Department of Computing and

Mathematics

ASSIGNMENT COVER SHEET

Unit title:	Databases
Assignment set by:	Stephen Gordon
Assignment ID:	1CWK100
Assignment title:	Mike's Motorboats
Assignment weighting:	100%
Type: (Group/Individual)	Group and Individual
Hand-in deadlines:	Final ERD: 25/02/22 @ 9pm Test: w/c 07/03/22 during EXTRA lab session Report Assignment: 11/03/22 @ 9pm
Hand-in format and mechanism:	via Unit area on Moodle and via in-class test. ERD should be in the form of a screenshot in a word document, rtf or similar. Test will be carried out in class during assessment week Report Assignment will require two files: a report documenting your work and a script containing all your SQL.
Support:	Help and support can be provided by tutors, or the unit leader (see Moodle page for unit) throughout the unit in person. This support can be provided during project lab sessions or you can arrange to meet a tutor, if necessary.

Learning outcomes being assessed:

Learning Outcome 1:	Create an appropriate relational model for a realistic problem and communicate this model using standard techniques.
Learning Outcome 2:	Create and query a relational database using an industry-standard Database Management System.
Learning Outcome 3:	Perform basic analysis on structured data, and report findings to technical and non-technical audiences.

Databases Project

Note: it is your responsibility to make sure that your work is complete and available for marking by the deadline. Make sure that you have followed the submission instructions carefully, and your work is submitted in the correct format, using the correct hand-in mechanism (e.g. Moodle upload). If submitting via Moodle, you are advised to check your work after upload, to make sure it has uploaded properly. Do not alter your work after the deadline. You should make at least one full backup copy of your work.

Penalties for late hand-in: see Regulations for Undergraduate Programmes of Study (https://www.mmu.ac.uk/academic/casqe/regulations/assessment-regulations.php). The timeliness of submissions is strictly monitored and enforced.

All coursework has a late submission window of 5 working days, but any work submitted within the late window will be capped at 40%, unless you have an agreed extension. Work submitted after the 5-day window will be capped at zero, unless you have an agreed extension.

Please note that individual tutors are unable to grant extensions to coursework. Extensions can only be granted on the basis of a PLP or approved Exceptional Factors (see below).

Exceptional Factors affecting your performance: see Regulations for Undergraduate Programmes of Study (https://www.mmu.ac.uk/academic/casqe/regulations/assessment/docs/ug-regs.pdf). For advice relating to exceptional factors, please see the following website: https://www2.mmu.ac.uk/student-case-management/guidance-for-students/exceptional-factors/ or visit a Student Hub for more information.

Plagiarism: Plagiarism is the unacknowledged representation of another person's work, or use of their ideas, as one's own. Manchester Metropolitan University takes care to detect plagiarism, employs plagiarism detection software, and imposes severe penalties, as outlined in the Student Handbook (http://www.mmu.ac.uk/academic/casqe/regulations/docs/policies_regulations.pdf and Regulations for Undergraduate Programmes (https://www.mmu.ac.uk/academic/casqe/regulations/assessment-regulations.php). Bad referencing or submitting the wrong assignment may still be treated as plagiarism. If in doubt, seek advice from your tutor.

As part of a plagiarism check, you may be asked to attend a meeting with the Unit Leader, or another member of the unit delivery team, where you will be asked to explain your work (e.g. explain the code in a programming assignment). If you are called to one of these meetings, it is very important that you attend.

Assessment Criteria:	Indicated in the attached assignment specification.
Formative Feedback:	Formative feedback will be provided throughout the unit during lab time and in tutor office hours (NOT via Microsoft Teams). **You are advised to ask your tutor to check your final ERD has the correct PKs and FKs before you submit it. It is YOUR responsibility to make sure that this happens. You can do this during lab time and/or tutor office hours. Your final ERD submitted at the formative checkpoint MUST EXACTLY**

	MATCH the final ERD in your report submitted at final report deadline.
Summative Feedback Format:	The group feedback sheet for the project will be provided via Moodle. The grade on the feedback sheet will apply to the group mark. That group mark will be adjusted for each individual according to the work received, the logbook, peer assessment and tutor observation, to produce an individual mark. Individual marks will also be provided to students via Moodle. For a brief summary of what is required to achieve a pass grade, as well as higher grades see page 22-5 of the assignment specification (this document). Feedback for both the group project and test will be provided 4 weeks after the deadline.

Databases Project

Introduction

This assignment is designed to assess your learning in a number of areas relating to databases. It's a group project that will continue throughout the whole of the unit teaching period, during which time you will remain in the same group. It should prove to be an invaluable learning experience, allowing you to experience the reality of working with others of varying abilities and experience whilst still providing room for you to excel in your learning by engaging fully with all aspects of the project work 

In addition, it gives you an opportunity to work on a database project without some of the pressures that exist in industry, such as changing requirements, and cost constraints. This will enable you to consider alternative approaches to your design, and implementation, giving you an opportunity to reflect on your work and, hopefully, learn from what you have done.

Remember that the purpose of this assignment is to provide you with an opportunity for learning, and us with a means of assessing your learning. You should continually be questioning your approach to the work and trying to find the best way of developing the system.

Note: This case study is entirely fictional, any personal details have been made up and any resemblance to real entities, people or otherwise, is entirely coincidental. Any apparent mistakes in the data are intentional and something you need to deal with as a system designer, making and stating appropriate assumptions.

Databases Project

Case Study: Mike's Motorboats

Mike's Motorboats (MM) is situated in a small town on the coast of the UK. It is a large shop which hires out boats (not just motorboats but rowing boats and sail boats) to the many tourists who flock to the area. The shop also sells boats and boating accessories, but this project is concerned only with the hire business, including the acquisition, maintenance and disposal of boats for hire.

The shop owns approximately 130 boats for the purpose of hiring. There is a Boat Record for every boat, an example is shown in appendix A. Mike allocates a unique number to each new boat and enters this on a new Boat Record. The Boat Record contains details of the model and manufacturer, the date that Mike bought the boat, how much he paid for it, and which of three classifications and four sizes the boat belongs to. Each boat is kept for ten years, after which time Mike sells it, usually to one of a handful of local dealers, entering the disposal details on the Boat Record. The Boat Record is then kept for a further two years, because of the warranty that Mike's Motorboats supplies.

The Boat Record also holds details of the boat's maintenance history. Sometimes a fault is noticed, and corrective action taken. Other times, without a fault being noticed, a standard service is carried out on the boat. This includes things like thoroughly cleaning the boat to prevent damp and mould, applying polish and paint where necessary, tightening/replacing leaky deck fittings. For motorboats a check is made for loose connections and chafe on wiring and pipe work, sump oil level and coolant levels are topped up, oil and fuel filters changed, sacrificial antinodes are replaced when one third degraded, the outer edges of propeller blades are checked for damage, etc.

Another other key document in Mikes Motorboats is the Rental Record. Each boat has its own Rental Record, an example is shown in appendix B. This usually takes up several sheets of paper, which are pinned together. Everything on the Rental Record is entered by hand. This includes the dates, customer details and amount paid for a hiring (determined by the period of hire: half day, full day, or several days).

The way the manual system currently works is as follows:

Customers enquire about hiring one or more boats by either calling in, in person, phoning, or writing. The Hiring Department, headed by Mike's Deputy Manager, Sheila, deals with enquiries. If it is a case that someone has called in and wants to take away some boat(s) there and then, the transaction details are entered on the Rental Record(s) for the boat(s) being hired. Sometimes a visitor just wants information about boat hiring, in which case Hiring Department staff jot down a few hand-written notes on an odd piece of paper and hand them to him or her. MM often need to search for customer last or first names, and sometimes they can only remember that the name begins with a certain letter.

If someone phones in, it is usually to make a general enquiry – in which case Mike's Motorboats can give the necessary information over the phone - or it is to reserve one or more boats. Details of the requested reservation are jotted down on a piece of paper, along with the caller's name and phone number. To avoid overbooking, there is a need to search through all recent rental records for hires on the appropriate day and ensure there is stock for each class and size of boat that is needed for that particular day. This used to be easy but now the business has become larger, some hires can be missed. Once they have checked the Rental Records to see if there will be the right number of the right classification and size of boat available for hire when the customer wants them, the Hiring Department phone back to inform the customer.

For a reservation, the details are entered on the Rental Records as much as possible (typically Rent Date, Customer Name, Customer Address, Post Code, Phone Number, Boat Class, and Size), and the rest of the data (actual boat ID loaned out, Return Date) is entered when the hiring actually happens and/or when payment is received and/or when the boat is returned to the Hiring department.

One problem is that the reservation might be taken several days or weeks in advance of the actual hiring, and because the reservation is entered on the next available line on the Rental Record, there is always the possibility that the reservation gets “lost” among all the other reservations and rentals. This has caused embarrassment several times in the past, because sometimes boats that had been reserved for someone were allowed to go out on hire or were reserved by other customers for the same day. When they make a rental in person the customer gets a Reservation Card, and for reservations over the phone these cards are kept in a box until the customer comes in.

Mike’s brother briefly worked at Mike’s. He set up some spreadsheets and a database for them to use, but his system failed to distinguish between a rental (of a particular boat) and a reservation (for a class and size of boat). This meant that it didn’t fit with the way Mike’s did things (their business processes) and so the hiring staff just ignored it and continued to use the old paper based system.

If the customer has written in, it is usually to make a general enquiry, in which case the Hiring Department emails a copy of the “sample prices of boat hires” list in an envelope and posts it back to the enquirer (rental rates are determined by the classification and size). Unfortunately, the list is occasionally out of date or inaccurate in some other way but copies of the new one have not yet been received from the printer. In these cases, either Sheila’s assistant, Khalid, or (usually) the Commercial Modern Apprentice, Megan, has to make hand-written corrections on the original before posting it.

Mike believes that too much potential business is being lost through the, sometimes haphazard, way in which enquiries are dealt with, and through failure to follow up customers who have expressed an interest in possible boat hire. Fortunately, a lot of the customers are loyal and hire boats time after time. The customer indicates how long they intend to use the boat for. This is normally a day or half day; periods of several days are occasionally arranged. Half days cost only a little less than full days hire for the larger boats. When the boat is returned, the rental sheet is updated with the actual date back, and the customers are charged for the rental period. When customers make payment for a hiring, a hand-written receipt is given (or emailed, for those customers who pay over the phone in advance). If the boat is returned late a penalty fee is charged. This tends to happen informally, and they don’t want it on the computer system.

Each Friday, Mike inspects Boat Records to identify which boats have not been serviced for two months and draws up a hand-written list of them. He gives this to Afsha and Sam, the two Technicians, and they work through the list the following week. It’s easy for Mike to fail to spot when a boat is due for service, partly because the handwriting on the Maintenance History part of the Boat Record can be appalling. When Afsha and Sam have serviced a boat, they update the Maintenance History. They often write the service info on the back of the first sheet of the boat record rather than in the space where they note repairs, so it is easy to see a last serviced date, but sometimes it is put on the front with the other repairs. They also receive information from the Hiring Department about boat faults that have been reported by customers when collecting or returning boats, and for which repairs are needed. Again, when the work has been carried out, Afsha and Sam update the Maintenance History. There’s no real system of prioritising all this “service” and “repair” work, so that sometimes boats which are in heavy demand are not available because they need work doing on them, while some other boats, which have been worked on and are available for hire, are very rarely hired.

Another problem with the repair and service side of the business is the alarming frequency with which the necessary spare part is not in stock. This can lead to boats being unavailable for weeks. On the other hand, some parts are over-ordered, and some of them are left lying around in the workshop for so long that they either go rusty or become obsolete. There’s no real check that ordered parts are delivered, or that delivered parts have been ordered. Copies of parts orders and delivery notes are kept in a filing cabinet, but just in a pile and only if someone remembers to put them away. Ordering and receiving parts from suppliers is the job of Sandy, the Parts Manager. A particular part can always be obtained from the original manufacturer of the boat, and maybe from one (and only one) of several other trusted suppliers.

Databases Project

Appendix A – Legacy Boat Record

Boat Record

Boat Number:	*00001*	Manufacturer:	*Superboat*
Model:	*Explorer*	address:	*Unit 7 Centurion Court Leyland*
Purchase: date	*22 Nov 10*	postcode	*PR25 3UO*
price	*£3910.00*	telephone	*01772 459666*
		email	*admin@superboat.co.uk*

Classification:		Disposal Details:	
Sail boat	☐	- sale date:	*30 Nov 2020*
Motorboat	☑	- dealer name:	*Joe's Junk*
Rowing boat	☐	- address	*15 Back Lane Buxton BU27 3LP*
Size:			
Very Large	☐	- telephone	*07365 534221*
Large	☐	- email	*JoesJunk@zdnet.com*
Standard	☑	- sale price	*£1500.00*
Small	☐		

Maintenance History

ref no	fault details	fault date	action taken	action date
1	*Chipped propeller*	*15feb15*	*Replace Propeller*	*27feb15*
2	*Bilge pumps gone*	*10jul15*	*New bilge pumps*	*27aug15*
3			*New head pumps*	*15aug15*
4			*Normal Service*	*20mar16*
5	*Cutless bearing worn through*	*02dec16*	*Fit new bearing*	*27jan17*

Appendix B – Legacy Rental Record

Mike's Motorboats – Rental Record

Boat: *Superboat Explorer* Boat Number: *00001*
Size: *Standard* Type: *Motorboat*

Rent Number	Rent Date	Rent Period	Date Back:		Customer:				Amount
			Due	Actual	Name	Email	Postcode	Tel	Paid
4734	*02may19*	*HD*	*02may*	*02may*	*John Terry*	*Terry2D@ok.com*	*SE10 1NH*	*0201772227*	*£125.00*
4745	*03may19*	*HD*	*03may*	*03may*	*Justin Bieber*	*Beiber@pop.com*	*LABC564*	*0167756413*	*£125.00*
4812	*04may19*	*2D*	*05may*	*06may*	*David Hockney*	*hockers@gall.com*	*N1 1XY*	*0154326412*	*£400.00*
4875	*06may19*	*FD*	*06may*	*06may*	*David Blaine*	*blaine@magic.org*	*N1 1XY*	*0154326412*	*£200.00*

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Appendix C - List of specific requirements

Below is a list of some of the requirements that have been discovered from interviews with staff and collection of documents.

There is a need to keep track of both reservations and rentals. They are not the same. Costs depend only upon the type and size of boats and that is what is stored for a reservation, not a boat number. See price list in Appendix D.

Constraints (must be checked using SQL when records are entered into the database)

C1. Observe preservation of entity integrity constraints through use of primary keys.
C2. All email addresses need to be unique and customer email addresses must be collected when entering any new record.
C3. A boat must fit into a category of: sailboat, motorboat, or rowing boat (kayaks are classed as rowing boats) and into a size of: very large, large, standard, or small.
C4. All boats must have a manufacturer
C5. All maintenance jobs have a default priority of 2 (where 1 is highest and 3 is lowest)

Appendix D – Example data

Mike's Motorboats have provided a sample of their data to be used for data migration tests.

List of customers:

Mike's Motorboats

Cust ID	First Name	Last Name	Tel. No.	Address	Email
1	Dion	Brodnecke	07174826351	9 Oak Street, Liverpool, L34 8DY	dbroes1d@who.int
2	Scarlett	Galley	03260476982	886 Northport Parkway, Liverpool, L3 6DF	scargr1c@imgur.com
3	Sissy	Gadson	04924556740	95 Putney Road, Liverpool, L2 7YG	sgadson1b@ucoz.com
4	Tabby	Minichi	07795213673	6 Amoth Court, Warrington, WT6 8UY	minitabc@imgur.com
5	Nellie	Greenmon	03816078215	40 Graceland Crossing, Liverpool, L23 8FY	nelliegreen12@patch.com
6	Hanny	Marsters	07075576685	2 Almo Trail, Liverpool, L21 9FY	hmarsters@netlog.com
7	Oswell	Aspinell	09931348133	64 Jackson Road, Liverpool, L5 6FH	OsAspinell@digg.com
8	Florance	Baston	07315082134	40 Magdeline Lane, Warrington, WT5 8WK	FloBar@dirtg.com
9	Candice	Tumilson	01639824657	1 Farragut Parkway, Liverpool, L75 8GJ	canditum15@bloomberg.com
10	Clair	Bavin	06245985897	87 Toban Drive, Liverpool, L26 8GH	clairBav@sprog.it

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List of dealers:

Dealer ID	Name	Tel. No.	Address	Email
1	Dalis Vannoort	07574137463	77 A828, Appin, AP7 6GU	dvannoort0@salon.com
2	Joe's Junk	07365534221	15 Back Lane, Buxton, BX7 5FY	JoesJunk@zdnet.com
3	Hoebart Kubera	07874051869	4 Finedon House, Marine Parade, Littlestone, LS4 6GU	hkubera2@who.int
4	Eva Iacomettii	07880072148	9 Hartlands, Onslow Road, Newent, NW5 8TU	eiacomettii3@admin.ch
5	Alley Pate	07822040557	07610 Arizona Alley, A67 8GU	apate4@gnu.org
6	Korrie Legge	07380018233	1076 Evesham Road, Astwood Bank, DT5 8JO	klegge5@reference.com
7	Minne Hinkens	07978390430	53 Balby Road, Balby, B7 8HK	mhinkens6@smh.com.au
8	Inigo MacAllaster	07893419552	1910 Farwell Plaza, G56 9FT	imacallaster7@blogspot.com
9	Linell Skeeles	07532931207	57 Great Russell Street, London, NW1 8TU	lskeeles8@goo.gl
10	Sioux Drogan	07417098738	75 Thomas Parsons Square, Ely, EL6 9GU	sdrogan9@dropbox.com

List of Manufacturers and Suppliers:

Manuf. ID	Name	Tel. No.	Address	Email
1	SuperBoat	01772459666	Unit 7 Centurion Court, Leyland, LE10 2DJ	admin@superboat.co.uk
2	Explorer Boats UK	01704807654	Meadow Lane, Burscough, BU56 8GH	admin@explorerboats.co.uk
3	The Northwich Boat Company	01270160160	Unit 1 Kings Lock Boatyard Booth Lane, Middlewich, MW67 7GY	admin@northwichboats.co.uk
4	Collingwood Boat Builders	01513742985	29 Townsend Street, Collingwood, CL27 2DU	admin@collingwoodboats.co.uk
5	Elton Moss Boat Builders	01270760160	Unit 4 Kings Lock Boatyard Booth Lane, Middlewich, MW63 8TY	admin@eltonmossboats.co.uk
6	Aintree Boat Company Ltd	01515239000	Brookfield Drive, Liverpool, L1 6GU	admin@aintreeboats.co.uk
7	Braidbar Boats Ltd	01625873471	Lord Vernons Wharf Lyme Road Higher, Poynton, PY12 9TS	admin@braidbarboats.co.uk
8	Bourne Boat Builders Ltd	01785714692	Teddesley Road, Penkridge, PE8 7SU	admin@bourneboats.co.uk
9	Stoke on Trent Boat Building Co Ltd	01782813831	Longport Wharf Station Street, Stoke-on-Trent, ST6 9GU	admin@stokeboats.co.uk
10	MGM Boats Narrowboat Builders	01162640009	27 Mill Lane, Leicester, LE6 9FY	admin@mgmboats.co.uk

Rental prices

Mike's Motorboats

Rental Prices

Mike's Motorboats

	Full Day			Half Day		
	Sail boat	**Motor boat**	**Row boat**	**Sail boat**	**Motor boat**	**Row boat**
Very large	£240	£280	£160	£170	£175	£100
Large	£180	£240	£140	£120	£150	£90
Standard	£160	£200	£120	£100	£125	£80
Small	£140	£170	£110	£90	£110	£70

One further boat record including maintenance details:

Mike's Motorboats

Boat Record

Boat Number:	*00003*	Manufacturer:	*Explorer Boats Ltd*
Model:	*MasterSail*	address:	*Meadow Lane*
			Burscough
Purchase: date	*12 Oct 15*	postcode	*L40 4BR*
price	*£3240.00*	telephone	*01704 807654*
		email	*admin@explorerboats.co.uk*

Classification:

Sail boat	☑
Motorboat	☐
Rowing boat	☐

Size:

Very Large	☐
Large	☑
Standard	☐
Small	☐

Disposal Details:
- sale date:
- dealer name:
- address
- telephone
- email
- sale price

Maintenance History

ref no	fault details	fault date	action taken	action date
1	*Damaged mast*	*17apr16*	*Repair Mast*	*27apr16*
2	*Bent Forestay*	*10jul17*	*Replace Forestay*	*22aug17*
3	*Shot Boom*	*07may18*	*Replace Boom*	*06june18*
4	*Rudderstock Chipped*	*07jul19*	*Repair Rudderstock*	*08jul19*
5			*Normal Service*	*27jan20*
6	*Rudderblade busted*	*19oct20*		

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Sample list of boats:

Boat ID	Class & Size	Boat Model	Manufact ID	Purchase Date	Boat Price	Last Service
1	Std_MBoat	Explorer	1	22-Nov-10	3910	22-Oct-20
2	VLrg_SBoat	TurboSail	2	12-Oct-09	3840	8-Oct-19
3	Lrg_SBoat	MasterSail	2	12-Oct-15	3240	12-Oct-20
4	Sml_SBoat	SmallSailor	3	12-Nov-15	2040	14-Oct-20
5	Sml_SBoat	SmallSailor	3	12-Nov-15	2040	13-Oct-20
6	Lrg_MBoat	Grande	5	14-Jan-15	5440	15-Oct-20
7	Lrg_MBoat	Grande	5	14-Jan-15	5440	13-Sep-20
8	Std_MBoat	Turbo Mid	2	14-Jan-15	5440	13-Sep-20
9	Lrg_RBoat	RowStream	3	12-Jan-15	440	10-Aug-20
10	Std_RBoat	RowerX	4	12-Jan-15	320	22-Sep-20
11	Lrg_SBoat	Explorer	1	10-Jan-16	3320	3-Mar-20
12	Std_SBoat	Navigator	1	10-Jan-16	3320	3-Apr-20
13	Std_MBoat	Turbo Mid	2	14-Feb-18	4440	14-Sep-20
14	Std_MBoat	Turbo Mid	2	14-Feb-18	4440	13-Sep-20
15	Lrg_MBoat	MasterBlaster	7	14-Jan-18	5440	14-Oct-19
16	Lrg_RBoat	HappyRower	8	10-Jan-18	340	2-Oct-20
17	Sml_RBoat	HappyRower	8	10-Jan-18	340	2-Oct-20
18	VLrg_RBoat	Streamer	3	9-Jan-17	640	7-Oct-20
19	VLrg_RBoat	Great Row	4	19-Jan-19	650	12-Sep-20
20	VLrg_MBoat	SuperBlaster	7	14-Jan-18	7440	7-Aug-20
21	Std_RBoat	Lizard	6	9-Jan-17	340	4-Oct-20
22	Lrg_MBoat	Grande	5	14-Feb-18	5440	13-Sep-20
23	Lrg_SBoat	MasterSail	2	12-Oct-15	3240	27-Jan-20

List of boats sold to Joe’s Junk (dealer id 2):

Boat ID	Sell Date	Sell Price
1	02-Jan-2020	1500
2	10-Oct-2019	1600

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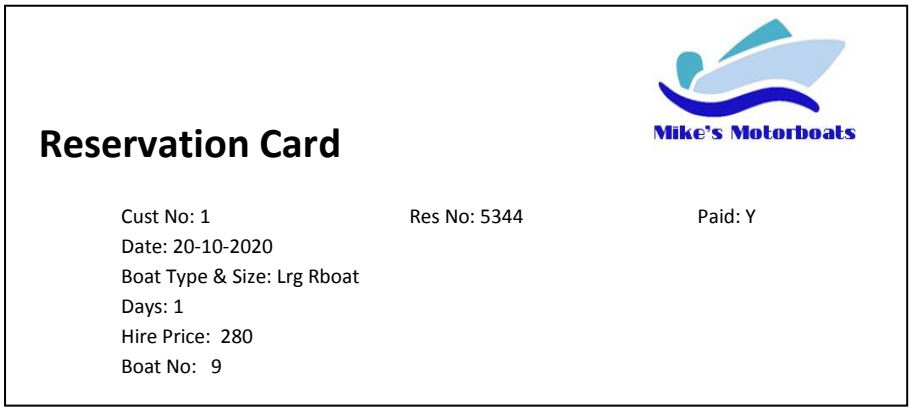
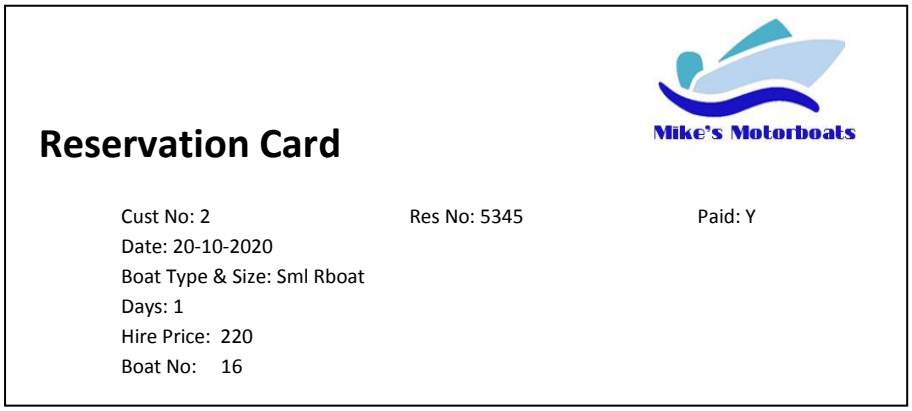
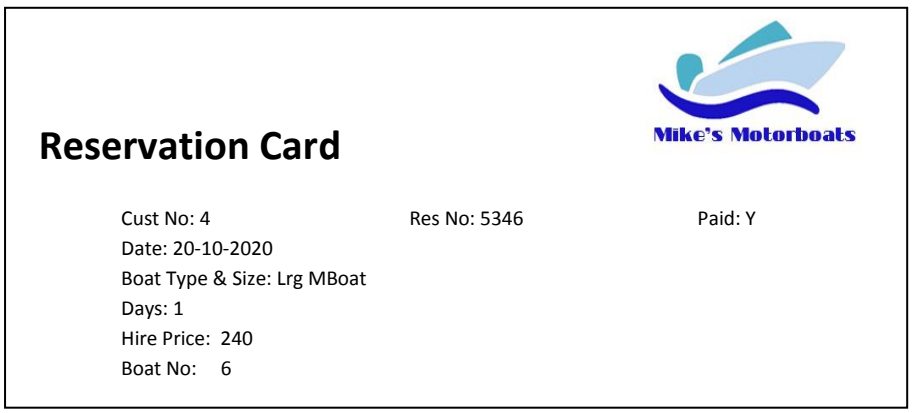
Stack of reservation/rental cards (if it has a boat number that means the reservation turned into a rental):







Databases Project

Reservation Card

Cust No: 7 Res No: 5349 Paid: Y
Date: 20-10-2020
Boat Type & Size: Lrg RBoat
Days: 1
Hire Price: 140
Boat No: 9

Reservation Card

Cust No: 6 Res No: 5348 Paid: Y
Date: 20-10-2020
Boat Type & Size: Lrg MBoat
Days: 1
Hire Price: 240
Boat No: 15

Reservation Card

Cust No: 2 Res No: 5350 Paid: Y
Date: 20-10-2020
Boat Type & Size: Lrg SBoat
Days: 1
Hire Price: 180
Boat No: 9

Reservation Card

Cust No: 5 Res No: 5352 Paid: Y
Date: 20-10-2020
Boat Type & Size: Sml RBoat
Days: 1
Hire Price: 110
Boat No: 16

Reservation Card

Cust No: 5 Res No: 5353 Paid: Y
Date: 20-10-2020
Boat Type & Size: Sml RBoat
Days: 1
Hire Price: 110
Boat No: 17

Reservation Card

Cust No: 9 Res No: 5354 Paid: Y
Date: 20-10-2020
Boat Type & Size: Std MBoat
Days: 2
Hire Price: 400
Boat No: 14

Reservation Card

Cust No: 2 Res No: 5351 Paid:
Date: 20-10-2020
Boat Type & Size: Lrg SBoat
Days: 1
Hire Price: 180
Boat No: 11

Reservation Card

Cust No: 8 Res No: 5364 Paid: Y
Date: 20-10-2020
Boat Type & Size: Sml SBoat
Days: 1
Hire Price: 110
Boat No: 4

Reservation Card

Cust No: 9 Res No: 5355 Paid: Y
Date: 20-10-2020
Boat Type & Size: Std MBoat
Days: 2
Hire Price: 400
Boat No: 13

Reservation Card

Cust No: 1 Res No: 5356 Paid: Y
Date: 20-10-2020
Boat Type & Size: Std MBoat
Days: 1
Hire Price: 200
Boat No: 8

Reservation Card

Cust No: 6 Res No: 5357 Paid: Y
Date: 20-10-2020
Boat Type & Size: Std MBoat
Days: 1
Hire Price: 200
Boat No: 1

Reservation Card

Cust No: 7 Res No: 5358 Paid: Y
Date: 20-10-2020
Boat Type & Size: Std RBoat
Days: 1
Hire Price: 120
Boat No: 10

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Reservation Card

Cust No: 10 Res No: 5366 Paid: Y
Date: 20-10-2020
Boat Type & Size: Std RBoat
Days: ½
Hire Price: 80
Boat No: 21

Reservation Card

Cust No: 4 Res No: 5360 Paid: Y
Date: 20-10-2020
Boat Type & Size: VLrg MBoat
Days: 1
Hire Price: 280
Boat No: 20

Reservation Card

Cust No: 8 Res No: 5361 Paid: Y
Date: 20-10-2020
Boat Type & Size: VLrg SBoat
Days: 1
Hire Price: 240
Boat No: 2

Reservation Card

Cust No: 10 Res No: 5359 Paid:
Date: 20-10-2020
Boat Type & Size: Std SBoat
Days: 1
Hire Price: 160
Boat No:

Reservation Card

Cust No: 3 Res No: 5362 Paid:
Date: 20-10-2020
Boat Type & Size: VLrg RBoat
Days: 1
Hire Price: 100
Boat No:

Reservation Card

Cust No: 3 Res No: 5365 Paid:
Date: 20-10-2020
Boat Type & Size: Std RBoat
Days: 1
Hire Price: 120
Boat No:

Reservation Card

Cust No: 3 Res No: 5363 Paid:
Date: 20-10-2020
Boat Type & Size: VLrg RBoat
Days: 1
Hire Price: 100
Boat No:

Reservation Card

Cust No: 1 Res No: 5342 Paid: Y
Date: 27-04-2020
Boat Type & Size: Lrg SBoat
Days: 1
Hire Price: 180
Boat No: 16

Reservation Card

Cust No: 4 Res No: 5341 Paid:
Date: 20-10-2019
Boat Type & Size: Lrg MBoat
Days: 1
Hire Price: 240
Boat No: 6

Reservation Card

Cust No: 2 Res No: 5343 Paid: Y
Date: 09-12-2019
Boat Type & Size: Lrg MBoat
Days: 1
Hire Price: 240
Boat No: 6

Databases Project

Assignment Tasks

One assignment should be handed in per group in the form of a Word document (or alternatively a rich text format (.rtf) file) **called "groupX.docx" for example groupA1.docx, groupA2.docx, groupC6.docx etc., according to your group name** and a SQL script (.sql) file **called "groupX.sql" for example groupA1.sql, groupA2.sql, groupC6.sql etc., according to your group name**. Although all group files need to be identical to one another, every group member should submit their group's files. This ensures successful submission, enables the feedback process and allows the submission of a further optional file for peer assessments (more details of this are given below).

The logbook has no word count because it should be as short as possible while providing the details that are requested. No word counts are provided for parts 2 and 3 because they are largely made up of diagrams and code. However, commentaries about the ERD diagrams (database design) should be around 200 words each per group; and commentaries about the whole project should be around 200 words per student.

Part 1: Logbook [20%] GROUP

This is a group project and one thing that you are required to do is to show that you can work well as a member of a group.

1. Produce a logbook of your progress during the project on Microsoft Teams.

    a. All project meetings (at least 2 meetings each group for part 2) should be recorded. The records here should match the records produced by Microsoft Teams. Record:
        i. the date of each meeting;
        ii. tasks allocated to individuals and to be completed before the next meeting; and
        iii. whether or not each task allocated in a previous meeting has been completed on time or not.

    b. Any absences from meetings: were group forewarned? what was done to keep in communication with absent group member, and ensure he/she could continue to contribute?

    c. The logbook should be placed in an appendix of your report, with logbook entries appropriately formatted and presented (see example below).

Part 2: Database Design & Implementation [50%] GROUP

Part 2 of your report should include a section for each request below.

1. Produce an executive summary giving readers an overview of your report and including the below information. [3%]

    a. purpose (one or two sentences explaining the purpose of your report);

b. background (one sentence explaining what Mike's Motorboats does);
c. problem statement (one paragraph stating the main issues with the current system);
d. summary of contents of report (one paragraph/two sentences)

According to the information that has been given above,

2. Identify the entities and attributes and draw a top-down entity relationship diagram (ERD) for the system. Provide a written commentary explaining any decisions made in moving from the individual diagrams to the group one. The commentary should list any assumptions you have made. [15%]
    a. An individual entity relationship diagram (ERD) should be drawn by each member of the group. These need to be placed into the appendix of your report to provide evidence of participation, without these you will lose marks. Each one should have a student name/number associated with it. They must all be different, but they do not need to be perfect because they will not be marked on their merits, just as to whether they are present or not. The aim of this is to make sure you all contribute to the group top-down ERD; and, crucially, learn from the experience. [4%]
3. Normalise the boat record (appendix A) showing all stages of the normalisation process (UNF, 1NF, 2NF, 3NF). Then produce a bottom up ERD from the tables produced at 3NF. [3%]
4. Merge top down and bottom up data models to produce a final ERD. [3%]
5. CREATE MariaDB tables from your design. Pay attention to constraints on particular attributes as outlined in the constraints section (Appendix C of the case study). Include the DROP and CREATE SQL statements in your report. [12%]
6. Insert all the data specified in appendices A, B and D into your tables (you can skip the customers in appendix B), inserting NULLs for missing data. You should also insert **FIVE (5)** additional tuples in EACH table that you create (for which this is sensible; some tables will require a limited number of tuples by their nature, you don't need to add extra tuples to these). All INSERTs should appear in your script (see below). Include one example SQL INSERT statement for each table in your report. [5%]
7. Retrieve all data from each table using a SELECT query. Include screen shots of the query results in your report showing all returned data rows to demonstrate that all data has been inserted. [3%]
8. Each student should produce a one paragraph statement explaining what they have learnt from the design and implementation process. [2%]

PLEASE NOTE that all the DROP, CREATE, INSERT, and SELECT statements (including all queries) that you produce should be compiled in that order into a single script file called "groupX.sql" for example groupA1.sql, groupA2.sql, groupC6.sql etc., according to your group name. You should try to make sure this executes without errors (given DROP errors on first run) before you hand it in. As well as submitting it as a file, place your script as text in an appendix in your report.

Part 3: In-Class Query Test [30%] INDIVIDUAL

Part 3 of your assignment is different. It will be assessed INDIVIDUALLY via an in-class-test. The test will be one hour long and will take place using a specific SQL Testing System. You will be given an

opportunity to practice using this system during the final week of the unit during a 1 hour lab session, with the test taking place during an extra lab session that has been added into your assessment week.

The test will be on a specific partial implementation of the Mike's Motorboats Database. You will be given an ERD describing the data structure of this implementation PRIOR to the test taking place, but not until AFTER your GROUP have submitted their final ERD (every individual from your group will need to submit the group final ERD). The test will contain 10 questions and will be different for each person.

During the test you will be able to use any reference information from the web (e.g. the MariaDB knowledge base). On Moodle you will find a list of the functions that you may need to know how to use for the test. not all of these are covered during lectures and lab sessions and it is your responsibility to look up these functions prior to the test and try them out to make sure you know how they work.

Peer Review

Normally group contributions to the project will be roughly equal, however, there is a need for a procedure to make sure that individuals get credited if they end up doing more work than others for the project. Anyone wishing to submit a peer review should submit it when they submit their assignment via Moodle (there is room for 3 files: report file, sql file and peer assessment) as a word document in the form of a Word document (or alternatively a rich text format (.rtf) file) **called "StuName_StuNumber_GroupX.docx" for example Khalid_Ahmad_140536754_GroupA1.docx, Sharon_Davies_GroupA6.docx etc., according to your student and group name**.

Your peer review should review of each of your group members, including yourselves, in terms of percentage contribution to project. E.g.:

Khalid Hassan = 20%
Susan Whiteley = 20%
Afsha Alam = 20%
Ella Ndiaye = 20%
Dave Smith = 20%

If nobody from your group sends in a peer review it will be assumed that all contributions were equal. Any large differences in percentage allocations will need to be justified by **one or two sentences** and these differences should be evident from a combination of: the logbook, the Microsoft Teams records, tutor observation and notes attached to the work produced. Group marks will then be adjusted for individuals at the lecturer's discretion.

Databases Project

Grade Achievement Criteria:

To achieve a pass grade for this assignment you are required to have:

1. *Attempted to produce a logbook*
2. *Attempted to produce an Executive Summary*
3. *Attempted to produce a top down ERD*
4. *Attempted to normalise the given documents and produce a bottom up Entity Relationship diagram (ERD)*
5. *Attempted the implementation in SQL of the tables produced*
6. *Attempted commentaries for the sections specified*
7. *Student statements included*
8. *Attempted SQL test (to be assessed and submitted separately)*

More details of what is required for each grade are given below. They give an idea of the sort of standard we are looking for in student's work for each of the main deliverables. **It is recommended that you read these carefully as they will help you determine what you need to do and, for higher grades, may even help your design.** Any work not meeting the minimum pass criteria will, naturally, be considered a fail.

Parts 1 - Logbook (20%)	Criteria
Pass (3rd)	• Logbook exists and records some meetings.
2nd	• Some entries completed, with each group member being tracked, and dates for each entry; evidence of satisfactory work allocation and group communication (including communication arrangements for any absent group members) evidence of (at least attempted) involvement of each group member in all steps specified in assignment brief.
1st	• Comprehensive dated entries, with each group member being mentioned in each entry, very well organised work allocation (including communication arrangements for any absent group members); comprehensive evidence of (at least attempted) involvement of each group member in all steps specified in assignment brief.

Databases Project

Part 2 – Database design and table implementation (50%)	Criteria
Pass (3rd)	• Very basic Executive Summary (some information missing) • ERD analysis and design diagrams provided with some supporting commentary to verify and critique design decisions. Attempted use of multiplicities and relationships in ERD diagrams. • Normalisation and bottom up ERD attempted. • Scripted table implementation with clear relationship to ERD. • Some database CREATES in one script file. Some INSERT statements in script as well. • Some data from case study inserted into tables • Some screen shots showing SELECT queries as evidence of table data insertion.

2nd	• Adequate Executive Summary (possibly some minor information missing)
	• ERD analysis and design diagrams with clear critique and evaluation of design decisions.
	• Lower 2nd ERD (50% plus) requires a tables and relationships to work and store customer, supplier, dealer, boat, maintenance and rental data with only a few errors.
	• Upper 2nd ERD (60% plus) requires the above, plus either:
	  ○ both reservations and rentals to be dealt with;
	  ○ or functionality for parts/orders including at least one weak entity
	  ○ or prices to be allocated according to class and size of boat
	• Individual ERDs from each student in appendix
	• Good use of multiplicities and relationships in ERD diagrams.
	• Good normalisation, bottom up ERD and merged final ERD
	• Successful scripted table implementation with clear relationship to ERD.
	• All database CREATEs and INSERTs in one script file with associated DROP statements.
	• Script includes some of the database constraints specified in Appendix C.
	• Data from case study inserted into tables; 60% plus requires the additional 5 rows in each table as per assignment.
	• Screen shots showing SELECT queries as evidence of table data insertion.

1st	• Good Executive Summary
	• High quality specification produced with clear contribution from group members and good evaluation of alternative designs.
	• Exceptional design diagrams showing proper use of multiplicities and relationships in ERD diagrams, normalisation, alternative designs.
	• Individual ERDs from each student in appendix
	• ERD 70% plus requires either:
	  ○ both reservations and rentals to be dealt with; with reservations being for class and size of boat, not boat number; and prices to be allocated according to class and size of boat and functionality for parts/orders including at least one weak entity
	  ○ or reservations and rentals to be dealt with in an efficient manner so that data relating to rentals and reservations is held in a single table, with FKs being used to distinguish between these; with reservations being for class and size of boat, not boat number; and prices to be allocated according to class and size of boat
	• ERD 80% plus requires both:
	  ○ reservations and rentals to be dealt with in an efficient manner so that data relating to rentals and reservations is held in a single table; with reservations being for class and size of boat, not boat number
	  ○ and functionality for parts/orders including at least one weak entity
	  ○ prices to be allocated according to class and size of boat
	• ERD 90% plus requires the 80% requirements, as well as the ability to record delivery of part of an order (rather than the full order)
	• Very good normalisation, bottom up ERD and merged final ERD
	• Very good quality evaluation of final system.
	• Successful scripted table implementation with clear relationship to ERD.
	• All database CREATEs and INSERTs in one script file with associated DROP statements
	• Script includes nearly all of the database constraints specified in Appendix C.
	• Data from case study inserted into tables, plus an additional 5 rows in each table.

	• Screen shots showing SELECT queries as evidence of table data insertion.

Part 3 – SQL Queries **TO BE DONE IN A SEPARATE TEST**. (30%)	Criteria
Pass (3rd)	• Scores totalled for each query.
2nd	• Scores totalled for each query.
1st	• Scores totalled for each query.

Formative feedback:

Before you start to implement your ERD using SQL (Part 2, section 4) you should try to make sure that your tutor has signed off the ERD as OK to implement. **THIS PROCESS CAN ONLY BE CARRIED OUT IN LAB TIME** set aside for your projects (NOT via Teams). This will be an informal process and **IT IS YOUR RESPONSIBILITY TO ASK YOUR TUTOR TO CHECK YOUR ERD BEFORE YOU HAND IT IN AND IMPLEMENT IT**. Here, the tutor will simply check that your ERD has all of the keys necessary for the tables to link up properly, so that your SQL implementation have a chance of working. It is possible to pass the unit without the code working properly, but it is recommended that you get the ERD signed off, if you can. You are advised to get this done as soon as you can because it is likely that your tutor will suggest numerous changes, and you will, therefore, wish the tutor to look at your ERD more than once to check your changes.

Logbook example:

Date: 02/09/2021
In this first meeting we all decided to meet regularly every Tuesday at 3pm, which was a convenient time for all of us. We arranged a meeting for next Tuesday. We all agreed to attempt the top down ERD before that meeting so that we could all contribute properly to the group ERD.

Everyone was present at this meeting. Meet up on 09/09/2021 to review work. We will share work through Teams so tutors can review, if necessary, come peer review and marking.

Date: 09/09/2021
Everyone had made their effort at the ERD. Tried to make group Top Down ERD, was difficult but asked tutor about it during previous session and she helped us quite a bit. All agreed to attempt normalisation for next session. Allocations:

All: Normalise boat record, and produce bottom up data model

Grant could not make meeting, but let the group know beforehand. He had done the work, though, and had posted it on Teams. Notes of allocations made on Teams and Grant can read when he is ready. Next meeting 16/09/2021

Date: 16/09/2021
Compared normalisations. Some of us found it very difficult, but, again, had a chance to show it to tutor in labs. Managed to merge top-down and bottom up ERDs to produce final ERD, ready for formative submission and to move on to Part 3 – producing the SQL script (i.e. for now until we receive formative feedback – when we can decide whether we should improve our design and alter our table code).

Allocations:

Myname: Complete SQL code for tables a,b and c.
Mandy: Complete SQL code for tables d,e and f.
Afzal: Complete SQL code for tables g,h, and i
Grant: Complete SQL code for tables j,k and l.

Everyone was present. Next meeting 23/09/2021

Date: 23/09/2021
Received feedback for ERD. We had a long meeting as a group and worked out how to improve our ERD. We now need to improve our table code.

Myname: Improve SQL code for tables a,b and c.
Mandy: Improve SQL code for tables d,e and f.
Afzal: Improve SQL code for tables g,h, and i
Grant: Improve SQL code for tables j,k and l.

Everyone was present. Next meeting 30/09/2021

Date: 30/09/2021
Pulled code for DROPs and CREATEs together into script; running without error. (Guidance notes useful here as it explained that referenced tables had to be created before those that referenced them and the DROPs had to be in reverse order above the CREATEs.) Because data has to be inserted in the correct order we decided we would take it in turns and each member said if they wanted to go first adding to the script as they go.

Myname: INSERTs for Customers, also table x and y + 5
Mandy: INSERTs for Manufacturers/suppliers and dealers + 5
Afzal: INSERTs for Boat data, also tables p and o + 5
Grant: INSERTs for Rents/reservations + 5

Everyone present. Next meeting 6/10/2021

Guidance Notes:

You'll not be able to complete all of the above work straight away, rather you will need to wait until the relevant material has been taught. For this reason, it's also likely that you'll not understand

some of the assignment at the moment. You can start having a go at any of work once you have seen the lecture introducing it, even if you've not started practicing it in the other sessions.

General advice for drawing the ERD:

1. Make sure you use UML notation as demonstrated in lectures. When drawing ERDs and performing normalisation refer to the quick guides and other material (e.g. the sheet entitled "Determining Relationships for ERDs" on Moodle is often helpful). Make sure you solve any many to many relationships.

2. ERD commentaries should cover all the decisions that you took when creating the top down ERD, any assumptions you made during your design, any adjustments you made (e.g. to PKs) to reconcile your bottom up design with your top down, and so on.

3. If you have a many to many between rental and boat you should think carefully. This is not wrong, but it may not be the most efficient way of organising the data. With the *input screen* it makes sense to allow a cashier to add many rentals for one customer at once. But you are not making the front end of the system and the way you design the input screen does not need to dictate how you STORE the data. Here you can just make it so that one rental is for one boat. And then, if you need the front end to display all the rentals a customer has made for one day, you can design a query to do that. That way you will have a simpler and more efficient data structure for your DB (and a one to many between rental and boat – not a many to many).

4. It is easier to merge suppliers of parts with manufacturers of boats, so you just have a single table for these. There's probably some crossover anyway.

5. Think about sold boats. Are there any advantages to holding them separately?

6. When adding the foreign keys to the ERD, these will be dictated by the relationships. Remember: the many ends "grabs" the FK. This means that: if an entity has a many end up against it, it needs the related FK to link the tables together in SQL code. If an entity doesn't have a many end up against it (and you're not dealing with a one-one relationship) then it shouldn't have an FK in it.

General advice for producing the SQL code:

1. It's possible to avoid problems with tables that already exist in (i.e. the tables you've been using to learn SQL) by prefixing all Mike's Motorboats tables with "MM_".

2. For table creation, you need to DROP the tables in your script before you create them, and you need to do it in reverse order (to the order in which you created them). This clears out the tables that you have created previously of the same name and allows you to deal with syntax errors, which you are likely to get a few of.

3. Regarding order of creation of tables: tables with FKs in them (referencing tables) must be created after the tables in which the data items that make up those FKs are used as PKs (the referenced tables).

4. INSERTS/SELECTs for dates need to be done in the correct date format, or you can specify the date format during the INSERT/SELECT statement by using the date formatting function STR_0TO_DATE as follows: (STR_TO_DATE('30/12/2020', `'%d/%m/%Y'`)).

Advice regarding your design and achieving higher grades:

1. Read the "Grade Achievement Criteria" section, above. Your design will only achieve a very high grade if you do all that is required.

2. Those wishing to get above 80% in the Group part of this project need to think about the difference between rentals and reservations carefully. One can store them in separate tables and that is fine, except that this may promote a degree of data redundancy (e.g. requiring us to store: date, boat size and type/class, and a customer ID in both rental and reservation tables), which we would prefer to avoid. This requires creative thinking. Can all of the rental and reservation information be held in one table? If so how? What data items would the table need? What data items would need to be filled for reservations? What further data items (FKs) would need to be filled for rentals? Remember that reservations are not for actual specific boats. These are only allocated when the rental is picked up.

   The ancient history library example (on Moodle – ERD Exercise 3) shows that, very often, entities that are born out of categories that sit within other entities. These categories tend to become useful as entities if that category is used in some way. For example, the ancient history library categorises book titles according to loan length. The library example can be applied to the case study where: a) boat reservations are for class and size TOGETHER and b) rental price is determined by class and size.

3. For those wishing to get above 90%, there is an additional extra problem to solve. How can you deal with a situation where only part of an order is delivered??