



Rewarding Learning

ADVANCED
General Certificate of Education
2025

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

WEDNESDAY 21 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.

You must answer the questions in the spaces provided.

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

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

Answer **all nine** 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)**, **4(a)**, **5(a)** and **6(a)**.



1 Before a scheduling system for lesson bookings is built at Software Solutions, Michael, a trainee systems analyst, aims to use a questionnaire to gather information from potential and existing customers to determine which types of lessons attract the most interest.

(a) Explain two benefits and two drawbacks of using a questionnaire for this purpose.

Benefit 1:

[1]

Benefit 2:

[1]

Drawback 1:

[1]

Drawback 2:

[1]



(b) Following the fact-finding phase, Michael collaborates with various stakeholders to gather a set of user stories.

(i) Explain the term user story.

[2]

(ii) The A4 notebook used to book multiple lessons is not fit for purpose. Complete the user story template below to help address this issue.

As a	receptionist
_____ [1]	_____ [1]
_____ [1]	_____ [1]

[4]

[Turn over



- 2 The development team at Software Solutions is evaluating different methodologies to implement a new software system at The Stables.

Using the table below, identify which methodology each description refers to.

Description	Methodology
As the Project/Business Ambassador, Mark will represent the interests of the employees at The Stables, acting as a liaison between them and the development team at Software Solutions.	
A Product Backlog is maintained for a proposed Event Booking portal and has a prioritised list of features that is open to changes based on the needs of The Stables.	
To quickly develop an enhanced Lesson Booking system, Software Solutions engages stakeholders, such as the receptionist, in collaborative workshops (JAD sessions) to prototype and develop the system.	
The software developers at Software Solutions are encouraged to be innovative and make bold decisions, like adopting new technologies for the Instructor Daily Schedule system, if it benefits Mark and Diane's business.	
The requirements for The Stable's new Billing interface are well-defined, so a linear approach will be used for its development.	

[5]





3 The developers have created a prototype for the Riding School's new online booking form. They will present the prototype to Mark, Diane and the receptionist.

(a) Outline four improvements that should be included in the prototype to help solve the current problems of the booking processes at the riding school.

1. _____
_____ [1]

2. _____
_____ [1]

3. _____
_____ [1]

4. _____
_____ [1]

[Turn over

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[6]

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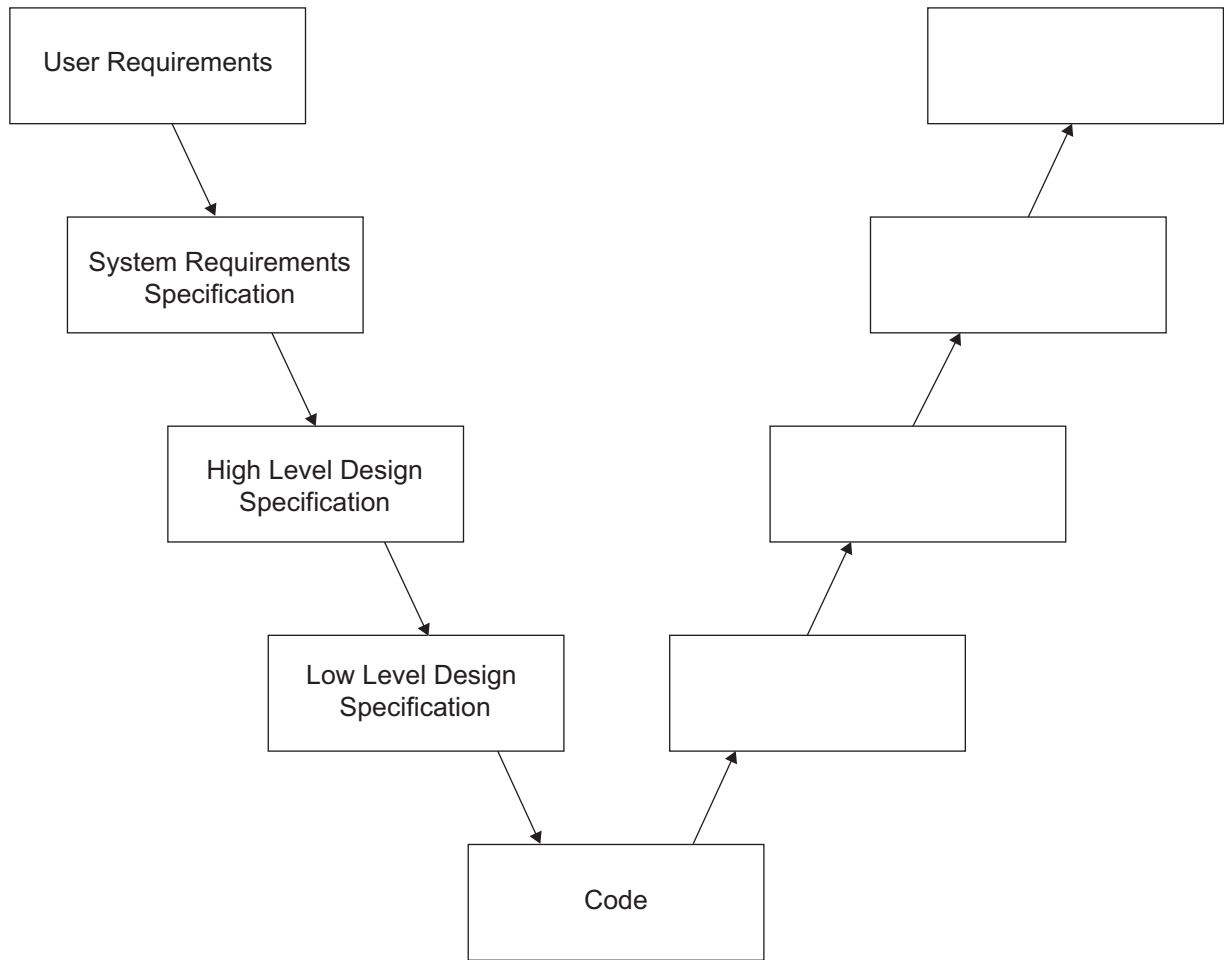
[Turn over



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[6]

(b) Michael has created the partial V-Model diagram below.
Complete the diagram by adding the corresponding testing phases.



[4]

[Turn over





[6]

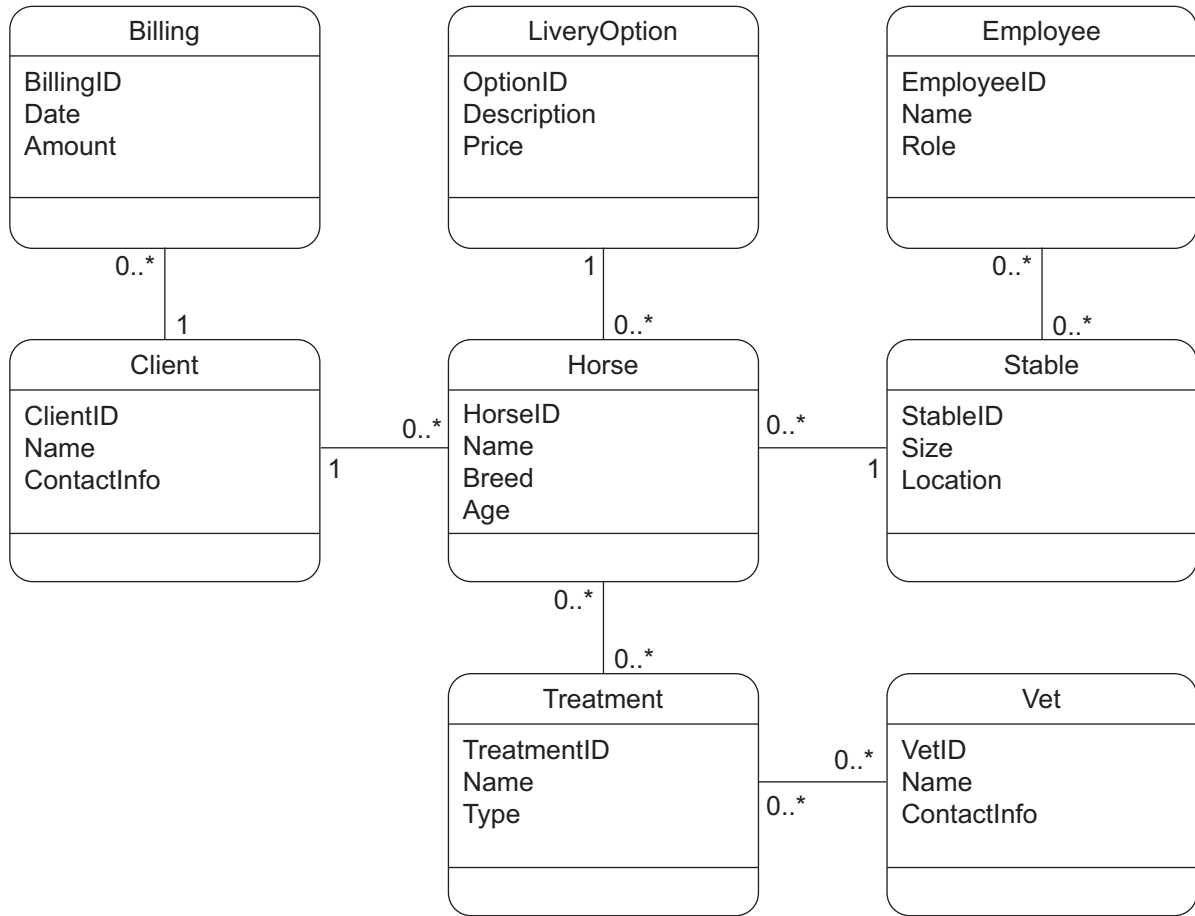
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(b) Michael has created the following class diagram to depict the relationships involved in the stabling of horses, treatments, livery options, and associated billing.



Give two reasons why the features of this diagram suggest that it was created in the analysis phase.

Reason 1:

[2]

Reason 2:

[2]



Sample Client and Horse Care Record

The Stables Client and Horse Care Record

Client Details

Name: Fiona O'Neill
 Address: 42 Ballysillan Road
Belfast
BT14 7QQ
 Contact Info: 028 9012 3456
 Email: fiona.oneill@email.com

Horse and Livery Service

Horse Details				Livery Service Details					
Name	Breed	DOB	Sex	Stable No.	Arrival Date	Livery Type	Service Start	Service End	Special Instructions
Apollo	Dutch Warmblood	15/04/19	Gelding	B12	04/01/25	Full Livery	04/01/25	N/A	Daily exercise required, special diet as per dietary log.
Bella	Thoroughbred	30/10/17	Mare	CO8	30/03/25	Part Livery	30/03/25	30/09/25	Extra bedding for arthritis, monitor water intake.

Vet Visitation and Treatment Record

Horse Name	Date of Visit	Vet Name	Vet Clinic Name	Reason for Visit	Treatment Provided	Follow-Up Appointment Date	Notes
Apollo	10/04/25	Dr. Emily Watson	Riverside Veterinary Specialists	Routine Vaccination	<ul style="list-style-type: none"> Annual vaccinations 	15/05/25	No adverse reactions noted.
Apollo	15/05/25	Dr. Emily Watson	Riverside Veterinary Specialists	Limping observed in left front leg	<ul style="list-style-type: none"> X-ray Anti-inflammatory medication Leg support 	09/07/25	Possible tendon strain; to re-evaluate movement in follow-up.
Bella	20/04/25	Dr. Sarah Jennings	Green Meadow Veterinary Centre	Dental checkup	<ul style="list-style-type: none"> Dental filling 	07/05/25	Mild tartar build-up noted; otherwise healthy.
Bella	07/05/25	Dr. Sarah Jennings	Green Meadow Veterinary Centre	Skin rash	<ul style="list-style-type: none"> Skin ointment Advice on dietary changes 	07/07/25	Allergic reaction suspected; to monitor if rash improves with diet change.



- 7 Details about clients, their horses (and the livery requirement for each horse), as well as vet visitation and treatment history are recorded and updated on a 'Client and Horse Care Record'. A sample of the record is shown on the page opposite.

Grace has listed the unnormalised fields, as shown below, that are required to begin the normalisation process:

ClientID, ClientFName, ClientSName, ClientAdd1, ClientAdd2, ClientPostCode, ClientTel, ClientEmail, {HorseID, HorseName, HorseBreed, HorseDOB, HorseGender, StableNo, ArrivalDate, LiveryServiceID, LiveryType, ServiceStart, ServiceEnd, SpecialInstructions, {VetVisitID, VetID, VetFName, VetSName, VetClinicID, VetClinicName VetVisitDate, VisitReason, {TreatmentID, TreatmentDesc}, VetFollowupDate, Notes}}

She has transformed the data to 1NF, as shown below:

1NF

CLIENT

ClientID, ClientFName, ClientSName, ClientAdd1, ClientAdd2, ClientPostCode, ClientTel, ClientEmail

CLIENT_HORSE

ClientID*, HorseID, HorseName, HorseBreed, HorseDOB, HorseGender, StableNo, ArrivalDate, LiveryServiceID, LiveryType, ServiceStart, ServiceEnd, SpecialInstructions

CLIENT_HORSE_VETVISIT

ClientID*, HorseID*, VetVisitID, VetID, VetFName, VetSName, VetClinicID, VetClinicName, VetVisitDate, VisitReason, VetFollowupDate, Notes

CLIENT_HORSE_VETVISIT_TREATMENT

ClientID*, HorseID*, VetVisitID*, TreatmentID, TreatmentDesc

[Turn over

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28ADV1117

8 Michael is creating an entity relationship model for the new system.

(a) Describe the following terms.

(i) Entity:

[2]

(ii) Relationship:

[2]

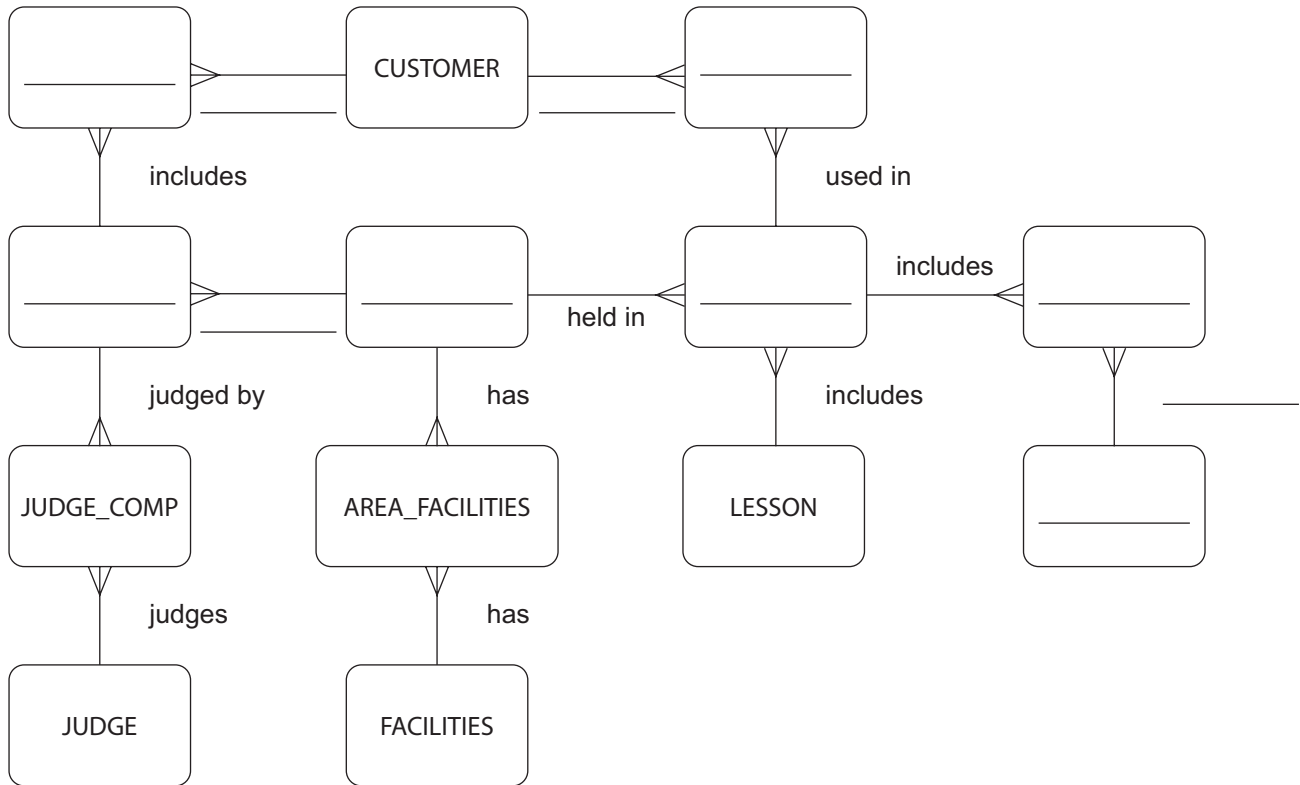
(iii) Cardinality:

[2]



(b) Complete the following ERM by inserting the correct word or phrase from the list below:

- | | |
|--------------|----------------|
| accommodates | INSTRUCTOR |
| AREA | LESSON_SLOT |
| assigned to | LSLOT_INSTRUCT |
| BOOKING | places |
| COMPETITION | registers |
| CUST_COMP | |



[11]

[Turn over



9 The following diagram is a partial database design for creating and populating lesson slots:

LESSONSLOT	
Field	Data Type
LessonslotID	int
DayOfWeek	varchar
StartTime	time
EndTime	time
LessonID	int
AreaID	int

LESSON	
Field	Data Type
LessonID	int
LessonName	varchar
Level	char
Duration	int
LessonType	char
LessonFormat	char

LSLOT_INSTRUCT	
Field	Data Type
LessonslotID	int
InstructorID	int

AREA	
Field	Data Type
AreaID	int
AreaName	varchar
AreaType	char

(a) The table below contains some records from the LESSON table:

LessonID	LessonName	Level	Duration	LessonType	LessonFormat
1	BRiding30	B	30	R	I
2	BRidingG30	B	30	R	G



- (i) One of the larger paddocks (AreaID:1) will be used every Monday for beginner riding group lessons with a duration of 30 minutes.

Complete the following SQL script which will insert a scheduled slot for this lesson, starting at 5pm.

INSERT INTO LESSONSLOT (DayOfWeek, StartTime, EndTime, LessonID, AreaID)

SELECT

'Monday' AS DayOfWeek,

'17:00:00' AS _____,

_____ (MINUTE, _____, '17:00:00')

AS EndTime,

L.LESSONID,

1 AS AreaID

FROM

LESSON L

L.LessonID = _____

[5]

- (ii) Lessonslot ID 15 contains information about a group hacking activity. This has been allocated to instructors 18 and 27. Write the SQL code to add this data to the LSLLOT_INSTRUCT table.

_____ [3]

[Turn over

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28ADV1123

- (b) Mark and Diane would like the new system to produce a report each Monday to determine the total number of bookings and hours each instructor has for the following week (Monday – Sunday). This will allow them to assess instructor workload.

The BOOKING table below has been added to the partial database:

BOOKING	
Field	Data Type
BookingID	int
LessonslotID	int
CustomerID	int
NumLessons	int
BookingDate	date
HealthIssues	varchar

Note:

- Assume that CUSTOMER and INSTRUCTOR tables exist.
- The list should be in descending order of hours.
- Instructor names (forename and surname) should be included.
- The NumLessons field in BOOKING is used to validate block bookings and is not needed for this report (block bookings will still have their own separate booking dates for each lesson).

Write the SQL script that will achieve this.



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For Examiner's use only	
Question Number	Marks
1	
2	
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9	

Total Marks	
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Examiner Number

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Rewarding Learning
ADVANCED
General Certificate of Education
2025

Software Systems Development

Unit A2 1

Systems Approaches and Database Concepts

Case Study

[ADV11]

AVAILABLE TO CANDIDATES – MARCH 2025

Pre-release Case Study

Instructions to Candidates:

The A2 1 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.

THE STABLES

THE STABLES is an up-and-coming equestrian centre located in extensive farmland ideal for keeping horses. The centre is surrounded by wooded trails and has access to a sandy beach. The centre is owned by Mark and Diane Simpson.

Originally, the centre provided livery options to the public for a small number of horses. This generated a reasonable source of additional income to supplement the couple's full-time employment. Being horse lovers and trained riders, they involved themselves in as much of the stable activity as possible but found that with their own full-time jobs they had very little leisure time. Two part-time stable hands assisted with the daily work involved.

Mark and Diane recognised that there was a real market for what they had to offer. After a lot of deliberation, they finally decided to go ahead with a major development of the centre and step back from their current jobs, taking on full-time roles in the business.

The centre has now expanded its provision to include additional livery facilities for up to 25 horses and a fully equipped riding school. It also hosts a range of events and activities for the public. As the reputation of the centre has grown, more and more people want to avail of the services provided.

The centre has become very busy and Mark and Diane are very pleased with their progress. They are keen to ensure the centre's continued success. They have now employed five fully qualified instructors and two grooms as well as the two part-time stable hands. Even with the increased number of staff the centre is still very busy. If a staff member is sick or unable to attend for some reason, it is almost impossible to find cover and lessons and events may have to be cancelled at short notice. This leads to a lot of dissatisfaction, especially for young riders and their parents, some of whom may have already set out with a horse box in tow on the journey to the centre.

Although the business has expanded rapidly, the administrative procedures have not matched this growth. Mark and Diane are having great difficulty managing all the information associated with the services provided by the centre within their outdated administrative systems. As a result, many problems are arising, including the frequent adjustment of staff schedules to accommodate booking errors. This is causing a lot of annoyance to the staff who feel that they cannot properly plan their work or be sure of their free time. There is increasing pressure on staff and Mark and Diane are finally taking note of their concerns. They are worried that some experienced staff may leave and are looking at how to address the problems within their budget constraints.

Owning and caring for a horse is a major commitment and can be very expensive and time consuming. There is also a considerable amount of physical effort involved in looking after horses. Many horse owners do not have suitable accommodation for their horse but still want the opportunity to own one and to enjoy riding. Livery options provide horse owners who do not have suitable facilities or the necessary time, with the opportunity to have their horse cared for at the centre.

Livery options are varied and can include input from the owner as well as allowing the horse to be used for lessons. All horses will have access to routine visits from the livery yard vet and farrier. These services are included in the livery option cost. However, extra treatments or additional specialist care in the event of sickness or accidents must be paid for by the horse owner. Some types of livery options are described in **Table 1** opposite. Livery option cost can vary depending on a range of things such as type of bedding, feed or additional services provided. Mark works out individual contracts for each owner.

Table 1 Livery option costs

Type	Description	Cost per month
Full	Stable, grazing, food, bedding, hay, mucking out, putting the horse out and bringing them in morning and evening, feeding and exercising as agreed with the owner who can have access at any time.	£720
Owner care /DIY	This option involves the owner being responsible for all care of the horse every day. Stabling is provided but not bedding and hay, which must be provided by the owner.	£190
Part-time	In this option, the care of the horse is shared between the owner and the livery yard. Stabling, food, bedding and hay are provided.	£400
Working	In this option, the horse can enjoy full/ partial/ owner/ grass livery at a reduced cost providing the horse can be used for riding lessons in the livery yard.	£470
Grass	This type of livery provides the horse with access to a field. The owner is responsible for all the care and feeding involved each day.	£120

When the centre took care of just six horses, administration was easy. All information was recorded and stored in a filing cabinet in the livery yard office. Each file consisted of separate pages with details for each client, their horse, copies of monthly bills, a further monthly page with details of any extra visits from the vet, vaccinations and any necessary additional treatments. Another page detailed any additional costs for that month and copies of any receipts issued. A copy of the owner contract was also filed. Methods of payment included cash, card and for one individual, payment by cheque.

This system was relatively easy to organise for the small number of horses involved, although even with just six horses, pages were sometimes misfiled and not fully updated. With the increased number of horses, maintenance of this filing system has become a very onerous task and the system is no longer fit for purpose. Mark and Diane are very aware that accurate records are essential for billing customers and maintaining accounts.

Administrative activities seem to come last amid all other jobs to be done and even after the appointment of a full-time receptionist, the introduction of bookings for the riding school and all the other events has now totally compounded existing problems.

LESSONS

The Riding School has been a tremendous success. There are indoor and outdoor arenas that are extensively scheduled. These can also be hired out for £40 per hour to other riding clubs. Facilities for flat work and jump training are available. Riding lessons are extremely popular with the public and cater for a full range of abilities. Lessons can be individual or grouped and are targeted at beginner, intermediate and advanced level riders. One-off 'riding experience' lessons are available to allow people get a taste of what is involved in riding and managing a horse. Event coaching is also available as well as a range of lessons in stable management and grooming.

The centre hosts a range of competitions, both internal and external, throughout the year and maintains a list of experienced judges to judge the events.

BOOKING

To make a booking, the centre must be contacted either by phone, e-mail or in person. Bookings should be handled by the receptionist but there are occasions when she is not present in the yard office. In this event, a client will ask anyone who is around to take the details and ensure that the arrangement is made. Unfortunately, this is not at all reliable. Staff at the centre are always busy and details may be forgotten, not passed on, or contain errors. On many occasions, dates for bookings are omitted.

When a booking is recorded for a new client, information should include name and contact details, level of ability, number of lessons (1,3,5,10), dates and any basic health issues. An attempt has been made to create a file of regular clients who have previously attended the centre in order to avoid repeating information. This is in disarray and has not really been helpful. A returning client sometimes must repeat personal details and this should not happen.

Bookings did not present a major problem when the numbers were small. In fact, Mark and Diane knew practically everyone and it was easy to make and adjust arrangements. This is no longer the case.

Initially all bookings went into one A4 notebook with days and dates handwritten at the top of each page. Mark and Diane soon realised that it was virtually impossible to extract the information necessary to make accurate weekly and daily schedules and making bookings for multiple lessons was often inaccurate. Diane tried to divide the notebook into 'beginner,' 'intermediate,' 'advanced' 'coaching', 'extra events' and 'general' sections but this was worse. She is now trying separate notebooks but this seems to be worse again. With missed entries, double bookings, wrong dates and times, the system is unwieldy and error prone. Billing clients is very difficult. Clients are not happy about the uncertainty of bookings and the accuracy of their bills. Children have been disappointed when there are issues around their lessons, such as cancellations or double bookings or when no booking situations arise.

All lessons must be booked at least one week in advance so that schedules can be drawn up for instructors and locations allocated. Lessons can be 30 minutes or 45 minutes long and can be individual or grouped or for competition coaching or stable management. Instructors are allocated to lessons based on their qualifications, experience and suitability for the level of the rider and the age group involved.

Diane tries to make a weekly schedule for the centre as well as a daily one for each staff member. It is a huge task that is causing major problems. It involves pulling together staff and location availability as well as all separate notebook information. Diane has tried many ways to produce useful schedules. She realised that it was impossible to supply all the information required for the week to display in the office. Indeed, because there are so many parameters involved it is nearly impossible to provide useful overall daily schedules showing all staff members activities. Diane has now opted for an individual daily schedule for each staff member. The daily schedule is basically a frequently amended handwritten list. No copy of this is retained so keeping track of duties for each staff member is not possible.

Mark and Diane decided that certain activities should be limited to specific days of the week. Beginner lessons can only take place on Monday, Wednesday and Friday afternoons from 4pm until 7pm and on Saturdays from 8.30am until 2pm, as most young riders will be at school during the day in term time. Intermediate and Advanced lessons can take place any time when resources are available. Evenings are popular, especially in the summertime. Coaching for events takes place on Saturday and Sunday afternoons. Riders may also enjoy 'hacking' along

the many trails around the centre. This is a relaxed non-competitive activity. Riders must have accomplished a certain standard before participating and be accompanied by an appropriate number of instructors.

A sample Instructor Daily Schedule is shown below.

Sample Instructor Daily Schedule

Instructor Schedule Tuesday April 22nd 2025

Claire Kennedy

*9.30-10.00 ^{replace with Peter Collins for 45}
~~private James Dorrian Intermediate lesson 2/5~~*

10.00-10.45 private Ian Evens Adv.

11.15-1.30 Hacking trail group (5) mixed int/adv (names to follow)

2.30-3.45 group James Canning, Hanna Smyth, Robert (4)

3.30-4.00 group (4) 3 1

4.00-4.45 group (3) beg 1/5, 3/10, 2/3

7.00-7.45 private B Ellen Harkin

Lessons are not cheap and riders are encouraged to make the best use of the time available. Discounts are available when a booking is made for 3, 5 or 10 lessons. These are applied at a rate of 4%, 6% or 8% respectively.

The centre maintains a strict policy of punctuality. Riders must give 48 hours notice of cancellations, otherwise they will be charged half of the lesson fee. Riders who do not show up at all for a lesson are charged the full fee.

Suitable attire is also stressed and lessons cannot proceed if the appropriate hats and boots are not worn. These can be hired for the day and must be paid for immediately.

Lesson rates for the centre are included in **Table 2**.

Table 2 Lesson rates

Time		30 mins	45 mins	2 hours
Beginner	Private	£30	£35	
	Group	£25	£30	
Intermediate	Private	£35	£40	
	Group	£25	£30	
Advanced	Private	£40	£45	
	Group	£35	£40	
Coaching	Private	£45	£40	
Stable management/ grooming/ tack				£30
Hacking				£50

Discounted rates for multiple bookings of 3, 5 or 10 lessons are applied at a rate of 4%, 6% or 8% respectively

Mark and Diane are exploring many new initiatives for the centre. Last summer they had two fun days when members of the public were invited to tour The Stables free of charge and participate in some riding activities and games for children. Refreshments were provided. They also trialled a three-day summer school. Eight beginner riders participated in a three-day programme totally focussed on basic care and handling of horses and, of course, beginner lessons. It was very successful and got really good reviews. They must now decide whether to consider developing these types of events and more competitions or if they should concentrate on resolving their current difficulties.

There is no doubt that the centre is successful and has the capacity to develop further in many ways. Mark is a realist and understands that administrative practices at the centre are causing a lot of major problems and presenting a very poor public image. He has no doubt that they must invest in a suitable computer system that will manage and control the entire administration for the centre. He has already investigated some available software packages, none of which cater for all the individual needs of the centre.

Diane, however, remains unconvinced and is determined to find a way of making her system work.

The company 'Software Solutions' has been employed by Mark and Diane to examine the current issues at The Stables and to potentially develop a new computer system.

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