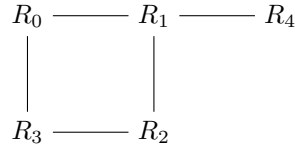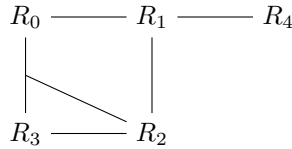# Query Optimization Exercise 8

January 2021

1   Exercise 1

We begin by listing the possible options for ordering with descending ordering
Benefit (omitting any orderings with benefit smaller than 1).

Relation	ordering Benefit
$(R_3 \bowtie R_0, R_3 \bowtie R_2)$	2
$(R_1 \bowtie R_4, R_1 \bowtie R_0)$	$\frac{500}{251} \approx 1.992$
$(R_1 \bowtie R_2, R_1 \bowtie R_0)$	$\frac{5}{3} \approx 1.667$
$(R_0 \bowtie R_3, R_0 \bowtie R_1)$	$\frac{150}{101} \approx 1.485$
$(R_2 \bowtie R_3, R_2 \bowtie R_1)$	$\frac{5}{4} = 1.25$
$(R_1 \bowtie R_4, R_1 \bowtie R_2)$	$\frac{300}{251} \approx 1.195$

1.1   Step 1

Update of ordering Benefit:

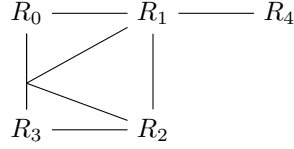| Relation	ordering Benefit
$((R_3 \bowtie R_2) \bowtie R_0, R_0 \bowtie R_1)$	$\frac{25}{11} \approx 2.27$
$(R_1 \bowtie R_4, R_1 \bowtie R_0)$	$\frac{500}{251} \approx 1.992$
$(R_1 \bowtie R_2, R_1 \bowtie R_0)$	$\frac{5}{3} \approx 1.667$
$(R_0 \bowtie R_3, R_0 \bowtie R_1)$	$\frac{150}{101} \approx 1.485$
$(R_2 \bowtie R_3, R_2 \bowtie R_1)$	$\frac{5}{4} = 1.25$
$(R_1 \bowtie R_4, R_1 \bowtie R_2)$	$\frac{300}{251} \approx 1.195$

1.2 Step 2

$$R_0 \text{ ——— } R_1 \text{ ——— } R_4$$

Graph: R_0 — R_1 — R_4; R_0 connects down to R_3; R_1 connects to R_3 and R_2; R_1 — R_2; R_3 — R_2.

2 Exercise 2

We assume for this exercise that the right outer join has the same properties regarding associativity as the left outer join.

Join tree:
- $\bowtie_{A.x=B.y}$ with left child A and right child $\bowtie_{B.x=C.y}$
- $\bowtie_{B.x=C.y}$ with left child B and right child $\bowtie^{--}_{C.x=E.y}$
- $\bowtie^{--}_{C.x=E.y}$ with left child $\bowtie_{C.y=D.x}$ and right child $\bowtie_{E.x=F.y}$
- $\bowtie_{C.y=D.x}$ with children C and D
- $\bowtie_{E.x=F.y}$ with children E and F
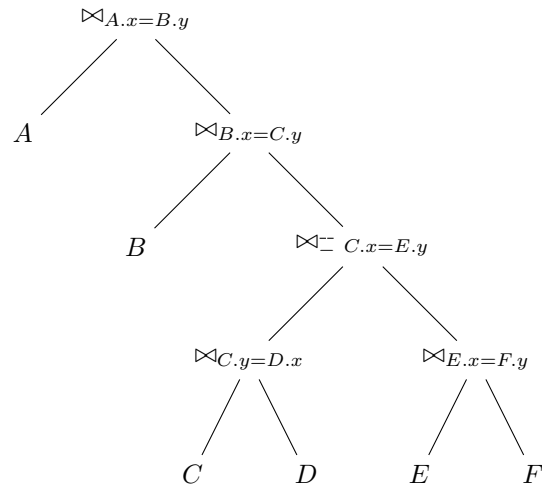
SES	TES
$\{A,B\}$	$\{A,B\}$
$\{B,C\}$	$\{B,C,D,E\}$
$\{C,E\}$	$\{C,D,E\}$
$\{C,D\},\{E,F\}$	$\{C,D\},\{E,F\}$

Graph:
$$C \text{ ——— } E \text{ ——— } F$$
with edges: C — D, C — B (cross), E — D (cross), B — A, D, B.

$$2$$