

Tutorial 4

Relational Algebra

COMP3278C

Introduction to Database Management Systems

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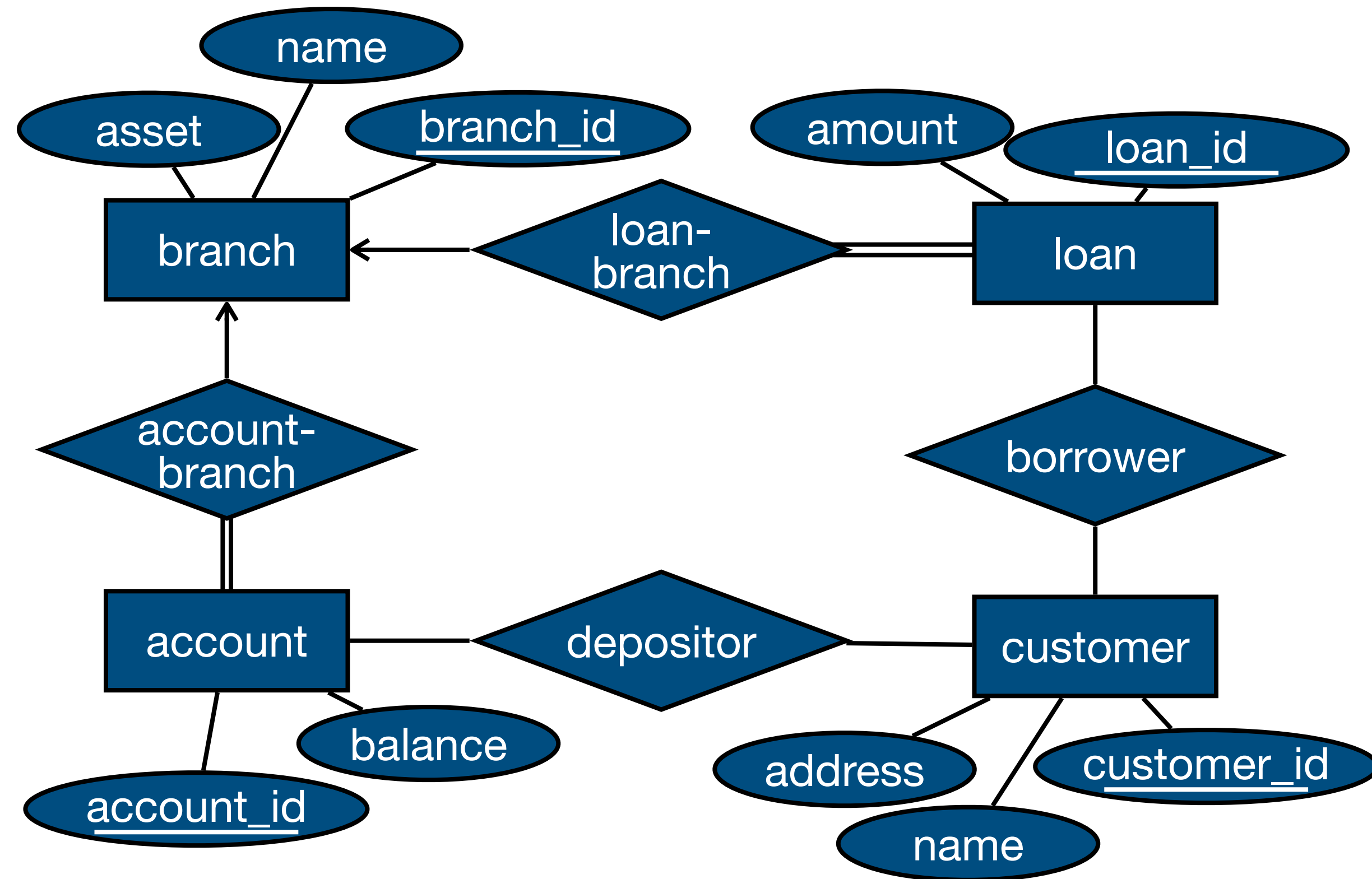
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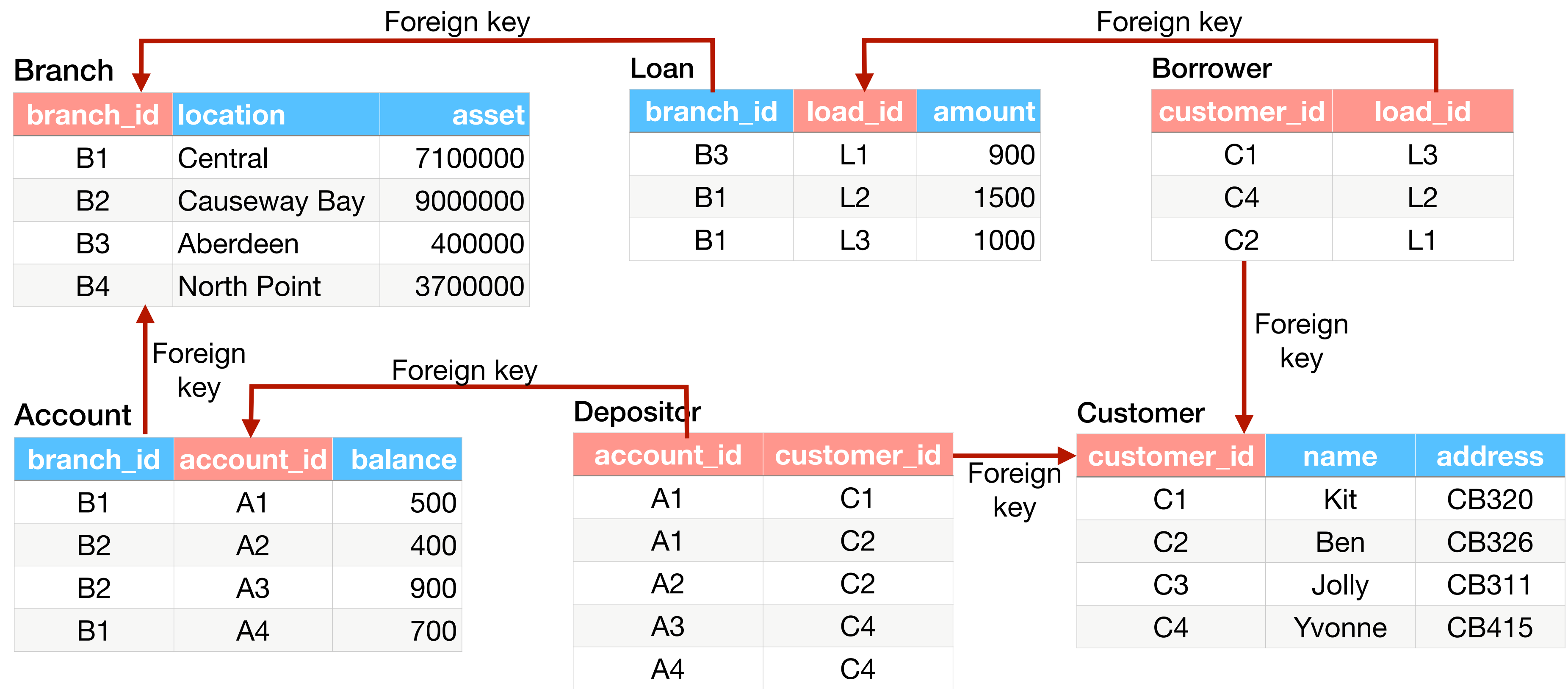
Learning Outcomes

- Outcome 1: Information Modeling
 - Able to understand the modeling of real-life information in database systems.
- Outcome 2: Query Languages
 - Able to use the languages designed for data access.
- Outcome 3: System Design
 - Able to design an efficient and reliable database system.
- Outcome 4: Application Development
 - Able to implement a practical application on a real database.

Banking Example



Banking Example



Exercise 1

Depositor

account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account

branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch

branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

- Query: Find the customer_id of all customer who have an account at a branch located in Central.

```
SELECT customer_id
FROM branch, account, depositor
WHERE
    account.account_id = depositor.account_id AND
    branch.branch_id = account.branch_id AND
    branch.location = 'Central';
```

Exercise 1

Depositor

account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account

branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch

branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

- Query: Find the customer_id of all customer who have an account at a branch located in Central.

```
SELECT customer_id
FROM branch, account, depositor
WHERE
    account.account_id = depositor.account_id AND
    branch.branch_id = account.branch_id AND
    branch.location = 'Central';
```


$$\pi_{customer_id}(\sigma_{branch.location='Central'}(branch \bowtie (account \bowtie depositor)))$$

Exercise 1

Depositor

account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account

branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch

branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

- Query: Find the customer_id of all customer who have an account at a branch located in Central.

```
SELECT customer_id
FROM branch, account, depositor
WHERE
    account.account_id = depositor.account_id AND
    branch.branch_id = account.branch_id AND
    branch.location = 'Central';
```



$\pi_{customer_id}(\sigma_{branch.location='Central'}(branch \bowtie (account \bowtie depositor)))$

Hint: Put down selection

Exercise 1

Depositor

account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account

branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch

branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

- Query: Find the customer_id of all customer who have an account at a branch located in Central.

```
SELECT customer_id
FROM branch, account, depositor
WHERE
    account.account_id = depositor.account_id AND
    branch.branch_id = account.branch_id AND
    branch.location = 'Central';
```


$$\pi_{customer_id}(\sigma_{branch.location='Central'}(branch \bowtie (account \bowtie depositor)))$$

Hint: Put down selection



$$\sigma_p(E_1 \bowtie E_2) = \sigma_p(E_1) \bowtie E_2$$

$$\pi_{customer_id}(\sigma_{branch.location='Central'}(branch) \bowtie (account \bowtie depositor))$$

Exercise 2

Depositor	
account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account		
branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch		
branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

- Query: Find the customer_id of all customers with an account at Central branch whose account balance is over \$1000

```
SELECT customer_id
FROM branch, account, depositor
WHERE
    account.account_id = depositor.account_id AND
    branch.branch_id = account.branch_id AND
    branch.location = 'Central' AND account.balance > 1000;
```

Exercise 2

Depositor	
account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account		
branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch		
branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

- Query: Find the customer_id of all customers with an account at Central branch whose account balance is over \$1000

```
SELECT customer_id
FROM branch, account, depositor
WHERE
    account.account_id = depositor.account_id AND
    branch.branch_id = account.branch_id AND
    branch.location = 'Central' AND account.balance > 1000;
```



$$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie (account \bowtie depositor)))$$

Exercise 2

Depositor

account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account

branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch

branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

```
 $\pi_{customer\_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie (account \bowtie depositor)))$ 
```

Hint: Put down selection

Exercise 2

Depositor

account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account

branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch

branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

Hint: Put down selection

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie (account \bowtie depositor)))$

$$(E_1 \bowtie E_2) \bowtie E_3 = E_1 \bowtie (E_2 \bowtie E_3)$$

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}((branch \bowtie account) \bowtie depositor))$

$$\sigma_p(E_1 \bowtie E_2) = \sigma_p(E_1) \bowtie E_2$$

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie account) \bowtie depositor)$

Exercise 2

Depositor	
account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account		
branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch		
branch_id	location	asset
B1	Central	7100000
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B4	North Point	3700000

Hint: Put down selection

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie (account \bowtie depositor)))$

$$(E_1 \bowtie E_2) \bowtie E_3 = E_1 \bowtie (E_2 \bowtie E_3)$$

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}((branch \bowtie account) \bowtie depositor))$

$$\sigma_p(E_1 \bowtie E_2) = \sigma_p(E_1) \bowtie E_2$$

$\pi_{customer_id}(\sigma_{branch.location='Central'}(branch) \bowtie \sigma_{account.balance > 1000}(account) \bowtie depositor)$

$$\sigma_{p_1 \wedge p_2}(E_1 \bowtie E_2) = (\sigma_{p_1}(E_1)) \bowtie (\sigma_{p_2}(E_2))$$

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie account) \bowtie depositor)$

Exercise 2

Depositor	
account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account		
branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch		
branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie (account \bowtie depositor)))$

Hint: Put down selection

$$(E_1 \bowtie E_2) \bowtie E_3 = E_1 \bowtie (E_2 \bowtie E_3)$$

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}((branch \bowtie account) \bowtie depositor))$

$$\sigma_p(E_1 \bowtie E_2) = \sigma_p(E_1) \bowtie E_2$$

$\pi_{customer_id}(\sigma_{branch.location='Central'}(branch) \bowtie \sigma_{account.balance > 1000}(account) \bowtie depositor)$

Hint: Put down projection

$$\sigma_{p_1 \wedge p_2}(E_1 \bowtie E_2) = (\sigma_{p_1}(E_1)) \bowtie (\sigma_{p_2}(E_2))$$

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie account) \bowtie depositor)$

Exercise 2

Depositor	
account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account		
branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch		
branch_id	location	asset
B1	Central	7100000
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B3	Aberdeen	400000
B4	North Point	3700000

Hint: Put down selection

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie (account \bowtie depositor)))$

$$(E_1 \bowtie E_2) \bowtie E_3 = E_1 \bowtie (E_2 \bowtie E_3)$$

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}((branch \bowtie account) \bowtie depositor))$

$$\sigma_p(E_1 \bowtie E_2) = \sigma_p(E_1) \bowtie E_2$$

$\pi_{customer_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie account) \bowtie depositor)$

Hint: Put down projection

$$\sigma_{p_1 \wedge p_2}(E_1 \bowtie E_2) = (\sigma_{p_1}(E_1)) \bowtie (\sigma_{p_2}(E_2))$$

$\pi_{customer_id}(\pi_{account_id}(\sigma_{branch.location='Central'}(branch) \bowtie \sigma_{account.balance}(account)) \bowtie \pi_{account_id, customer_id}(depositor))$

$$\pi_{L_1 \cup L_2}(E_1 \bowtie E_2) = \pi_{L_1 \cup L_2}((\pi_{L_1 \cup L_3}(E_1) \bowtie (\pi_{L_2 \cup L_3}(E_2))))$$

$\pi_{customer_id}(\sigma_{branch.location='Central'}(branch) \bowtie \sigma_{account.balance}(account) \bowtie depositor)$

Exercise 2

Depositor	
account_id	customer_id
A1	C1
A1	C2
A2	C2
A3	C4
A4	C4

Account		
branch_id	account_id	balance
B1	A1	500
B2	A2	400
B2	A3	900
B1	A4	700

Branch		
branch_id	location	asset
B1	Central	7100000
B2	Causeway Bay	9000000
B3	Aberdeen	400000
B4	North Point	3700000

```

$$\pi_{customer\_id}(\pi_{account\_id}(\pi_{branch\_id}(\sigma_{branch.location='Central'}(branch)) \bowtie \pi_{account\_id,branch\_id}(\sigma_{account.balance}(account))) \bowtie \pi_{account\_id,customer\_id}(depositor))$$

```

$$\pi_{L_1 \cup L_2}(E_1 \bowtie E_2) = \pi_{L_1 \cup L_2}((\pi_{L_1 \cup L_3}(E_1) \bowtie (\pi_{L_2 \cup L_3}(E_2))))$$

```

$$\pi_{customer\_id}(\pi_{account\_id}(\sigma_{branch.location='Central'}(branch) \bowtie \sigma_{account.balance}(account)) \bowtie \pi_{account\_id,customer\_id}(depositor))$$

```

$$\pi_{L_1 \cup L_2}(E_1 \bowtie E_2) = \pi_{L_1 \cup L_2}((\pi_{L_1 \cup L_3}(E_1) \bowtie (\pi_{L_2 \cup L_3}(E_2))))$$

```

$$\pi_{customer\_id}(\sigma_{branch.location='Central'}(branch) \bowtie \sigma_{account.balance}(account) \bowtie depositor)$$

```

Hint: Put down projection

$$\sigma_{p_1 \wedge p_2}(E_1 \bowtie E_2) = (\sigma_{p_1}(E_1)) \bowtie (\sigma_{p_2}(E_2))$$

Hint: Put down selection

```

$$\pi_{customer\_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie (account \bowtie depositor)))$$

```

$$(E_1 \bowtie E_2) \bowtie E_3 = E_1 \bowtie (E_2 \bowtie E_3)$$

```

$$\pi_{customer\_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}((branch \bowtie account) \bowtie depositor))$$

```

$$\sigma_p(E_1 \bowtie E_2) = \sigma_p(E_1) \bowtie E_2$$

```

$$\pi_{customer\_id}(\sigma_{branch.location='Central' \wedge account.balance > 1000}(branch \bowtie account) \bowtie depositor)$$

```


Exercise 3

- Query: Find the sID and name of the employee who know all the IT skills in the company.

Write Relational Algebra

Staff

sID	name	dpt_id
1	Peter	1
2	Sharon	1
3	David	2
4	Joe	3

IT_skill

skill_ID	skill_name	desc
1	C++	...
2	JAVA	...
3	MySQL	...

Has

sID	skill_ID
1	1
1	2
1	3
2	3
3	3
4	1
4	2
4	3

Exercise 3

Staff			IT_skill			Has	
sID	name	dpt_id	skill_ID	skill_name	desc	sID	skill_ID
1	Peter	1	1	C++	...	1	1
2	Sharon	1	2	JAVA	...	1	2
3	David	2	3	MySQL	...	1	3
4	Joe	3				2	3
						3	3
						4	1
						4	2
						4	3

- Query: Find the sID and name of the employee who know all the IT skills in the company.

Write Relational Algebra

$$(Has \div \pi_{skill_ID}(IT_skill))$$



$Has \div \pi_{skill_ID}(IT_skill)$

sID
1
4

Exercise 3

Staff			IT_skill			Has	
sID	name	dpt_id	skill_ID	skill_name	desc	sID	skill_ID
1	Peter	1	1	C++	...	1	1
2	Sharon	1	2	JAVA	...	1	2
3	David	2	3	MySQL	...	1	3
4	Joe	3				2	3
						3	3
						4	1
						4	2
						4	3

- Query: Find the sID and name of the employee who know all the IT skills in the company.

Write Relational Algebra

$$(Has \div \pi_{skill_ID}(IT_skill)) \bowtie Staff$$



$Has \div \pi_{skill_ID}(IT_skill)$

sID
1
4



$(Has \div \pi_{skill_ID}(IT_skill)) \bowtie Staff$

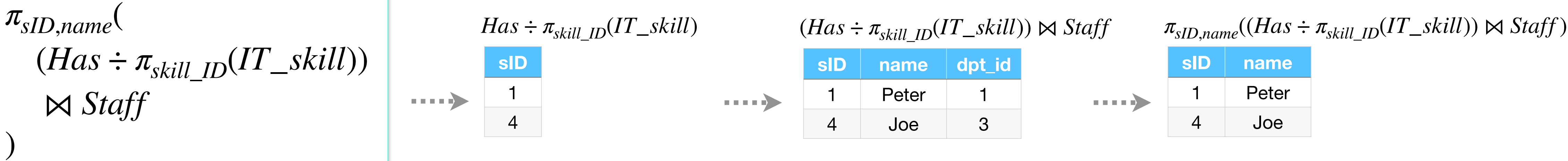
sID	name	dpt_id
1	Peter	1
4	Joe	3

Exercise 3

Staff			IT_skill			Has	
sID	name	dpt_id	skill_ID	skill_name	desc	sID	skill_ID
1	Peter	1	1	C++	...	1	1
2	Sharon	1	2	JAVA	...	1	2
3	David	2	3	MySQL	...	1	3
4	Joe	3				2	3
						3	3
						4	1
						4	2
						4	3

- Query: Find the sID and name of the employee who know all the IT skills in the company.

Write Relational Algebra



Exercise 4

- Query: Find the sID of the staffs who know about C++ or works in the IT department (dpt_id=2).

Write Relational Algebra

Staff			IT_skill			Has	
sID	name	dpt_id	skill_ID	skill_name	desc	sID	skill_ID
1	Peter	1	1	C++	...	1	1
2	Sharon	1	2	JAVA	...	1	2
3	David	2	3	MySQL	...	1	3
4	Joe	3				2	3
						3	3
						4	1
						4	2
						4	3

Exercise 4

- Query: Find the sID of the staffs who know about C++ or works in the IT department (dpt_id=2).

Write Relational Algebra

U

Staff			IT_skill			Has	
sID	name	dpt_id	skill_ID	skill_name	desc	sID	skill_ID
1	Peter	1	1	C++	...	1	1
2	Sharon	1	2	JAVA	...	1	2
3	David	2	3	MySQL	...	1	3
4	Joe	3				2	3
						3	3
						4	1
						4	2
						4	3

Exercise 4

Staff			IT_skill			Has	
sID	name	dpt_id	skill_ID	skill_name	desc	sID	skill_ID
1	Peter	1	1	C++	...	1	1
2	Sharon	1	2	JAVA	...	1	2
3	David	2	3	MySQL	...	1	3
4	Joe	3				2	3
						3	3
						4	1
						4	2
						4	3

- Query: Find the sID of the staffs who know about C++ or works in the IT department (dpt_id=2).

Write Relational Algebra

$$\pi_{sID}(Has \bowtie \sigma_{skill_name='C++'}(IT_skill))$$
$$\cup$$



sID
1
4

$$\pi_{sID}(Has \bowtie \sigma_{skill_name='C++'}(IT_skill))$$

Exercise 4

Staff			IT_skill			Has	
sID	name	dpt_id	skill_ID	skill_name	desc	sID	skill_ID
1	Peter	1	1	C++	...	1	1
2	Sharon	1	2	JAVA	...	1	2
3	David	2	3	MySQL	...	1	3
4	Joe	3				2	3
						3	3
						4	1
						4	2
						4	3

- Query: Find the sID of the staffs who know about C++ or works in the IT department (dpt_id=2).

Write Relational Algebra

$$\pi_{sID}(Has \bowtie \sigma_{skill_name='C++'}(IT_skill))$$
$$\cup$$
$$\pi_{sID}(\sigma_{dpt_id=2}(Staff))$$



sID
1
4



sID
3

Exercise 4

Staff			IT_skill			Has	
sID	name	dpt_id	skill_ID	skill_name	desc	sID	skill_ID
1	Peter	1	1	C++	...	1	1
2	Sharon	1	2	JAVA	...	1	2
3	David	2	3	MySQL	...	1	3
4	Joe	3				2	3
						3	3
						4	1
						4	2
						4	3

- Query: Find the sID of the staffs who know about C++ or works in the IT department (dpt_id=2).

Write Relational Algebra

$$\pi_{sID}(Has \bowtie \sigma_{skill_name='C++'}(IT_skill))$$
$$\cup$$
$$\pi_{sID}(\sigma_{dpt_id=2}(Staff))$$



sID
1
4



sID
3



sID
1
4
3

Exercise 5

- Query: List the name of the IT skills that the staffs named “Peter” and “David” know. If they do not know any skill, print *null*.

Write Relational Algebra

Staff

sID	name	dpt_id
1	Peter	1
2	Sharon	1
3	David	2
4	Joe	3
5	David	4

IT_skill

skill_ID	skill_name	desc
1	C++	...
2	JAVA	...
3	MySQL	...

Has

sID	skill_ID
1	1
1	2
1	3
2	3
3	3
4	1
4	2
4	3

Exercise 5

- Query: List the name of the IT skills that the staffs named “Peter” and “David” know. If they do not know any skill, print *null*.

Write Relational Algebra

$$\sigma_{name='Peter'\vee name='David'}(Staff)$$



$\sigma_{name='Peter'\vee name='David'}(Staff)$

sID	name	dpt_id
1	Peter	1
3	David	2
5	David	4

Staff

sID	name	dpt_id
1	Peter	1
2	Sharon	1
3	David	2
4	Joe	3
5	David	4

IT_skill

skill_ID	skill_name	desc
1	C++	...
2	JAVA	...
3	MySQL	...

Has

sID	skill_ID
1	1
1	2
1	3
2	3
3	3
4	1
4	2
4	3

Exercise 5

- Query: List the name of the IT skills that the staffs named “Peter” and “David” know. If they do not know any skill, print *null*.

Write Relational Algebra

$$(\sigma_{name='Peter' \vee name='David'}(Staff) \bowtie Has)$$

$$\sigma_{name='Peter' \vee name='David'}(Staff)$$

sID	name	dpt_id
1	Peter	1
3	David	2
5	David	4

$$\sigma_{name='Peter' \vee name='David'}(Staff) \bowtie Has$$

sID	name	dpt_id	skill_ID
1	Peter	1	1
1	Peter	1	2
1	Peter	1	3
3	David	2	3
5	David	4	<i>null</i>

Staff

sID	name	dpt_id
1	Peter	1
2	Sharon	1
3	David	2
4	Joe	3
5	David	4

IT_skill

skill_ID	skill_name	desc
1	C++	...
2	JAVA	...
3	MySQL	...

Has

sID	skill_ID
1	1
1	2
1	3
2	3
3	3
4	1
4	2
4	3

Exercise 5

- Query: List the name of the IT skills that the staffs named “Peter” and “David” know. If they do not know any skill, print *null*.

Write Relational Algebra

$$(\sigma_{name='Peter' \vee name='David'}(Staff) \bowtie Has) \bowtie IT_skill$$

$$\sigma_{name='Peter' \vee name='David'}(Staff)$$

sID	name	dpt_id
1	Peter	1
3	David	2
5	David	4

$$\sigma_{name='Peter' \vee name='David'}(Staff) \bowtie Has$$

sID	name	dpt_id	skill_ID
1	Peter	1	1
1	Peter	1	2
1	Peter	1	3
3	David	2	3
5	David	4	<i>null</i>

$$(\sigma_{name='Peter' \vee name='David'}(Staff) \bowtie Has) \bowtie IT_skill$$

sID	name	dpt_id	skill_ID	skill_name	desc
1	Peter	1	1	C++	...
1	Peter	1	2	JAVA	...
1	Peter	1	3	MySQL	...
3	David	2	3	MySQL	...
5	David	4	<i>null</i>	<i>null</i>	<i>null</i>

Staff

sID	name	dpt_id
1	Peter	1
2	Sharon	1
3	David	2
4	Joe	3
5	David	4

IT_skill

skill_ID	skill_name	desc
1	C++	...
2	JAVA	...
3	MySQL	...

Has

sID	skill_ID
1	1
1	2
1	3
2	3
3	3
4	1
4	2
4	3

Exercise 5

- Query: List the name of the IT skills that the staffs named “Peter” and “David” know. If they do not know any skill, print *null*.

Write Relational Algebra

$$\pi_{sID, name, skill_name}(\sigma_{name='Peter' \vee name='David'}(Staff) \bowtie Has) \bowtie IT_skill)$$

$$\sigma_{name='Peter' \vee name='David'}(Staff)$$

sID	name	dpt_id
1	Peter	1
3	David	2
5	David	4

$$\sigma_{name='Peter' \vee name='David'}(Staff) \bowtie Has$$

sID	name	dpt_id	skill_ID
1	Peter	1	1
1	Peter	1	2
1	Peter	1	3
3	David	2	3
5	David	4	<i>null</i>

$$(\sigma_{name='Peter' \vee name='David'}(Staff) \bowtie Has) \bowtie IT_skill$$

sID	name	dpt_id	skill_ID	skill_name	desc
1	Peter	1	1	C++	...
1	Peter	1	2	JAVA	...
1	Peter	1	3	MySQL	...
3	David	2	3	MySQL	...
5	David	4	<i>null</i>	<i>null</i>	<i>null</i>

sID	name	skill_name
1	Peter	C++
1	Peter	JAVA
1	Peter	MySQL
3	David	MySQL
5	David	<i>null</i>

Staff

sID	name	dpt_id
1	Peter	1
2	Sharon	1
3	David	2
4	Joe	3
5	David	4

IT_skill

skill_ID	skill_name	desc
1	C++	...
2	JAVA	...
3	MySQL	...

Has

sID	skill_ID
1	1
1	2
1	3
2	3
3	3
4	1
4	2
4	3

Tutorial 4

END

COMP3278C

Introduction to Database Management Systems

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