UMass Lowell — Dept. of C.S.

Database I (COMP 3090)

Student: Phong Vo

ID: 01790283

HOMEWORK #3

Exercise 2.4.3

a) Give the class names and countries of the classes that carried guns of at least 16-inch bore.

$R1 := \sigma_{bore \geq 16} (Classes)$

$R2 := \pi_{class, country} (R1)$

Result:

Class	Country
Iowa	USA
North Carolina	USA
Yamato	Japan

b) Find the ships launched prior to 1921

$R1 := \sigma_{launched < 1921} (Ships)$

$R2 := \pi_{name} (R1)$

Result:

name
Haruna
Hiei
Kirishima
Kongo
Ramilies
Renown
Repulse
Resolution
Revenge
Royal Oak
Royal Sovereign
Tennessee

a)
SELECT class, country
FROM classes
WHERE bore >= 16;

b)
SELECT name
FROM ships
WHERE launched < 1921;

c) Find the ships sunk in the battle of the Denmark Strait. ⌐

$R1 := \sigma_{result = 'sunk' \text{ AND } battle = 'Denmark Straits'}$ (Outcomes)

$R2 := \pi_{ship} R1$

Ship
Bismarck
Hood

SELECT ship
FROM outcomes
WHERE battle='Denmark Strait' AND
**   result='sunk';**

d) List of capital ships that launched after 1921 and heavier than 35,000 tons.

$R1 := Ships \bowtie Classes$

$R2 := \sigma_{displacement > 35000 \text{ AND } launched > 1921} (R1)$

$R3 := \pi_{name} (R2)$

Result

name
Iowa
Missouri
Musashi
New Jersy
North Carolina
Washington
Wisconsin
Yamato

SELECT DISTINCT s.name
FROM   classes c, ships s
WHERE   s.launched > 1921 AND
**   c.displacement > 35000;**

e) List the name, displacement and number of guns of the ships engaged in the battle of Guadalcanal.

$$R1 := \sigma_{battle = 'Guadalcanal'} (Outcomes)$$

$$R2 := (R1) \bowtie_{name = ship} (Ships)$$

$$R3 := (R2) \bowtie Classes$$

$$R4 := \Pi_{name, displacement, numGuns} (R3)$$

Result:

name	displacement	numGuns
Kinishima	32000	8
Washington	37000	9

f) List all the capital ships mentioned in the database

$$R1 := \Pi_{name} (Ships)$$

$$R2 := \Pi_{ship} (Outcomes)$$

$$R3 := \int_{name} (R2)$$

$$R4 := R1 \cup R3$$

SELECT DISTINCT ship
FROM outcomes
UNION
SELECT DISTINCT name
FROM ships;

Result

name
California
Haruna
Hiei
Iowa
Kinishima
Kongo
Missouri
Musashi
New Jersey
North Carolina
Ramilies
Renown
Repulse
Resolution
Revenge
Royal Oak
Royal Sovereign
Tennessee
Washington
Wisconsin
Yamato
South Dakota
West Virginia
Yamashiro

g) Find the classes that had only one ship as a member of that class

$$R1 := \Pi_{class}(Classes) \quad // \text{ taking all of classes}$$

$$R2 := \sigma_{name <> class}(Ships) \quad // \text{ each class has members which}$$
// have a class-naming ship and other

$$R3 := \Pi_{class}(R2)$$

$$R4 := R1 - R3 \quad // \text{ the result contains the class-naming ships}$$

Result:

class
Bismarck

```
SELECT s.class
FROM classes s
WHERE s.class NOT IN
        (SELECT DISTINCT s.class
         FROM ships s
          WHERE s.name<>s.class);
```

b) Find those countries that have both battleships and battle cruisers.

$$R1 := \sigma_{type = 'bb'}(Classes)$$

$$R2 := \Pi_{country}(R1)$$

$$R3 := \sigma_{type = 'bc'}(Classes)$$

$$R4 := \Pi_{country}(R3)$$

$$R5 := R2 \cap R4$$

Result:

country
Japan
Gt. Britain
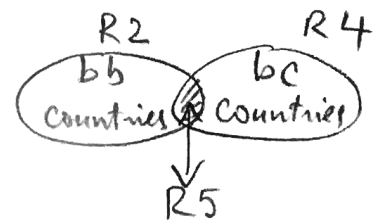
```
SELECT DISTINCT country
FROM classes
WHERE type='bb'
INTERSECT
SELECT DISTINCT country
FROM classes
WHERE type='bc';
```

i) Find the ships that were damaged in one battle, but later fought in another.

$$R1 := \text{Battles} \bowtie_{(battle = name)} \text{Outcomes}$$

$$R2 := \pi_{Ship, result, date} (R1)$$

$$R3 := \rho_{R3(ship3, result3, date3)} (R2)$$

$$R4 := R2 \bowtie_{ship = ship3 \text{ AND } result = 'damaged' \text{ AND } date < date2} R3$$

$$R5 := \pi_{ship} (R4)$$

Result: not found