

FIT9132 Introduction to Databases

Assignment 1 Logical - ReadMore Community Library (RCL)

Purpose	<p>Given the provided case study from Assignment 1 - Conceptual, and additional forms/documents related to the case study, students will be asked to transform the information provided into a sound database design and implement it in Oracle. This task covers learning outcomes:</p> <ol style="list-style-type: none"> 1. Apply the theories of the relational database model. 2. Develop a sound relational database design. 3. Implement a relational database based on a sound database design.
Your task	<p>This is an open-book group task (students will work in groups of two or three, with members selected randomly). The final output for this task will be a logical model implemented in the Oracle RDBMS</p>
Value	<p>30% of your total marks for the unit</p>
Due Date	<p>Task Submission: Week 9 - Wed, 18th September 2024, 4:30 pm Self and Group Evaluation (Feedback Fruit): Mon, 30th September 2024, 4:30 pm Note:</p> <ol style="list-style-type: none"> 1. Short extension is unavailable for group assessment 2. Staff support is unavailable after business hours
Submission	<ul style="list-style-type: none"> • Via Moodle Assignment Submission. • FIT GitLab check-ins will be used to assess the <i>history</i> of development
Assessment Criteria	<ul style="list-style-type: none"> • Normalise the supplied case study documents and integrate the resultant relations into a logical model. • Depict the data requirements expressed in the case study via a relational database logical model. • Generate a schema that meets the case study data requirements from the logical model produced • Consistent use of industry-standard notation and convention
Late Penalties	<ul style="list-style-type: none"> • 5% of the marks available for the task (-4.5 marks) deduction per calendar day or part thereof for up to one week • Submissions over 7 calendar days after the due date will receive a mark of zero (0), and no assessment feedback will be provided. • 0 marks for the peer evaluation component (see marking guide) if the Self and Group Evaluation is not completed by the due date (no late submission permitted)
Support Resources	<p>See Moodle Assessment page</p>
Feedback	<p>Feedback will be provided on student work via:</p> <ul style="list-style-type: none"> • general cohort performance • specific student feedback ten working days post-submission • a sample solution following Assignment 1 - Logical marking

INSTRUCTIONS

Please note that your group *must not* start the modelling task until each member individually has completed the Applied 6 logical model for the property rental case study, pushed it to their private repo, and compared your answer with that provided in the sample solution to check their understanding. The completion of this individual task will be checked via your GitLab account pushes.

This task continues the work you have started in Assignment 1 Conceptual by refining/extending the model you developed and implementing it as a set of tables under your Monash Oracle database account.

Since this is an ongoing development process based on your assignment 1 conceptual submission and marker feedback, ***you must ensure that they remain confidential and are only seen by your group members and the unit teaching staff.***

The Assignment 1 Conceptual brief must be read in conjunction with the Assignment 1 Logical brief (this document) - i.e. your final model must encompass both sets of requirements. You may modify your Assignment 1 Conceptual model in any manner you wish as you work through Assignment 1 Logical, provided your final model meets both requirements. Your Assignment 1 Conceptual model will not be submitted or assessed again; any modifications you make to your conceptual model are only part of the group working towards your logical model.

In developing your final logical data model, composite attributes present in your conceptual model must be expanded into their component simple attributes *unless explicitly directed otherwise*. If the supplementary material presented in this document does not guide you in deciding the components, you may make any reasonable decision on their simple component attributes.

Further discussions with ReadMore Community Library have revealed the points listed below:

- RCL has expanded the previous details supplied to indicate that, as well as Counter Reserve status; they assign a status value to indicate if a book is:
 - On Counter Reserve,
 - On Loan, or
 - Available for borrowing.
- RCL assigns a Borrower Class to each registered borrower. The classes which they currently use are Adult, Child and Organisation. A borrower's class controls how many books the borrower can have on loan at any time and their standard loan period in days (the number of days a book can be borrowed). RCL has indicated that they wish to add other classes of borrowers in the future.
- If a borrower has an overdue loan, RCL prevents the borrower from borrowing any further books (bans them) until the outstanding loan is returned. On returning the outstanding loan, the borrower is charged a fine based on the number of days they are late (the number of days late is not required to be stored in the system). RCL has indicated that only around 1.8% of loans are returned late.
- If a book copy is currently on loan, a borrower may reserve it and be informed when it becomes available. To use this service, a borrower must provide a contact phone number so they can be informed when the copy becomes available. RCL records the date and time the borrower placed the reserve. A given book copy may have several

outstanding reserves against it. When the book is available, the borrower with the oldest reserve is informed via a telephone call and a loan is arranged. This borrower's reserve will then be removed from the system.

- RCL has book copies that are stolen, lost, or damaged and can thus no longer be assigned in a loan. They have asked for your advice on how their database should handle such copies and ask that this be included in your design.
- RCL has indicated they wish to treat the branch address, LGA contact name, and all phone numbers as simple attributes.

ReadMore Community Library has supplied the following two forms as samples of those used within their business.

You should note:

- *The data shown is incomplete and only **representative** of the type of data for each item. The forms contain fabricated data, so you are aware of typical requirements.*
- *Several examples of a form may be provided to show you the variety of the data; you only need to do **ONE normalisation per type of report**.*

(i) ReadMore Community Library Catalogue Search Output:

Sample A:

Call No:	005.74 C822D 2023
Title:	Database systems : design, implementation, and management
Authors	<ul style="list-style-type: none"> • ID: 2036 Name: Coronel, Carlos • ID: 4809 Name: Morris, Steven
Subjects:	<ul style="list-style-type: none"> • ID: 1045 Description: Database design • ID: 1044 Description: Database management • ID: 1040 Description: Databases
Contents:	Part I: Database Concepts-- 1. Database Systems -- 2. Data Models -- Part II: Design Concepts-- 3. The Relational Database Model -- 4. Entity Relationship (ER) Modeling -- 5. Advanced Data Modeling -- 6. Normalization of Database Tables -- Part III: Advanced Design and Implementation -- 7. Introduction to Structured Query Language (SQL) -- 8. Advanced SQL -- 9. Database Design -- Part IV: Advanced Database Concepts -- 10. Transaction Management and Concurrency Control -- 11. Database Performance Tuning and Query Optimization -- 12. Distributed Database Management Systems -- 13. Business Intelligence and Data Warehouses -- 14. Big Data Analytics and NoSQL -- Part V: Databases and the Internet -- 15. Database Connectivity and Web Technologies -- Part VI: Database Administration -- 16. Database Administration and Security.
Publisher:	ID: 1230 Name: Cengage Learning
Date Published:	2023
Edition	14th Edition
No pages:	816
Language:	English
Note:	Includes bibliographical references and index.
Identifiers:	<ul style="list-style-type: none"> • ISBN: 9780357673034 Type: Hardcover • ISBN: 9780357673072 Type: Loose Leaf



Sample B:

Call No:	820.914 A211 A6/H 2002
Title:	The ultimate hitchhiker's guide to the galaxy
Authors:	<ul style="list-style-type: none">• ID: 0231 Name: Adams, Douglas
Subjects:	<ul style="list-style-type: none">• ID: 7321 Description: Science Fiction• ID: 7519 Description: Prefect, Ford (Fictitious character)• ID: 7520 Description: Dent, Arthur (Fictitious character)
Contents:	The hitchhiker's guide to the galaxy -- The restaurant at the end of the universe -- Life, the universe, and everything -- So long, and thanks for all the fish -- Young Zaphod plays it safe -- Mostly harmless.
Publisher:	ID: 0067 Name: Del Rey Books
Date Published:	2002
Edition	
No pages:	832
Language:	English
Note:	
Identifiers:	<ul style="list-style-type: none">• ISBN: 9780345453747 Type: Paperback

(ii) ReadMore Community Library Borrowers Quarterly Report:

QUARTERLY BORROWER LOAN REPORT

Borrower No 1234

Report Date: 30 Jun 2024

Borrower

First Name: Mary

Last Name: Greenwood

Borrower Class Adult

Borrowing Status Permitted ☐
Banned ☒

Branch Code	Book Copy ID	Branch Name	Borrowed	Due Back	Returned	Fine Amnt	Date Fine Paid
100	2373	Clayton Central	02 Apr 2024 09:10	09 Apr 2024	07 Apr 2024 09:15		
100	4455	Clayton Central	15 Apr 2024 14:00	18 Apr 2024	20 Apr 2024 12:34	\$4	20 Apr 2024
100	4901	Clayton Central	28 Apr 2024 10:00	4 May 2024	4 May 2024 10:21		
100	4455	Clayton Central	28 Apr 2024 11:10	4 May 2024	4 May 2024 11:06		
100	4216	Clayton Central	28 Apr 2024 10:15	4 May 2024	4 May 2024 10:09		
100	7536	Clayton Central	4 May 2024 10:00	11 May 2024	11 May 2024 10:20		
100	2373	Clayton Central	4 May 2024 12:30	11 May 2024	11 May 2024 09:10		
102	0372	West Riding	11 May 2024 13:00	18 May 2024	11 May 2024 09:16		
102	4455	West Riding	11 May 2024 13:05	18 May 2024	18 May 2024 12:15		
... multiple rows omitted ...							
100	0876	Clayton Central	15 Jun 2024 13:15	16 Jun 2024	16 Jun 2024 16:10		
102	2354	West Riding	20 Jun 2024 16:00	27 Jun 2024			

Note overdue loans are flagged in this report with:

REMEMBER to keep up to date with the Ed Assignment 1 Logical forum, where further clarifications may be posted (this forum is to be treated as your client).

Please be careful **not to publicly post anything that includes your reasoning, logic, or any part of your work to this forum**. Doing so violates Monash plagiarism/collusion rules and carries significant academic penalties. If you need to discuss your approach, ensure you use Ed private posts.

You can make assumptions if needed; however, they must align with the details in this brief and the assignment forums and be documented (see the required submission files). *Other than surrogate keys*, where appropriate, you must remember the design adage "**All that is required has been included, and all that has been included is required**", i.e. you must not add features outside the requirements expressed in the brief.

Group Communication

Your group **MUST** use your private group channel in MS Teams **for all group communication during this assignment, which is not face-to-face**. Microsoft Teams provides facilities to support group interaction, including chat, group email, shared desktop, meetings, video/audio calling and shared files.

Activity in your private group channel is only visible to your group members and the teaching staff. It is important that you use Microsoft Teams for your group activities, as your marker may need to check the group members' contributions to the task and attendance at meetings—such a decision will be based on the activity in your private group channel **ONLY**.

Git Management

Ensure your group name is on every page of any document you submit. If a document is multipage (such as the normalisation), please *include page numbers on every page*.

GIT STORAGE

Your work for these tasks **MUST** be saved in your group's local working directory (repo) in the Ass1 Logical folder. **As a start, in your local repo, create a folder named rcl_model and then in this folder, save your model as rcl_logical, i.e. save it as rcl_logical.dmd inside the rcl_model folder.**

Your model must be **regularly pushed to the FIT GitLab server** to build a clear history of its development. At least **nine pushes of your Oracle Data Modeller model** to the FIT GitLab server are required. Please note that nine pushes is a *minimum*; in practice, we would expect significantly more. **This number of pushes must be evenly distributed amongst group members.** All commits must include a **meaningful commit message** that clearly describes what the particular commit is about and **must be correctly assigned to a valid GitLab author**.

Groups must regularly check that their pushes have been successful by logging in to the FIT GitLab server's web interface; you must not simply assume they are working. Before submission via Moodle, log in to the GitLab server's web interface and ensure your submission files are present.

GIT automatically maintains a history of all files pushed to the server. You do not need to, and **MUST** not, add a version name to your various versions. Please ensure you use the same name for all versions of a particular file.

Groups MUST NOT use REVERT or RESET when working on this assignment task.

Doing so could potentially cause severe errors in your remote repo. If you have problems pushing to the remote group repo, move your current local group repo out of the way (to a new folder) and reclone your group repo as discussed in the Applied 2 lesson (section A2-1.2).

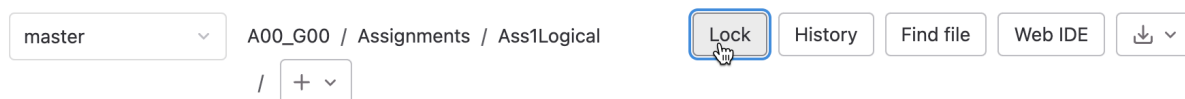
Working on Oracle Data Modeler Models in your Group Repo

If multiple students work on a logical model simultaneously, merging these changes can be difficult since the files have complex XML structures. For this reason, you must take a simple approach to working on the model - **lock the remote repo when making changes**. Only one member of your group can and must work on the model at a particular time.

Whenever a particular student wishes to work on the model, they should go to the Git Server web interface and check if another group member has locked the Ass1 Logical folder.

If the folder is locked, you must not carry out any work on the assignment task.

If it has not been locked, you can proceed to lock the folder by selecting "Lock":



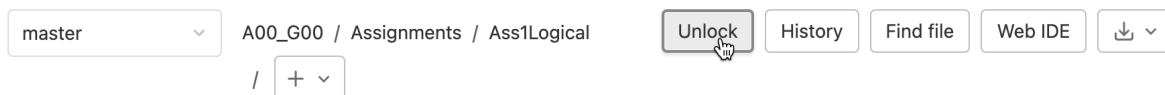
Ensure you are in the correct folder when this lock is applied.

You will know the items are locked as each will have a lock icon attached to it:



If you hover over the padlock icon, you can see who has the folder locked currently.

After locking the folder, you MUST do a pull (*no changes must be made in your group local repo until the lock is in place AND this pull has been completed*). When you have completed your work and pushed it to Git, you should return to the Git web interface and unlock the folder:



The model must not be completed by only one member of the group. In assessing your group's work, we will examine the commit log to ensure all group members have contributed to building the model.

Tasks to complete

1. Perform **normalisation to 3NF** for the data depicted in the two supplied sample documents. Remember there are only two documents to normalise (you have been given several samples to help you understand the likely content).

The approach **you must use** is shown in the normalisation applied class solutions. The normalisation must be carried out form by form (i.e., one form at a time), beginning by representing the document you are working on as a single UNF relation and then moving through 1NF, 2NF, and 3NF. **No marks will be awarded if you use a different approach.**

During normalisation, you must:

- **Not add surrogate keys.**
- **Include all attributes** (you must **not remove** any attribute as derivable)
- Clearly **show UNF, 1NF, 2NF and 3NF.**
- Clearly **show all candidate keys** for each relation in 1NF.
- **Identify the Primary Key in all relations by underlining the PK attribute/s.**
- **Identify all dependencies** at the various normalisation stages (Partial at 1NF, Transitive at 2NF and Full at 3NF). You should use the same notation as depicted in the normalisation sample solutions, for example:
attr1 -> attr2, attr3
If none exist, you must note this by stating:
No partial dependencies present and/or
No transitive dependencies present
- **Carry out attribute synthesis.**

The **relation and attribute names used throughout your normalisation and those on your subsequent logical model must be the same.**

Your normalisation must be carried out in an MS Word document in your group's private MS Teams channel so that a full development history is available. **All group members must contribute to this normalisation (i.e. be visible as editors in the document history).** The document does not need to be pushed to GitLab other than as listed in Submission Requirements.

2. Prepare a logical level design for the ReadMore Community Library database based on your group's Assignment 1 Conceptual model, your marker's feedback, your reading of this case study, and the normalisations you carried out in step 1 above.
 - The logical model must be drawn using the Oracle Data Modeler. Information engineering or Crow's foot notation must be used to draw the model. Your logical model must **not** show data types.
 - All relations depicted must be in 3NF. Candidate keys are possible natural keys; **you must ensure your model protects all candidate keys** to maintain the business rules.
 - You must **add at least one surrogate key to your design** (you are free to select the most appropriate relation to make this change in). You **must explain why you added the surrogate key to your chosen relation as part of your assumptions.** We have a unit rule about requiring a surrogate key if the relation has a composite key with more than two attributes, but this is not

the only reason you might add a surrogate. You may add surrogate keys to multiple relations if you wish.

- All **attributes must be commented in the database** (i.e., the comments must be part of the table structure, not simply comments in the schema file).
- Check clauses/look-up tables must be applied to attributes where appropriate.
- You **MUST** include the legend in your model. Please edit the legend panel to show your group name.
- **Please carefully check slide 37 from the Topic 5 Workshop and ensure you follow the steps listed.**
- Your GIT repository must indicate your development history with multiple commits/pushes as you work on your model.

3. **Generate the database schema in Oracle Data Modeler and use the schema to create the database in your Oracle account (this should be tested in your individual Oracle accounts - a group Oracle account is unavailable).**

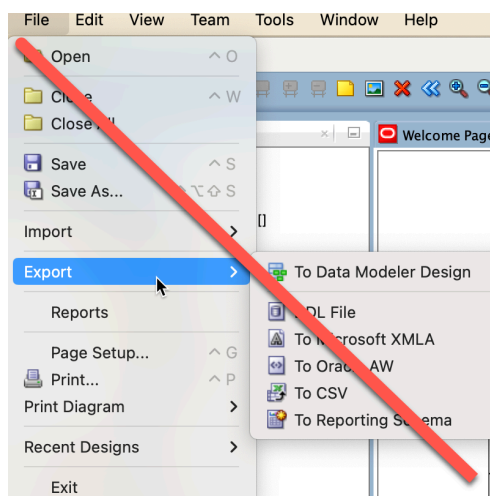
The **only** edit you are permitted to carry out to the generated schema file is to add header comment/s containing your details (group/members names) and the commands to spool/echo your run of the script. In generating your schema file, ensure you:

- Capture the output of the run of your schema statements using the spool command.
- Ensure your script includes drop table statements at the start of the script.
- Name the schema file as **rcl_schema.sql**.

4. Maintain a Group Diary that records when the group met to discuss/work on the task, including the date, who was present and a brief statement of what occurred. This Group Diary must be maintained in Microsoft Teams as a shared document in your private group channel. It **should continue the diary you started in Assignment 1 Conceptual**. It does not need to be pushed to GitLab other than as listed in Submission Requirements.

As part of your assignment submission, each group member will be required to provide confidential feedback on the group member's performance/interactions via FeedbackFruits.

Please note when working with your model, **ensure that you NEVER select any export options from the Data Modeler menu:**



such actions can fill your Oracle account space and render it unusable.

Submission Requirements

Assignment 1 Logical Due: **Week 9 - Wed, 18th September 2024, 4:30 pm**

The following files **must** be submitted to Moodle and **exist in your group FITGitLab server repo**. The source files must exist in either your group's GitLab Repo or your group's private MS Teams channel:

- A **PDF** document showing your full normalisation of the two sample ReadMore Community Library documents showing all normal forms (UNF, 1NF, 2NF and 3NF). Name the file **rcl_normalisation.pdf**
- A single-page **PDF** file containing the final logical Model you created in Oracle Data Modeler. Name the file **rcl_logical.pdf**. This pdf must be created via File - Data Modeler - Print Diagram - To PDF File from within Data Modeler, do not use screen capture.
- A zip file containing your Oracle Data Modeler project (when zipping these files, be sure to include the .dmd file and the folder of the same name). Name the zip file **rcl_model.zip**.

Part of the assessment of your submission will involve your marker extracting your model from this zip, opening it in Data Modeller, and engineering to a new Relational model. From this, your marker will generate a schema, which will then be compared with your submitted schema (**they must be the same for your schema to be accepted**). For this reason, your **model must be able to be opened by your marker and contain your complete model (i.e. both your logical and relational models) otherwise, your task 2 and 3 will not be able to be fully marked, resulting in significant loss of marks**. You **MUST** carefully check that your model is complete - ensure you take your submission archive, copy it to a new temporary folder, extract your submission parts, extract your model and ensure it opens correctly **before** submission. Please view the video on Ed under the lesson "A6 Oracle Data Modeler Support Videos", which demonstrates this process.

- A schema file (CREATE TABLE statements) generated by Oracle Data Modeler. Name the file **rcl_schema.sql**
- The output from the Oracle spool command showing the tables have been created. Name the file **rcl_schema_output.txt**
- A PDF document containing any assumptions you have made in developing the model or comments your marker should be aware of. If you have made no assumptions, submit the document with a single statement saying "No assumptions made". This document must also explain your solution to the requirement "*They have asked your advice on how their database should deal with such copies and ask that this is included as part of your design*". Name the file **rcl_assumptions.pdf**
- A PDF copy of your full group diary named **rcl_####_diary.pdf** (replace #### with your group number, e.g. rcl_G001_diary.pdf).

These files must be *submitted as individual files*, i.e., **you must upload seven separate files to Moodle** (the seven files must **not** be zipped into a single archive) before the assignment due date/time. **One group member only needs to submit the files after the group has agreed that the submission is complete and ready to be graded.**


Late submissions will incur penalties of 4.5 marks deduction per day or part thereof. Submissions received more than 7 days late will not be accepted.

Please note that we **cannot mark any work on the FITGitLab Server**. You need to ensure that you submit correctly via Moodle since it is only in this process that you complete the required student declaration, without which work **cannot be assessed**. **Email submission in any form is NOT ACCEPTABLE.**

It is your responsibility to ENSURE that the files you submit are the correct files - after uploading a submission and before actually submitting in Moodle, you MUST download the submission and double-check its contents.

Your assignment **MUST** show a status of "Submitted for grading" before it will be marked.

Submission status

Attempt number	This is attempt 1.
Submission status	Submitted for grading 
Grading status	Not graded

If your submission shows a status of "Draft (not submitted)", it will not be assessed and **will incur late penalties after the due date/time**.

Interview

Groups may be required to attend an interview to explain their model and the approach used.

Marking Guide

Submitted designs will be assessed against the optimal solution for this task. This optimal solution will be available as a sample solution after Assignment 1 Logical has been graded.

Assignment 1 Logical Group submission content graded out of 90 marks as shown below:

Marking Criteria	Items assessed
Normalise the supplied case study documents and integrate the resultant relations into a logical model. [24 marks]	<p>Maximum 18 marks - Normalisation:</p> <ul style="list-style-type: none"> • Marks awarded for each correct normalisation step • Marks awarded for correct attribute synthesis • Mark penalty for additional attributes or surrogate keys added during normalisation <p>Maximum 6 marks - Dependency diagrams:</p> <ul style="list-style-type: none"> • Marks awarded for each correct dependency depicted within normalisation <p>Mapping to logical model:</p> <ul style="list-style-type: none"> • Mark penalty for incorrect mapping of each relation to logical model
Depict the data requirements expressed in the case study via a relational database logical model. [43 marks]	<p>Maximum 10 marks - Relations:</p> <ul style="list-style-type: none"> • Marks awarded for each required relation and its attributes identified • Mark penalty for extra relations included • Marks penalty for placement of attribute in incorrect relation • Mark penalty for multivalued attributes included <p>Maximum 10 marks - Primary keys:</p> <ul style="list-style-type: none"> • Marks awarded for each correct assignment of a primary key <p>Maximum 10 marks - Relationships:</p> <ul style="list-style-type: none"> • Marks awarded for each required relationship identified • Mark penalty for each incorrect minimum and maximum cardinality for each required relationship depicted • Mark penalty for unnecessary relationships included • Mark penalty for redundant relationships included <p>Maximum 4 marks - Surrogate key:</p> <ul style="list-style-type: none"> • Marks awarded for creation of at least one appropriate surrogate key

	<ul style="list-style-type: none"> Marks awarded for creation of unique index/s to protect natural key/s <p>Maximum 3 marks - Attribute data types:</p> <ul style="list-style-type: none"> Marks awarded for each correctly identified Oracle data type Marks awarded for each null constraint correctly implemented based on business rules <p>Maximum 6 marks - Business Rules:</p> <ul style="list-style-type: none"> Marks awarded for each correctly identified integrity requirement to implement case study's business rules
<p>Generate a schema which meets the case study data requirements from the logical model produced [8 marks]</p> <p>This section will be awarded 0 marks if no relational model is present in your submission</p>	<p>Maximum 5 marks - Relational model generation: this section</p> <ul style="list-style-type: none"> Marks awarded for correct generation of relational model from submitted logical model. <i>MUST be presented in submitted model and must match generation from logical model</i> <p>Maximum 3 marks - Schema generation:</p> <ul style="list-style-type: none"> Marks awarded for correct generation of SQL schema file from submitted logical model Mark penalty for missing column comments
<p>Consistent use of industry standard notation and convention [5 marks]</p>	<p>Maximum 5 marks - Modelling standards:</p> <ul style="list-style-type: none"> Marks awarded for application of Unit logical model notation convention Mark penalty for showing data types on logical model Mark penalty for missing model legend and/or relationship labels Mark penalty for missing required documents and/or not adding Group name to all pages submitted
<p>Correct use of Git by group [10 marks]</p>	<p>Maximum 10 marks - Git used appropriately:</p> <ul style="list-style-type: none"> Marks awarded for nine pushes showing a clear development history for the logical model Marks awarded for even distribution of pushes amongst all group members Marks awarded for correct Git author details used in pushes (see week 2 Applied ed lesson) Marks awarded for the use of meaningful commit messages (ie. not blank or of the form "Push1")

Late submission penalty - 4.5 marks for each 24 hours late or part thereof

Assignment 1 Logical Individual Group Evaluation graded out of 10 marks as shown below:

Peer Evaluation	Maximum 10 marks - Contribution and Participation in your group: <ul style="list-style-type: none"> • Communication • Project Management • Quality of contribution • Quantity of contribution • Use of MS Teams within the group private channel • Support for the group's working environment as assessed by self-evaluation and group members (peer) evaluation via Feedback Fruits • This component will be moderated, if necessary, by your tutor based on any group issues/concerns which are not addressed
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Late submissions of your peer/self review will not be accepted.

Final Assignment Mark Calculation

- 90 marks from the content of the group submission => maximum of 27 marks to unit grade
PLUS
- 10 marks from the individual member's group evaluation (self-review, peer review and tutor moderation) => maximum of 3 marks to unit grade

Total: 100 marks, recorded as a grade out of 30 towards your unit grade