

Tutorial Week 3 Solution: The Relational Model

1. Flight Booking Schema

If you have tables of the same name in your database you can remove them with:

```
DROP TABLE Plane CASCADE CONSTRAINTS;  
DROP TABLE Flight CASCADE CONSTRAINTS;
```

Note also:

- In Oracle you can omit the type of a referencing column, even though they are explicitly stated in the solution given.
- All variable-length strings use Oracle's `VARCHAR2` data-type. This is because ANSI SQL requires empty `VARCHAR` strings to be distinct from `NULL`s, and Oracle have never got round to implementing this.

```
CREATE TABLE Plane (  
    plane_id VARCHAR2(8) PRIMARY KEY,  
    category VARCHAR2(10) NOT NULL  
        CHECK( category IN ('jet', 'turboprop')),  
    capacity INTEGER NOT NULL  
);  
  
CREATE TABLE Flight (  
    flight_id INTEGER PRIMARY KEY,  
    departs DATE NOT NULL,  
    plane_id VARCHAR2(8) NOT NULL REFERENCES Plane,  
    origin VARCHAR2(20) NOT NULL,  
    destination VARCHAR2(20) NOT NULL,  
    CONSTRAINT one_flight_per_day  
        UNIQUE(plane_id, departs)  
);
```

2. Populating the DB

Try inserting some of the values below, and view the data in a table after rows are inserted. You should be able to see rows by clicking on a created table from the navigation tree on the left, and then clicking on the data tab.

```

-- Add some planes
INSERT INTO Plane VALUES ('aa-1234', 'jet', 250);
INSERT INTO Plane VALUES ('ab-1334', 'turboprop', 17);
INSERT INTO Plane VALUES ('ac-4234', 'jet', 300);
INSERT INTO Plane VALUES ('ad-7234', 'jet', 90);
INSERT INTO Plane VALUES ('ae-6237', 'turboprop', 50);

COMMIT;

-- Some examples of breaking constraints:
-- Domain constraint: date capacity should be integer
INSERT INTO Plane VALUES ('zz-3456', 'turboprop', sysdate);
--> ERROR ORA-00932: inconsistent datatypes: expected NUMBER
got DATE
-- BUT WATCH OUT: Implicit conversions...
-- string capacity should be integer (but still works):
INSERT INTO Plane VALUES ('ax-9999', 'turboprop', '50');
-- integer plane_id should be string (but still works):
INSERT INTO Plane VALUES (123456, 'jet', 255);

-- NOT NULL constraints:
-- Explicit NULL when category NOT NULL in schema
INSERT INTO Plane VALUES ('bj-78', NULL, 500);
--> ERROR ORA-01400: cannot insert NULL into
("BJEF8061"."PLANE"."CATEGORY")
-- Same thing with implicit NULLs
INSERT INTO Plane (plane_id, capacity) VALUES ('bj-78', 500);
--> ERROR ORA-01400: cannot insert NULL into
("BJEF8061"."PLANE"."CATEGORY")
-- BUT WATCH OUT: empty VARCHAR/VARCHAR2 strings are also
treated as NULL (contrary to ANSI SQL)
INSERT INTO Flight VALUES ('vh-1', '25-DEC-12', 'aa-1234',
'sydney', '');
--> ERROR ORA-01400: cannot insert NULL into
("BJEF8061"."FLIGHT"."DESTINATION")

-- Primary key constraints
-- Plane ID must be unique
INSERT INTO Plane VALUES ('ax-6666', 'jet', 90);
INSERT INTO Plane VALUES ('ax-6666', 'jet', 85);
--> ERROR ORA-00001: unique constraint
(BJEF8061.SYS_C00451979) violated
-- Primary keys are also implicitly NOT NULL
INSERT INTO Plane VALUES (NULL, 'jet', 17);
--> ERROR ORA-01400: cannot insert NULL into
("BJEF8061"."PLANE"."PLANE_ID")
-- Same goes for UNIQUE constraints, but can have NULLs unless
the attributes are also NOT NULL

-- Foreign key constraints

```

```
INSERT INTO Flight VALUES (1, '25-DEC-12', 'xmas00',  
'Lapland', 'Sydney');  
--> ERROR ORA-02291: integrity constraint  
(BJEF8061.SYS_C00451974) violated - parent key not found  
-- Need to have the plane in the database first:  
INSERT INTO Plane VALUES ('xmas00', 'jet', 13);  
INSERT INTO Flight VALUES (1, '25-DEC-12', 'xmas00',  
'Lapland', 'Sydney');
```