
1005	Perfect Price	Makro	1/8/2011	£20.00	
102	Perfect Price	Makro	1/9/2011	£2000.00	

[3]

- 6 An option for Charlie is to implement a database system to keep track of the orders made to the cash and carry from each shop. The systems designer designed the following computerised form in order to record the order.

Each shop can generate many orders depending on demand. The same goods can be purchased by a number of different shops.

PerfectPrice Cash & Carry Order				
<b>Order Number</b>	027			
Shop	PerfectPrice 1			
Shop Address	Belfast branch			
Supplier	Wholesalers			
<b>Date</b>	1/October/2013			
<b>Item code</b>	<b>Description</b>	<b>Quantity</b>	<b>Item cost</b>	<b>Amount</b>
013	Skimmed Milk	50	£0.75	£37.50
024	White loaf	25	£1.00	£25.00
<b>Total</b>	£62.50			

- (a) Analyse the information above **and** produce an ER model that does **not** contain a many to many relationship.



[7]



**(b)** Complete the following statements.

**(i)** The rule for first normal form is

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

**(ii)** The rule for second normal form is

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

**(ii)** The rule for third normal form is

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

**(c)** Normalise the data in the order form to **third normal form** showing your working out at each stage.

[illegible]

- 7 (a) The system designer wishes to create a table in SQL that will store customer details.

The fields he wishes to include are:

```
customer_id
firstname
lastname
address1
address2
postcode
tel_no
customerjoindate
```

Generate a SQL statement to create these fields.

[illegible]

[6]

- (b)** When designing and creating tables, SQL Server requires the creation of table/field constraints as well as describing table fields (i.e. providing field names and setting data types).

Complete the following statements.

- (i)** A constraint is

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[1]

- (ii)** The function of a constraint is

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[1]

- (iii)** Types of constraints include

1 

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2 

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3 

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4 

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[4]

- (c)** State a constraint that should be included in the statement in 7(a), on the previous page, in order to complete the table definition.

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[1]

- 8** The Systems Analysts at SolveIT Solutions want Charlie and Ed to understand that the delivery of completed projects can sometimes be problematic.

**(a)** Give **two** examples of poor project management.

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[2]

**(b)** Discuss how the analysts could minimise the impact of poor management.

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[4]

- (c) The new project will involve the process of **planning** and **managing resources**.

Discuss the main features of the **two** processes, planning and managing resources, that will result in a successful project being achieved for PerfectPrice. Your answer should make reference to any factors that might constrain the development process.

*The quality of written communication is assessed in this question.*

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[12]

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

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# **MARK SCHEME DIVIDER FRONT**

**MARK SCHEME  
DIVIDER BACK**



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## **Software Systems Development**

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# **GENERAL MARKING INSTRUCTIONS**

## **General Marking Instructions**

### ***Introduction***

Mark schemes are intended to ensure that the GCE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses.

### ***Assessment objectives***

Below are the assessment objectives for GCE Software Systems Development:

Candidates must:

- demonstrate knowledge and understanding of concepts, systems approaches, and solutions relevant to software systems development (AO1);
- apply their knowledge and understanding to develop and implement solutions to the problems identified (AO2); and
- analyse and evaluate the concepts of software systems development and candidates' own performance in problem solving (AO3).

### ***Quality of candidates' responses***

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 17-year old or 18-year-old which is the age at which the majority of candidates sit their GCE examinations.

### ***Flexibility in marking***

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

### ***Positive marking***

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 17-year-old or 18-year-old GCE candidate.

### ***Awarding zero marks***

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

### ***Types of mark schemes***

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

### ***Levels of response***

Tasks and questions requiring candidates to respond in extended writing are marked in terms of levels of response. In deciding which level of response to award, examiners should look for the 'best fit' bearing in mind that weakness in one area may be compensated for by strength in another. In deciding which mark within a particular level to award to any response, examiners are expected to use their professional judgement.

### ***Quality of written communication***

Quality of written communication is taken into account in assessing candidates' responses to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of levels of response. The description for each level of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within levels of response as follows:

Level 1: Quality of written communication is basic.

Level 2: Quality of written communication is good.

Level 3: Quality of written communication is excellent.

In interpreting these level descriptions an example is provided below. Examiners should refer to the specific guidance given within the mark scheme for each question:

**Level 1 (Basic):** The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

**Level 2 (Good):** The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 (Excellent):** The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

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## **Software Systems Development**

**Unit AS1**

**Introduction to Object Oriented Development**

**[CODE]**

**SPECIMEN**

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**MARK  
SCHEME**



- 1 Complete the following definitions within an Object Oriented Programming environment by inserting the appropriate term.
- (a) *Encapsulation* means that a group of **related** properties, methods, and other members are treated as a **single** unit or object.
- (b) *Inheritance* describes the ability to create **new** classes based on an **existing** class with its **attributes** and **behaviours**.

Award [1] for each correct term.  
All other valid points will be given credit.

([1] x 6)  
(AO1)

[6]

[6]

- 2 (a) Discuss variables of **primitive type**, **reference type** and **static** in the context of a programming language. Give suitable examples.

#### Indicative content

Students should discuss the concept of a variable and consider the function of each type in particular circumstances. Students should note that variables of primitive type support the manipulation of numeric, character and logic values and that in this case, the variable holds the value. Examples include, integer, byte, short, float, double, Boolean char or other.

Students should note that variables of reference type are used to represent more complex values such as objects. These variables hold addresses of objects. Examples include, Strings, arrays, objects e.g. `IOStream`.

Students should note that the initial value of a static variable is the default value of the variable's type. With a static variable, only one copy of the class member exists. They should note that the class does not need to be instantiated for it to exist. An example could be to track the number of instances of class that are created (or appropriate).

All other valid points will be given credit.

**Level 1 ([1]–[3])****Overall Impression: Basic**

Candidate provides a basic discussion relating to the concept of variables and their function.

Basic knowledge and understanding of variables of primitive type, reference type and static in context of a programming language is displayed.

Basic examples are given.

The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary.

Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

**Level 2 ([4]–[6])****Overall Impression: Good**

Candidate provides a good discussion relating to the concept of variables and their function.

Good knowledge and understanding of variables of primitive type, reference type and static in context of a programming language is displayed.

Some good examples are given.

The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 ([7]–[8])****Overall Impression: Excellent**

Candidate provides an excellent discussion relating to the concept of variables and their function.

Excellent knowledge and understanding of variables of primitive type, reference type and static in context of a programming language is displayed.

Excellent examples are given.

The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

[0] is awarded for responses not worthy of credit.

(AO1), (AO3)

**[8]**

- (b) Using the given primitive data values, **double discount** and **double cost**, determine the output from the pseudocode below:

```
set cost = 200
if (cost less than 200)
    discount = cost * 0.1
else
    discount = cost * 0.25
endif
output discount
```

discount = \_\_\_\_50\_\_\_\_\_  
(AO2)

[1]

- (c) The call statement below is made to a function **void swap (int, int)** with the following data:

```
int x = 45 and y = 50
```

```
swap (arguments: x , y)
output x and y
```

```
void swap (parameters: int a, int b )
    Int temp
    temp = a
    a = b
    b = temp
end function
```

The output is x = 45 and y = 50

- (i) Explain why the output is **not** x = 50 and y = 45.

Arguments passed by value and are swapped locally in the function [1].

The original values remain unchanged [1].  
(AO2)

[2]

- (ii) Consider how the code could be changed to ensure the swap process is successful.

Pass the argument by reference [1]

Example `int &a` or `int &b` [1]

(AO3)

[2]

[13]

- 3 (a) With reference to classes, analyse how the following modifiers facilitate the key object oriented concept of **data encapsulation**.

Students should consider the different types of class noting the following points.

- **Private** is the key modifier which enables encapsulation by ensuring the integrity of variables/methods as they cannot be modified directly by other classes. For private, points could include - applied to class members, can be used directly only within the class.
- **Public** is the only modifier to allow limited access to methods by any other classes. These classes have access to data only as determined by the class. Other classes can modify data, only if criteria is met, as determined by the class. For public, points could include - applied to methods (not recommended for data), can be accessed by other classes also.
- **Protected** allows access to variables directly by its subclasses where other classes must gain access through public methods as determined by class. For protected, points could include - applied to class members, can be accessed only by hierarchy of derived classes.

Candidates should be awarded

[1] for Applied to class member or

[1] for can be seen only with one class

[2] for a correct analysis of each modifier.

All other valid points will be given credit.

[0] is awarded for a response not worthy of credit.

(3 x [2])

(AO1), (AO3)

[6]

- (b) Object Oriented programming languages rely on the concept of inheritance.

Define inheritance in this context **and** give **two** advantages of the concept.

**Inheritance Definition:** New derived class (subclass) from base class (superclass) [1].  
Takes on (inherits) attributes and behaviours of base class [1].

**Advantages:** Any **two** from:

- Reusability of code, modification of functionality required only in derived class testing required for derived class only.
- Greater reliability of structure.

Award [2] for correct definition and [1] for each correct advantage.  
All other valid points will be given credit.  
(AO1), (AO2)

[4]

- (c) Discuss the difference between method overloading and method overriding.

#### **Indicative content**

**Overloading:** Can use the same method name multiple times with only the passed arguments changed (return type does not apply) (within a class or hierarchy of classes) e.g. any suitable methods or constructors.

**Overriding:** Derived class can modify functionality of an inherited method.  
Use of 'new' word in derived class method of same name e.g. base method and derived method of same name and arguments with use of 'new' and modified method body.  
The difference is that for a sub class the overriding method has visibility.

All other valid points will be given credit.

**Level 1 ([1]–[2])****Overall Impression: Basic**

Candidate provides a basic distinction between method overloading and method overriding.

Basic knowledge and understanding is demonstrated of both method overloading and method overriding.

The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary.

Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

**Level 2 ([3]–[4])****Overall Impression: Good**

Candidate provides a good distinction between method overloading and method overriding.

Good knowledge and understanding is demonstrated of both method overloading and method overriding.

The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 ([5]–[6])****Overall Impression: Excellent**

Candidate provides an excellent distinction between method overloading and method overriding.

Excellent knowledge and understanding is demonstrated of both method overloading and method overriding.

The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

[0] is awarded for a response not worthy of credit.  
(AO1), (AO3)

[6]

[16]

**4** Validation of input data is an important aspect of programming.

Write the program code as required for the **two** methods given in (a) and (b).

**(a) int enterQtyStock(int min, int max)**

which will allow the user to enter a quantity of stock and validate it in the range min to max e.g. 10 to 50.

```
Function:  int enterQtyStock(parameters: int min, int max)
           initialise qty, flag and error message
           do
               set flag to true
               Prompt/ Input qty
               If( qty<min or qty> max or empty)
                   Output error message
                   Control of error message
                   set flag false
               End if
           Loop while flag is false
           Return stockQty
End function enterQtyStock
```

**Example of C# Code**

```

public static int enterQtyStock(int min, int max)
{
    int qty = 2;
    String errMess = "Invalid stock qty    Please re-enter range({0}- {1})
    bool ok = true;

    do
    {
        ok = true;
        try
        {
            Console.SetCursorPosition(5, 12);
            Console.Write("Enter Stock Number    range({0}- {1}) : ", min

            qty = Convert.ToInt32(Console.ReadLine());
            if (qty < min || qty > max)        // test range min - max
            {
                ok = false;
                Console.SetCursorPosition(5, 25);
                Console.Write(errMess);
            }
        }
        catch (Exception ex)
        {
            ok = false;
            Console.SetCursorPosition(5, 25);
            Console.Write(errMess);
        }
    } while (!ok);
    //clearErrMess();
    return qty;
}
}

```

All other valid responses will be given credit.

Answers should include:

- Data declaration [1]
- Prompt/Input statements [2]
- Check for range [2]
- Check for illegal characters/no entry [2]
- Control of error message [1]
- Return of StockQty [1]

(AO1), (AO2)

[9]



**(b) string enterStockCode( )**

which will allow the user to enter a StockCode and validate it for 2 characters followed by 3 digits.

The characters allowed are BL, FS, HJ, PX.

Assuming that the stock code has been entered as a string, write the **section of code** that will breakdown the code into its two parts e.g. BL and 100.

```
Function:  string enterStockCode(parameters: none)
           initialise str, letters, flag, num, and error message
           do
               set flag to true
               Prompt/ Input stockCode

               Split into format( 2 chrs, 3 digits) letters and num
               If ( num not number )
                   Set Flag to false
               Switch letters
                   case"BL":
case"FS":
case"HJ":
               case"PX": set flag to true
                   default:      set flag  to false
               if flag = false
                   Output error message
                   Control of error message

               End if
               Loop while flag is false
               Return stockCode
           End function enterStockCode
```

## Example of C# Code

```
public static String enterStockCode()
{
    String str="", letters="", errMess="Incorrect format. Please re-enter ";
    int num=0;
    bool ok = true;

    do
    {
        ok = true;
        try
        {
            Console.SetCursorPosition(5, 10);
            Console.Write("Enter Stock Code format eg. PX234 : ");
            str = Console.ReadLine().Trim();
            letters = str.Substring(0, 2).ToUpper();
            num = Convert.ToInt32(str.Substring(2));
            switch (letters) //test letters
            {
                case "BL": goto case "PX";
                case "FS": goto case "PX";
                case "HJ": goto case "PX";
                case "PX": ok = true; break;
                default: ok = false;
                    Console.SetCursorPosition(5, 25);
                    Console.Write(errMess);
                    break;
            }
        }
        catch (Exception ex)
        {
            ok = false;
            Console.SetCursorPosition(5, 25);
            Console.Write(errMess);
        }
    } while (!ok);
    //clearErrMess();
    return str.Trim();
}
```

All other valid responses will be given credit.

Answers should include:

- Data declaration/Prompt/Input statement [1]
  - Breakdown of string entry [2]
  - Check for valid Letters [2]
  - Check for a number [2]
  - Return of StockCode [1]
- (AO1), (AO2)

[8]

- (c) Write the code for the call statements to these methods in the class method **main()** assuming the following variables have been declared:

```
int      qtyStock;  
String   stockCode;
```

```
stockCode = enterStockCode();  
qtyStock = enterQtyStock(10, 50);
```

Or any other valid code planning  
(AO1), (AO2)

[3]

[20]

- 5 An array is used to store a list of numbers as shown below:

6	21	17	11	76	9	2	91	13	42
---	----	----	----	----	---	---	----	----	----

- (a) Write the program code which will create **and** populate an array called **nums**, of type integer with this data.

e.g:

```
int[ ] nums = new int[ ] { 6, 21, 17, 11, 76, 9, 2, 91, 13, 42 };
```

All other valid responses will be given credit.  
(AO1), AO2)

[4]

- (b) Consider the following code for the array **and** justify your answers to the questions below:

Search(Parameters: array nums, numrequired)

Loop x from 0 to size of array

```
if ( nums[x] == numRequired )  
    return x
```

```
end loop  
return -1
```

```
end function
```

- (i) What value is returned if numRequired is 11? 3 [1]  
(AO1)

Suitable justification [1]

Examples could include **one** of the following:

sequential search to value [1]

count from zero [1]

number exists [1]

Award [2] for suitable justification and example.  
(AO3)

[2]

- (ii) What value is returned if numRequired is 50? 1 [1]  
(AO1)

Suitable justification [1]

Examples could include **one** of the following:

sequential search to end of structure [1]

number does not exist [1]

returns -1 because not found [1]

Award [2] for suitable justification and example.  
(AO3)

[2]

- (iii) Comment on why this arrangement would not be effective for a large array of numbers **and** indicate which changes you would recommend to improve the efficiency.

Sequential search is slow [1].

Must check each value in array to determine value is not present [1].

Sort values [1] and include exit code in search[1].  
(AO3)

[4]

- (iv) Discuss using a suitable example how the code derived from the pseudocode given above could be amended to enhance the search for the modified array in (iii).

### Indicative content

The answer may include:

- The time taken by a sequential search for a required number can be enhanced by exiting the list if a list number for comparison is greater than the required number.
- As the list is sorted the required number cannot be present in the list.
- The time saved is in proportion to the index of the required number's position.
- The larger the file the more efficient a binary search would be as generally a required number will be found within five comparisons.
- This search compares the list number at the mid-point with the required number.
- If the required number is less it will then be compared with the list number in the mid-point of the first half of the list.
- This continues until the number is found or the mid-point cannot be halved.

For example:

```
Int pos = -1;
```

```
for (int x = 0; x < nums.Length; x++)  
{  
    if (nums[x] == req)  
    {  
        pos = x;  
        x = nums.Length;  
    }  
    elseif (nums[x] > req)  
        x = nums.Length;  
}
```

```
return pos;
```

basic exit  
more complex eg binary search

All valid responses and examples will be given credit.

**Level 1 ([1]-[2])****Overall Impression: Basic**

Candidate provides a basic discussion of how the code may be amended to enhance the search for the modified array.

Basic knowledge and understanding of program code is displayed.

They make a basic reference to how an enhanced search can be achieved.

The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary.

Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

**Level 2 ([3]-[4])****Overall Impression: Good**

Candidate provides a good discussion of how the code may be amended to enhance the search for the modified array.

Good knowledge and understanding of program code is displayed.

They make a good reference to how an enhanced search can be achieved.

The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 ([5]-[6])****Overall Impression: Excellent**

Candidate provides an excellent discussion of how the code may be amended to enhance the search for the modified array.

Excellent knowledge and understanding of program code is displayed.

They make an excellent reference to how an enhanced search can be achieved.

The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

[0] is awarded for a response not worthy of credit.

(AO1), (AO3)

[6]

[20]

6 A record shop stocks music albums. Each album has the following attributes:

- Stock No (integer 1000–9000 )
- Name of recording artist (text 2–30 characters)
- Name of album (text 1–30 characters)
- Price
- Quantity in stock

(a) Write the program code, that could be included in a class **Album**, to represent the following:

(i) Attributes defined

```
Class Album
Class Album
{
    int    stockNo;
    string artistName;
    string albumName;
    double price;
    int    qtyInStock;
```

[1] for each declared attribute.

(1 x [5])

(AO1), (AO2)

[5]

(ii) A default constructor for the Album object, which does **not** take any parameters.

```
public Album()
{
    this.stockNo      =0;
    this.artistName   ="";
    this.albumName    ="";
    this.Price        =0;
    this.qtyInStock   =0;
```

For any 3 [1] for all 5 [2]

(AO1), (AO2)

[2]

- (iii) A constructor for the Album object, which processes album information i.e. defines an album with specific details.

```
public Album(intstockNo, stringartistName,string    albumName,
            doubleprice, intqtyInStock)
{
    this.stockNo = stockNo;
    this.artistName = artistName;
    this.albumName = albumName;

    this.price = price;
    this.qtyInStock = qtyInStock;
}
```

[1] for any 3, [2] for all 5  
(AO2)

[2]

- (iv) Get and set methods for the Stock No, and Name of album.

```
public int NoDiscs [1]
{
    get {return NoDiscs;}
    set {noDiscs=value;}
} [1]

public string AlbumName [1]
{
    get {return albumName;}
    set {albumName=value;}
} [1]
```

(2 x [2])  
(AO1), (AO2)

[4]

- (v) A method **increaseStock(int)** to alter the stock levels whenever there has been a delivery, for example:

```
public void    increasesStock(int qty) [1]
{
    this.qtyInStock += qty;
} [1]
```

(AO1), (AO2)

[2]



(b) For the class TestAlbum, write the sections of program code to:

- (i) Create an instance **alb** of the object Album, using the default constructor written in your answer to part (a)(ii) on the previous page.

**Album alb = new Album();**  
(AO2)

[1]

- (ii) Prompt the user to input the data for an album **and** use the set methods to set the attributes for the objects. (No validation required.)

Example of C# Code:

```
Console.SetCursorPosition(5, 7);
Console.Write("Enter Stock Number    : ");
stockNo = Convert.ToInt16( Console.ReadLine());
alb.StockNo = stockNo;

Console.SetCursorPosition(5, 9);
Console.Write("Enter Album Name      : ");
albumName = Console.ReadLine();
alb.AlbumName(albumName);
```

prompt/entry [2]

appropriate convert [2]

set methods [2]

All other valid responses will be given credit.

(AO1), (AO2)

[6]

- (iii) For a delivery, assume the following data has been input:

album No                                      into    albumNoDel  
the quantity delivered    into    qtyDel

Write code to call the method **increaseStock(int)** to increment the quantity in stock of the relevant album, alb, or display an appropriate error message.

```
if (alb.getStockNo() == albumNoDel)                                      [1]
    alb.increaseStock(qtyDel);                                              [1]
else
    Console.Write("Error: StockNo not found    : "); [1]
```

(AO1, AO2)

[3]

[25]

**Total [100]**





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## **Software Systems Development**

Unit A2 1

Systems Approaches and Database  
Concepts

**[CODE]**

**SPECIMEN**

---

**MARK  
SCHEME**

1 Complete the table below:

User	Role as user of the current system	Why this user might want a new system
Charlie	Charlie uses the current system to exercise complete control over all aspects of the business. He uses information from the system all the time including information relating to orders, deliveries, accounting information and staffing. He makes decisions based on information he gathers from the business. These are at a range of levels including strategic decisions.	Charlie might want to: improve overall customer service; Collect accurate information for decision making; Improve efficiency in stock control; Improve accounting procedures; Obtain accurate current information to assist business opportunities; Improve staff relations; and Have information readily available even when key staff are absent.
Secretary	The secretary uses the current system to check delivery notes against orders, update the notebook and match invoices against orders and delivery notes. The secretary is responsible for administering the credit system for customers. The secretary is responsible for collating and summarising data collected from the managers of each outlet.	This user might want a new system to: Relieve the pressure of work; and Maintain accurate information relating to delivery notes, orders, and invoices.
Manager	This user uses the current system to manage staff schedules, money reconciliation and stock issues.	The manager might want a new system to: Relieve the pressure of work; Ensure staff data is properly recorded; Ensure that money reconciliation is correctly managed; and Manage stock properly in the outlet.

([1] x 2) for each acceptable user of the current system. This should not include cleaning staff.

(AO1)

[2]

([1] x 2) for each valid reason of the role as a user of the current system.

(AO2)

[2]

([1] x 2) for each valid justification why this user might want a new system.

All other valid points will be given credit.

(AO3)

[2]

[6]

- 2 (a) Complete the following table to show which of the following statements are true or false.

Statement	True/False
In Dynamic Systems Development Method, user involvement is not encouraged.	False
Products are delivered frequently throughout the development.	True
Iterative development is encouraged throughout the development process.	True
Changes during the development process are not reversible.	False
Testing occurs at the end of the development process.	False

([1] x 5) for each correct answer.  
(AO1)

[5]

- (b) Define what is meant by the term timebox.

A timebox is when a developer sets aside a defined amount of time to complete a set of tasks and stops at the end of that period of time regardless of whether the tasks are fully completed or not.

[1] for correct statement.  
(AO1)

[1]

- (c) Discuss the term MoSCoW in the context of PerfectPrice.

The acronym MoSCoW stands for:

**Must Have**

In the context of PerfectPrice, the developers would determine the user requirements and prioritise them carefully. The developers would clearly identify the essential requirements necessary for any new system to function. These might include detailed specification of required applications, database structures and hardware and networking specifications.

**Should Have**

The developers would define requirements that the system should have but that are above those required for minimum functionality. These might include the speed of the system and the quality of the interface.

**Could Have**

The developers would also specify requirements that the system could be included, perhaps not just at present but in the future. These might include an on line ordering service for PerfectPrice.

**Want to Have**

The developers would also specify requirements that the system could be included, perhaps not just at present but in the future. These might include an on line ordering service for PerfectPrice. The developers would also consider requirements and options that PerfectPrice might want to have. These might include the capability to establish a web presence for the company.

([2] x 4) for each valid answer.  
(AO1, AO2, AO3)

[8]

[14]

- 3 (a) Complete the following table by inserting (✓) in the correct column to identify the approach which matches the characteristic.

Characteristics	Waterfall	Agile
Changing requirements are acceptable even late in the development cycle		✓
The software product is built using a linear approach	✓	
The project can be assessed throughout the development lifecycle		✓
Every phase of the project must be completed before the next can commence	✓	
Software is tested at end of the development process	✓	

(AO1)

[5]

**(b)** Discuss the application of an Agile method called SCRUM to PerfectPrice including particular reference to the following:

- The Scrum Team
- The Daily Scrum Meeting

### **Indicative Content**

Students should consider why this method is relevant in this particular case. The likely development at PerfectPrice would lend itself to this type of method. Use of SCRUM would allow small aspects of the new system to be completed and implemented gradually. The users of the system would have opportunity to see and use aspects of the system quickly and different approaches could be applied to different requirements, for example the development of stock control or an intranet system. They should also note that the analysts are keen to use the method and clearly have expertise in the area. Points that might also be included in the answer are:

The Scrum Team is made up of a small number of developers, 4–7.

- Everyone in the team has ownership of the work required and there are no set roles.
- The team is self organising.
- The team is totally responsible for how it achieves the work to be done.
- The team also includes a Product Owner (largely responsible for identifying and prioritising the product backlog) and a ScrumMaster (largely responsible for leading the team and helping it progress effectively).

The Daily Scrum Meeting is a short daily meeting during which every team member must report on:

- What they did the day before.
- What they intend to do today.
- What obstacles they encountered.
- The meeting may require team members to stand up. The ScrumMaster will make sure the meeting is properly conducted. The meeting helps all involved to be fully aware of the developments and to reconsider issues such as work allocation.

All other valid responses will be given credit.

**Level 1 ([1]–[3])****Overall Impression: Basic**

Candidate provides a basic discussion relating to the case study showing limited understanding of the Scrum Team and the Daily Scrum Meeting.

Basic knowledge and understanding of the roles and functions displayed.

Basic reference to the Scrum Team, the Daily Scrum Meeting and the roles and purposes involved.

The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary.

Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

**Level 2 ([4]–[6])****Overall Impression: Good**

Candidate provides a good discussion relating to the case study showing a good understanding of project planning and management of resources.

Good knowledge and understanding of the roles and functions displayed.

The Scrum Team, the Daily Scrum Meeting and the roles and purposes involved are described in good detail.

The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 ([7]–[8])****Overall Impression: Excellent**

Candidate provides an excellent discussion relating to the case study showing thorough understanding of the range of project planning and management of resources.

Excellent knowledge and understanding of the roles and functions involved.

The Scrum Team, the Daily Scrum Meeting and the roles and purposes involved described in thorough detail.

The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

[0] marks awarded for a response not worthy of credit.

(AO1, AO2, AO3)

[8]

[13]



4 (a) What is a functional requirement?

Any **one** from:

- A functional requirement is a requirement of the system that enables a user to perform a specific action.
- A functional requirement must be included to fulfil the objectives of the business.
- It is usually defined by an action statement.

(AO1)

[1]

(b) Give **two** examples of functional requirements at PerfectPrice.

Any **two** from:

- A new system must provide daily reports for Charlie.
- A new system must have a stock control system linked to order processing.
- A new system must process invoices and provide monthly financial reports.
- Secure login (note that security could be regarded as non functional as well).

([1] x 2) for any valid functional requirement.  
(AO2)

[2]

(c) What is a non-functional requirement?

Any **one** from:

- A non-functional requirement is a requirement of the system that reflects the qualities that the user would like to have included in the system.
- It is usually defined by a descriptive statement.
- Non-functional requirements define attributes and qualities.

(AO1)

[1]

(d) Give **two** examples of non-functional requirements at PerfectPrice.

Any **two** from:

- The ease of use of the new system interface in PerfectPrice.
- The security of the new system in PerfectPrice.
- The performance of the new system in PerfectPrice.

All other valid responses will be given credit.  
([1] x 2) for any valid non-functional requirement.  
(AO2)

[2]

[6]

5 (a) Explain **one** possible consequence to PerfectPrice if the software is **not** error free.

Any **one** from:

- Costs in excess of the original budget established at the time of initial contract.
- The time taken to modify the software may cost the business in lost sales.
- Loss of customer satisfaction.
- The software may not meet the customer's needs and so they make take their business elsewhere. Loss of business.
- It will not meet their needs.
- It will lack the required functionality and perform as expected.

All other valid responses will be given credit.  
[1] for brief explanation. [2] for a full explanation.  
(AO2)

[2]

- (b) Discuss the types of testing that might be carried out on a system during its development. Your answer should include reference to the people likely to be involved **and** the phase of development being considered.

### Indicative Content

- **Program testing** this is carried out by the programmer.
  - Responsible for ensuring that program unit performs according to system specification before being integrated with other program modules.
  - It allows problems/bugs to be isolated at an early stage.
- **System testing** this is performed by the system developer/analyst.
  - This testing is responsible for ensuring that the whole system functions according to the system specification.
- **Integration testing** this is performed by the system developer/analyst.
  - This is performed after program testing is complete.
  - Individual program modules are executed together.
  - To ensure they interact/communicate correctly with one another.
- **Acceptance testing** this is performed by the end user when system testing is complete and the software is ready for release.
  - They will test the system in its real environment with suitable volumes of data and specific circumstances.

Candidates may also refer to unit testing, black box testing or white box testing.

All other valid responses will be given credit.

**Level 1 ([1]–[2])****Overall Impression: Basic**

Candidate provides a basic answer showing limited understanding of testing types.

Limited discussion referring to at least one type of testing.

Some alternative types of testing noted.

The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary.

Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

**Level 2 ([3]–[4])****Overall Impression: Good**

Candidate provides a good answer showing a reasonable understanding of a range of testing types

Some discussion regarding alternative types of testing. Reference to two or more testing types is given.

Reference made to the personnel involved with each testing type.

The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 ([5]–[6])****Overall Impression: Excellent**

Candidate provides an excellent answer showing thorough understanding of the range of testing types.

Excellent discussion of the range of testing types demonstrated.

Reference is made to at least three alternative types of testing.

Personnel involved with each type of testing correctly identified.

The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

[0] awarded for a response not worthy of credit.

(AO2, AO3)

[6]

- (c) Complete the table by giving a reason for the rejection of each order.

Order Number	Shop name	Supplier	Date	Invoice total	Reason for rejection
1001	Perfect Price	Makro	1/12/2012	£1000.00	The date is in the future and therefore invalid
1005	Perfect Price	Makro	1/8/2011	£20.00	The total is outside the range acceptable
102	Perfect Price	Makro	1/9/2011	£2000.00	The order number is not four digits in length

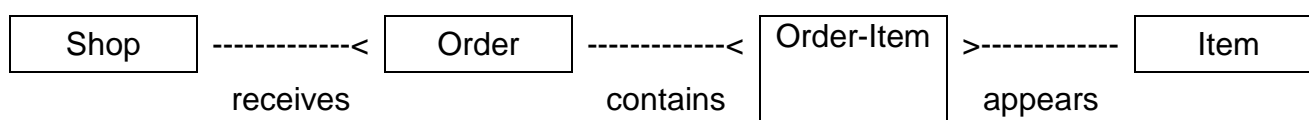
(AO2)

[3]

[11]

- 6 (a) Analyse the description above **and** produce an ER model that does **not** contain a many to many relationship.

Students should analyse the description and determine the entities required to fulfil the requirement of generating many orders depending on the demand. This will include the necessity for Order, Order-Item and Item. They should consider the necessary relationships between the entities and having done this, name them appropriately. Students must consider the fact that the model should not contain a many to many relationship.



Four correct entities [2]

or

Two or more correct entities [1]

Three correctly names relationships [2]

Two correctly named entities [1]

Candidate notes the requirement to generate many orders depending on demand [1]

Candidate notes the necessity for Order, Order-item and Item [1]

Candidate considers that the model does not contain a many to many relationship [1]

Award [3] for the correct entities and relationships (AO2)

Award [4] for the analysis (AO3)

(AO2), (AO3)

[7]

(b) Complete the following statements:

(i) 1<sup>st</sup> INF – Remove Repeating Groups. [1]  
(AO1)

(ii) 2<sup>nd</sup> NF- Part Key Dependencies. [1]  
(AO1)

(iii) 3<sup>rd</sup> NF – Independent Items. [1]  
(AO1) [3]

(c) Normalise the data in the order form to **third normal form** showing your working out at each stage.

### 1<sup>st</sup> Normal Form

**Order** (Order Number, Shop name, address, supplier, date, invoice total)

**Order-Item** (Order No, item Code, description, quantity, item cost, amount)

[1] for each entity.

([1] x 3)

(AO2)

[3]

### 2<sup>nd</sup> Normal Form

**Order** (Order Number, Shop name, address, supplier, date, invoice total)

**Order-Item** (Order No, item Code, quantity, amount)

**Item** (Item Code, Description, item cost)

[1] for each entity.

([1] x 3)

(AO2)

[3]

### 3<sup>rd</sup> Normal Form

**Order** (Order Number, Shop name, supplier, date, invoice total)

**Shop** (Shop name, address)

**Order-Item** (Order No, item Code, quantity, amount)

**Item** (Item Code, Description, item cost)

[1] for each entity.

([1] x 3)

(AO2)

[3]



- 7 The system designer wishes to create a table in SQL that will store customer details.

The fields he wishes to include are:

customer\_id  
firstname  
lastname  
address1  
address2  
postcode  
tel\_no  
customerjoindate

Generate a SQL statement to create these fields.

- (a) CREATE TABLE customer  
(customer\_id SMALLINT UNSIGNED,  
firstname VARCHAR(25)  
lastname VARCHAR(30)  
address1 VARCHAR (30)  
address 2 VARCHAR (30)  
postcode VARCHAR (20)  
tel\_no  
customerjoindate smalldate)

[1] for any six of the above.  
(AO1, AO2)

[6]

- (b) When designing and creating tables, SQL Server requires the creation of table/field constraints as well as describing table fields (i.e. providing field names and setting data types).

Complete the following statements:

- (i) A constraint is **a restriction put on one or more columns in a table.**

(AO1)

[1]

- (ii) The Function of a constraint is to ensure consistency.

(AO1)

[1]

- (iii) Types include Primary, Foreign, Unique, Not Null.

(AO1)

[4]



- (c) State a constraint that should be included in the statement in 7(a), on the previous page, in order to complete the table definition.

CONSTRAINT pk\_customer PRIMARY KEY (customer\_id)  
(AO2)

[1]

[13]

8 The Systems Analysts at SolveIT Solutions want Charlie and Ed to understand that the delivery of completed projects can sometimes be problematic.

- (a) The Systems Analysts at SolveIT Solutions want Charlie and Ed to understand that the delivery of completed projects can sometimes be problematic.

Give **two** examples of poor project management.

Any **two** from:

- Lack of realistic aims and objectives.
- Plan is not properly monitored or controlled.
- Unrealistic deadlines, deadlines which are constantly changed.
- Resources are not properly identified.

All other valid answers will be given credit.  
(2 x [1]) for valid examples.  
(AO1)

[2]

- (b) Discuss how the analysts could minimise the impact of poor management.

**Indicative content:**

- Identify project manager.
- Identify project team and associated roles.
- Set out realistic aims and objectives.
- Identify appropriate resources.
- Set achievable targets that can be achieved.
- Identify problems quickly and react.
- Agree fallback options in advance.

All other valid answers will be given credit.

**Level 1 [1]**

**Overall Impression: Basic**

Candidate provides a basic answer with limited discussion about how the impact of poor project management could be minimised.

**Level 2 [2]**

**Overall Impression: Satisfactory**

Candidate provides a satisfactory answer with reasonable discussion about how the impact of poor project management could be minimised.

**Level 3 [3]**

**Overall Impression: Good**

Candidate provides a good answer with good discussion about how the impact of poor project management could be minimised.

**Level 4 [4]**

**Overall Impression: Excellent**

Candidate provides a excellent answer with through discussion about how the impact of poor project management could be minimised.

[0] marks awarded for a response not worthy of credit.  
(AO3)

[4]

- (c) The new project will involve the process of **planning** and **managing resources**.

Discuss the main features of the **two** processes, planning and managing of resources, that will result in a successful project being achieved for PerfectPrice. Your answer should make reference to any factors that might constrain the development process.

**Indicative Content:**

A successful project will be achieved through effective planning and the continual management of available resources.

Planning

- Project management team.
- Use project management software.
- Milestones can be set and measured against progress.
- Scope of the project clearly defined and set out in advance.
- Risks can be identified.
- All tasks clearly defined can and set out in advance with available resources.
- Finance planned and contingencies considered.

Managing resources

- Physical and human resources need to be handled properly.
- Use appropriate software to maximise usage.
- Control needs to be used over resource use.
- Performance should be monitored.
- Change control may be necessary.

Constraints of project

- Poor requirements defined.
- Poor risk management.
- Project too complex.
- Finance.
- Interference.
- Changing requirements.

All other valid answers will be given credit.

**Level 1 [1–3]****Overall Impression: Basic**

Candidate provides a basic answer showing limited understanding of project planning and management of resources in the context of PerfectPrice.

Basic knowledge and understanding displayed.

Basic reference to planning, management of resources and constraints.

The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

**Level 2 [4–6]****Overall Impression: Satisfactory**

Candidate provides a satisfactory answer showing a reasonable understanding of project planning and management of resources in the context of PerfectPrice.

Some knowledge and understanding demonstrated.

Planning, management of resources and constraints are discussed in reasonable detail.

The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 [7–9]****Overall Impression: Good**

Candidate provides a good discussion showing good understanding of the range of project planning and management of resources in the context of PerfectPrice.

Good knowledge and understanding demonstrated.

Planning, management of resources and constraints are discussed in good detail.

The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

**Level 4 [10–12]****Overall Impression: Excellent**

Candidate provides an excellent discussion showing thorough understanding of the range of project planning and management of resources in the context of Perfect Price.

Excellent knowledge and understanding demonstrated.

Planning, management of resources and constraints are discussed in thorough detail

[0] awarded for a response not worthy of credit.  
(AO2, AO3)

[12]

[18]

**Total [100]**

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**INTERNAL ASSESSMENT  
DIVIDER FRONT**

**INTERNAL ASSESSMENT  
DIVIDER BACK**



**ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2014**

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## **Software Systems Development**

Unit AS 2

Event Driven Programming

**[CODE]**

**SPECIMEN**

---

## **Internal Assessment Task**



## ASSESSMENT EVIDENCE

In this unit, you learned how to:

- Define Graphical User Interface (GUI) objects;
- Demonstrate events in an event driven application;
- Design and implement multiple form applications;
- Design and implement an event driven application;
- Link an object application to simple files;
- Test an event driven application; and
- Evaluate an event driven application.

## TASK

You must produce an event driven application (possibly a game or a quiz) and associated documentation that includes the following:

- An introduction/background to the problem;
- A statement of the requirements of the application;
- A storyboard showing the design process and the forms to be included in the GUI. The storyboard should include modifications made in the development process;
- An explanation of the design of your solution including reference to and implementation of events, triggers buttons, key presses and mouse clicks as well as the design and implementation of multiple forms, menus and toolbars as applied to the solution. The explanation should demonstrate how an object application is linked to simple files;
- An explanation of how you tested the design of the application;
- A test plan demonstrating the required concepts;
- The development and implementation of the solution;
- Analysis of testing;
- An evaluation of the test plan;
- A critical evaluation of the solution to the problem in terms of the initial requirements, features and functionality;
- A reflective evaluation of your own performance; and
- Your solution and all accompanying documentation must be submitted in electronic format, on CD or DVD.

## Time Allocation:

This unit represents approximately **60 hours of work**.

## AS 2 EVENT DRIVEN PROGRAMMING – ASSESSMENT CRITERIA AND MARK BANDS

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
AO1	<b>Marks ([1]–[3])</b> Candidate demonstrates basic knowledge and understanding of the requirements of the system.  This is evidenced by the provision of a basic statement of the requirements of the application.	<b>Marks ([4]–[6])</b> Candidate demonstrates a satisfactory knowledge and understanding of the requirements of the system.  This is evidenced by the provision of a satisfactory statement of the requirements of the application.	<b>Marks ([7]–[11])</b> Candidate demonstrates a good knowledge and understanding of the requirements of the system.  This is evidenced by the provision of a valid, clear statement of the requirements of the application.	<b>Marks ([12]–[14])</b> Candidate demonstrates an excellent knowledge and understanding of the requirements of the system.  This is evidenced by the provision of a comprehensive statement of the requirements of the application.	<b>14 marks available</b>
	Candidate demonstrates basic knowledge and understanding of the design process. This is evidenced by the provision of a basic storyboard relating to the design process.	Candidate demonstrates a satisfactory knowledge and understanding of the design process. This is evidenced by the provision of a satisfactory storyboard relating to the design process.	Candidate demonstrates a good knowledge and understanding of the design process. This is evidenced by the provision of a detailed storyboard that relates clearly to the design process and acknowledges modifications as required.	Candidate demonstrates an excellent knowledge and understanding of the design process. This is evidenced by the provision of a highly detailed storyboard that relates specifically to the design process and acknowledges and addresses modifications as required.	

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>AO1 (cont.)</b>	Candidate demonstrates basic knowledge and understanding of the development and implementation of the solution, providing a basic explanation of the event driven application. This is evidenced by an explanation showing limited understanding of triggers, multiple forms and menus and how the application is linked to simple files in the solution.	Candidate demonstrates satisfactory knowledge and understanding of the development and implementation of the solution by providing an appropriate explanation of the event driven application. This is evidenced by an explanation showing understanding of triggers, multiple forms and menus and how the application is linked to simple files in the solution.	Candidate demonstrates good knowledge and understanding of the development and implementation of the solution by providing an appropriate, valid explanation of the event driven application. This is evidenced by an explanation showing a detailed understanding of triggers, multiple forms and menus and how the application is linked to simple files in the solution.	Candidate demonstrates excellent knowledge and understanding of the development and implementation of the solution by providing an appropriate, valid explanation of the event driven application. This is evidenced by an explanation showing a highly detailed understanding of triggers, multiple forms and menus and how the application is linked to simple files in the solution.	
	Candidate shows basic knowledge and understanding of the need for a robust and dependable system. This is evidenced by the inclusion of a basic test plan.	Candidate shows satisfactory knowledge and understanding of the need for a robust and dependable system. This is evidenced by the inclusion of a test plan that tests navigation and some data capture.	Candidate shows good knowledge and understanding of the need for a robust and dependable system. This is evidenced by the inclusion of a detailed test plan that tests all navigation and some capture.	Candidate shows excellent knowledge and understanding of the need for a robust and dependable system. This is evidenced by the inclusion of a comprehensive test plan that tests all navigation and data capture.	

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>AO2</b>	<b>Marks ([1]–[5])</b> Candidate shows basic application of knowledge and skills with regard to the use of GUI objects in an event driven application. This is evidenced by the provision of a basic event driven application.	<b>Marks ([6]–[11])</b> Candidate demonstrates satisfactory application of knowledge and skills with regard to the use of GUI objects in an event driven application. This is evidenced by the provision of a satisfactory event driven application with relevant screen shots and graphics.	<b>Marks ([12]–[17])</b> Candidate demonstrates good application of knowledge and skills with regard to the use of GUI objects in an event driven application. This is evidenced by the provision of a good event driven application with a good range of relevant screen shots and graphics.	<b>Marks ([18]–[22])</b> Candidate demonstrates excellent application of knowledge and skills with regard to the use of GUI objects in an event driven application. This is evidenced by the provision of a relevant detailed event driven application with a comprehensive range of relevant screen shots and graphics.	<b>22 marks available</b>
	Forms show basic evidence of understanding of the requirements of the application.	Forms show satisfactory understanding of the requirements of the application.	Forms show good understanding of the requirements of the application.	Forms show excellent understanding of the requirements of the application.	
	Forms are basically ordered.	Forms are logically ordered and fit for purpose as a consequence of user evaluation.	Forms are logically ordered and fit for purpose as a consequence of user evaluation. This is evidenced by the accuracy, layout and organisation of the forms.	Forms are logically ordered and clearly fit for purpose as a consequence of thorough user evaluation. This is evidenced by the accuracy, layout and organisation of the forms.	

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>AO2 (cont.)</b>	Candidate shows basic application of knowledge and skills in relation to the solution to the problem. This is evidenced by a basic solution that meets some of the user requirements in terms of screen navigation data capture and output produced.	Candidate shows satisfactory application of knowledge and skills in relation to the solution to the problem. This is evidenced by a satisfactory solution that meets most user requirements in terms of screen navigation, data capture and output produced. This is evidenced by screenshots and by reference to the code produced.	Candidate shows good application of knowledge and skills in relation to the solution to the problem. This is evidenced by a good solution that meets user requirements in terms of screen navigation, data capture and output produced. This is evidenced by a good range of screenshots and by clear reference to the code produced.	Candidate shows excellent application of knowledge and skills in relation to the solution to the problem. This is evidenced by an excellent solution that meets all user requirements in terms of screen navigation, data capture and output produced. This is evidenced by a comprehensive range of screenshots and by detailed reference to the code produced.	
	Candidate shows basic knowledge and skills in relation to testing the solution. This is evidenced by a few screenshots demonstrating the implementation of the test plan.	Candidate shows satisfactory application of knowledge and skills in relation to testing the solution. This is evidenced by a range of screenshots demonstrating the implementation of the test plan. The screenshots show all navigation and some data capture being tested.	Candidate shows good application of knowledge and skills in relation to testing the solution. This is evidenced by a good range of screenshots demonstrating the implementation of the test plan. The screenshots show all navigation and all data capture being tested.	Candidate shows excellent application of knowledge and skills in relation to testing the solution. This is evidenced by a comprehensive range of screenshots demonstrating the implementation of the test plan. The screenshots show all navigation and all data capture being tested.	

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
<b>AO3</b>	<b>Marks ([1]–[3])</b> Candidate demonstrates a basic understanding of analysis and evaluation of the outcomes of the testing procedures and the results obtained.	<b>Marks ([4]–[7])</b> Candidate demonstrates a satisfactory analysis and evaluation of the outcomes of the testing procedures and the results obtained.	<b>Marks ([8]–[11])</b> Candidate demonstrates a good analysis and evaluation of the outcomes of the testing procedures and the results obtained.	<b>Marks ([12]–[14])</b> Candidate demonstrates an excellent analysis and evaluation of the outcomes of the testing procedures and the results obtained.	<b>14 marks available</b>
	Candidate evaluates the solutions in the final report with limited reference to initial user requirements, features and functionality of the solution.	Candidate evaluates the solutions in the final report with some reference to initial user requirements, features and functionality of the solution.	Candidate fully evaluates the solutions in the final report with good reference to initial user requirements, features and functionality of the solution.	Candidate comprehensively evaluates the solutions in the final report with comprehensive reference to initial user requirements, features and functionality of the solution.	
	Candidate provides basic or no reflective evaluation relating to their own performance.	Candidate evaluates their own performance in terms of time management and makes some reference to how improvements could be achieved.	Candidate clearly evaluates their own performance in terms of time management, interaction and development of personal skills. Candidate clearly identifies how improvements could be achieved.	Candidate comprehensively evaluates their own performance in terms of time management and development of personal skills. Candidate comprehensively identifies how their own performance could be improved.	

Assessment Objective	Level 1 Basic	Level 2 Satisfactory	Level 3 Good	Level 4 Excellent	Total
AO3 (cont.)	Relevant material is poorly organised and presented with a lack of clarity and coherence.	Relevant material is sufficiently organised and presented with some clarity and coherence.	Relevant material is well organised and presented with a competent degree of clarity and coherence.	Relevant material is succinct, well organised and presented with a high degree of clarity and coherence.	
	Use of specialist vocabulary and spelling, punctuation and grammar is basic.	Use of specialist vocabulary and spelling, punctuation and grammar is satisfactory.	Use of specialist vocabulary and spelling, punctuation and grammar is good.	Use of specialist vocabulary and spelling, punctuation and grammar is excellent.	
Total Marks Available					(50)

**[0] marks is awarded for a response not worthy of credit.**



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**General Certificate of Education**  
**2015**

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## **Software Systems Development**

Unit A2 2

Implementing Solutions

**Case Study**

**[CODE]**

**SPECIMEN**

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# **Pre-release Case Study**

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**Instructions to Candidates:**

You must complete the A2 2 Implementing Solutions Internal Assessment Task using this Pre-release Case Study.

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## **BACKGROUND INFORMATION**

### **KNOWLEDGE**

KNOWLEDGE is an organisation set up to encourage young people to develop their expertise in the areas of the science, computing and technology. It is well recognised that the availability and cost of specialist resources, including tuition, in these areas can inhibit the progress of many young people. More talented young people could fulfil their potential and pursue the careers to which they are best suited if additional funding was available to enhance resources.

KNOWLEDGE is funded annually by a whole range of sponsors. This funding provides resources and tuition for those young people between the ages of 14 and 19, who can demonstrate their talent, potential and commitment in these specialist areas.

Each year, applications are invited for participation in a range of competitions at the KNOWLEDGE Fair in London.

Applicants must be aged between 14 years and 19 years old. Applicants must complete an application form that provides the organisers with:

- applicant details;
- information relating to their level of attainment in their specialist area;
- the competition(s) in which they wish to participate; and
- details of their project as well as details of the type of resources or tuition, for which they hope to get sponsorship.

Suitable applicants are selected for interview based on a range of selection criteria including, project type, age, level of achievement, and satisfactory recommendations from two teachers in their specialist area. The rest are rejected and invited to reapply at a later date.

Applicants attend for interview with two representatives from KNOWLEDGE, one of whom is a specialist in the particular area under consideration. For example, if an applicant wishes to participate in a science category, a science specialist will be present.

Candidates are given a score out of 15 based on their interview. This is broken down into 4 marks for communication and interpersonal skills, 5 marks for evidence of technical understanding, 4 marks for ability to answer questions and 2 marks for presentation.

Applicants then proceed to take part in their particular competition.

There are currently 40 competitions running during the KNOWLEDGE Fair although it is likely that this will increase. The maximum number of applicants selected for any given competition is 20. An applicant can participate in up to three events in any one year but will only be interviewed once in each specialist area (Science, Computing and Technology). Candidates who have already been awarded a prize for a particular category in any given year cannot reapply for that category for a period of two years.

Applicants are allocated a project demonstration time of up to 15 minutes. Judges take a further 5 minutes to review each project. A panel of two judges allocates points out of 35 to the three top applicants in a competition and these points are added to the points the applicant has achieved already at interview.

The applicant with the highest score in a particular category is awarded the sum of money allocated to that category. Money allocations can range from £100 to £2000. On the final evening, of the KNOWLEDGE Fair at which the winners are announced, there is a ticket only event for the applicants and two members of their family. The money raised from this event goes some way to covering the costs involved.

## **PROBLEM**

The administrators of KNOWLEDGE wish to automate the task of recording, sorting, analysing, awarding and reporting on the annual KNOWLEDGE Fair. For each event schedules of participants along with scoring sheets must be provided for judges.

- The top applicant in each competition must be identified.
- A detailed analysis of applicant participation in competitions is required.
- Applicants participating in more than one event should be identified.
- The administrators would also like to maintain an annual statistical archive.

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## **Software Systems Development**

Unit A2 2

Implementing Solutions

**[CODE]**

**SPECIMEN**

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## **Internal Assessment Task**

### **Instructions to Candidates:**

You must use the A2 2 Implementing Solutions Pre-release Case Study to complete this Internal Assessment Task.

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## **ASSESSMENT EVIDENCE**

In this unit, you will learn how to:

- Apply project management techniques to document the stages of the development process;
- Select, justify and evaluate a systems approach to the solution of a given problem;
- Define and document User requirements;
- Document and test the design of your solution;
- Develop a desktop solution using a RDMS;
- Implement, document and present your solution to the given problem;
- Test your solution to the given problem; and
- Evaluate your solution.

### **Problem:**

The administrators of KNOWLEDGE wish to automate the task of recording, sorting, analysing, awarding and reporting on the annual KNOWLEDGE Fair. For each event schedules of participants along with scoring sheets must be provided for judges.

- The top applicant in each competition must be identified;
- A detailed analysis of applicant participation in competitions is required;
- Applicants participating in more than one event should be identified; and
- The administrators would also like to maintain an annual statistical archive.

### **Task:**

You must produce a solution, presented on appropriate electronic media, such as CD and Podcast, to the specified problem that includes the following:

- A detailed project plan that reflects the actual project development;
- An explanation and justification of your approach to the development and design of your solution;
- A detailed User Requirements Specification;
- The design of your solution;
- An explanation of how you tested the design;
- An explanation of how you developed a desktop solution using a RDMS;
- The development and implementation of your solution using a selected software tool to connect the required database to the GUI for the specified problem;
- Documentation of the solution including the code to create and populate the supporting database; code to develop the solution; and an instructional user guide;
- A test plan;
- Sample documented test outcomes;
- An evaluation of your test procedures;
- A critical evaluation of your solution to the problem; and
- A reflective evaluation of your own performance.

### **Time Allocation:**

This unit represents approximately **60 hours of work**.