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General Certificate of Education

2019

Centre Number

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Candidate Number

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# Software Systems Development

Unit A2 1:

Systems Approaches and Database Concepts



ADV11

[ADV11]

FRIDAY 31 MAY, AFTERNOON

### TIME

2 hours.

### INSTRUCTIONS TO CANDIDATES

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

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 ten** 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, 6 and 7**.

For Examiner's use only			
Question	Marks available	Marks	Remark
1	6		
2	8		
3	7		
4	6		
5	16		
6	8		
7	6		
8	6		
9	21		
10	16		
<b>Total</b>	<b>100</b>		

1 Robert, the senior analyst at Business Solutions, includes all his trainees in a discussion about the strategy for development at The Woods. One trainee considers that programming should commence immediately without any analysis or design.

(a) Illustrating your answer with two specific examples from the case study, explain why it is necessary for Business Solutions to conduct a proper systems analysis of the existing system at The Woods.

Example 1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Example 2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [4]

(b) Identify two issues that could arise if Business Solutions decide not to apply a methodology to the development process at The Woods.

Issue 1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Issue 2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

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**(Questions continue overleaf)**



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[8]

Examiner Only	
Marks	Remark

3 Robert has asked the trainees to complete the following paragraphs relating to the application of different methodologies at The Woods. Words and phrases may be used more than once.

- |                       |                         |                       |
|-----------------------|-------------------------|-----------------------|
| <b>Product Owner</b>  | <b>prototypes</b>       | <b>burndown chart</b> |
| <b>timeboxing</b>     | <b>prototyping</b>      | <b>users</b>          |
| <b>documentation</b>  | <b>Project Manager</b>  | <b>DSDM</b>           |
| <b>daily meetings</b> | <b>product backlog</b>  | <b>iterative</b>      |
| <b>agile</b>          | <b>Scrum Master</b>     | <b>releases</b>       |
| <b>iterations</b>     | <b>Development Team</b> | <b>sprint</b>         |
| <b>SCRUM</b>          | <b>programmers</b>      | <b>analysts</b>       |
| <b>structure</b>      | <b>working software</b> | <b>sprints</b>        |

Methodologies provide a \_\_\_\_\_ for the development process. Methodologies which are agile, emphasise \_\_\_\_\_ over \_\_\_\_\_.

These methodologies involve considerable involvement with clients. Using \_\_\_\_\_ which is an \_\_\_\_\_ method would mean that a \_\_\_\_\_ team would be formed that could complete aspects of the project in time constrained \_\_\_\_\_.

The \_\_\_\_\_ facilitates this agile process. There is very little \_\_\_\_\_ produced.

In the course of the development a \_\_\_\_\_ is created after every \_\_\_\_\_. A \_\_\_\_\_ may be used to show work effort still remaining. It is the responsibility of the \_\_\_\_\_ to prioritise \_\_\_\_\_ items.

[7]

Examiner Only	
Marks	Remark

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**(Questions continue overleaf)**

- 4 Insert the word **true** or **false** in the table below to indicate which statements are true and which are false.

Statement	true/false
Diagrams used in UML include Use Case, Class, ER and Sequence diagrams.	
The analyst would use a sequence diagram to represent Henry's interaction with the system.	
Multiplicity shows the number of object instances in one class that relate to one object instance in an associated class.	
The <<include>> statement means that a use case that can exist on its own, can also be used in other use cases because of some shared functionality.	
Use case diagrams provide a static view of a system.	
The <<extend>> statement indicates that a use case can be extended by the functionality of another use case.	

[6]

Examiner Only	
Marks	Remark

5 (a) Project management of such a big development is critical to its success.

The Project Manager at Business Solutions has conducted a risk assessment and has identified the following areas of concern. He has created a risk log.

Complete the table below.

Risk	Example	How this might be managed
Budget		
Scope		
Time		

[6]

Examiner Only	
Marks	Remark

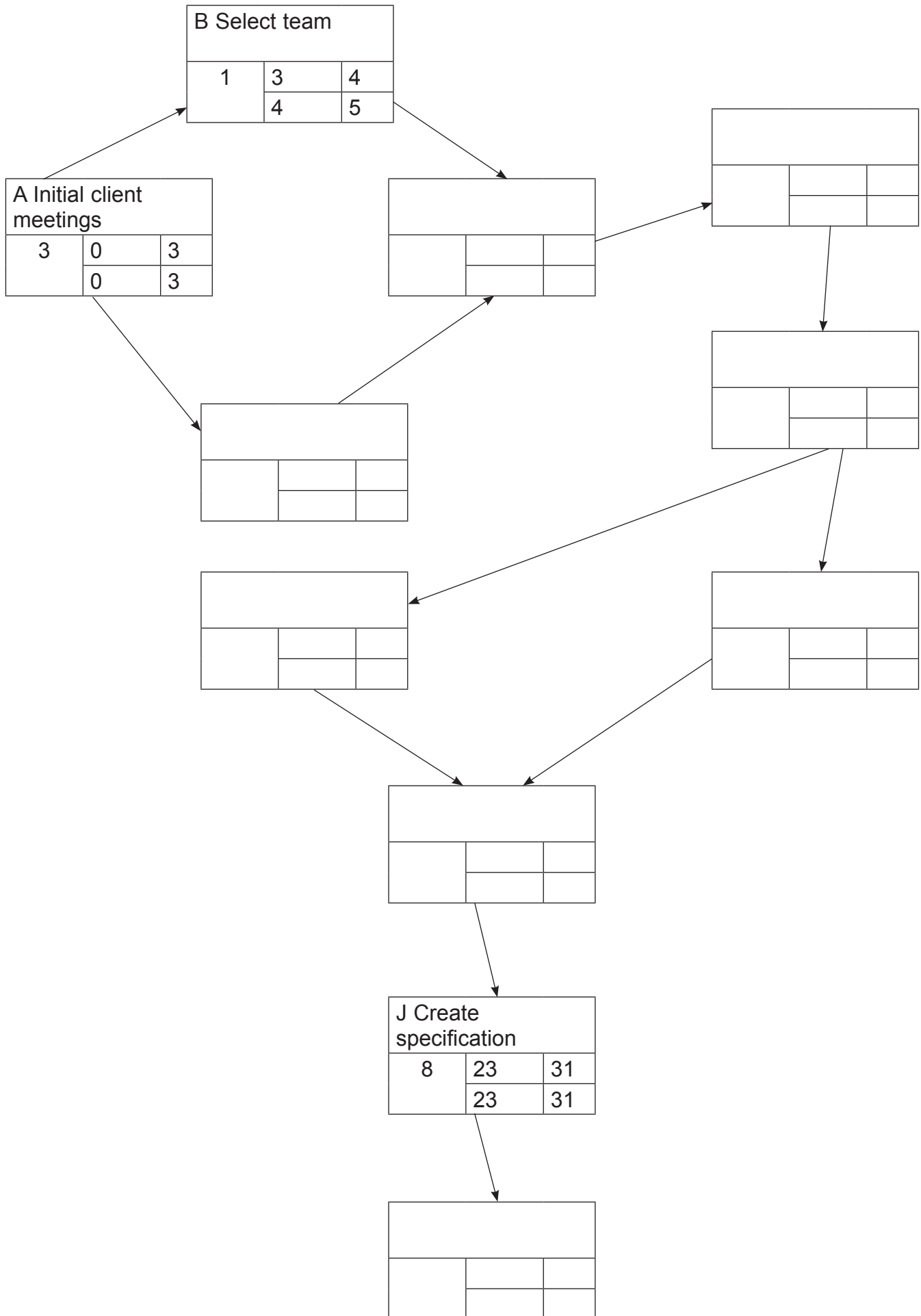
- (b) The Project Manager has set out an initial plan relating to the first part of the development.

He has identified the following high level activities and has started to construct a PERT chart.

	Activity	Duration (days)	Predecessor
A	Initial client meetings	3	-
B	Select team	1	A
C	Develop strategy	2	A
D	Draft terms of reference	1	B, C
E	Agree terms with client	1	D
F	Examine documentation	3	E
G	Conduct interviewing	8	F
H	Conduct observation visits	5	F
I	Create feasibility report	5	G, H
J	Create specification	8	I
K	Code solution	20	J

- (i) Complete the PERT chart opposite.

Examiner Only	
Marks	Remark



(ii) Define the critical path.

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

(iii) The Project Manager has been made aware that the time allocated for observation may be insufficient. What is the minimum additional time that could be allocated to the observation process without altering the duration of the project?

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

Examiner Only	
Marks	Remark

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[8]

Examiner Only	
Marks	Remark



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- 8 Using the partial database design for Stock Ordering given in **Figure 1** below:

**Figure 1 Partial Database Design for Stock Ordering**

<b>Stock</b>	<b>Supplier</b>	<b>Category</b>
StockNo StockDescription SupplierNo QtyInStock ReorderLevel ReorderQty CategoryNo StockPrice StockSalePrice	SupplierNo SupplierName DateStart Delivery_D_W SupplierTelNo	CategoryNo CategoryDescription

<b>SupplierOrder</b>	<b>SupplierStockOrder</b>
SupplierOrderNo SupplierNo SupplierOrderDate SupplierOrderDateDelivered	SupplierOrderNo StockNo OrderQty

Complete the table below by naming the missing primary and foreign keys required.

<b>Table</b>	<b>Primary Key</b>	<b>Foreign Key(s)</b>
Stock	StockNo	
SupplierOrder		SupplierNo
SupplierStockOrder		

[6]

<b>Examiner Only</b>	
<b>Marks</b>	<b>Remark</b>





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**10 Refer to Figure 2, page 4, of the Pre-Release Case Study. Figure 2 is an extract taken from the secretary’s Notebook. It shows details of some bookings which have been completed on the 3rd May 2019. The analyst normalises the data from this extract to help determine the contents for the database tables.**

Un-normalised Data

BookingNo, CarReg, RepairNo, RepairDescription, HourlyRate, ExpectedDuration, staff, customer, ActualDuration, DateBooked, StartTime, StockNo, StockDescription, Qty, StockSalePrice

**(a)** Give an example of a data item from the Notebook extract in **Figure 2** that must be changed to an atomic format to begin the normalisation process.

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

**(b)** The analyst has identified two repeating groups for repair bookings:

Multiple dates may be required when a repair booking awaits delivery of part(s);

Multiple stock parts may be required for a repair booking.

Complete the normalisation of the data using the table names identified below.

**1NF**

BOOKING

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

BOOKING\_DETAILS

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

BOOKING\_STOCK

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Examiner Only	
Marks	Remark



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

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# Software Systems Development

Unit A2 1

Systems Approaches and Database Concepts

Case Study

**[ADV11]**

**FRIDAY 31 MAY, AFTERNOON**

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## EXAMINATION COPY

### Instructions to Candidates:

The A2 1 Systems Approaches and Database Concepts examination is based on this pre-release Case Study.

You must use **this** clean copy of the Pre-release material in the examination and **not** your own annotated copy.

## The Woods

Woods garage has been in business for around 30 years. It occupies a substantial site on the outskirts of town. The garage previously supplied fuel and a small range of car products to the public. In recent years, it started doing repairs and MOT services. A car washing and valet service was then introduced and the premises and forecourt were redesigned accordingly.

The owner, Henry Woods, started to address the needs of families in the network of houses being constructed in the surrounding area by also opening a small shop. He is now effectively running a very successful business. Demand is increasing with the growth of the housing estates and Henry realises the huge opportunity for development. He has taken time to consider a detailed business plan, taking advice from a range of professionals, particularly his accountant.

Henry's overall strategic plan documents the provision of a range of services within one centre. As he owns the site of the original garage and several other surrounding fields, he sought and obtained planning permission for the future developments.

The garage and shop are already well established but their growth has been haphazard and there are many issues that Henry wants to resolve as he continues the development.

The shop stock has the usual basic range of products and is supplied by a wholesaler in town as well as the local dairy and farmers. Henry has begun to stock a range of locally grown organic vegetables and has also created an area in the shop for a deli service. He intends to include a delivery service for customers. Currently the shop opens from 8am until 6pm Monday to Saturday and 10am until 5.30pm on a Sunday. The shop is run by two full-time assistants and three part-time staff.

Like the shop, the garage is extremely busy. Henry wants to extend the services he already provides to offer a specialist taxi service tailored to the needs of the local population. He is aware of the limited transport facility provided by the local Woodside Community Hub and recognises the benefits for people living in the area. He wants to supplement services already available, providing an affordable transport service for the community. This will include regular bookings, school collections, special provision for elderly people and a 24-hour service. He has already sourced a range of suitable vehicles.

In addition, Henry intends to open a hair and beauty salon, a cafe, a butcher's shop and possibly a gym.

In the first instance he wishes to fully develop the garage and shop facilities and start the hair and beauty salon. He has already appointed the staff for the salon and is having discussions with the staff in the garage and shop about additional help.

Henry has been advised to review his entire administrative system. He has considered many of the things that cause him difficulty. He recognises that in order to proceed effectively he must get the current issues sorted out so that the future developments will run smoothly.

The garage, which originally mainly supplied fuel, has grown considerably. The garage has been doing repairs for quite a while but has a basic recording system. On occasion, customers just drop in when something is wrong, in the hope that a mechanic will be available to fix the problem straight away. This is unsatisfactory for everyone and causes problems if a mechanic leaves a scheduled job to assist the new arrival.

Bookings are either made in person or by telephone. Bookings can be made for a routine service (MOT, mileage service) as well as repairs. The secretary checks for an available time in a 'page a day' diary and records the booking. If she is busy she might not record all details.

Details from the diary are written on a whiteboard in the office each day, Monday to Friday. The whiteboard is subdivided into hour long intervals. These run from 8am until 5pm. The booking details are written on the whiteboard in the garage office (**Figure 1**). To complete a booking the actual duration can be shorter or longer than the expected duration.

**Figure 1 Extract from whiteboard bookings for 4th April 2019**

Thursday 4th April 2019								
Start Time	Booking No.	Name	Tel	Reg	Service	Duration	Complete	Initials/ comment
8	121	<i>Helen James</i>	<i>07777901 99888</i>	<i>ABC-88888</i>	<i>MOT</i>	<i>3 hrs</i>	<i>yes</i>	<i>WB Wrong Time</i>
9	122	<i>James Stevenson</i>	<i>02899999999</i>	<i>HKY 9999</i>	<i>Brakes</i>	<i>1hr 45 mins</i>	<i>No brake caliper needed</i>	<i>CD Wrong time/swope↑</i>
10	114	<i>D Kelly</i>	<i>No number</i>	<i>Clutch</i>	<i>PHP 4537</i>	<i>1 hr 15 mins</i>	<i>no</i>	<i>WB late start 10.30 wrong part - try for next Wednesday</i>
11								
12								
1								

Inaccuracies frequently occur on the whiteboard.

Details of 'drop in' customers are not always written on the whiteboard, as staff who are used to doing things on a first come, first served basis tend to tell customers to just 'drop in' and see what happens. This has caused billing problems for the secretary. In addition, there is no consideration given to either the time allocation needed for a particular job or to the number of staff available at any one time. This has led to multiple bookings with no possible means of getting them completed on schedule. This has obviously become a much bigger issue since the garage has become more successful.

During the day, the secretary records details of the completed repairs in a notebook (**Figure 2**) for billing purposes.

**Figure 2 Extract from the secretary's Notebook taken on 3rd May 2019 showing completed repairs**

Completed Repairs 3/5/2019													
Booking No.	CarReg	Repair No.	Description	Duration (hrs) Expected / Actual	Hourly Rate	Staff	Customer	Date Booked	Start Time	Stock No.	Description	Qty	Sale Price
534	XW15445	154	MOT	3 / 2	50.00	Joe(3)	Mr John Smith	1/5	11:00	MS51	Tyre	2	60
											W10 Wipers	1	28.50
											RP9 Radiator	1	130.00
				2		David B(1)		3/5	8:00				
541	VNZ1836	171	Service	5 / 4	40.00	Joe(3)	Ms Mia Wong	3/5	8:00	W10	Wipers	1	28.50
											XO2 Oil	2	12.75
542	TU12121	154	MOT	3 / 3	50.00	Pete (10)	Ms Mary Brown	3/5	10:00				
543	PW16945	63	RepairB	4 / 4	45.00	David D(5)	Mr Tom Smith	3/5	11:00	RS56	Brake Pipe	2	36.00
											RS12 Brake Fluid	1	7.75

The whiteboard is cleaned at the end of each day and new dates are allocated in the diary for any incomplete bookings. This is not always reliable and can lead to incorrect billing. Mechanics are supposed to advise the secretary that the repair or service has been completed and what parts or other stock have been used. This does not happen properly and the written records are poorly kept.

Inevitably stock is an issue. There are occasions when a scheduled repair cannot be completed because an item of stock is missing and a further time slot would be allocated. The secretary orders stock once a week but the orders are seldom accurate (**Figure 3**). The secretary is supposed to check supplier stock numbers and sizes but tends to rely on what she regards as her experience in placing orders. Many items are either over or under stocked. The secretary does not maintain a comprehensive list of suppliers and does not compare or check prices. The same suppliers are used regardless of better options elsewhere. Unnecessary items are sometimes added because they have been ordered before. Often important items are overlooked because no one was available to check if they were really needed. Because records are poorly kept and the stock reorder process is limited, mechanics frequently do not have the correct items to complete their work. As demand rises this problem is increasing and leading to considerable dissatisfaction among customers and staff.

**Figure 3 Sample Stock Order**

*THE WOODS Newtown Road, Newtown, BT2 4NN, Tel: 02899 999999*

*STOCK ORDER NO: 537*

*To: Motor Supplies Ltd (52)      Date: 24th April 2019*  
*120 Cavendish Road*  
*Belfast*  
*BT99 499*

<i>Stock No.</i>	<i>Description</i>	<i>Quantity</i>	<i>Price</i>	<i>Total</i>
<i>RS 56</i>	<i>Brake Pipe</i>	<i>5</i>		
<i>M122</i>	<i>Car panel auto clips</i>	<i>4 packs</i>	<i>14.99</i>	<i>59.96</i>
<i>PR3</i>	<i>Mirror stick on</i>	<i>3 (2 pack)</i>	<i>9.99</i>	<i>29.97</i>
<i>704</i>	<i>Bumper lip</i>	<i>2</i>	<i>26.99</i>	<i>53.98</i>
	<i>Bulb TT996</i>	<i>10</i>	<i>10.65</i>	<i>106.50</i>
	<i>Filter accessory pack</i>	<i>1</i>	<i>16.99</i>	<i>16.99</i>
	<i>Oil filters</i>	<i>5</i>	<i>35.99</i>	<i>179.95</i>

The secretary has expressed concern at perceived criticism of her work, suggesting that it has never been an issue previously and insisting that there is nothing wrong with her system of doing things. Henry has installed a spreadsheet on the computer in the office and is trying to encourage her to learn how to build a computerised list of stock. He would like to record on the spreadsheet when stock items are used and try to trigger a new order alert. He wants the secretary to record new stock in a similar way. He believes that this fairly straightforward approach to stock problems would help considerably.

Bookings for the valet service must be made a week in advance. This does not deter customers from turning up to try and get a slot. The secretary records the name of the customer and the number of the car as well as the type of valet required. There is a variety of services available ranging from a basic sponge wash to a full internal and external valet. Prices are displayed in the office. Because these bookings are recorded in a diary in the office, staff are not always properly allocated to the jobs. This has led to rescheduling of appointments and unhappy customers.

In the shop, Henry operates a manual stock control system with staff counting items on shelves. Staff must check this at the end of each day and provide him with totals. He tries to manage the order system himself. However, there are daily orders to control as well as weekly orders and one-off orders that arise every so often. However, he still needs to ensure a proper stock order and delivery system. With items arriving on a daily basis and fresh produce to manage, it has become very difficult to ensure that the process is efficient.

Henry is very keen to involve the staff in discussions regarding future developments. However, some of the staff, as well as the secretary, see nothing wrong with the way things are at present. Henry's own knowledge is limited and he is convinced that, if the secretary had a proper spreadsheet, this would solve stock problems for the garage and shop. He thinks this could also allow for bookings in the garage and the hair and beauty salon.

Henry recognises his own limitations and has asked a company in Belfast, Business Solutions, to advise him on the way forward. Business Solutions is a company that has an established training programme for analysts and programmers. Every opportunity is taken to enable trainees to acquire and develop skills.



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