CSC343 Worksheet 1

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Note: This is student designed study guide to make learnings easier. This does not reflect the course material. Please take it only as a reference.

1. **Exercise 2.4.1:** This exercise builds upon the products schema of Exercise 2.3.1. Recall that the database schema consists of four relations, whose schemas are:

```
1    Product(maker, model, type)
2    PC(model, speed, ram, hd, price)
3    Laptop(model, speed, ram, hd, screen, price)
4    Printer(model, color, type, price)
5
```

   Some sample data for the relation Product is shown in Fig. 2.20. Sample data for the outer three relations is shown in Fig. 2.21. Manufactureres and model numbers have been "Sanitized", but the data is typical of products on sale at the beginning of 2007.

   Write expressions of relational algebra to answer the following queries. You may use the linear notation of Section 2.4.13 if you wish. For the data of Figs. 2.20 and 2.21, show the result of your query. However, your answer should work for arbitrary data, not just the data of these figures

   a) What PC models have a speed of at least 3.00?
   b) Which manufacturers make laptops with a hard disk of at least 100GB?
   c) Find the model number and price of all products (of any type) made by manufacturer B..
   d) Find the model nubmers of all color laser printers
   e) Find those maufactueres that sell Laptops, but not PC's.
   f) Find those hard-disk sizes that occur in two or more PC's.

2. **Exercise 2.4.2:** Draw expression trees for each of your expressions of Exercise 2.4.1

3. **Exercise 2.4.3:** This exercise builds upon Exercise 2.3.2 concerning World War II capital ships. Recall it involves the following relations:

```
1     Classes(class, type, country, numGuns, bore, displacement)
2     Ships(name, class, launched)
3     Battles(name, date)
4     Outcomes(ship, battle, result)
5
```

Figures 2.22 and 2.23 give some same data for these four relations. Note that unlike the data for Exercise 2.4.1, there are some "dangling tuples" in this data, e.g. ships mentioned in *Outcomes* that are not mentioned in *Ships*.

Write expressions of relational algebra to answer the following queries. You may use the linear notation of Section 2.4.13 if you wish. For the data of Figs. 2.22 and 2.23, show the result of your query. However, your answer should work for arbitrary data, not just the data of these figures.

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

b) Find the ships launched prior to 1921.

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

d) The treaty of Washington in 1921 prohibited capital ships heavier than 35,000 tons. List the ships that violated the treaty of Washington.

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

f) List all the capital ships mentioned in the database. (Remember that all these ships may not appear in the *Ships* relation).

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

h) Find those countries that had both battleships and battlecruisers.

i) Find those ships that "lived to fight another day"; they were damanged one battle, but later fought in another

4. **Exercise 2.4.4:** Draw expression trees for each of your expressions of Exercise 2.4.3

5. **Exercise 2.4.5:** What is the difference between the natural join $R \bowtie S$ and the theta-join $R \bowtie_C S$ where the condition C is that $R.A = S.A$ for each attribute A appearing in the schemas of both R and S

Reference

1) Stanford: CS145 - Introduction to Databases, link