# UW PCE Data Science Autumn 2017 Assignment 5

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1. {a, b, c} is a relation that contains the tuples a, b, and c. In the following cases the tuples have arity of 1. Calculate the following:

a. ({1, 2, 3} ᴜ {5, 7, 11}) ∩ {2, 4, 6, 8, 10}

{1, 2, 3, 5, 7, 11} ∩ {2, 4, 6, 8, 10}

**{2} <============================================= ANSWER**

b. ({1, 2, 3} ∩ {2, 4, 6, 8, 10}) ᴜ ({5, 7, 11} ∩ {2, 4, 6, 8, 10})

({2}) ᴜ (<null>)

**{2} <============================================= ANSWER**

2. A relation exists with 4 columns, named Column1, Column2, Column3, and Column4. Column1 is of type text. Column2, Column3, and Column4 are of type int:

a. Use relational algebra to fulfill the intent of the following SQL.

SELECT Column1, Column3 FROM MyTable WHERE Column2 = Column3

**ΠC1, C3 (σφ (R))**

**Where:**

**Φ = (Column2=Column3)**

**R = MyTable;**

**C1 = Column1;**

**C3 = Column3;**

b. Reverse the order of projection and selection in your algebraic formulation from item 2a. What is the result of the new algebraic expression?

**σφ (ΠC1, C3(R))**

**Where:**

* + **Φ = (Column2=Column3)**
  + **R = MyTable;**
  + **C1 = Column1;**
  + **C3 = Column3;**

3. πc1, c2(σφ1(σφ2(πc1, c2, c3, c5(R))))

Where

• φ1: C1 = C5;

• φ2: C5 = “Test”;

• R: MyTable;

a. Write a SQL statement that declares the intent of the algebraic notation

πc1, c2(σφ1(σφ2( πc1, c2, c3, c5(R) )))

πc1, c2(σφ1(σφ2( Select c1, c2, c3, c5 FROM MyTable AS R1 )))

πc1, c2(σφ1(SELECT \* FROM (Select c1, c2, c3, c5 FROM MyTable AS R1) WHERE C1=C5 )) πc1, c2(SELECT \* FROM (SELECT \* FROM (Select c1, c2, c3, c5 FROM MyTable AS R1) WHERE C1=C5 AS R2) WHERE C5 ="Test" )

SELECT C1, C2 FROM (SELECT \* FROM (SELECT \* FROM (SELECT C1, C2, C3, c5 FROM MyTable AS R1) WHERE C1=C5 AS R2) WHERE C5 ="Test" )

**SELECT C1, C2 FROM ((SELECT C1, C2, C3, c5 FROM MyTable) WHERE C1=C5 AS R) WHERE C5 ="Test"**

b. Simplify the algebraic statement.

πc1, c2(σφ1(σφ2(πc1, c2, c3, c5(R))))

**πc1, c2(σφ3(R))**

**Where**

**• φ3: C1 = “Test”;**

**• R: MyTable;**

4. SELECT \* FROM T1 JOIN T2 ON T1.C1 = T2.C1

a. Write out an equivalent in relational algebra using the join operator

**T1 ⋈φ T2 where φ: T1.C = T2.C1**

b. Write out an equivalent in relational algebra without using the join operator

**σφ(T1 X T2 ) where φ: T1.C1 = T2.C1**

5. πS.C1, R.C2(σφ1(R) ⋈φ2 S)

where

• φ1 = (R.C2 = ‘A’)

• φ2 = (R.C1 = S.C2)

Write out equivalent SQL and test this SQL using relations R and S that you create for this example.

Also see DS400B\_HW05.sql

SELECT \* FROM R

SELECT \* FROM S

-- Join (theta Join): R ⋈{R.C1=S.C2} S

SELECT \* FROM R

JOIN S ON RC1=SC2

-- Select: σ{C2 = 'A'}(R)

SELECT \* FROM R

WHERE RC2 = 'A';

-- Join (theta Join): σ{C2 = 'B'}(R) ⋈{R.C1=S.C2} S

SELECT \* FROM (SELECT \* FROM R WHERE RC2 = 'A') AS q1

JOIN S ON q1.RC1=SC2

SELECT \* FROM (SELECT \* FROM (SELECT \* FROM R WHERE RC2 = 'A') AS q1

JOIN S ON q1.RC1=SC2) AS q2

**-- FINAL ANSWER**

**-- Project: π{S.C1 R.C2}(σ{C2 = 'B'}(R) ⋈{R.C1=S.C2} S)**

**SELECT SC1, RC2 FROM (SELECT \* FROM (SELECT \* FROM R WHERE RC2 = 'A') AS q1**

**JOIN S ON q1.RC1=SC2) AS q2**

**-- FINAL ANSWER**