



Rewarding Learning

ADVANCED
General Certificate of Education
2022

Centre Number

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Candidate Number

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Software Systems Development

Unit A2 1:

Systems Approaches and Database Concepts

MV18

[ADV11]

MONDAY 30 MAY, AFTERNOON

Time

2 hours, plus your additional time allowance.

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 nine** questions.

Information for Candidates

The total mark for this paper is 100.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in **questions 1, 3, 5 and 6**.

(b) Identify two other areas for investigation and select one technique that would be applicable to each, giving a reason for your answer. [2 marks for each]

(i) _____

(ii) _____

- 2 Digital Advances is discussing the possible use of DSDM as a development methodology with Jane and her team.

One of the analysts illustrates its use with a series of statements.

Insert the word **true** or **false** in the table below.
[5 marks]

Statement	true/false
Jane and the team will only be required at the beginning of the development.	
Digital Advances will provide Jane with a prioritised list of requirements.	
Requirements are contained in the Product Backlog.	
Timeboxes should only contain Jane's essential requirements.	
Planned releases are given to Jane in a series of increments.	

- 4 The development team working on the project intends to use UML to help build the User Requirements at Harpers. They have prepared a short summary to explain this process to Jane and her team.

Complete the following paragraphs using the word list provided. Words and phrases may be used more than once. [10 marks]

actors

<<include>>

requirements

add decoration

Jane

rules

associations

make payment

scope

Baker

multiplicity

Staff

class

notations

static

Customer

orders

structure

document

place order

Use Case

<<extend>>

record customer details

use cases

functionality

relationships

UML is a pictorial language that uses _____ and _____ to help specify, _____ and _____ systems.

In order to represent the functionality of the cake ordering process and help gather the _____ to get an inside and outside view, Digital Advances will create a _____ diagram. This diagram describes _____ and _____ .

It will determine internal factors and show interaction with external _____ associated with the processes. Possible _____ in the cake ordering process could be a _____ or a _____ member.

The diagram will have a range of _____ that will be linked with actors such as _____ and _____ .

An example could be _____ , which will have the required relationship _____ with _____ and the optional relationship _____ to _____ .

5 In order to ensure the software solution for Harpers is robust and reliable, careful consideration must be placed on all aspects of testing. The team at Digital Advances is considering using the V-Model approach.

(a) Complete the missing detail on the diagram opposite.
[5 marks]

(i) _____

(ii) _____

(iii) _____

(iv) _____

(v) _____

(vi) _____

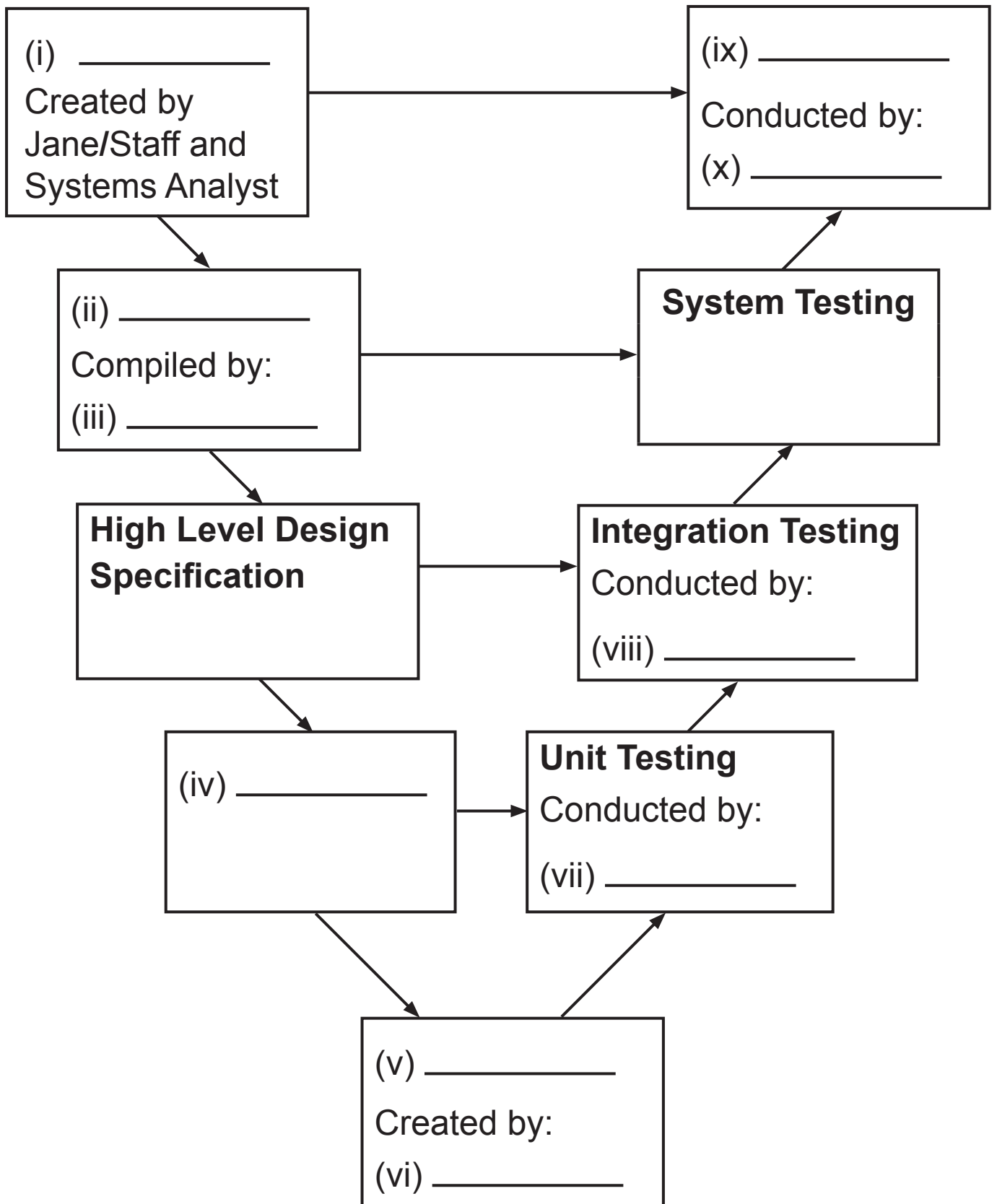
(vii) _____

(viii) _____

(ix) _____

(x) _____

V-Model



6 Beth, the project manager, wants to explain the purpose of project management to Jane and her team. She illustrates this with the 'Iron Triangle', explaining that changing any constraint can risk impact on the others.

(a) Complete the table below: [8 marks]

Constraint	Example	Risks
_____	Jane now wants to include an option for scheduling and costing that wasn't defined in the original requirements.	(i) _____ _____ _____ (ii) _____ _____ _____
Cost	Cost of equipment and the employment of new staff has been underestimated and the budget is very tight.	(i) _____ _____ _____ (ii) _____ _____ _____
_____	_____ _____ _____ _____	(i) Might have to increase the size of the development team or pay overtime (ii) _____ _____ _____

7 In order to help Jane understand the nature of a possible solution, Cónn, a database expert at Digital Advances, is providing an overview of some database features. Detail Cónn’s explanation for each of the following.

(i) Cónn wants to explain the function and content of a data dictionary as well as how it could be constructed, using a specific example. [2 marks]

(ii) Cónn wants to outline the concept of data redundancy to Jane, illustrating his explanation with an example from her cake ordering system. [2 marks]

(iii) Cónn wants Jane to understand the concept of data integrity, again illustrating his explanation with an example from the business. [2 marks]

- 8 It has been noted that many staff who work in offices and shops near Harpers would like to order their lunches in advance, to avoid wasting time in a queue if the cafe is busy.

It has been proposed that the following order docket would be printed and given to the customer when collecting their lunch order. An insert has been supplied for clarity.

<i>Harpers Lunch Order Docket</i>							
<i>Order received: 6/5/22</i>		<i>Order for: 9/5/22</i>		<i>Order No: 25</i>			
<i>Cust ID: C25</i>							
<i>Name: James Davidson</i>							
<i>Address/Company: Parker Solicitors</i>							
<i>Telephone: 078789999</i>							
<i>Item ID</i>	<i>Desc</i>	<i>Item Cost</i>	<i>Sequence No</i>	<i>Qty</i>	<i>Filling ID</i>	<i>Filling Cost</i>	<i>Totals</i>
P1W	Panini (White)	£ 1.50					
			1st	1	F1	£ 0.70	£ 2.20
			2nd	2	F1	£ 0.70	
					F7	£ 0.50	£ 5.40
S1G	Sandwich (Granary)	£ 0.80					
			1st	2	F3	£ 0.70	
					F7	£ 0.50	£ 4.00
			2nd	2	F5	£ 0.60	£ 2.80
			3rd	1	F6	£ 0.60	
					F13	£ 0.40	£ 1.80
						<i>Order Total:</i>	£ 16.20
						<i>Paid Y/N:</i>	
						<i>Collected Y/N:</i>	
<i>Fillings</i>							
F1: Ham	F5: Tuna	F9: Pickle	F13: Sweetcorn				
F2: Bacon	F6: Egg	F10: Onion	F14: Beetroot				
F3: Chicken	F7: Cheese	F11: Coleslaw	F15: Pineapple				
F4: Turkey	F8: Tomato	F12: Lettuce	F16: Pepper				

(a) The analyst has identified three repeating groups for the lunch orders. Transform the data from the order docket into **first** normal form, ensuring values are atomic where appropriate. [8 marks]

1NF

ORDER

ORDER_ITEM

ORDER_ITEM_SEQUENCE

9 Refer to the partial database design for cake orders in **Figure 1** opposite when answering this question.

(a) Write the SQL script to create the CAKEORDERDETAILS table. [4 marks]

(b) (i) What effect would an inner join have on the CAKEORDER and CAKEORDERDECOR tables? [1 mark]

(ii) Which join should be used on the CAKEORDER and CAKEORDERDECOR tables to ensure that all order details are available? [1 mark]

Figure 1 Partial Database Design for Cake Orders

<p>CAKEORDER</p> <p>cakeOrderID cakeOrderDate dateRequired occasionID shapeID cakeSizeID fillingID icingID customerID orderStaffID collectedStaffID</p>	<p>CAKEORDERDECOR</p> <p>cakeOrderID writing decoration skillCost deliveryCost</p>	<p>CAKEORDERDETAILS</p> <p>cakeOrderID cakeTypeID noLayers</p>
<p>OCCASION</p> <p>occasionID occasion depositReqYN</p>	<p>CAKETYPE</p> <p>cakeTypeID cakeType costLayer</p>	<p>CAKESIZE</p> <p>cakeSizeID cakeSize costIncreasePercent</p>

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Question	Marks available	Marks	Remark
1	10		
2	5		
3	6		
4	10		
5	11		
6	14		
7	6		
8	14		
9	24		
Total	100		

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Harpers Lunch Order Docket

Order received: 6/5/22

Order for: 9/5/22

Order No: 25

Cust ID: C25

Name: James Davidson

Address/Company: Parker Solicitors

Telephone: 078789999

Item ID	Desc	Item Cost	Sequence No	Qty	Filling ID	Filling Cost	Totals
P1W	Panini (White)	£1.50					
			1st	1	F1	£0.70	£2.20
			2nd	2	F1	£0.70	
					F7	£0.50	£5.40
S1G	Sandwich (Granary)	£0.80					
			1st	2	F3	£0.70	
					F7	£0.50	£4.00
			2nd	2	F5	£0.60	£2.80
			3rd	1	F6	£0.60	
					F13	£0.40	£1.80

Order Total: £16.20

Paid Y/N:

Collected Y/N:

Fillings

F1: Ham

F5: Tuna

F9: Pickle

F13: Sweetcorn

F2: Bacon

F6: Egg

F10: Onion

F14: Beetroot

F3: Chicken

F7: Cheese

F11: Coleslaw

F15: Pineapple

F4: Turkey

F8: Tomato

F12: Lettuce

F16: Pepper

Harpers

Cake Order

Customer Details

Name Carol Smith Date Ordered 22/7/22

Address 25, High Road, Newtown Date Required 29/7/22

Telephone No: 0999999999 e-mail: csmith99@9999.vom

Occasion	Birthday	Anniversary	Standard		
	✓				
Shape	Round	Square	Rectangle		
		✓			
Size	Small	Medium	Large		
		✓			
Type	Vanilla	Chocolate	Lemon	Raspberry	Strawberry
	✓				✓
Filling	Butter	Cream	Vanilla	Fresh cream	
				✓	
Icing	Fondant	Chocolate	Plain	Coloured	
				pink	

Layered Single / Triple

Writing Happy Birthday Jenny **Decoration** Ballerina Transfer

8 today

Lots of Love

from Mum and Dad

Cost	£15		Order taken by:	J M
Deposit	£5		Order completed by:	
Balance	£10		Paid	



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Software Systems Development

Unit A2 1

Systems Approaches and
Database Concepts
Case Study

MV18

[ADV11]

MONDAY 30 MAY, AFTERNOON

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.

An A3 insert is supplied for clarity of the Table on Page 7.

Harpers

Harpers is a café and cake shop situated in the High Street in Newtown. The café has been in business for around ten years and has recently been extended and redesigned to cater for a growing customer base and the need to increase seating, particularly outdoor seating.

The business is renowned for its cake-making expertise and supplies speciality cakes for all types of occasion. As well as the speciality cakes, the café provides a full range of very popular bakery items and the usual tea, coffee, breakfast and lunch options. The café opens from 8.00 am – 6.00 pm Monday to Friday and from 8.00 am – 4.00 pm on Saturdays.

The business is managed by the owner, Jane Harper, who now employs three full-time and five part-time staff members at the café. There are always at least two full-time staff and two part-time staff present each day. A rota is drawn up each month so that holidays and days off can be scheduled and full coverage of the café achieved. Initially, there was just Jane plus three staff members to handle everything, but as the business grew there were increasing demands on the staff and more help was required.

All baking for the café and cake shop is done off-site in a fully-equipped kitchen that Jane designed and built where her double garage was originally positioned at home.

Jane is assisted in the off-site kitchen by two bakers who work from 6 am until 1 pm. Jane generally oversees the cafe order and cake order for the off-site kitchen and works on cakes between 6 am and 10 am. She then continues her role managing the café and cake shop for the rest of the day.

Customer numbers have greatly increased and Jane is aware of the need to maintain the business at the same efficiency levels evident when it was a much smaller operation. The customer demand has made Jane consider other options. She recognises the trend for takeaway food and that she is already catering for this in a haphazard manner. She is also considering the possibility of extending her services to provide catering for businesses and special events. She has already catered for some birthday parties and christening events for friends.

There are always two staff members on duty at the counter in the café where bakery products are sold. They are constantly busy and often have to get another member of staff to assist. This is particularly necessary when customers arrive to collect cake orders, as this involves going out to the back storeroom, checking dockets and ensuring that balances are fully paid. Sometimes customers also require assistance in taking their cakes and other items back to their cars. Recording the orders, which mostly come in by phone, is time-consuming and error-prone.

The off-site kitchen provides an extensive range of products to fulfil the demands of the café and the cake shop. Pastries and bread products, a range of soups, pre-packaged sandwiches, wraps and paninis are available. These are prepared at the off-site kitchen and transported to the café twice each morning.

Two members of staff work in the kitchen at the café. They prepare breakfasts and lunches for 'eat in' customers. Items like toasties, soup and paninis are already prepared off-site and just require heating. Customers can either buy pre-prepared sandwiches and rolls to 'eat in' or else request that they are made up fresh with fillings of their choice.

The café is particularly busy until after lunch time. In the afternoon there are just teas and coffees to provide and the staff have the opportunity to clear up properly and prepare for the next day. The café order for the off-site kitchen is made each afternoon. Other orders for the basics necessary to run the café are generated weekly and supplied by a local wholesaler. These orders will include staple items such as teas, coffee, soft drinks, eggs, cheese, ham, bacon, salt, pepper, sauces, biscuits, crisps, cleaning products and napkins. A daily order for milk and bread is also checked, although this is fairly standard and generally only requires minor adjustment.

Jane has noted that there has been a big increase in customers who want to pre-order lunches for the following day. These customers are mostly local office workers. Jane has no real method for dealing with this current trend. These orders are scribbled on sticky notes and stuck on the till. These orders must be considered in the daily order that goes to the off-site kitchen, but this does not always happen and some orders are lost, leading to customer issues.

Cake orders

Jane has an extensive range of options for her cakes. They can be ordered in all shapes and sizes for all occasions. When the café was a much smaller enterprise, Jane developed an ordering system which is still in place. It is quite simply a pre-printed order book with carbon copies that can be torn off and given to the customer.

Staff at the café record orders for cakes in the order book. Details must include at least the customer name and contact details (telephone or email), date ordered and collection date, as well as specific information regarding the type of cake.

Jane has never changed the format of the order book even though the range of options she has supplied over the years has increased. This means that where a cake type is not pre-printed it must be handwritten in the book. This can be confusing and details may be omitted. Using a book is not efficient for tracking orders.

Cakes can be ordered in a range of standard types, shapes, sizes and fillings that are pre-printed in the order book where they can be ticked. Cakes are normally double layered but customers can request single or triple layered. Special requirements for writing on cakes or for transfers or any other type of decoration must be handwritten. Jane bases her cake cost on the type, size and number of layers with the decoration cost based on the skill required. Customers can pay a deposit, pay in advance or pay on collection. Payments must also be recorded in the order book. The order should be initialled by the member of staff who has received it. This helps if there are any queries, or if some detail is accidentally left out that the staff member may remember later. Staff are always very busy and can forget to initial the order.

Orders for wedding or formal occasion cakes must be handwritten in the book. Again, customer name, contact details and cake details must be provided. As these cakes are generally much more expensive, a minimum £10 deposit is required. When a wedding cake is requested, the customer details are completed as usual at the top of the cake order form and the word 'Wedding' is written in the first row under 'Occasion'. A sticky note with outline cake details is then stuck on to the page.

Customers frequently require different types of cake for each tier of a wedding cake. It is really important to record these

details accurately. Some of these cakes also require delivery to a particular venue as they can be difficult for the customer to transport. There is an additional £5 delivery charge for this service. An estimate for the cost of the cake will be written on the order, but this must be agreed with Jane who will always contact the customer to ensure the order is accurate, agree the cost and sometimes point out better choices.

Jane takes the order book home from the cafe at the close of business every day and it is returned the following morning with the first delivery from the off-site kitchen. When she finishes a cake, she ticks the order in the order book to indicate that the order is completed. When the cake is collected staff at the café must also mark the amount paid in the order book, deducting any deposit. They must also initial the order when payment is made and the cake is collected. If a cake is not collected by 4 pm, staff must call the customer.

As the business has grown, there have been serious issues with this ordering process. Taking the order book home and returning it the following day is not practical. The order book is the only record of orders and if lost would cause a considerable problem for the business. It also represents evidence of sales for reconciliation with the shop tills, as well as its role in auditing. On occasion, Jane has either forgotten to collect it or else return it. When the order book is not returned, any incoming orders must be written on a sheet of paper. Details are sometimes not fully recorded. As the order book is just a sequential set of pages, there is no way of having any real organisation, especially regarding completion of the product and delivery to the café for collection. A cake could be ordered for the next day or for next week. It is difficult to ensure that cakes are baked for the correct date.

An A3 insert is available for clarity

HARPERS

CAKE ORDER

CUSTOMER DETAILS

Name Carol Smith Date Ordered 22/7/22

Address 25, High Road, Newtown Date Required 29/7/22

Telephone No: 0999999999 e-mail: csmith99@9999.vom

Occasion	Birthday	Anniversary	Standard		
	✓				
Shape	Round	Square	Rectangle		
		✓			
Size	Small	Medium	Large		
		✓			
Type	Vanilla	Chocolate	Lemon	Raspberry	Strawberry
	✓				✓
Filling	Butter	Cream	Vanilla	Fresh cream	
				✓	
Icing	Fondant	Chocolate	Plain	Coloured	
				pink	

Layered Single / Triple

Writing Happy Birthday Jenny **Decoration** Ballerina Transfer

8 today

Lots of Love

from Mum and Dad

Cost	£15		Order taken by:	JM
Deposit	£5		Order completed by:	
Balance	£10		Paid	

Café orders

In the afternoon, an experienced member of staff at the café will compile the daily café order. This café order is taken to the off-site kitchen each evening along with the cake order book. The café order is difficult to create and its accuracy depends a lot on the knowledge and experience of the person creating it.

The last thing that Jane wants is to have excess food prepared and consequently wasted. It is difficult, however, to ensure that the quantities and types of food required each day are accurate. Some issues that influence the order include looking at the day of the week, holiday periods and special events, as well as consideration of the pattern of activity over a period of time. For example, Jane knows that more people are likely to have lunch on Fridays and Saturdays. She knows that Monday mornings are quite slack except during holiday periods, especially in the run-up to Christmas, when many people like to shop at what are assumed to be quiet periods. She also knows that something must be done to make sure that pre-orders for lunch are managed effectively.

There are regular items available every day and also seasonal ones. For example, mince pies at Christmas, hot cross buns at Easter and specially decorated pastries at Hallowe'en.

Where possible, Jane will avoid waste and try to freeze items that are over ordered. Again, this is not always possible. All wastage must be recorded by staff at the end of each day. This is recorded on the original order form that is returned with the daily orders. Jane has designed a simple order form for the café orders.

In addition to all of this, Jane must also consider the stock order for the off-site kitchen.

Jane has a very successful, thriving business and is keen to maintain its excellent reputation. She recognises that her administration requires a significant overhaul that will involve the implementation of a computer system. She is seeking advice on how to move forward with her ideas.

Jane has met with representatives from the Digital Advances Computer Consultancy. They are going to review the entire business and make recommendations for the implementation of a new computer system. Jane is keen for her whole team to be involved in the development process.

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