Exercise 1:

1. Create simple SQL statements to create the above relations (no constraints for initial creations).

```
CREATE TABLE Classes(
  class VARCHAR(30),
  type CHAR(2),
  country VARCHAR(20),
  numGuns INT,
  bore INT,
  displacement INT
);


CREATE TABLE Ships(
  name VARCHAR(30),
  class VARCHAR(30),
  launched INT
);


CREATE TABLE Battles(
  name VARCHAR(30),
  date_fought DATE
);


CREATE TABLE Outcomes(
  ship VARCHAR(30),
  battle VARCHAR(30),
  result VARCHAR(10)
);
```

2.

```sql
INSERT INTO CLASSES(CLASS, TYPE, COUNTRY, NUMGUNS, BORE, DISPLACEMENT)VALUES ('Bismarck','bb','Germany',8,15,42000);

INSERT INTO CLASSES(CLASS, TYPE, COUNTRY, NUMGUNS, BORE, DISPLACEMENT)VALUES ('Kongo','bc','Japan',8,14,32000);

INSERT INTO CLASSES(CLASS, TYPE, COUNTRY, NUMGUNS, BORE, DISPLACEMENT)VALUES ('North Carolina','bb','USA',9,16,37000);

INSERT INTO CLASSES(CLASS, TYPE, COUNTRY, NUMGUNS, BORE, DISPLACEMENT)VALUES ('Renown','bc','Gt. Britain',6,15,32000);

INSERT INTO CLASSES(CLASS, TYPE, COUNTRY, NUMGUNS, BORE, DISPLACEMENT)VALUES ('Revenge','bb','Gt. Britain',8,15,29000);

INSERT INTO CLASSES(CLASS, TYPE, COUNTRY, NUMGUNS, BORE, DISPLACEMENT)VALUES ('Tennessee','bb','USA',12,14,32000);

INSERT INTO CLASSES(CLASS, TYPE, COUNTRY, NUMGUNS, BORE, DISPLACEMENT)VALUES ('Yamato','bb','Japan',9,18,65000);


INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('California','Tennessee',1921);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Haruna','Kongo',1915);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Hiei','Kongo',1914);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Iowa','Iowa',1943);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Kirishima','Kongo',1914);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Kongo','Kongo',1913);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Missouri','Iowa',1944);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Musashi','Yamato',1942);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('New Jersey','Iowa',1943);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('North Carolina','North Carolina',1941);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Ramilles','Revenge',1917);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Renown','Renown',1916);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Repulse','Renown',1916);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Resolution','Revenge',1916);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Revenge','Revenge',1916);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Royal Oak','Revenge',1916);
```

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Royal Sovereign','Revenge',1916);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Tennessee','Tennessee',1920);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Washington','North Carolina',1941);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Wisconsin','Iowa',1944);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Yamato','Yamato',1941);

INSERT INTO BATTLES(NAME, DATE_FOUGHT)VALUES ('North Atlantic',to_date('27-May-1941', 'dd-mon-yyyy'));

INSERT INTO BATTLES(NAME, DATE_FOUGHT)VALUES('Guadalcanal',to_date('15-Nov-1942', 'dd-mon-yyyy'));

INSERT INTO BATTLES(NAME, DATE_FOUGHT)VALUES('North Cape',to_date('26-Dec-1943', 'dd-mon-yyyy'));

INSERT INTO BATTLES(NAME, DATE_FOUGHT)VALUES('Surigao Strait',to_date('25-Oct-1944', 'dd-mon-yyyy'));

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Bismarck','North Atlantic', 'sunk');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('California','Surigao Strait', 'ok');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Duke of York','North Cape', 'ok');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Fuso','Surigao Strait', 'sunk');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Hood','North Atlantic', 'sunk');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('King George V','North Atlantic', 'ok');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Kirishima','Guadalcanal', 'sunk');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Prince of Wales','North Atlantic', 'damaged');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Rodney','North Atlantic', 'ok');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Scharnhorst','North Cape', 'sunk');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('South Dakota','Guadalcanal', 'ok');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('West Virginia','Surigao Strait', 'ok');

INSERT INTO OUTCOMES(SHIP, BATTLE, RESULT)VALUES('Yamashiro','Surigao Strait', 'sunk');

Exercise 2:

1.

```sql
SELECT NAME
FROM CLASSES JOIN SHIPS ON SHIPS.CLASS = CLASSES.CLASS
WHERE SHIPS.LAUNCHED >= 1921 AND CLASSES.DISPLACEMENT > 35000;
```

2.

```sql
SELECT OUTCOMES.SHIP, CLASSES.DISPLACEMENT, CLASSES.NUMGUNS
FROM OUTCOMES FULL OUTER JOIN SHIPS ON SHIPS.NAME = OUTCOMES.SHIP
        FULL OUTER JOIN CLASSES ON SHIPS.CLASS = CLASSES.CLASS
WHERE OUTCOMES.BATTLE = 'Guadalcanal';
```

3.

```sql
SELECT SHIP
FROM OUTCOMES
UNION
SELECT NAME
FROM SHIPS
```

4.

```sql
SELECT C1.COUNTRY
FROM CLASSES C1, CLASSES C2
WHERE C1.COUNTRY = C2.COUNTRY AND C1.TYPE = 'bb' AND C2.TYPE='bc';
```

5.

```sql
CREATE VIEW OutcomesWithDate AS
  SELECT Outcomes.ship, Outcomes.battle, Outcomes.result, Battles.date_fought
  FROM Outcomes JOIN Battles ON Outcomes.battle=Battles.name;


SELECT C1.SHIP
FROM OUTCOMESWITHDATE C1 LEFT OUTER JOIN OUTCOMESWITHDATE C2 ON C1.SHIP = C2.SHIP
WHERE C1.RESULT = 'damaged' AND C1.DATE_FOUGHT < C2.DATE_FOUGHT;
```

6.

```sql
SELECT C.COUNTRY
```

FROM CLASSES C

WHERE NUMGUNS = (SELECT MAX(NUMGUNS)

   FROM CLASSES

);

7.

CREATE VIEW BORE_NUMGUNS AS

SELECT S.NAME, C.BORE, C.NUMGUNS

FROM SHIPS S JOIN CLASSES C USING (CLASS);

SELECT NAME

FROM BORE_NUMGUNS X

WHERE NUMGUNS = (SELECT MAX(NUMGUNS)

        FROM BORE_NUMGUNS

        WHERE BORE=X.BORE);

8.

CREATE VIEW Class_Count AS

 SELECT class

 FROM Ships

 GROUP BY class

 HAVING COUNT(name)>=3;

CREATE VIEW SHIP_OUTCOME AS

SELECT SHIPS.CLASS,SHIPS.NAME, OUTCOMES.SHIP, OUTCOMES.RESULT

      FROM SHIPS JOIN OUTCOMES ON OUTCOMES.SHIP = SHIPS.NAME

WHERE Outcomes.result='sunk';

SELECT Class_Count.class, COUNT(SHIP_OUTCOME.SHIP) AS SUNK_SHIPS

FROM Class_Count LEFT OUTER JOIN SHIP_OUTCOME ON Class_Count.class=SHIP_OUTCOME.class

GROUP BY Class_Count.class;

DROP VIEW SHIP_OUTCOME;

DROP VIEW Class_Count;

Exercise 3.

1.

INSERT INTO CLASSES(CLASS, TYPE, COUNTRY, BORE, DISPLACEMENT)VALUES ('Vittorio Veneto','bb','Italy',15,41000);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Vittorio Veneto','Vittorio Veneto',1940);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Italia','Vittorio Veneto',1940);

INSERT INTO Ships(NAME, CLASS, LAUNCHED)VALUES ('Roma','Vittorio Veneto',1942);

2.

DELETE FROM classes

WHERE class NOT IN (

      SELECT class

      FROM Ships outer join classes using(class)

      group by class

      having count(name)>=3

      );

3.

Update CLASSES set bore = bore*2.5;

Update CLASSES set displacement = displacement/1.1;

Exercise 4.

1.

```sql
ALTER TABLE Classes ADD CONSTRAINT classes_pk PRIMARY KEY(class);


Create Table Exceptions (
  row_id ROWID,
  Owner Varchar2(30),
  table_name Varchar2(30),
  constraint varchar2(30)
);


select ships.*, constraint
from ships, EXCEPTIONS
where ships.rowid = EXCEPTIONS.ROW_ID;


DELETE FROM Ships
WHERE class IN (
SELECT class
FROM Ships, Exceptions
WHERE Ships.rowid = Exceptions.row_id
);


ALTER TABLE Ships ADD CONSTRAINT ship_to_classes_fk
FOREIGN KEY(class) REFERENCES Classes(class);


2.
ALTER TABLE Battles ADD CONSTRAINT battles_pk PRIMARY KEY(name);


select Outcomes.*, constraint
from OUTCOMES, EXCEPTIONS
where OUTCOMES.rowid = EXCEPTIONS.ROW_ID;
```

```
DELETE FROM OUTCOMES

WHERE battle IN (

SELECT name

FROM Battles, Exceptions

WHERE Battles.rowid = Exceptions.row_id

);


ALTER TABLE Outcomes ADD CONSTRAINT outcomes_to_battles_fk

FOREIGN KEY(battle) REFERENCES Battles(name);
```

3.

```
ALTER TABLE Ships ADD CONSTRAINT ships_pk PRIMARY KEY(name);


select Outcomes.*, constraint

from OUTCOMES, EXCEPTIONS

where OUTCOMES.rowid = EXCEPTIONS.ROW_ID;


DELETE FROM OUTCOMES

WHERE ship IN (

SELECT ship

FROM OUTCOMES, Exceptions

WHERE Outcomes.rowid = Exceptions.row_id

);


ALTER TABLE Outcomes ADD CONSTRAINT outcomes_to_ships_fk

FOREIGN KEY(ship) REFERENCES Ships(name);
```

4. (child record found problem)

```sql
SELECT classes.*, constraint
FROM classes, Exceptions
WHERE classes.rowid = Exceptions.row_id;


Delete from ships
Where class in (
SELECT class
FROM Classes, Exceptions
WHERE Classes.rowid = Exceptions.row_id
);


Select Classes.*, constraint
FROM Classes, Exceptions
WHERE Classes.rowid = Exceptions.row_id;


Delete from Classes
where class in (
Select class
From Classes, Exceptions
Where Classes.rowid = Exceptions.ROW_ID
);


ALTER TABLE Classes ADD CONSTRAINT chk_bore check(bore<=16);
```

5.
```sql
ALTER TABLE Classes ADD CONSTRAINT chk_bore_gunnum check(numguns <=9 or bore<=14);
```

6.
```sql
CREATE OR REPLACE VIEW OutcomesView AS
```

```sql
SELECT ship, battle, result

FROM Outcomes O

WHERE NOT EXISTS (

SELECT *

FROM Ships S, Battles B

WHERE S.name=O.ship AND O.battle=B.name AND

S.launched > TO_NUMBER(TO_CHAR(B.date_fought, 'yyyy'))

)

WITH CHECK OPTION;
```

//Now we can try some insertion on this view.

//INSERT INTO OutcomesView (ship, battle, result)

VALUES('Musashi', 'North Atlantic','ok');

//This insertion, as expected, will fail since Musashi is launched in 1942, while the

North Atlantic battle took place on 27-MAY-41.

7.

```sql
CREATE OR REPLACE VIEW ShipsView AS

SELECT *

From Ships S2

Where NOT EXISTS (

SELECT *

From Ships S1

Where S1.NAME = S1.CLASS AND S2.NAME <> S1.NAME AND

S2.Class = S1.Class AND S2.LAUNCHED < S1.LAUNCHED

)

WITH CHECK OPTION;
```

//Now we can try some insertion on this view.

//INSERT INTO Shipsview(NAME, CLASS, LAUNCHED)VALUES ('Venezia','Vittorio Veneto',1938);

//This insertion will fail since Vittorio Veneto is launched in 1940, while Venezia is launched in 1938

8.

```
CREATE OR REPLACE VIEW BattlesView AS

SELECT ship, battle, result

FROM Outcomes X

WHERE NOT EXISTS (

SELECT *

FROM Outcomes Y

WHERE Y.ship = X.ship AND Y.result = 'sunk' AND (SELECT date_fought from Battles Where name = X.battle)>(SELECT date_fought from Battles Where name = Y.battle)

)

WITH CHECK OPTION;
```