



Topic 6

Considering Personal Data in Database Design Creating & Altering the Database

Workshop 2025 S1

*Note for this Workshop we are using examples and syntax particular to
Oracle*





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Considering Personal Data in Database Design



Collecting personal customer data for drone rental

- When a company/ business collects personal information they must take reasonable steps to tell you what they will do with it
- Some personal information is considered “sensitive” and requires explicit consent to be collected
- Privacy, Equal Opportunity and Discrimination laws govern the collection and use of personal data (see Topic 1)



This unit covers database *design* but it's important to be aware of *context* and your *responsibilities* (both legal and moral) in real world environments

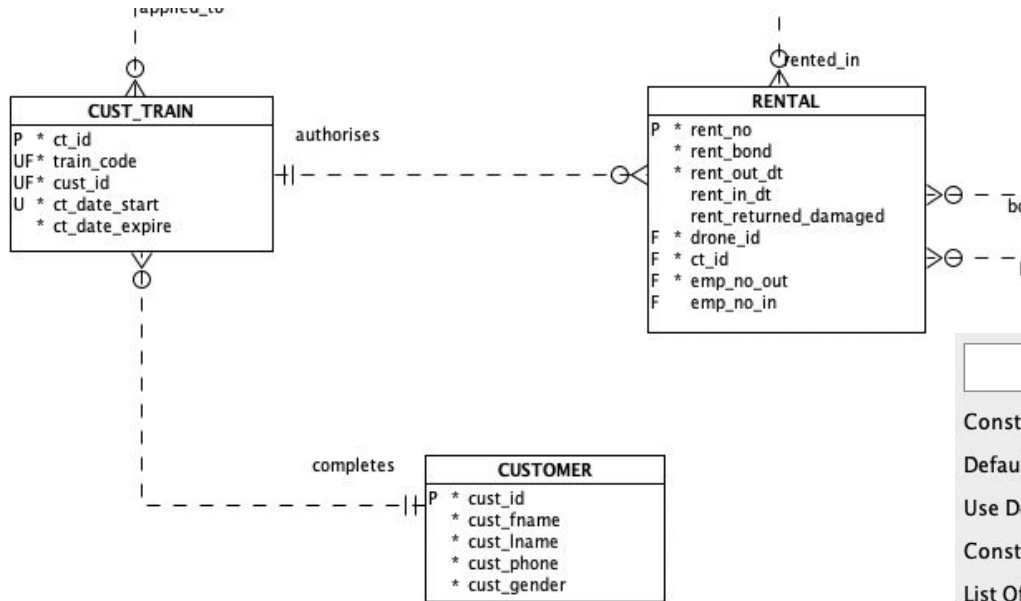
What personal customer data should be collected?

- Possible questions to your client in a real world situation might be:
 - Name (do you need to collect first, last and middle name?)
 - Preferred name (do you need to know how customers want to be addressed?)
 - Contact details (address, phone, email?)
 - Preferred method of contact (from above)
 - Age or Date of Birth (does a renter need to be over 18?)
 - Title (will you be sending them formal mail or correspondence?)
 - Gender (do you want to understand who your customer base is and how to reach all genders?)
 - Language spoken at home (do you want to reach potential customers in multiple languages?)
 - Special needs/ accessibility (do you want to cater for customers with special needs or accessibility requests?)
- The **client along with privacy/legal obligations decides what should be included NOT the designer**

Adding attributes that record personal information

- When adding an attribute that records personal information such as gender, as a designer, you must consider whether:
 - the attribute can be null or not (e.g. how important is the data - a client discussion)
 - visualised by *null* or *not null* symbol on logical model
 - the possible values for the attribute:
 - Fixed values, such as 'M' for Men, 'W' for Women, or 'U' for Undisclosed
 - implemented by check constraint
 - Extendable values, such as Men, Women, and other options
 - implemented by look up table

Example 1: Gender - Check Constraint



What about other genders?

- Non binary
- Gender diverse
- Prefer not to say
- ...

Default and Constraint

Constraint Name:

Default Value:

Use Domain Constraint: ☐

Constraint:

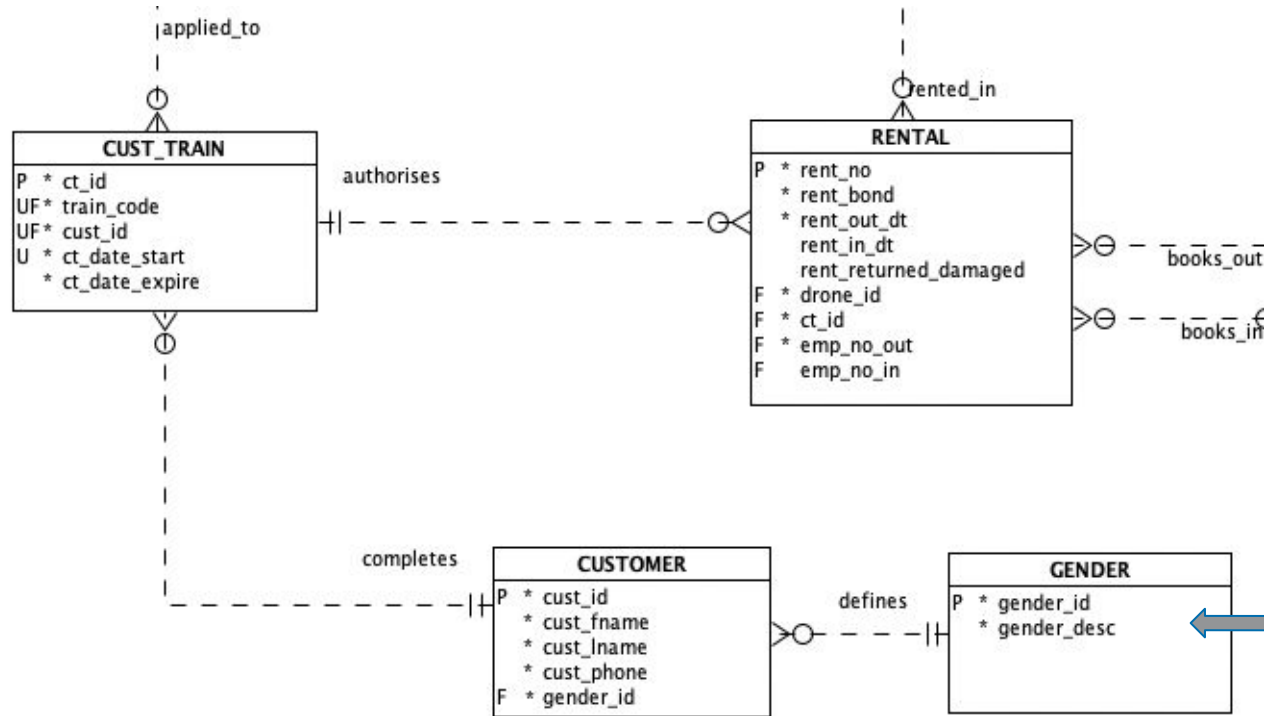
List Of Ranges:

List Of Values:

Value	Description
M	Male/Man
F	Female/Woman
U	Undisclosed/Other

```
ALTER TABLE customer ADD CONSTRAINT chk_custgender  
CHECK ( cust_gender IN ( 'M', 'F', 'U' ) );
```

Example 1: Gender - Lookup Table



Opportunity to add other genders.

Where does this stop ... striking a balance

Your title

Mr

Mrs

Ms

Miss

Where is this being delivered?

Title

About you

Title

- ✓ Title
- Mr
- Mrs
- Miss
- Ms
- Dr

✓ Please select

- Mr
- Mrs
- Miss
- Ms
- Mx
- Mr & Mrs
- Mr & Mr
- Mrs & Mrs
- Sir
- Madam
- Prof
- Dame
- Dr
- Lord
- Lady
- Air Commodore
- Brigadier
- Captain
- Colonel
- Commander
- Commodore
- District Judge
- General
- Group Captain
- H. H. Sheikh
- H.E.
- HRH
- Her Hon. Judge
- His Hon. Judge
- Lt. Col
- Lt.
- Major
- Priest
- Rabbi
- Rev
- Reverend Mother
- Sergeant
- Sister
- Squadron Leader
- The Hon. Mr Justice
- The Hon. Mrs Justice
- The Hon. Ms Justice
- The Lady
- The Lord
- The Marchioness
- The Marquess
- The Most Revd
- The Revd Canon
- The Revd
- The Rt. Hon
- The Rt. Rev
- The Venerable
- The Very Revd
- Viscount
- Viscountess
- Wing Commander



DELIVERY ADDRESS

TITLE +

FIRST NAME +

LAST NAME +

COMPANY NAME +

TELEPHONE +

COUNTRY +

POSTCODE +

By using this we

All Rights Reserved

What do you *really* need to collect?

- Titles are a proxy for gender, so you may not need to ask for both
- If titles and gender are not integral to the customer's business - don't record them
- If titles are somewhat important, but the client suspects customers are unlikely to require more unusual options - go for Mr, Mrs, Ms, Miss, Mx and perhaps other
- If titles are vital and the client knows they have some customers with unusual titles - use a free text box instead of a drop down in the application (note: a varchar attribute in the database design will cause the loss of value control and likely lead to data inconsistency)

Blog: <https://www.zuko.io/blog/titles-in-online-forms-how-inclusive-should-you-be>

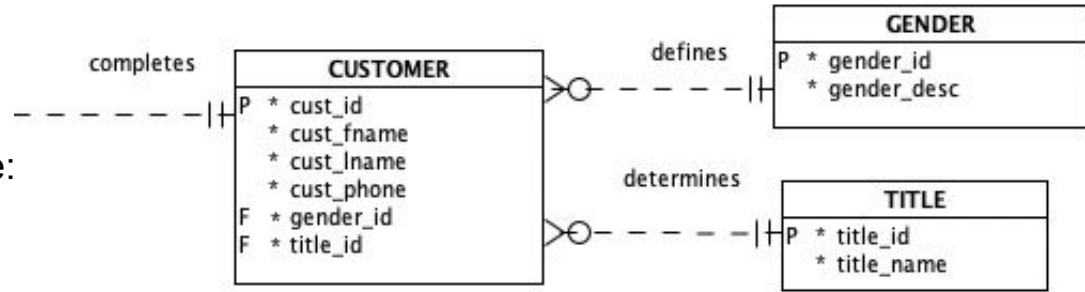
Example 2: Titles

List of titles:

- Ms
- Mr
- Miss
- Mrs
- Dr

Can be extended further to include:

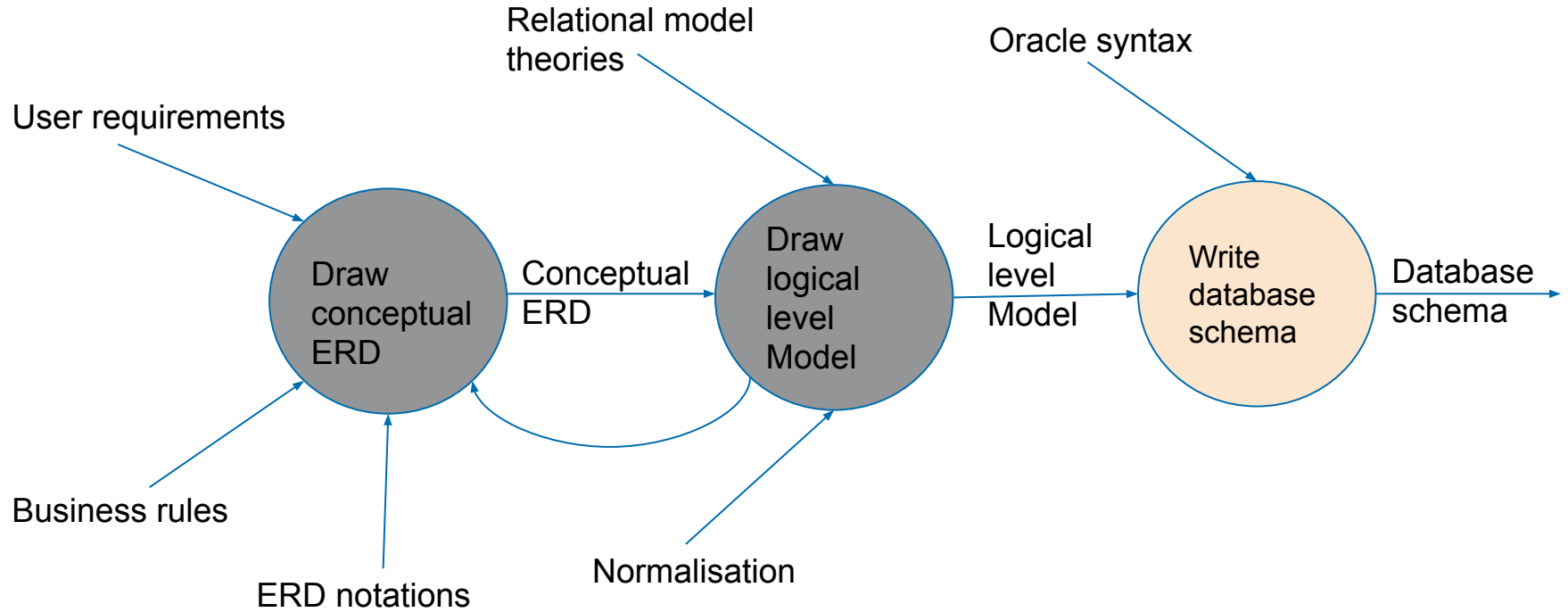
- Mx
- M
- ... etc.



OR allowed as free form (varchar)

Creating & Altering the Database





SQL general syntax

- A single statement is ended with SEMICOLON.
- Predefined KEYWORDS represent clauses (components) of a statement.
- Keywords are NOT case sensitive.
- Examples:

```
CREATE TABLE unit
(
    unit_code    CHAR(7) NOT NULL,
    unit_name    VARCHAR2(50) CONSTRAINT uq_unit_name UNIQUE NOT NULL,
    CONSTRAINT pk_unit PRIMARY KEY (unit_code)
);

SELECT * FROM unit;
```

Q1. The SQL Language is made up of the following components (multiple answers can be selected):

- A. Data Control Language (DCL)
- B. Data Query Language (DQL)
- C. Data Definition Language (DDL)
- D. Data Manipulation Language (DML)
- E. Data Structured Query Language (DSQL)
- F. Data Update Language (DUL)

SQL Statements

- Data Definition Language (DDL)
 - Creating database structure
 - CREATE TABLE, ALTER TABLE, DROP TABLE
- Data Manipulation Language (DML)
 - Adding and Manipulating database contents (rows)
 - INSERT, UPDATE, DELETE
 - Retrieving data from database
 - SELECT
- Data Control Language (DCL)
 - Set permissions on objects
 - GRANT, REVOKE



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CREATE A TABLE (DDL)



Q2. An attribute is to be used to store Australian postcodes eg. 3001, 2000 - the data type should be:

- A. VARCHAR2(4)
- B. CHAR(4)
- C. NUMBER(4)
- D. STRING(4)

Q3. An attributes is to be used to store a customers outstanding balance - the permitted range is \$0 to \$2000.00 - the data type should be:

- A. VARCHAR2(8)
- B. NUMBER(4,2)
- C. NUMBER(6,2)
- D. NUMBER

Q4. An attribute is to be used to store the year an event occurred - the data types which could be used are (multiple answers can be selected):

- A. DATE
- B. DATE(4)
- C. NUMBER(4)
- D. CHAR(4)

Q5. An attribute is to be used to store the finish time of athletes entered in a 800m running event in minutes and seconds eg. 3 min 25 sec - the data type which should be used is:

- A. DATETIME
- B. TIME
- C. DATE
- D. NUMBER(3,2)

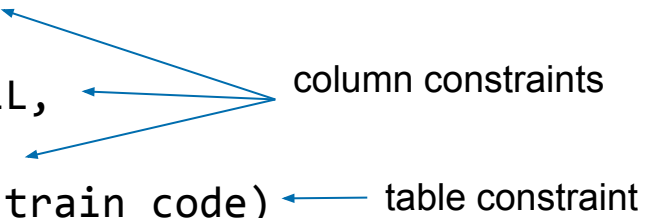
Common ORACLE data types

- **Text:** CHAR(size), VARCHAR2(size)
 - e.g., CHAR(10), VARCHAR2(10)
 - CHAR(10) → 'apple' = 'apple '
 - VARCHAR2(10) → 'apple' != 'apple '
- **Numbers:** NUMBER(precision, scale)
 - Weight NUMBER(7) or NUMBER(7,0) → Weight = 7456124
 - Weight NUMBER(9,2) → Weight = 7456123.89
 - Weight NUMBER(8,1) → Weight = 7456123.9
- **Date/Time:** DATE, [TIMESTAMP not used by this unit]
 - DATE can store a date and time (time to seconds), stored as Gregorian date
 - *TIMESTAMP can store a date and a time (up to fractions of a second)*
 - *TIMESTAMP WITH TIME ZONE*

Column VS Table Level Constraints

TRAINING		
P	* train_code	CHAR (5)
	* train_desc	VARCHAR (100)
	* train_hrs	NUMERIC (2)

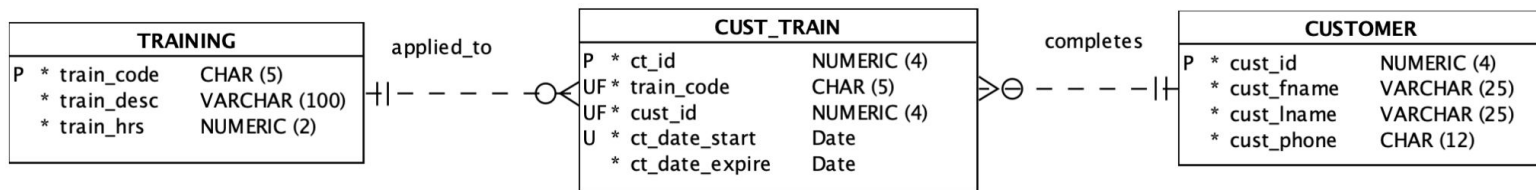
```
CREATE TABLE training (  
    train_code      CHAR(5) NOT NULL,  
    train_desc      VARCHAR2(100) NOT NULL,  
    train_hrs       NUMBER(2) NOT NULL,  
    CONSTRAINT training_pk PRIMARY KEY (train_code)  
);
```



column constraints

table constraint

All constraints other than the not null constraints must have a name.

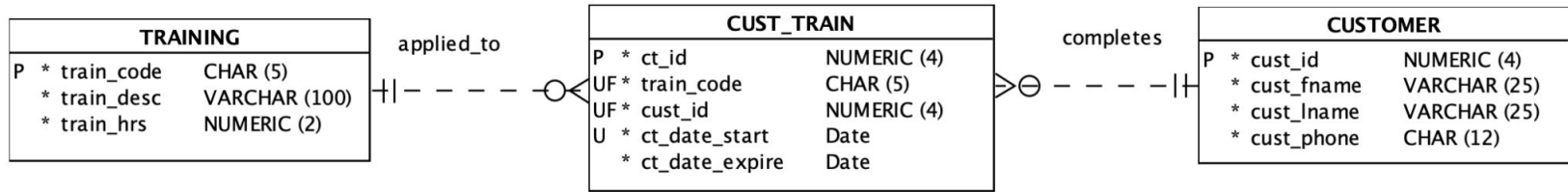


```

CREATE TABLE training (
    train_code      CHAR(5) NOT NULL,
    train_desc      VARCHAR2(100) NOT NULL,
    train_hrs       NUMBER(2) NOT NULL,
    CONSTRAINT training_pk PRIMARY KEY ( train_code )
);
  
```

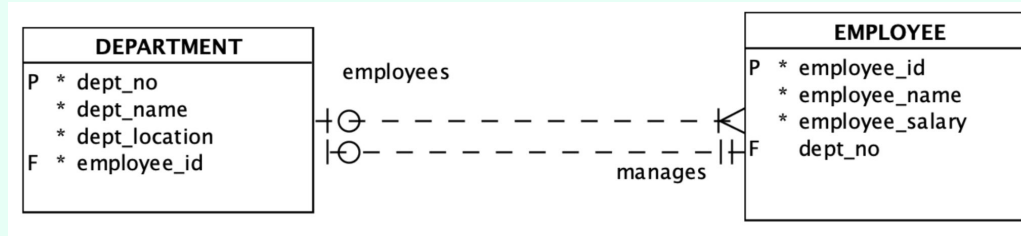
```

CREATE TABLE customer (
    cust_id         NUMBER(4) NOT NULL,
    cust_fname      VARCHAR2(25) NOT NULL,
    cust_lname      VARCHAR2(25) NOT NULL,
    cust_phone      CHAR(12) NOT NULL,
    CONSTRAINT customer_pk PRIMARY KEY ( cust_id )
);
  
```



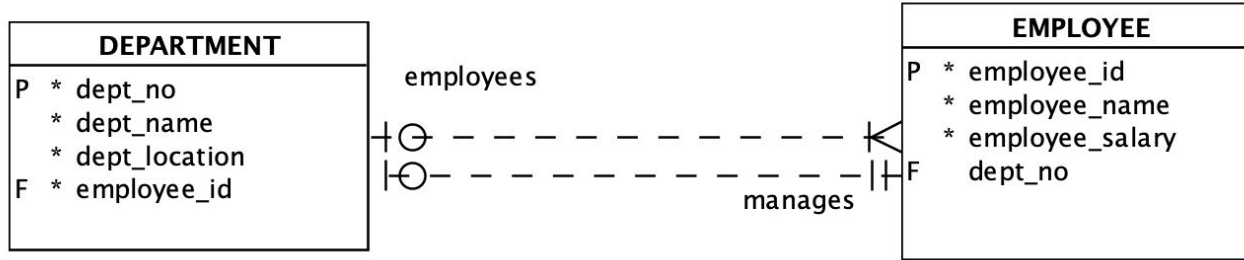
```
CREATE TABLE cust_train (
    ct_id          NUMBER(4) NOT NULL,
    train_code     CHAR(5) NOT NULL,
    cust_id        NUMBER(4) NOT NULL,
    ct_date_start  DATE NOT NULL,
    ct_date_expire DATE NOT NULL,
    CONSTRAINT cust_train_pk PRIMARY KEY ( ct_id ),
    CONSTRAINT cust_train_uq UNIQUE ( train_code, cust_id, ct_date_start ),
    CONSTRAINT training_cust_train_fk FOREIGN KEY ( train_code )
        REFERENCES training ( train_code ),
    CONSTRAINT customer_cust_train_fk FOREIGN KEY ( cust_id )
        REFERENCES customer ( cust_id )
);
```


Q6. The foreign keys in this model can be declared by (multiple answers can be selected if required) - be prepared to justify your answer:



- A. Column Constraints
- B. Table Constraints
- C. Use of the ALTER command
- D. None of these

Problems here?



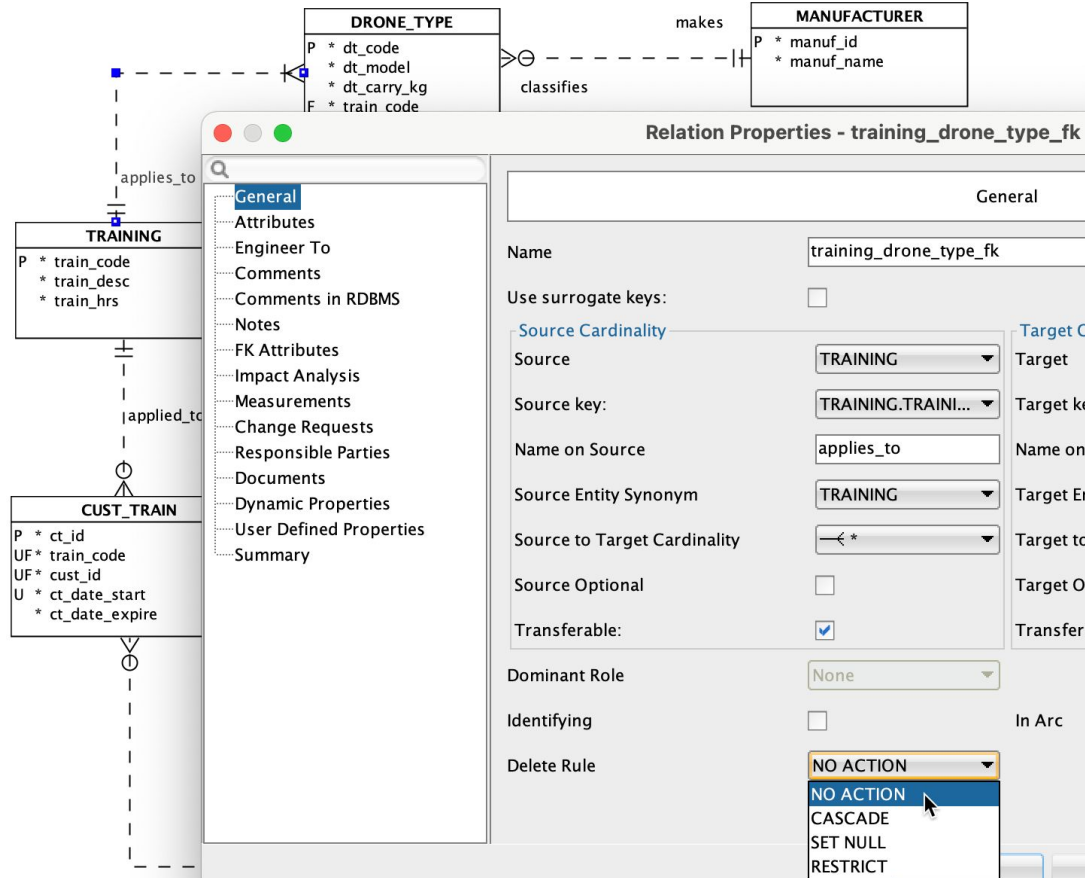
Alternative (BETTER) method of defining FKs

```
CREATE TABLE cust_train (  
    ct_id          NUMBER(4) NOT NULL,  
    train_code     CHAR(5) NOT NULL,  
    cust_id        NUMBER(4) NOT NULL,  
    ct_date_start  DATE NOT NULL,  
    ct_date_expire DATE NOT NULL  
);  
ALTER TABLE cust_train  
ADD  
    (CONSTRAINT cust_train_pk PRIMARY KEY ( ct_id ),  
     CONSTRAINT training_cust_train_fk FOREIGN KEY ( train_code )  
                                     REFERENCES training ( train_code ),  
     CONSTRAINT customer_cust_train_fk FOREIGN KEY ( cust_id )  
                                     REFERENCES customer ( cust_id ),  
     CONSTRAINT cust_train_uq UNIQUE ( train_code, cust_id, ct_date_start));
```

Referential Integrity

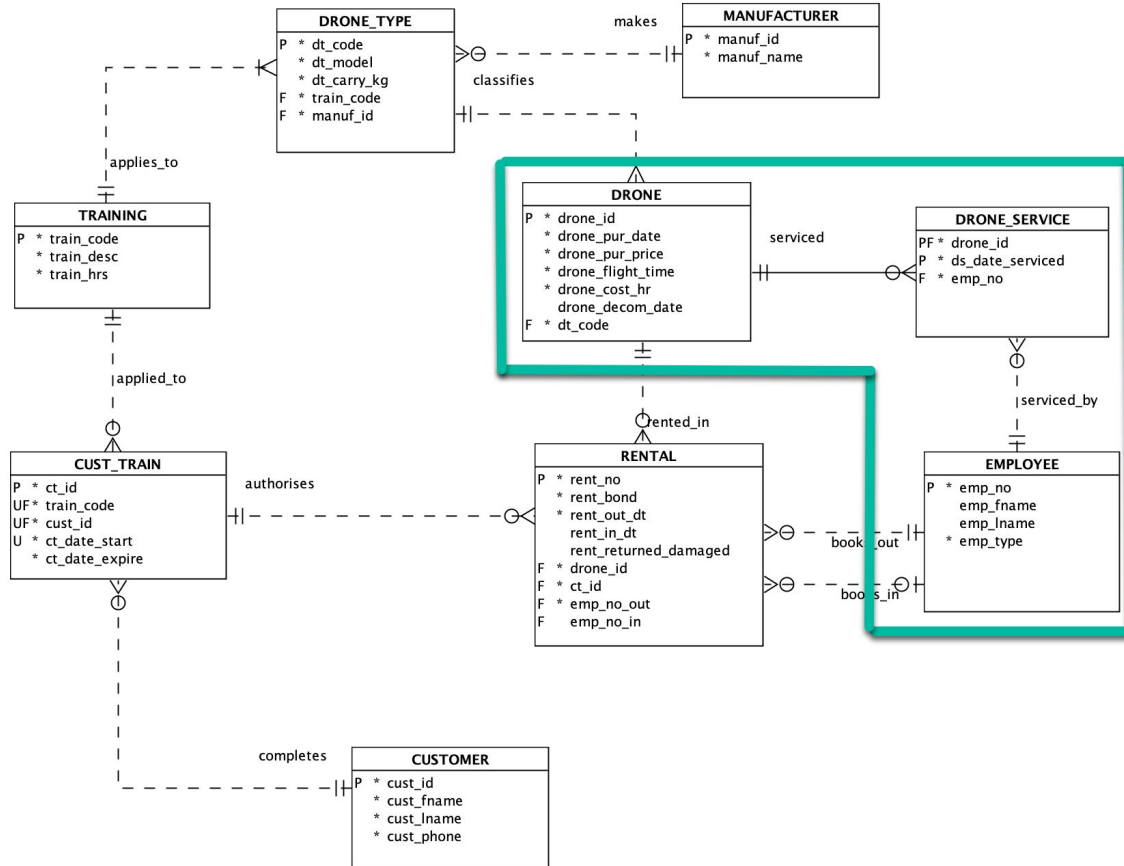
- To ensure referential integrity, SQL defines three possible actions for FKs in relations when a deletion of a primary key occurs:
 - RESTRICT (Oracle No Action basically equivalent)
 - Deletion of tuples is NOT ALLOWED for those tuples in the table referred by the FK (the table containing PK) if there is corresponding tuple in the table containing the FK.
 - CASCADE
 - A deletion of a tuple in the table referred by the FK (the table containing PK) will result in the deletion of the corresponding tuples in the table containing the FK.
 - NULLIFY
 - A deletion of a tuple in the table referred by the FK (the table containing PK) will result in the update of the corresponding tuples in the table containing the FK to NULL.

Referential Constraints Oracle Data Modeler

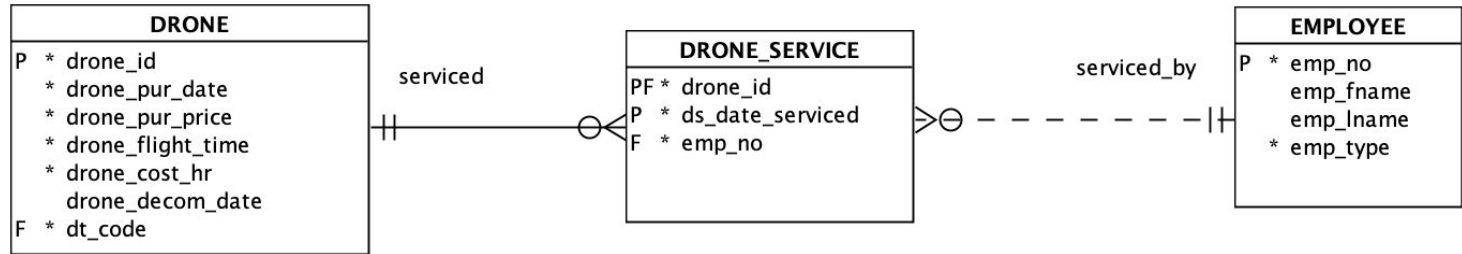


What Referential Integrity Constraint to implement?

- Use the model to decide on what referential integrity constraint to implement.
 - Mandatory vs Optional participation.
- **The constraints must be decided at the design phase.**

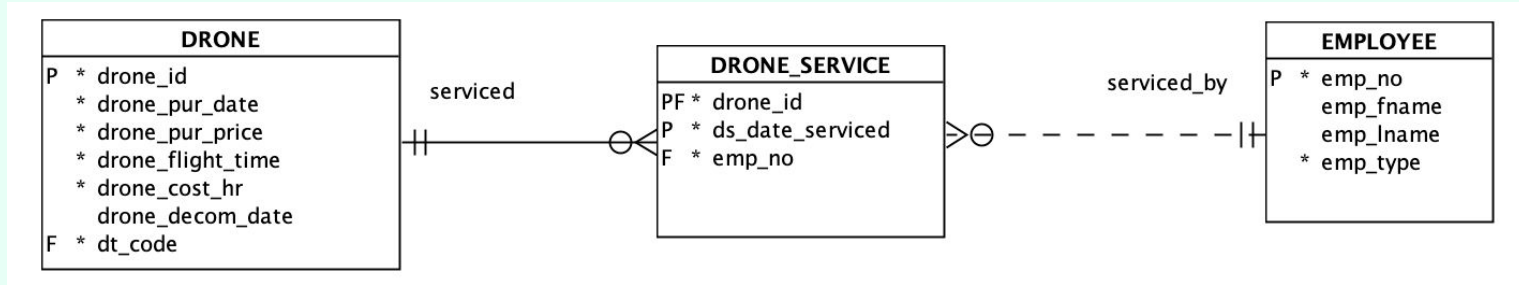


Q7. What could we select for the referential constraint involving DRONE_SERVICE.drone_id FK (multiple answers may be selected):



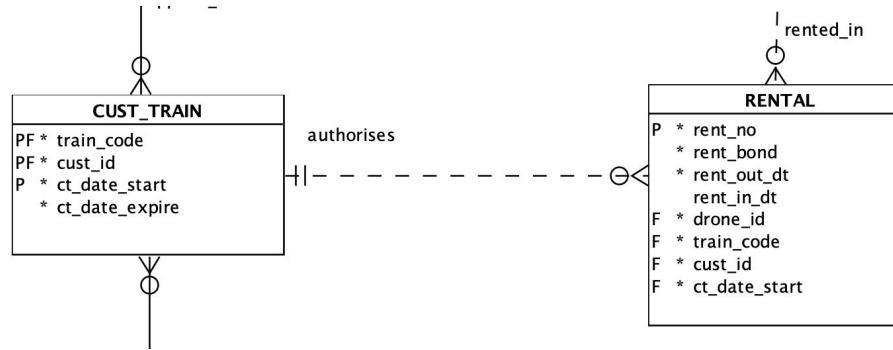
- A. RESTRICT
- B. SET NULL
- C. CASCADE
- D. None of these

Q8. What could we select for the referential constraint involving DRONE_SERVICE.emp_no FK (multiple answers may be selected):



- A. RESTRICT
- B. SET NULL
- C. CASCADE
- D. None of these

COMPOSITE FK's



Returning to the DRONE case before a surrogate key for CUST_TRAIN was added

What PK for cust_train and FK for the "authorises" relationship is required?

COMPOSITE FK's

PK for CUST_TRAIN

```
ALTER TABLE cust_train
  ADD CONSTRAINT cust_train_pk PRIMARY KEY ( train_code,
                                              cust_id,
                                              ct_date_start );
```

Mapping of "authorises" relationship (FK in RENTAL)

```
ALTER TABLE rental
  ADD CONSTRAINT cust_train_rental_fk FOREIGN KEY ( train_code,
                                                    cust_id,
                                                    ct_date_start )
  REFERENCES cust_train ( train_code,
                          cust_id,
                          ct_date_start );
```

Provision of a surrogate PK in CUST_TRAIN simplifies the schema

ALTER TABLE

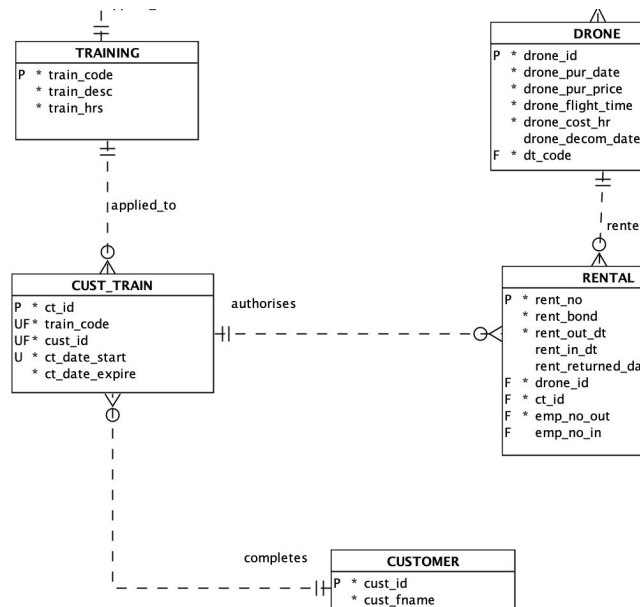
- Used to change a tables structure.
- For example:
 - Adding column(s).
 - Removing column(s).
 - Adding constraint(s) - used previously for FK's, but can be any constraint
 - Removing constraint(s)

Add a new attribute to store whether training courses are paid(P) or free(F):

```
ALTER TABLE training ADD (  
    train_type CHAR(1) DEFAULT 'P',  
    CONSTRAINT chk_train_type CHECK ( train_type IN ( 'P', 'F' ) )  
);  
  
ALTER TABLE training MODIFY train_type NOT NULL;
```

Manipulate Constraints

- Turn constraint ON or OFF to temporarily disable
 - ALTER TABLE cust_train
DISABLE CONSTRAINT training_cust_train;
 - ALTER TABLE cust_train
ENABLE CONSTRAINT training_cust_train;
 - **MUST not be used on "live" active database**
- Remove/re add constraint to modify constraint
 - ALTER TABLE cust_train
DROP CONSTRAINT training_cust_train;
 - ALTER TABLE cust_train
ADD
(CONSTRAINT training_cust_train_fk FOREIGN
REFERENCES training (train_code) **ON DELETE CASCADE**);
- *Would you wish to do the above - reasons?*



DELETING A TABLE

- Use the DROP statement.

- Examples:

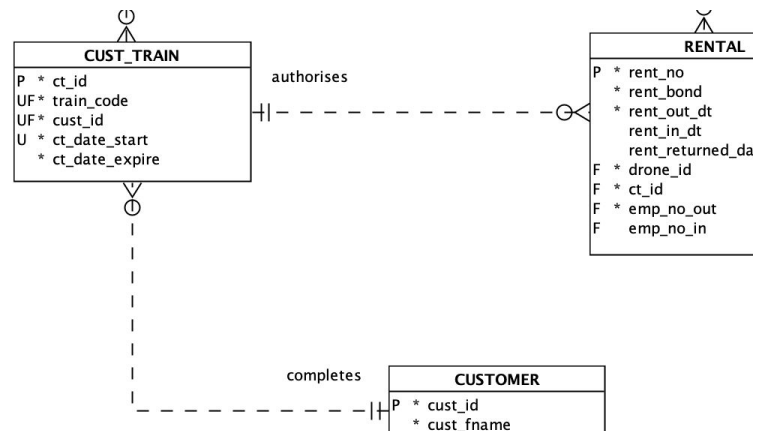
- DROP TABLE customer PURGE;

- will not work, why?

- DROP TABLE customer **CASCADE CONSTRAINTS PURGE**;

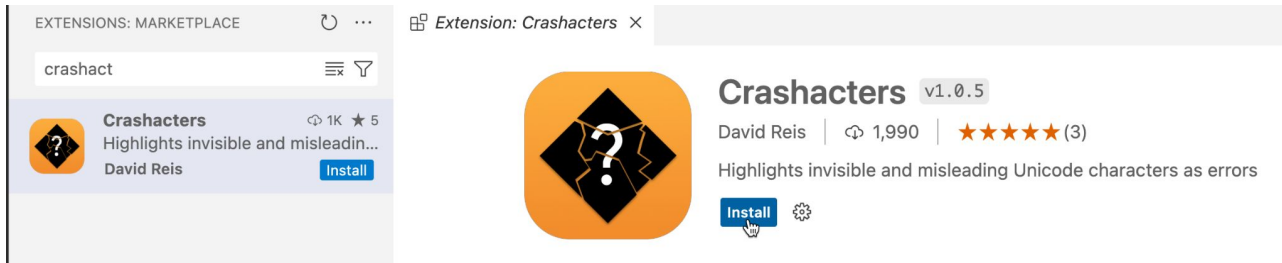
- CASCADE CONSTRAINTS** leaves data in CUST_TRAIN removes FK constraint:

	CT_ID	TRAIN_CODE	CUST_ID	CT_DATE_START	CT_DATE_EXPIRE
1	1	DJIHY	1	14/FEB/21	14/FEB/23
2	2	DJIHY	2	14/FEB/21	14/FEB/23
3	3	DJIHY	3	14/FEB/21	14/FEB/23
4	4	DJIHY	4	14/FEB/21	14/FEB/23



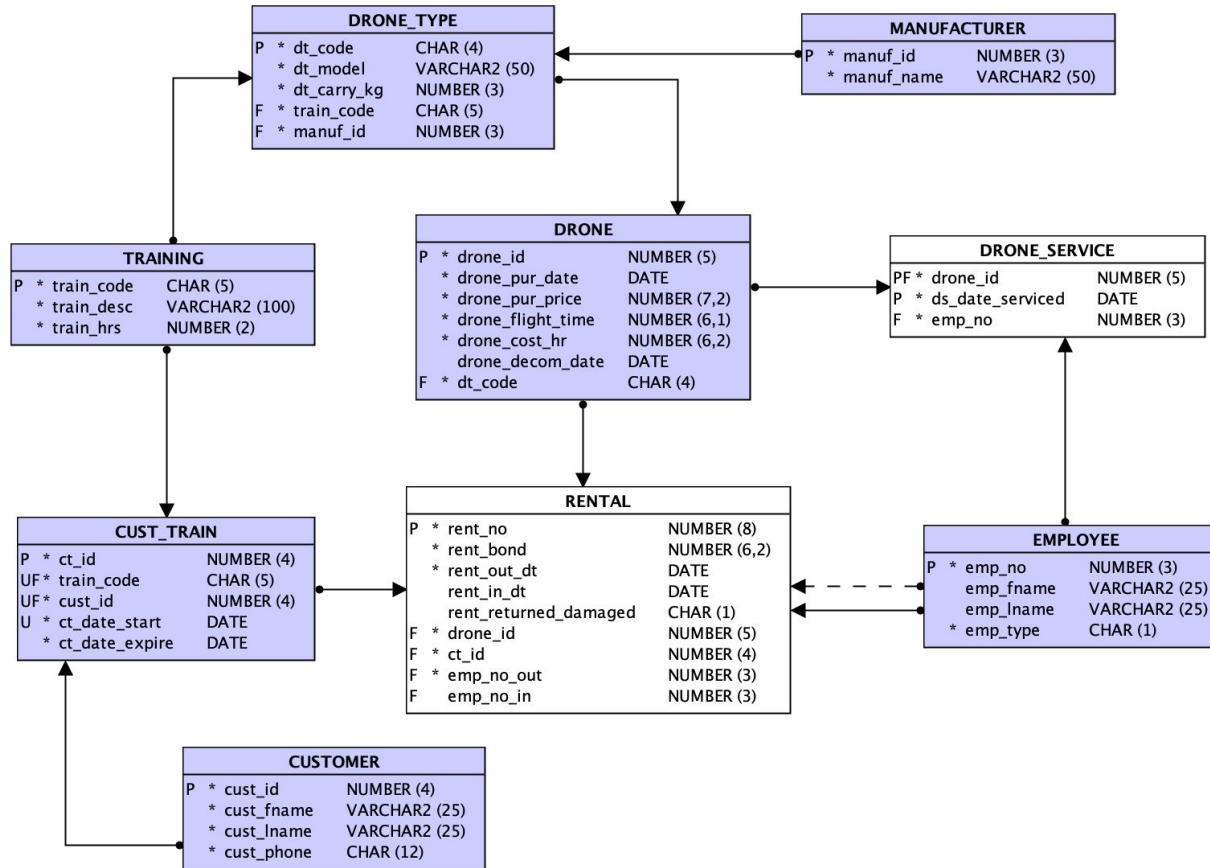
PUTTING THIS TO WORK

Before starting on this task please install the Crashacters extension in VS Code:



The screenshot shows the VS Code Extensions Marketplace interface. On the left, a search bar contains the text "crashact". Below the search bar, the "Crashacters" extension by David Reis is listed with a rating of 5 stars and 1K downloads. The extension's description is "Highlights invisible and misleading Unicode characters as errors". An "Install" button is visible next to the extension. On the right, a larger view of the "Crashacters" extension is shown, featuring an orange icon with a black diamond and a white question mark. The version is "v1.0.5". The author is "David Reis" with 1,990 downloads and a 5-star rating (3 reviews). The description is "Highlights invisible and misleading Unicode characters as errors". An "Install" button is also present, with a gear icon for settings.





Assume purple relations (tables) have been created

Q9. Code the create table commands for the white relations using SQL Developer (omit column comments).


```
-- DROP TABLES
```

```
DROP TABLE drone_service CASCADE CONSTRAINTS PURGE;
```

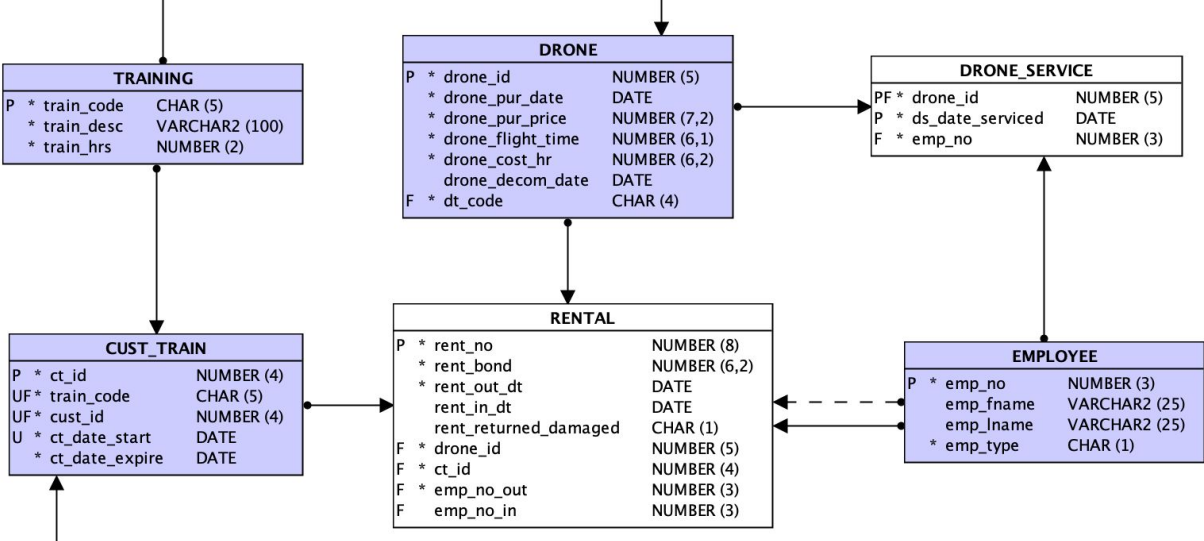
```
DROP TABLE rental CASCADE CONSTRAINTS PURGE;
```

```
-- CREATE TABLES
```

```
CREATE TABLE drone_service (  
    drone_id      NUMBER(5) NOT NULL,  
    ds_date_serviced DATE NOT NULL,  
    emp_no        NUMBER(3) NOT NULL  
);
```

```
CREATE TABLE rental (  
    rent_no       NUMBER(8) NOT NULL,  
    rent_bond     NUMBER(6, 2) NOT NULL,  
    rent_out_dt   DATE NOT NULL,  
    rent_in_dt    DATE,  
    rent_returned_damaged CHAR(1),  
    drone_id      NUMBER(5) NOT NULL,  
    ct_id         NUMBER(4) NOT NULL,  
    emp_no_out    NUMBER(3) NOT NULL,  
    emp_no_in     NUMBER(3)  
);
```

Q10. How may PK and FK constraints are needed for the white tables (multiple answers possible):



- A. DRONE_SERVICE
2 PK, 2 FK
- B. DRONE_SERVICE
1 PK, 2 FK
- C. RENTAL
1 PK, 1 FK
- D. RENTAL
1 PK, 4 FK
- E. RENTAL
1 PK, 3 FK

```

-- PKs
ALTER TABLE drone_service ADD CONSTRAINT drone_service_pk
    PRIMARY KEY ( ds_date_serviced, drone_id );

ALTER TABLE rental ADD CONSTRAINT rental_pk PRIMARY KEY ( rent_no );

-- FKs
ALTER TABLE drone_service
    ADD CONSTRAINT drone_drone_service_fk FOREIGN KEY ( drone_id )
        REFERENCES drone ( drone_id );
ALTER TABLE drone_service
    ADD CONSTRAINT employee_drone_service_fk FOREIGN KEY ( emp_no )
        REFERENCES employee ( emp_no );

ALTER TABLE rental
    ADD CONSTRAINT cust_train_rental_fk FOREIGN KEY ( ct_id )
        REFERENCES cust_train ( ct_id );
ALTER TABLE rental
    ADD CONSTRAINT drone_rental_fk FOREIGN KEY ( drone_id )
        REFERENCES drone ( drone_id );
ALTER TABLE rental
    ADD CONSTRAINT employee_rental_in_fk FOREIGN KEY ( emp_no_in )
        REFERENCES employee ( emp_no );
ALTER TABLE rental
    ADD CONSTRAINT employee_rental_out_fk FOREIGN KEY ( emp_no_out )
        REFERENCES employee ( emp_no );

```

-- Other Constraints

```
ALTER TABLE rental
  ADD CONSTRAINT chk_rent_return_damaged
    CHECK ( rent_returned_damaged IN ( 'N', 'Y' ) );
```

During this workshop column comments were omitted to speed up the coding

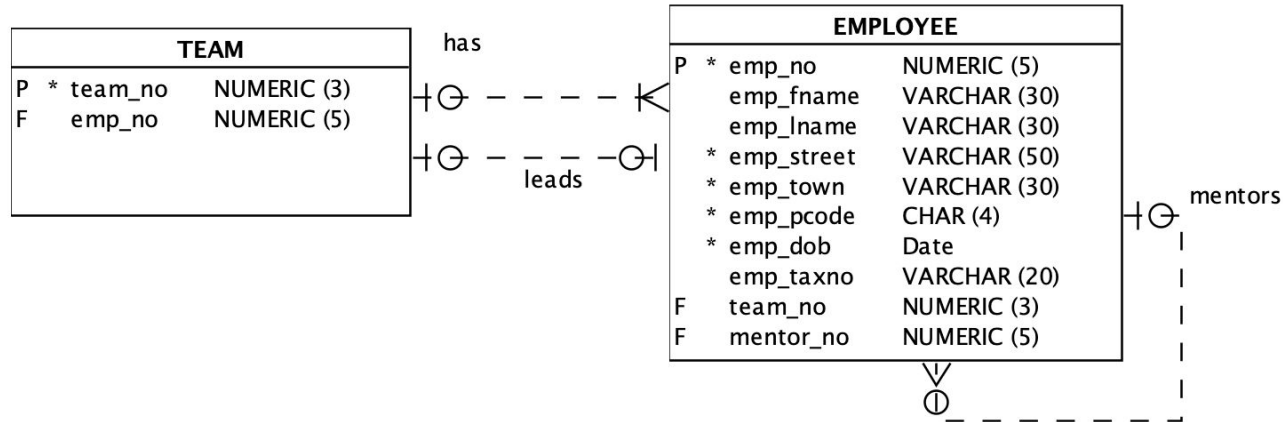
*****HOWEVER**** column comments **MUST** always be provided in the final schema*

For example:

```
COMMENT ON COLUMN rental.rent_no IS
  'Rental identifier';
COMMENT ON COLUMN rental.rent_bond IS
  'Rental bond';
```

...

Post Workshop Task: Code the SQL create table statements for the following segment of the Monash Software model (column comments are required):



Answer available 5 PM Sunday