

# BCS Certificate in Requirements Engineering

**NOTE:**

These are sample questions, with marking guidelines, for each of the BCS Diploma certificate modules. Each sample question has been written to help candidates prepare for the module examination by providing an example of the general approach adopted by these questions. Therefore, the total marks assigned to the sample questions will vary depending upon the certificate module.

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# REQUIREMENTS ENGINEERING

## Requirements Elicitation question

### Scenario 1

Food Service Supplies (FSS) is a UK-based provider of perishable foodstuffs to the catering industry. Their main clients are hotels, schools and hospitals, although they have also recently started supplying professional catering companies.

Orders are received via three channels: 1) calls directly from the customer to a telesales function, 2) online orders placed directly by the customer via the internet and 3) receipt of paper order forms into the sales department's data processing team.

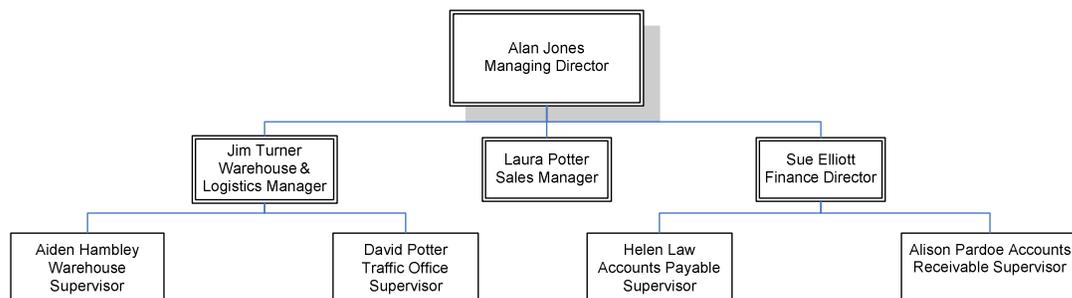
Upon receipt of an order it is entered into the Sales Order Processing (SOP) system where it is validated and sent to the Stock Management System (SMS) used by the warehouse. The SMS manages the picking process and, when an order has been picked, the details are transferred to the Traffic Management System (TMS). The TMS is used by the Traffic Office to schedule and track the dispatch and delivery process. Finally, the signed Delivery Note (signed by the customer upon receipt of the goods) is returned by the delivery driver to the Accounts Payable team where it is processed in the Central Accounts System (CAS) and an invoice generated for the customer.

As part of a new continuous service improvement initiative FSS Managing Director Alan Jones has initiated a project to investigate the requirements for a proposed Service Level Reporting (SLR) solution to track service level failures and report on key performance indicators across the organization. Examples of service failures are:

- mis-interpretation of customer order
- mis-picking of products
- damage to goods during distribution
- incorrect invoice (e.g. charge for products not received)

Alan Jones is keen to move quickly on this as he is convinced that FSS are losing business due to service failures that are not properly tracked and resolved. Consequently, the Requirements Engineering work must be completed and signed-off within a six week period from the project start date.

It has been decided that the scope of the initial solution should be restricted to the following organisational functions: sales, warehousing, distribution and accounts. An organization chart of these areas is provided below.



### Question

- a) It has been suggested that a workshop **SHOULD** be used to obtain the high level requirements for the new SLR system. Give **three** reasons why a workshop would be a useful technique for achieving this. (3 marks)
- b) Identify **three** stakeholders that you believe **SHOULD** be included in the workshop and explain why they **SHOULD** attend. (4½ marks)
- c) Following the workshop it will be necessary to explore the high level requirements in more detail with each stakeholder individually. For each stakeholder identified in part b) suggest a possible elicitation technique that you **COULD** use to define their detailed requirements and explain why the technique would be suitable. (4½ marks)
- (Total 12 marks)

### Specimen answer and marking scheme

- a) Possible reasons are:
- There are a range of stakeholders from different organisational functions who would all have their own perspectives which would need to be considered.
  - Each organisational function experiences their own specific types of service failure (such as mis-interpretation of customer order in sales, mis-picking of products in the warehouse, damage to goods during distribution).

- It would be necessary to establish a consensus agreement between the key stakeholders as to which requirements are relevant and which are not, and also the priority of each requirement.
- Due to the tight timescale for completion of the Requirements Engineering work, a workshop will enable speedy identification and prioritization of the high-level requirements.

Marks can be awarded for suitable plausible alternatives.

*Up to 1 mark for each reason explaining why a workshop would be a useful technique to obtain the high-level requirements.*

*Up to 3 marks*

*(Total for part (a) is 3 marks)*

b) Possible stakeholders and reasons are:

<b>Stakeholder</b>	<b>Reason</b>
<i>Alan Jones</i>	<i>Alan has initiated the project and will be keen to ensure that the requirements identified are in line with his objectives. As project sponsor he will also be keen to gauge whether the scope is 'creeping', and hence, the budget and timescales are not likely to be met.</i>
<i>Laura Potter</i>	<i>Will be able to identify potential service level failures arising during order capture, both telesales and through processing of manual order forms. Will identify specific reports to help monitor and resolve service failures arising from the sales function.</i>
<i>Aiden Hambly</i>	<i>Will be able to identify potential service level failures resulting from picking and packing activities within the warehouse. Will identify specific reports to help monitor and resolve service failures arising from the warehousing function.</i>
<i>David Potter</i>	<i>Will be able to identify potential service level failures resulting from dispatch and delivery activities. Will identify specific reports to help monitor and resolve service failures arising from the logistics (dispatch and delivery) function.</i>
<i>Helen Law</i>	<i>Will be able to identify potential service</i>

Stakeholder	Reason
	<i>level failures resulting from delivery discrepancies and inaccuracies introduced during the invoicing process. Will identify specific reports to help monitor and resolve service failures arising from the accounts function.</i>

Note: It is unlikely that Jim Turner and Sue Elliott will be involved in the workshop as they are too detached from the issues but marks can be awarded for justified answers.

Up to ½ mark for each stakeholder

Up to 1½ marks

Up to 1 mark for each reason explaining why a stakeholder should attend

Up to 3 marks

(Total for part (b) is 4½ marks)

c) Possible techniques and reasons are:

Stakeholder	Technique	Reason
<i>Alan Jones</i>	<i>Document analysis</i>	<i>Alan is likely to have some key management information reporting requirements, which will need to be explicitly defined. Document analysis will enable a more precise understanding of the output document requirements and the data to be reported.</i>
	<i>Interview</i>	<i>As the sponsor of the project, it will be useful to understand any internal politics before dealing directly with the other stakeholders. An interview is particularly appropriate here because of the need for confidentiality and detailed one-to-one discussion.</i>
<i>Laura Potter</i>	<i>Interview</i>	<i>It would be useful to talk to Dawn on a one-to-one basis to identify the particular challenges faced by her team and help focus the elicitation effort, which could then lead on to observation (see below).</i>
	<i>Observation</i>	<i>Given the fact that the telesales function is likely to be a very busy</i>

		<i>environment and the staff are likely to be very busy, a non-intrusive form of elicitation such as observation will be most suitable.</i>
	<i>Document analysis</i>	<i>In order to understand the nature of service level failures arising from manual orders, a document analysis exercise to examine sample order forms would be useful. It is not clear from the scenario whether Dawn understands all of the potential service failures so this may highlight some areas that she may not be aware of.</i>
<i>Aiden Hambly</i>	<i>Interview</i>	<i>Similar to Laura Potter but for the warehouse team.</i>
	<i>Observation</i>	
	<i>Document analysis</i>	<i>Similar to Laura Potter but to understand the nature of service level failures arising from manual picking lists.</i>
<i>David Potter</i>	<i>Interview/ Document analysis</i>	<i>A joint interview combined with document analysis might be useful to identify issues experienced by the Traffic Office clerks reporting to David Potter and to identify potential failures arising from the generation of Dispatch Notes and the loading of picked orders onto trucks for delivery.</i>
<i>Helen Law</i>	<i>Interview/ Document analysis</i>	<i>Similar to Laura Potter but to understand the nature of service level failures arising from completed Delivery Notes (it would probably best to do this with the delivery drivers themselves but they have not been included in the scenario) and the generation of Invoices.</i>
<i>All</i>	<i>Document analysis</i>	<i>This technique can be used to help define detailed reporting requirements (and their associated data requirements) for each function.</i>
	<i>Interview/ Observation</i>	<i>An interview with each stakeholder at their desk may enable an informal observation of the process for entering details from source documents into the appropriate computer system and the generation of any documentation</i>

		<p><i>(e.g. an interview with Helen Law to understand the process for entering details from completed Delivery Notes into CAS and the generation of Invoices) and any potential service failures that can originate as a consequence of the activity.</i></p>
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*Up to ½ mark for each elicitation technique.*

*Up to 1½ marks*

*Up to 1 mark for each reason explaining why a technique is suitable.*

*Up to 3 marks*

*(Total for part (c) is 4½ marks)*

## Requirements Analysis question

### Scenario 2

ReliefAid is a charity that transports aid to those places in the world that have suffered some form of catastrophe such as floods, or earthquake. The aid is in the form of clothing and blankets, tents, some civil engineering equipment to help restore the infrastructure after disruption, dried food rations and first aid supplies. There is also a large team of volunteer reservists who can fly to the stricken areas with the supplies and offer help on the ground.

The charity has a central depot where all supplies are initially stored, and a series of satellite depots in the UK (all placed near airports, so that supplies can be issued urgently). The satellite depots have only limited quantities of the supplies as their capacity is small. The central depot keeps the satellite depots supplied but does not expect to send supplies direct to the stricken areas. Dispatches to a satellite depot should only be made in response to a requisition order from that depot. All dispatches to a satellite depot need to be 'posted' to the central depot database as a dispatch record.

The trustees of the charity have approved funds to build a new IT warehousing system to manage the stock levels in both central and satellite depots. Stage 1 of the system is just to manage the stock at the central depot. The actual software development will be carried out offshore. A team of consultant business analysts have held a series of workshops with various Subject Matter Experts (SMEs) and have produced an initial list of requirements. The business analysts are ready to analyse these requirements prior to producing the Requirements Document for the software developers.

The requirements are shown in the table below.

1	The system must be able to record dispatches to a satellite depot. It must make a note of what was dispatched and what time. It should record when it was signed for and highlight any problems with the items delivered.
2	The system must be able to consolidate multiple orders from one satellite depot.
3	The system must record what items, and their quantity, are needed to be sent out to respond to a given disaster.
4	The system must allow post-postings to be recorded the next day.

## Question

a) Study the four requirements listed above and comment on their suitability according to the following criteria:

- clarity/ambiguity
- relevance to the project objectives
- reasonableness and testability.

*(4 marks)*

b) Suggest two actions you might take to improve each of these requirements.

*(8 marks)*

*(Total 12 marks)*

## Specimen answer and marking scheme

NB suggestions for improvement do NOT include awarding a MSCW priority.

1. *The system must be able to record dispatches to a satellite depot. It must make a note of what was dispatched and at what time. It should record when it was signed for and highlight any problems with the items delivered.*

a) **Criticism:** This requirement is made up of at least **three** separate requirements, and so will be very difficult to test. There is also lack of clarity about the nature of the problems that might be encountered.

b) **Suggestions:** Separate out the **three** separate requirements (i.e. record dispatch sent; record receipt of dispatch, note problems with items.) Clarify with the users what they mean by “highlighting problems”. Perhaps draw a process model to understand the different steps and responsibilities involved in dispatch.

2. *The system must be able to consolidate multiple orders from one satellite depot.*

a) **Criticism:** The context and scope of this requirement is very unclear – over what period of time should orders be candidates for consolidation? How many orders are posted – one single consolidated, or multiple?

b) **Suggestions:** Go back to stakeholders and clarify the uncertain issues. Perhaps draw a partial data model to understand what the data needs are and any business rules/constraints around the question of consolidation.

3. *The system must record what items, and their quantity, are needed to be sent out to respond to a given disaster.*

a) **Criticism:** This seems to be out of scope, as Stage 1 is only concerned with stock control of Central Depot; Also, emergency relief items are only sent from Satellite depots, not Central, so there seems to be a lack of clarity about the roles of the depots. As there is always confusion in the aftermath of a natural disaster, with the scale of aid needed unclear for a few days, it is unlikely that anyone can assess exactly what will be needed in order to respond, so the requirement may not be feasible.

b) **Suggestions:** Confirm with the sponsor whether or not this is in scope, and whether it correctly reflects the business model of depots’ responsibilities. We also need to understand whether there is a baseline for immediate relief shipments before the situation on the ground is clarified.

4. *The system must allow post-postings to be recorded the next day.*

- a) **Criticism:** So far there has been no mention of the term “post-postings”; the term is ambiguous, so we are not yet in a position to assess whether it is or is not a good requirement. What is the significance of “next day”?
- b) **Suggestion:** Speak to the SME about the process of post-postings and discover the implications of this activity, whether there are other dependant activities or requirements based upon it. Perhaps draw a process model of completing a post-posting so that the process and data needed are clear.

*Up to 1 mark per valid criticism of a requirement.*

*Up to 4 marks*

*Up to 1 mark for each relevant suggestion to improve a requirement. Up to two suggestions per requirement.*

*Up to 8 marks*

*(Total 12 marks)*

## Use case diagram question

### Scenario 3

Mr Pierre is the owner and manager of the restaurant 'Pierre's'. This is a popular French restaurant, with a lot of repeat trade, that is busy most evenings and full at weekends. The restaurant is only open in the evenings and seats 50 customers with only one service per night.

Currently all bookings are received over the telephone. On answering the call, Mr Pierre always requests the required date and the number of guests to be seated. He then checks to see if the booking can be accommodated. Where the booking can be accommodated, he asks the customer for further booking details including the booking name, contact number and number of people in the booking. He then logs the booking into the restaurant diary under the relevant date.

Mr Pierre also asks whether there are any special dietary requirements or whether the booking is for a special occasion such as birthday or anniversary, so he can arrange for birthday cakes, balloons, special wines etc.

Mr Pierre always reads the details he has taken back to the customers so that they can confirm their bookings.

If the restaurant is full on the required evening, Mr Pierre offers an alternative date for the booking or, if this is not acceptable, asks if the customer would like to be added to a waiting list. The waiting list is recorded at the bottom of each page in the diary and a contact name & number along with number of people in the booking is taken. This enables Mr Pierre to view bookings regularly and manage changes to bookings should someone cancel or change their booking.

On a daily basis the Head Chef, Jacques, will check the diary to see if there is any special dietary requirement he needs to be aware of that day. Francoise, the Head Waiter, also prints the diary each day in order to draw up a table plan for each service.

As the restaurant is so busy Mr Pierre would like to start opening lunch times but currently the telephone bookings are taking up too much of his time. Further, Mr Pierre has received feedback from his customers that they cannot sometimes get through to book as the phone line is busy. In response to this, Mr Pierre has decided to invest in an on-line booking system that would enable customers to make reservations on-line.

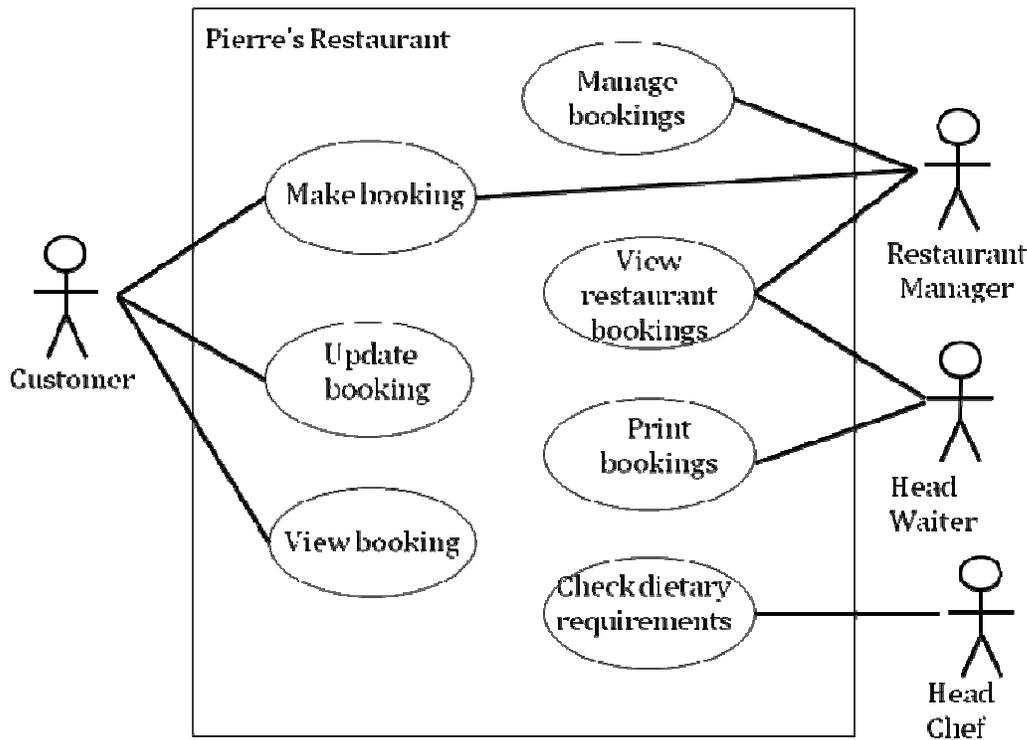
Mr Pierre is keen that the new system does as a minimum what his current restaurant diary enables him and his staff to do. The hope is that this will reduce the telephone calls as well as provide an alternative method of booking at his restaurant which has been requested by for his loyal customers.

## Question

Draw a use case diagram identifying the Actors and Use Cases required for the Pierre's restaurant on-line system.

(10 marks)

### Specimen answer and marking scheme



*½ mark for each actor.*

*2 marks*

*Up to 1 mark for each correctly named (verb-noun) use case with correct association line.*

*7 marks*

*1 mark for showing the boundary.*

*1 mark*

*Note: Candidates may identify separate use cases for lower level functionality such as 'cancel booking', 'view special requirements' or 'view waiting list'. Where this is the case, marks should be awarded in line with the specimen answer and marking scheme. For example, 1 mark should be awarded where there are several decomposed use cases relating to 'update booking'; additional marks should not be given.*

*(Total 10 marks)*

## Use case description question

### Scenario 4

See the Mr Pierre's restaurant scenario for the use case diagram question.

### Question

- a) Provide an outline 'happy day' use case description for making a booking through the on-line booking system. This scenario **SHOULD** assume that the restaurant has availability and therefore a booking can be made. *(5 marks)*
- b) For the use case description described in part a), identify an additional **three** alternate flows that **COULD** be invoked from the basic flow. *(3 marks)*
- (Total 8 marks)*

## Specimen answer and marking scheme

a) Use case: 'Make a booking'

1. The 'Make booking' use case starts when the Customer requests to make a booking
2. System requests 'date of booking' and 'number of people in booking'
3. Customer enters 'date' and 'number of people in booking'
4. System checks whether number entered exceeds total bookings for the restaurant on that date
5. System confirms availability and requests further booking details (booking name, number of people in booking, contact details)
6. Customer enters booking details
7. System requests special requirements
8. Customer enters details of special requirements
9. System prompts customer to confirm booking details
10. Customer confirms details
11. System confirms booking

b) Possible additional flows are:

- Restaurant full – provide alternate date.
- Restaurant full – add to waiting list.
- Booking details not confirmed.

*½ mark for each step in the basic flow correctly identified.*

*Up to 5  
marks*

*Up to 1 mark for identifying each alternate flow.*

*Up to 3  
marks*

*(Total 8 marks)*

## Class diagram question

### Scenario 5

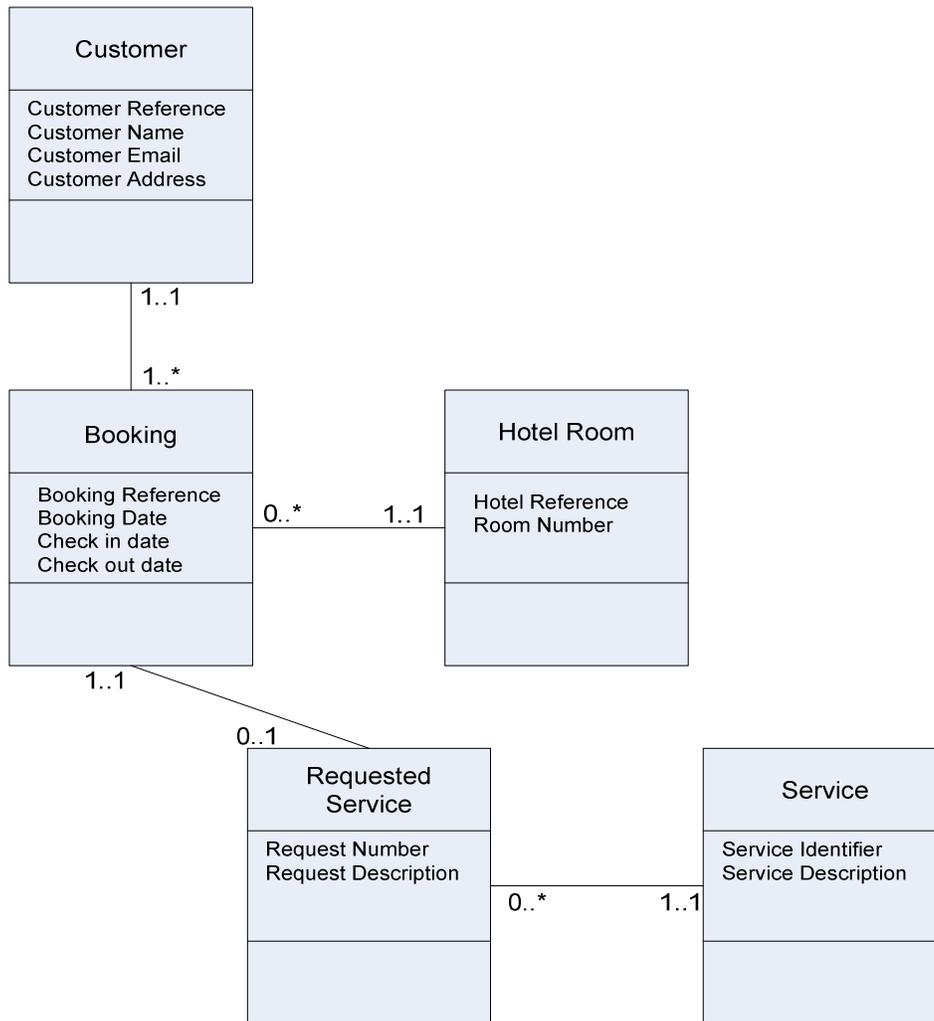
A set of requirements have been agreed for Roomrate, a proposed new online hotel booking system. The Roomrate project was initiated by two young graduate entrepreneurs who wanted to offer a hotel booking service for small, unusual hotels offering individually-designed rooms. The founders have asked a friend, who is a business analyst, to analyse the requirements for the site. The analyst has conducted an initial interview with the entrepreneurs and has built a data model to reflect the requirements. The data model is shown below.

The entrepreneurs have signed off the requirements and work is underway to design and develop the site. However, following the initial requirements work, the entrepreneurs have engaged a new employee who will be the marketing manager for the organisation. This person has looked at the target market and the services to be offered and has defined them in greater detail than had been done previously. He has declared that the site will be aimed largely at the under 35 years market and will offer additional services including video games, organised competitions and a range of food and drinks. These services are in addition to standard requirements such as non-smoking rooms, twin beds or adjoining rooms.

As a result of this, he has identified two further requirements:

- The ability to make multiple room bookings.
- The ability to request multiple additional services when booking a room.

These have been raised as change requests and their inclusion has been approved.



### Question

Identify two business rules shown on this data model that would not meet the requirements expressed by the marketing manager. Explain the impact each business rule shown on the model would have on the Roomrate customers.

*(6 marks)*

## Specimen answer and marking scheme

1. The multiplicity shown on the relationship between Booking and Hotel Room defines the following business rules:

- Each Booking must be for one and only one Hotel Room
- Each Hotel Room may have zero or many Bookings

This means that where there is a group booking, each room would have to be booked separately which would be very time-consuming if a number of rooms are required. It also runs the risk of the group not obtaining sufficient rooms if bookings are made by other customers while the group is completing the set of room bookings.

2. The multiplicity shown on the relationship between Booking and Requested Service defines the following business rules:

- Each Requested Service must be for one and only one Booking
- Each Booking may have zero or one Requested Service

This means that where a booking has been made only one service can be requested for that room. This will cause annoyance for customers because the site publicises a list of services but only one can be selected. Further no additional service can be requested if a standard service, such as twin beds, is required.

*1 mark for explaining the multiplicity that states each business rule*

*Up to 2 marks*

*Up to 2 marks for explaining the impact of each business rule*

*Up to 4 marks*

*(Total 6 marks)*