# FIT9132 Introduction to Databases

Normalisation and Logical Database Design - Pets First (PF)

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|---|---|
| **Purpose** | **Given the provided case study from assignment 1A, 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:**<br><br>1. **Apply the theories of the relational database model.**<br>2. **Develop a sound relational database design.**<br>3. **Implement a relational database based on a sound database design.** |
| **Your task** | **This is an open book, group task (students will work in groups of two or three students with members selected randomly). The final output for this task will be a logical model implemented in the Oracle RDBMS** |
| **Value** | **30%** of your total marks for the unit (includes individual Design Portfolio) |
| **Due Date** | **Task Submission: <span style="color:red">Thur, 14 Sep 2023, 4:30pm</span>**<br>**Self and Group Evaluation (Feedback Fruit): <span style="color:red">Thur, 21 Sep 2023, 11:55 pm</span>** - *(no late submission permitted)* |
| **Submission** | ● **Via Moodle Assignment Submission**.<br>● **FIT GitLab check ins will be used to assess *history* of development** |
| **Assessment Criteria** | ● **Normalise the supplied case study documents and integrate the resultant relations into a logical model.**<br>● **Depict the data requirements expressed in the case study via a relational database logical model.**<br>● **Generate a schema which meets the case study data requirements from the logical model produced**<br>● **Consistent use of industry standard notation and convention** |
| **Late Penalties** | ● 10% deduction per calendar day or part thereof for up to one week<br>● Submissions more than 7 calendar days after the due date will receive a mark of zero (0) and no assessment feedback will be provided.<br>● 0 marks for 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** | See Moodle Assessment page |
| **Feedback** | Feedback will be provided on student work via:<br>● general cohort performance<br>● specific student feedback ten working days post submission<br>● *a sample solution following assignment 1B marking* |

**INSTRUCTIONS**

**Please note that your group *must not* start the modelling task until each member individually has completed the week 6 Applied 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.**

This task continues the work you have started in assignment 1A 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 1A submission and marker feedback, *you must ensure that your assignment 1A submission and the marker feedback remains confidential and is only seen by the members of your group and the unit teaching staff*.

**Assignment 1B's brief must be read in conjunction with the assignment 1A brief - i.e. your final model must encompass both sets of requirements.** You may modify your assignment 1A conceptual model in any manner you wish as you work through assignment 1B, provided your final model meets both sets of requirements. Your assignment 1A conceptual model will not be submitted or assessed again, updates are only part of the group working towards your logical model.

In developing your final logical data model, composite attributes present on your conceptual model must be expanded into their component simple attributes, unless otherwise directed. 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 Pets First (PF) have revealed the points listed below:

i.  PF have indicated that they wish all phone numbers in the system, and the clinic addresses to be recorded as simple attributes.

ii.  Every visit which occurs must involve at least one service charge, there however may be no drug charges. Drugs and services have a standard charge which must be recorded as part of the database; however, the attending vet may modify these charges. A particular service will only be charged once for a visit - if necessary, the vet will adjust the cost charged to cover any "extra" work under this service. As an example, using the first invoice you have been supplied with - the standard service cost for a standard examination (EXM10) may be $60, but here on the sample invoice the vet has given a $5 discount and changed only $55.

The line cost listed on an invoice is the total cost for items listed on that line, for example in the third invoice the $40 charge for Bactrim tablets is the total charge for the 10 tablets.

iii.  PF wishes to be able to record if an animal is currently alive or not

iv.  PF would like to be able to easily expand:

○  the vet specialisations, as they employ further vets with new specialisations, and
○  the types of animals, as they treat a new type which they have not previously seen

Pets First have supplied the following two forms as samples of those which are used within their business.

*You should note:*

● *that the data shown is incomplete and only representative of the type of data for each item.*
● *several examples of each form have been provided to show you the variety of the data, you only need to do ONE normalisation per form.*

**(i) Training course attendance details**:

**Training Course**       **Run By**

Course ID 256      Vet ID 45

Title Heart UltraSound Imaging      Name Graham Sharp

Duration 2.5 Hrs

**When** 22nd August 2023 10 AM

**Where** Clinic ID: 12 Name: Clayton Small Animal Clinic

**Participants**

| Vet ID | Home Clinic ID | Given Name | Family Name | Completed | Expiry (if Applicable) |
|--------|----------------|------------|-------------|-----------|------------------------|
| 12 | 12 | Vivianna | Drayton | Y | 22 August 2024 |
| 23 | 12 | Paulie | Furst | Y | 22 August 2024 |
| 34 | 12 | Booth | Darnell | Y | 22 August 2024 |
| 56 | 12 | | Willshire | N | |
| 57 | 10 | Drayton | Horning | Y | 22 August 2024 |
| 62 | 10 | Ruthanne | Middleton | Y | 22 August 2024 |

*... not all rows necessarily shown ...*

**Training Course**      **Run By**

Course ID 257      Vet ID 13

Title Heartworm Treatment/Prevention      Name Marian Wu

Duration 1 hr

**When** 22nd August 2023 10 AM

**Where** Clinic ID: 12 Name: Clayton Small Animal Clinic

**Participants**

| Vet ID | Home Clinic ID | Given Name | Family Name | Completed | Expiry (if Applicable) |
|--------|----------------|------------|-------------|-----------|------------------------|
| 14 | 12 | Carree | Najera | Y | |
| 15 | 12 | Kelly | Cresar | Y | |
| 16 | 12 | Brittani | Sellwood | Y | |
| 17 | 12 | Cory | Esome | Y | |

*... not all rows necessarily shown ...*

(ii) **Clinic visit invoice**:

# Pets First

**Invoice for Professional Services**

Patient                                          Owner

        Animal ID  567                                Owner Id  212

        Name  Forrest                            Given name  Catherine

Attending Vet                                    Family Name  Do

        Vet ID  28

        Name  Xinxin Jiang

Account for services provided on 15/08/2023 at 10:30 AM

| Service Code | Service Description | Line Cost |
|---|---|---|
| EXM10 | Examination: Standard | $55.00 |

| | Total Amount Due | $55.00 |
|---|---|---|

***Payment for services provided is required immediately after service completed***

**Paid By:**     CASH ☑

                 EFT ☐

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# Pets First

**Invoice for Professional Services**

**Patient**                                      **Owner**

        Animal ID  567                                Owner Id  212

        Name  Forrest                            Given name  Catherine

**Attending Vet**                                Family Name  Do

        Vet ID  28

        Name  Xinxin Jiang

Account for services provided on 17/08/2023 at 10:30 AM

| Service Code | Service Description | Line Cost |
|---|---|---|
| EXM10 | Examination: Standard | $60.00 |

| | Total Amount Due | $60.00 |
|---|---|---|

***Payment for services provided is required immediately after service completed***

**Paid By:**     CASH ☐

                 EFT ☑

# Pets First

### Invoice for Professional Services

**Patient**                                      **Owner**

    Animal ID  567                      Owner Id  212

    Name  Forrest                    Given name  Catherine

**Attending Vet**                                Family Name  Do

    Vet ID  45

    Name  Graham Sharp

Account for services provided on 19/08/2023 at 9:30 AM

| Service Code | Service Description | Line Cost |
|---|---|---|
| EXM11 | Examination: Detailed Assessment | $85.00 |
| LAB12 | Laboratory: Urinalysis Dipstick, Specific Gravity | $45.90 |
| INJ01 | Injection: Clinic administered injection | $10.00 |

| Drug ID | Drug Name | Qty Supplied | Line Cost |
|---|---|---|---|
| 567 | Convenia Injection | 1 | $25.00 |
| 253 | Bactrim Tablets | 10 | $40.00 |

| Total Amount Due | $205.90 |
|---|---|

*Payment for services provided is required immediately after service completed*

**Paid By:**    CASH ☐

                  EFT ☑

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

Please be careful to **ensure you do not publicly post anything which includes your reasoning, logic or any part of your work to this forum**, *doing so violates Monash plagiarism/collusion rules* and has significant academic penalties. Use private posts or email your allocated tutor to raise such questions.

You are free to make assumptions if needed however they must align with the details here and in the assignment forums and must be clearly 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** make use of 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 it may be necessary for your marker 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 shown on every page of any document you submit**. If a document is a multipage document (such as the normalisation), please also make sure you *include page numbers on every page*.

**GIT STORAGE**

Your work for these tasks MUST be saved in your group local working directory (repo) in the Assignment 1B folder and *regularly pushed to the FIT GitLab server* to build a clear history of development of your model. A minimum of nine pushes of your SQL Developer model to the FIT GitLab server is required. Please note 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** which 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 web interface of the FIT GitLab server; you must not simply *assume* they are working. Before submission, via Moodle, you **must** log in to the web interface of the GitLab server and ensure your submission files are present on the GitLab server.

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. Check Git File Versions video under week 3 block on Moodle if you need to clarify this.

**Groups MUST NOT make use of REVERT or RESET when working on this assignment task**, doing so will potentially cause serious errors to your remote repo. If you have problems in pushing to the remote group repo, you should move your current local group repo out of the way (to a new folder) and then reclone your group repo as discussed in the week 2 Applied notes (section 2.4).

**Working on SQL Developer Models in your Group Repo**

If multiple students work on a logical model at the same time, merging these changes can be quite difficult, since the files are not plain text files. For this reason, you are required to take a simple approach to working on the model - **lock the remote repo when making changes**.

Whenever a particular student wishes to work on the model, they should go to the Git Server web interface and check if the assignment 1B folder has been locked by another member of the group.

***If it has, 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":

| master ∨ | ▪️▪️ ▪️ / Assignments / Ass1B / + ∨ | Lock | History | 🔍 Find file | Web IDE | ⑂ ∨ |
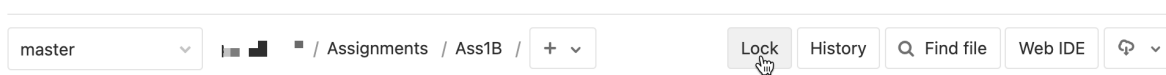
Ensure you are in the correct folder when this lock is applied.

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

📄 readme.txt 🔒

If you hover over the padlock icon, you will be able to see who currently has the folder locked.

**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 successfully completed*). When you have completed your work, and pushed it to Git, you should return to the Git web interface and unlock the folder:

| master ∨ | ▪️ ▪️ ▪️ / Assignments / Ass1B / + ∨ | Unlock | History | 🔍 Find file | Web IDE | ⑂ ∨ |

**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 members of the group 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 of each to help your understanding of the likely content).

    The approach **you are required to use** is the same approach as shown in the normalisation applied class solution. *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.
    ○ Clearly **identify the Primary Key in all relations by underlining the PK attribute/s**.
    ○ Clearly **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 members of the group 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.  Based on your group's assignment 1A conceptual model, your markers feedback, your reading of this case study and the normalisations you carried out in step 1 above, **prepare a logical level design** for the Pets First database.

    ○ The logical model must be drawn using the Oracle Data Modeler. The information engineering or Crow's foot notation must be used in drawing the model. Your logical model must **not** show data types.
    ○ All relations depicted must be in 3NF
    ○ You are required to **add at least one surrogate key to your design** (you are free to select the most appropriate relation to make this change in). 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 as part of your model. Please edit the legend panel to show your group name
- ○ Note that your GIT repository must clearly indicate your development history with multiple commits/pushes as you work on your model.

3. **Generate the schema for the database** 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 not available).

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 **pf_schema.sql.**

4. Maintain a Group Diary which 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 does not need to be pushed to GitLab other than as listed in Submission Requirements.

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

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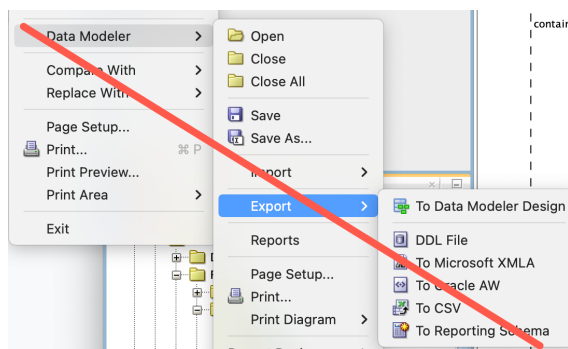


such actions can fill your Oracle account space and render it unusable.

## Submission Requirements

Assignment 1B: Due: **Thursday 14 Sep 2023 4:30 PM (Week 8)**

The following files **must** be submitted to Moodle and **must also 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 Pets First documents showing all normal forms (UNF, 1NF, 2NF and 3NF). Name the file **pf_normalisation.pdf**

- A single page **pdf** file containing the final logical Model you created in Oracle Data Modeler. Name the file **pf_logical.pdf.** This pdf must be created via File - Data Modeler - Print Diagram - To PDF File from within SQL Developer, do not use screen capture.

- A zip file containing your Oracle Data Modeler project (in zipping these files be sure you include the .dmd file and the folder of the same name). Name the file **pf_oraclemodel.zip.**

  Part of the assessment of your submission will involve your marker extracting your model from this zip, opening it in SQL Developer Data Modeller, engineering to a new Relational model and 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 <u>complete model</u> (i.e. both your logical <u>and</u> 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 Moodle under week 6, "Preparing Files for Submission", which demonstrates this process.

- A schema file (CREATE TABLE statements) generated by Oracle Data Modeller. Name the file **pf_schema.sql**

- The output from SQL Developer spool command showing the tables have been created. Name the file **pf_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". Name the file **pf_assumptions.pdf**

- A PDF copy of your group diary named as **pf_##_Ass1B_diary.pdf** (replace ## with your group number eg. pf_A01-Group001_Ass1B_diary.pdf)

These files must be *submitted as individual files* **ie. you must upload to Moodle seven separate files as named above** (the seven files must *not* be zipped into a single archive) before the assignment due date/time.  **The files only need to be submitted by one member of the group after the group has agreed that the submission is complete and ready to be graded**.

*Late submission will incur penalties of 9 marks deduction per day or part thereof late*. Submissions are not accepted beyond 7 days late.

Please note 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**.

**It is your responsibility to ENSURE that the files you submit are the correct files - we strongly recommend after uploading a submission, and prior to actually submitting in Moodle, that you 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 1B has been graded.

***Assignment 1B 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]** | **Maximum 18 marks - Normalisation:**<br><br>● Marks awarded for each correct normalisation step<br>● Marks awarded for correct attribute synthesis<br>● Mark penalty for additional attributes or surrogate keys added during normalisation<br><br>**Maximum 6 marks - Dependency diagrams:**<br><br>● Marks awarded for each correct dependency depicted within normalisation<br><br>**Mapping to logical model:**<br><br>● 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]** | **Maximum 10 marks - Relations:**<br><br>● Marks awarded for each required relation and its attributes identified<br>● Mark penalty for extra relations included<br>● Marks penalty for placement of attribute in incorrect relation<br>● Mark penalty for multivalued attributes included<br><br>**Maximum 10 marks - Primary keys:**<br><br>● Marks awarded for each correct assignment of a primary key<br><br>**Maximum 10 marks - Relationships:**<br><br>● Marks awarded for each required relationship identified<br>● Mark penalty for each incorrect minimum and maximum cardinality for each required relationship depicted<br>● Mark penalty for unnecessary relationships included<br>● Mark penalty for redundant relationships included<br><br>**Maximum 4 marks - Surrogate key:**<br><br>● Marks awarded for creation of at least one appropriate surrogate key |

| | |
|---|---|
| | ● Marks awarded for creation of unique index/s to protect natural key/s<br><br>**Maximum 4 marks - Attribute data types:**<br><br>● Marks awarded for each correctly identified Oracle data type<br>● Marks awarded for each null constraint correctly implemented based on business rules<br><br>**Maximum 5 marks - Business Rules:**<br><br>● Marks awarded for each correctly identified integrity requirement to implement case studies business rules |
| Generate a schema which meets the case study data requirements from the logical model produced<br>**[8 marks]**<br><br><span style="color:red">**This section will be awarded 0 marks if no relational model is present in your submission**</span> | **Maximum 5 marks - Relational model generation: this section**<br><br>● Marks awarded for correct generation of relational model from submitted logical model.<br>● *MUST be presented in submitted model and must match generation from logical model*<br><br>**Maximum 3 marks - Schema generation:**<br><br>● Marks awarded for correct generation of SQL schema file from submitted logical model<br>● Mark penalty for missing column comments |
| Consistent use of industry standard notation and convention<br>**[5 marks]** | **Maximum 5 marks - Modelling standards:**<br><br>● Marks awarded for application of Unit logical model notation convention<br>● Mark penalty for showing data types on logical model<br>● Mark penalty for missing model legend and/or relationship labels |
| Correct use of Git by group<br>**[10 marks]** | **Maximum 10 marks - Git used appropriately:**<br><br>● Marks awarded for nine pushes showing a clear development history for the logical model<br>● Marks awarded for even distribution of pushes amongst all group members<br>● Marks awarded for correct Git author details used in pushes (see week 2 Applied notes Appendix)<br>● Marks awarded for the use of meaningful commit messages (ie. not blank or of the form "Push1") |

<span style="color:red">**Late submission penalty - 9 marks for each 24 hours late or part thereof**</span>

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

| Peer Evaluation | **Maximum 10 marks - Contribution and Participation in your group:** |
|---|---|
| | ● Communication<br>● Project Management<br>● Quality of contribution<br>● Quantity of contribution<br>● Use of MS Teams within the group private channel<br>● Support for the group's working environment as assessed by self-evaluation and group members (peer) evaluation via Feedback Fruits<br>● This component will be moderated, if necessary, by your tutor based on any group issues/concerns which are not addressed |

## 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 members 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