HD·EDUCATION

HD EDUCATION

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TUTOR:Joey

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关于
HD EDUCATION

HD · EDUCATION（简称HD·EDU）成立于2018年1月，拥有学业辅导和职业规划两大核心业务。从创办伊始就秉承着 “让年轻人成为知识的生产者、传播者、受惠者” 的使命，坚持从留学生的角度出发，为他们量身制定属于他们的课程。“成为最受年轻人喜爱的教育品牌“一直是我们的不懈追求。

截止2020年，我们的Tutor人数已达1300人，业务范围涵盖了澳大利亚、新西兰、美国、英国4个国家的40多所高等校，为15万留学生提供了优质的学习辅导服务，成为澳大利亚华人留学生覆盖人数最多的在线教育学习平台。

HD·EDU的成长有你陪伴

课后，如果您有任何建议和意见，我们都非常欢迎您联系小助手分享您的想法，给予我们改进和提高的机会！

感谢您参与HD Education的辅导课程！

TUTOR
Self-Introduction
自我介绍

TUTOR: Joey

#

1.🎓 Monash University

2. 📄 Bachelor of Computer Science in Data Science

Master of Information Technology

3. 📖 三年数据库相关教学经验

4. 👩🏻‍🏫 从学生角度出发讲解，耐心负责

5. ❤️ 吸猫 乐高 旅游

6. 👩🏻‍💻目前在某互联网大厂任数据工程师

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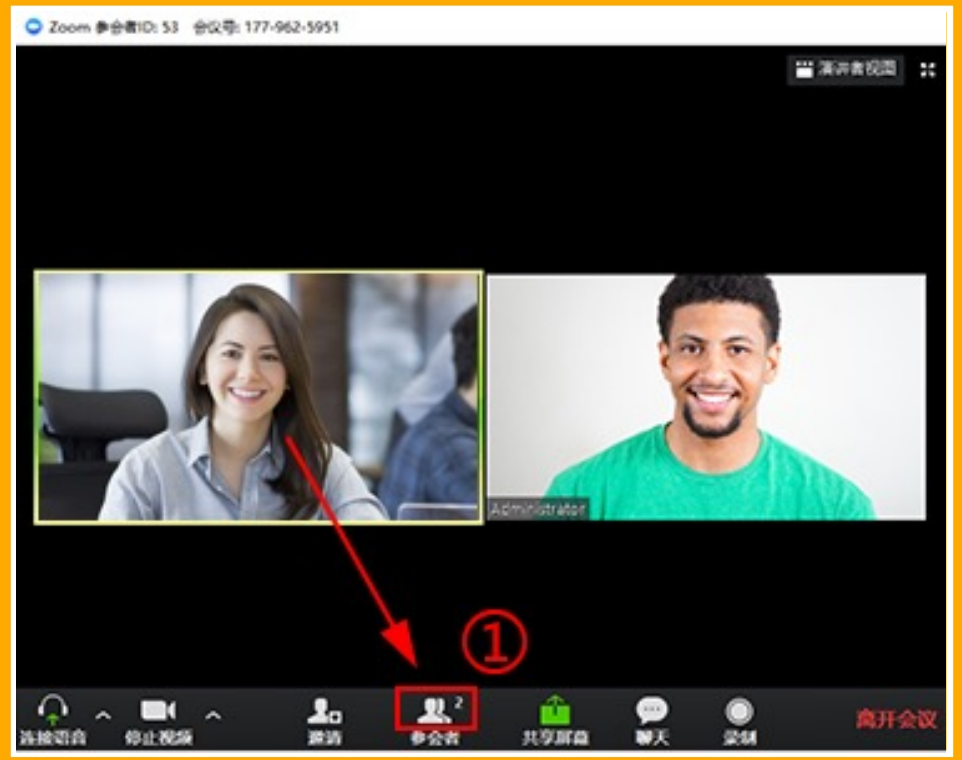
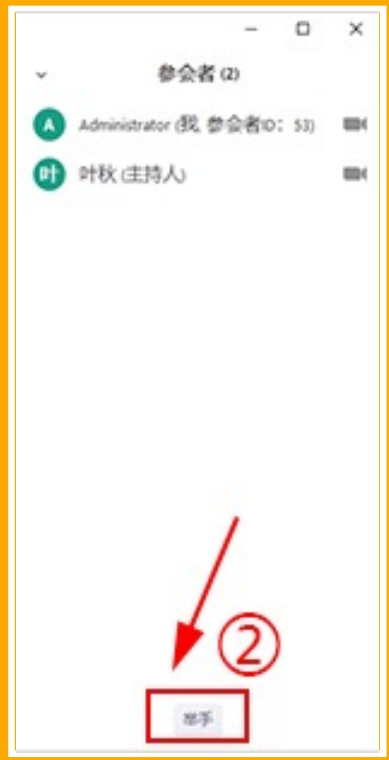
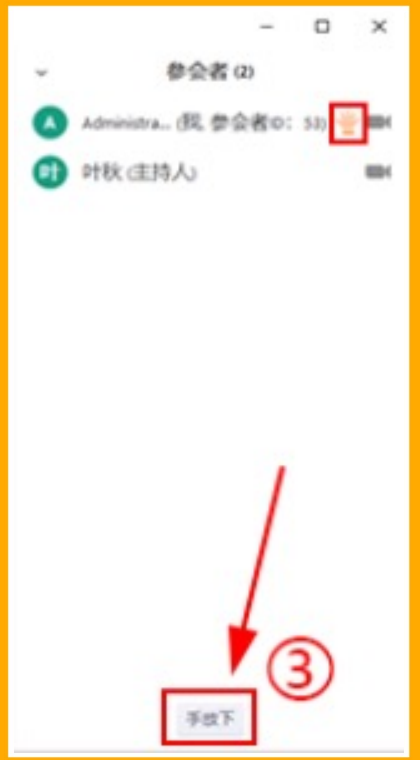
同学们有问题怎么办?

方法一:举手







1.点【参会者】
2.点【举手】即可与老师实时互动
3.问题被解答了还可以【手放下】

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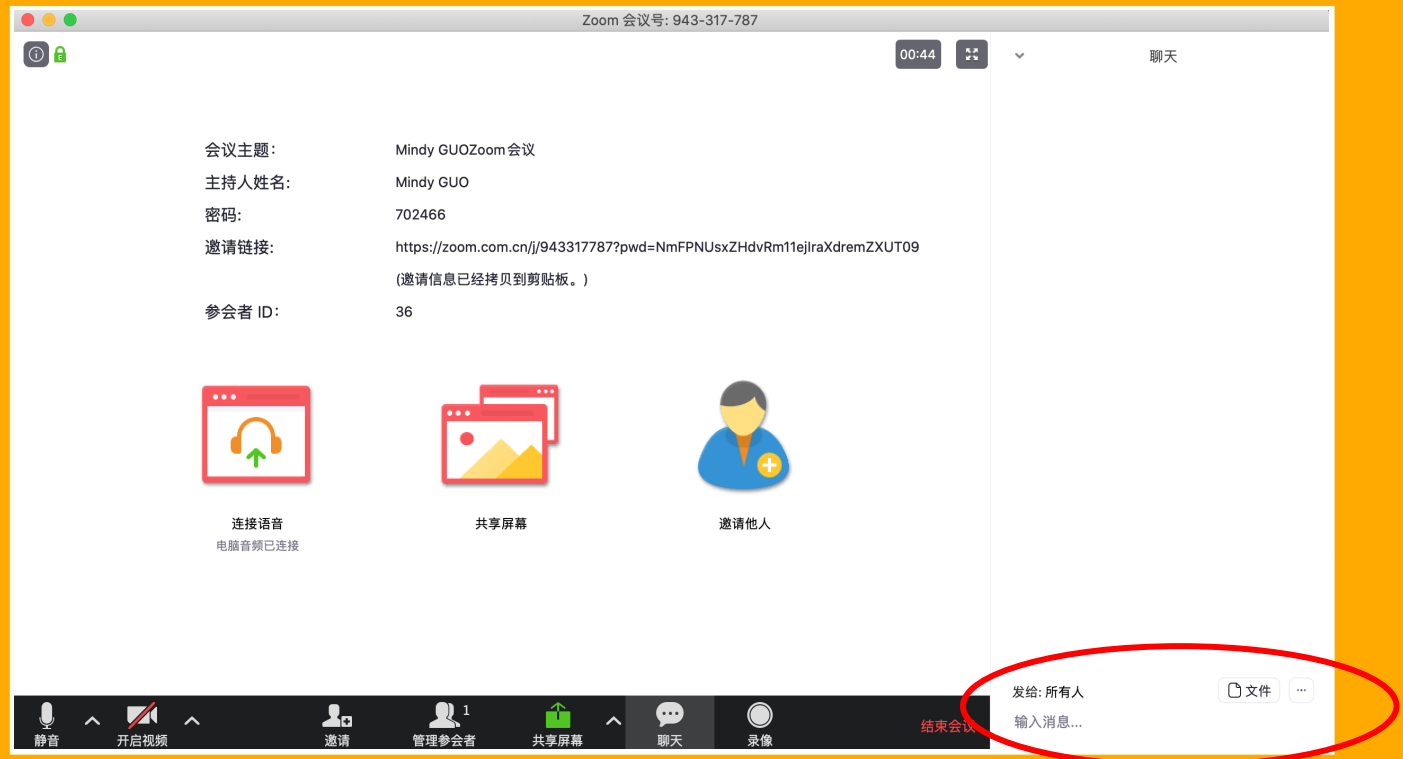
同学们有问题怎么办?

方法二:
文字提问



红圈处输入问题提问

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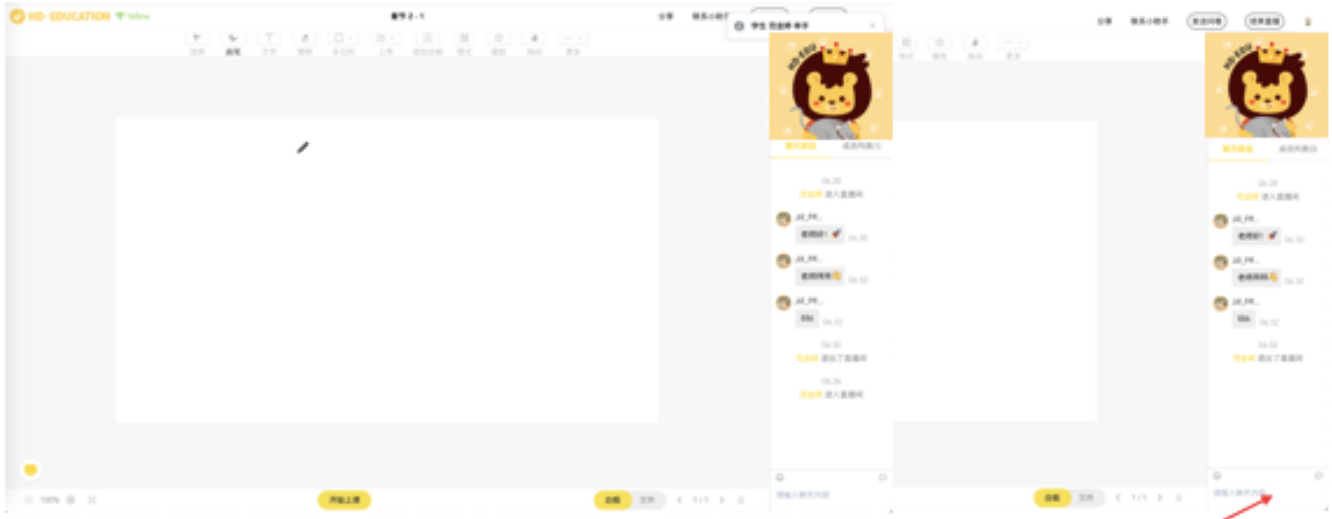
同学们有问题怎么办?

直播平台

互动方法

直播平台：举手+聊天室提问



点【参会者】再点【举手】，即可与老师实时互动！ 在此输入你想问的问题

问题被解答了还可以【手放下】

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CONTENT

课程目录

上周回顾

重要程度：★★★
难易程度：★★★★★

- Entity (Strong Entity vs. Weak Entity)
  - Strong Entity (key来源于自己)
  - Weak Entity (key从别的entity拿来的)

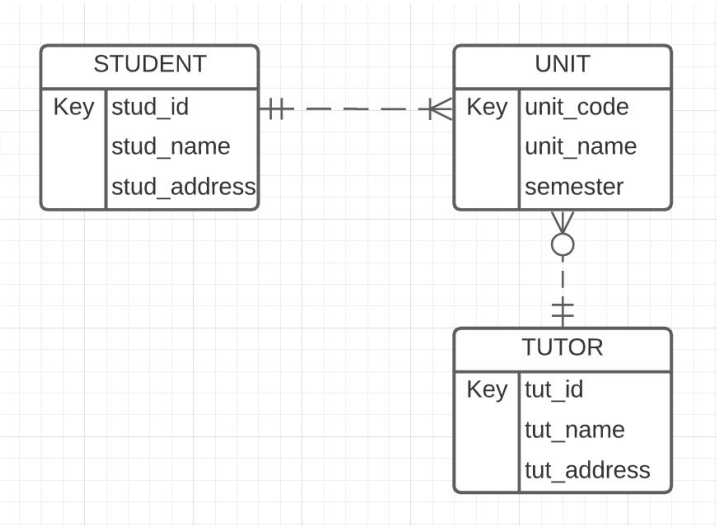
- Attribute
  - Simple (gender, height…)
  - Composite(address, fullname…)
  - Single-Value (id, unit code…)
  - Multi-Value(degree, skill, color…)
  - Derived (age, total price…)

- Relationship (number of Relationship vs. Relationship Degree)
  - Number Of Relationship: entity之间存在多少个关系
  - Relationship Degree: 有多少entity参与了某段关系

- Relationship Connectivity:

O: Zero
|: One
<: Many

O|: zero or one
O<: zero to many
|<: one to many
||: one and only one

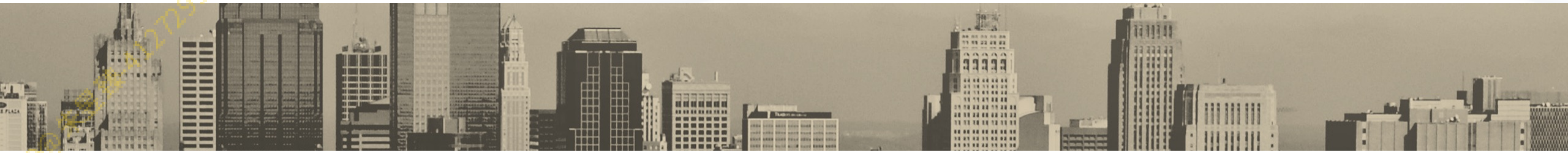


本章节知识点

知识点1 Conceptual Model

知识点2 Relational Model

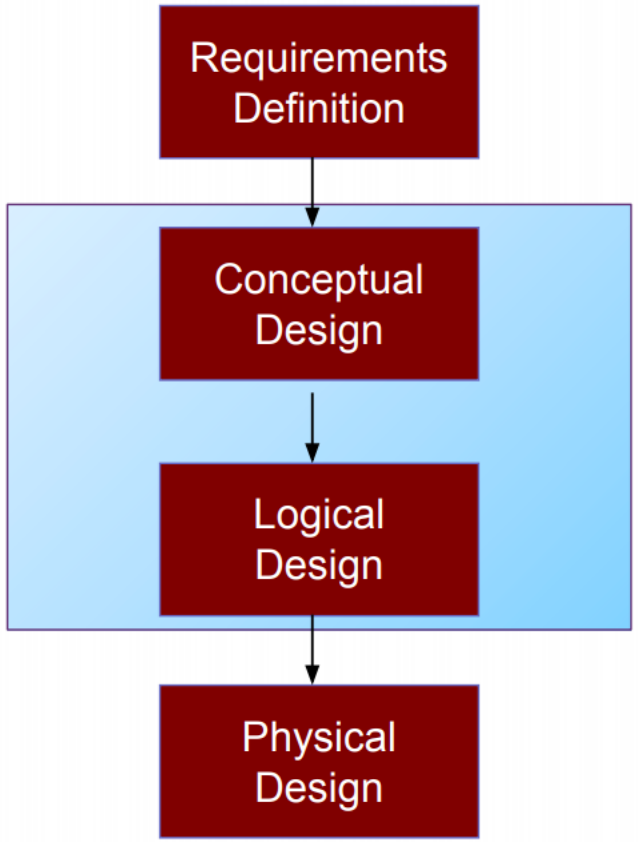
知识点3 Relational Algebra



知识点讲解

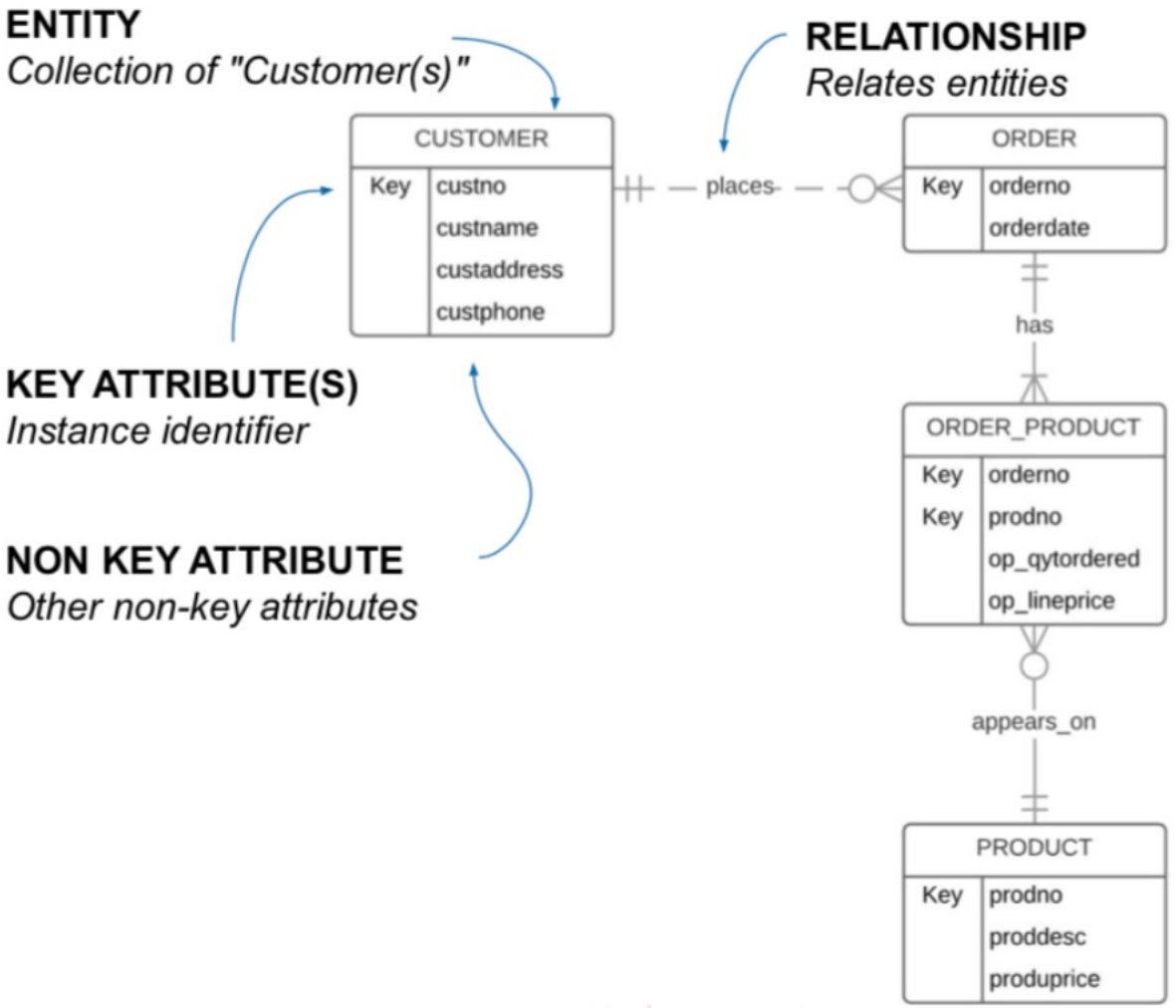
Conceptual model

重要程度：⭐⭐⭐
难易程度：⭐⭐⭐⭐



Conceptual model

重要程度：⭐⭐⭐
难易程度：⭐⭐⭐⭐



例题分析

Prepare an Entity Relationship Diagram (ERD), showing all attributes and the identifier of each entity for the following description of a Property Rental System:

● Properties are rented by tenants. Each tenant is assigned a unique number by the Agency. Data held about tenants include family name, given name, property rented, contact address - street, city, state, postcode & telephone number. A tenant may rent more than one property and many tenants may rent parts of the same property (eg. a large shopping complex).

● Properties are owned by owners. Each property is assigned a unique property number. The agency only recognises a single owner for any of the properties it handles. The owner, address, and value are recorded for each property. Also, the lease period and bond are recorded for each property or sub-property rented. An owner may own several properties. For each owner an owner number is assigned, the owner name is also recorded.

● Properties are subject to damage and the agency records all instances of damage to its properties - property, date, type of damage and repair cost are recorded. Repair costs are charged directly to tenants

● Tenants pay accounts to the Agency - these consist of weekly rental payments, bond payments (for new properties) and damage bills. The date of payment, tenant, property, type of account (Rental, Bond, Damage) and amount are recorded. Each payment is assigned a payment number.

You should prepare a conceptual model based on the details supplied here, however as you model note down the areas where you consider further information is required from your client.

例题分析

1. 找Entity, 要知道材料里给了多少个Entity （看名词）

2. 找Attribute, 一般会紧跟着Entity, 或者在Entity附近出现 （看名词）
（1）如出现unique， each xxx has only one… 此attribute为key
（2）遇到multi-valued的要拆出来成为新的entity

3. 找Relationship：
（1）看Entity 之间有没有动词连接，如果有，两者必然有关系
（2）找和数量有关的词，如many，some，more than one…
（3）如果Entity 和 Entity 之间产生了关系，并且两者之间出现了A can have many B, B can have many A 的情况时，要注意N:N 的情况

例题分析

Entity: PROPERTY, TENANT, OWNER, DAMAGE, PAYMENT, RENT(associative entity)

Attribute （从材料中能直接看到的）:

PROPERTY(prop_no, prop_address, prop_value)

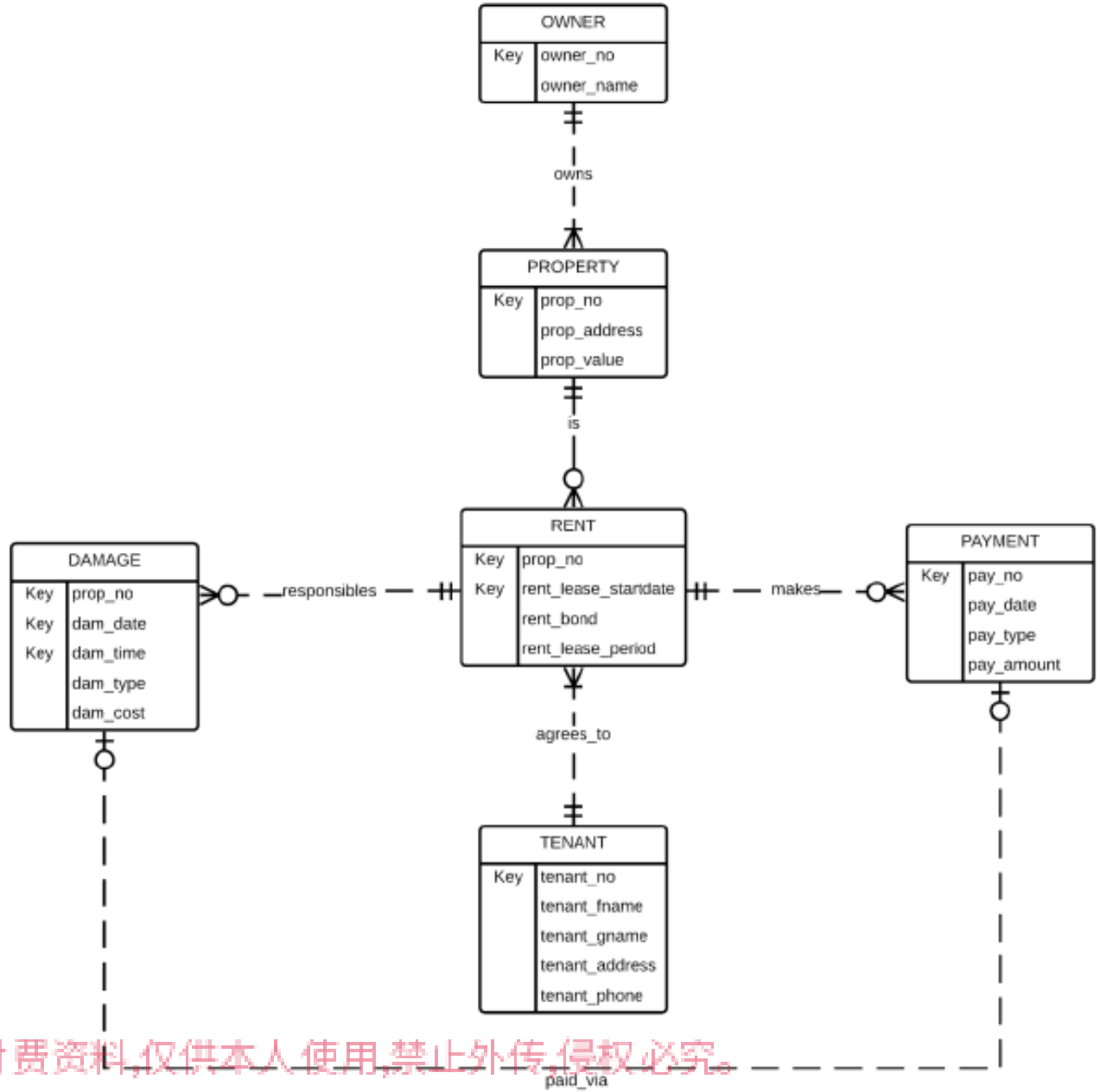
OWNER(owner_no, owner_name)

TENANT(ten_no, ten_fname, ten_gname, ten_address, ten_phone)

DAMAGE(damage_date, damage_time, damage_type)

PAYMENT(pay_no, pay_date, pay_time)

RENT(rent_lease_start_date, rent_bond, rent_lease_period)



Relational model

重要程度：⭐⭐⭐
难易程度：⭐⭐⭐⭐

- **Relational Model 是数据库管理的一个模型**

- **Consist of two parts (Heading & Body)**
  - Relation heading (a.k.a. relational schema)
  - RelationName(attribute1, attribute2, attribute3...) 表格列的名称
    - STUDENT(stud_id, stud_name, stud_address...)
  - EACH attribute(stud_id) corresponds to one underlying domain
    - dom(stud_id) —> student_id
  - Relation Body (a.k.a. relation instance) - 表格里的具体数据
  - Relation degree: 表格中attribute的数量
  - Relational cardinality: number of tuples 表格中数据的行数

custno	custname	custadd	credlimit
SMI13	SMITH	Wide Rd, Clayton, 3168	2000
JON44	JONES	Narrow St, Clayton, 3168	10000
BRO23	BROWN	Here Rd, Clayton, 3168	10000

Note: 注意区别 relation(关系) 和 relational schema(关系模式)

- relation 是动态的，随着时间可能会发生生变化
- (添加删除信息等)
- relational schema是静态的，关系模式是不不会发生生改变的

Relational Model -- Property

重要程度：⭐⭐
难易程度：⭐⭐

- **NO duplicate tuples 没有完全一样的两行数据**
- **Tuples have no order within a relation 表格中的行是无序的**
- **Attributes have no order 表格中的列是无序的**
- **Tuple values are atomic (multi-valued attributes are NOT allowed in the table)**

custno	custname	custadd	credlimit
SMI13	SMITH	Wide Rd, Clayton, 3168	2000
JON44	JONES	Narrow St, Clayton, 3168	10000
BRO23	BROWN	Here Rd, Clayton, 3168	10000

Relational Model – KEY

重要程度：⭐⭐
难易程度：⭐⭐

❖ **Four types: Superkey, Candidate Key, Primary Key, Foreign Key**

- **Superkey**: 能标识唯一tuple的属性的集合
  - {stud_id, stud_name} —> 唯一一行信息, 所以{stud_id, stud_name} 是superkey
  - {stud_id} —> 唯一一行信息，所以{stud_id} 是superkey
    {stud_name} —> 可能多于一行信息，所以{stud_name} 不是superkey

- **Candidate key**: 不含多余attribute的superkey
  - {stud_id, stud_name}是superkey, 但是输入stud_name自身实际上并不能保证只能得到唯一一行信息，所以stud_name属于 superkey中多余的attribute，stud_id是unique的，可以保证只得到**唯一一行**信息，所以**stud_id 是candidate key**
  - 同理，stud_oshc is candidate key (Every student has a unique stud_oshc)

stud_id	stud_name	stud_dob	stud_oshc
1110	John	02/01/1996	mon2000
1111	Amy	05/05/1998	mon2001
1112	Ben	02/01/1996	mon2002
1113	John	02/11/1996	mon2003

Relational Model – KEY

重要程度：⭐⭐
难易程度：⭐⭐

❖ **Four types: Superkey, Candidate Key, Primary Key, Foreign Key**

- **Primary key**: 从candidate key中选一个，每个表中有且仅有一个pk (但有可能由多于一个的attribute组成 --> composite pk)
  - better choose the one with numeric data type
  - Natural pk & Surrogate pk (logical model) - Natural: case 中本身带有的
  - surrogate: 根据自自己己的需求添加的 (conceptual model 中不允许出现)

- **Foreign key :**某个表的fk是另一表的pk (两表有关联的前提下) 或为NULL
  - 目的:描述两个表的关系

stud_id	stud_name	stud_dob	stud_oshc
1110	John	02/01/1996	mon2000
1111	Amy	05/05/1998	mon2001
1112	Ben	02/01/1996	mon2002
1113	John	02/11/1996	mon2003

Relational Model – Data Integrity

重要程度：⭐⭐
难易程度：⭐⭐

- **Entity Integrity 实体完整性**
  - Primary key MUST NOT be NULL - Primary key MUST be UNIQUE

- **Referential Integrity 参照完整性**
  - The values of FK must either MATCH a value of full PK in the related relation or to be NULL
  - FK 必须来自于某个有关联的表的PK, 不然就为空

- **Column/Domain Integrity**
  - All values in a given column must come from the same domain (the same data type and range) –
  - 同一列的数据需要为同一数据类型以及范围

Relational Algebra -- Overview

重要程度：⭐⭐⭐⭐
难易程度：⭐⭐⭐

❖ **Select, Project, Join**

- **SELECT 选择运算**
  - $\sigma_{expr}(Rel)$ <-- Standard Notation
  - **Select rows** (select one or more rows from [TABLE] where [CONDITION])
  - Our notation: Sel [expr] (Rel)
  - e.g. Sel[student_mark > 70] (MARK) : select rows from table MARK where student_mark > 70

- **PROJECT 投影运算**
  - $\pi_{A,B,C}(Rel)$ <-- Standard Notation
  - **Select columns**
  - Our notation: Proj [A,B,C] (Rel)
  - e.g. Proj [stud_id] (STUDENT): select whole column named stud_id

- **JOIN 连接运算**
  - Four methods: theta-join, equi-join, natural join & outer join(full outer, left outer, right outer)

Relational Algebra -- Join

重要程度：⭐⭐⭐⭐
难易程度：⭐⭐⭐

- **Theta-Join 等值连接**
  - 选取属性间满足某条件的**tuples**进行连接

A	B	C
A1	B1	5
A1	B2	6
A2	B3	8
A2	B4	12

Relation R

Theta-join where R.B = S.B

$\bowtie_F$

B	E
B1	3
B2	7
B3	10
B3	2
b5	2

Relation S

A	R.B	C	S.B	E
A1	b1	5	b1	3
A1	b2	6	b2	7
A2	b3	8	b3	10
A2	b3	8	b3	2

Relational Algebra -- Join

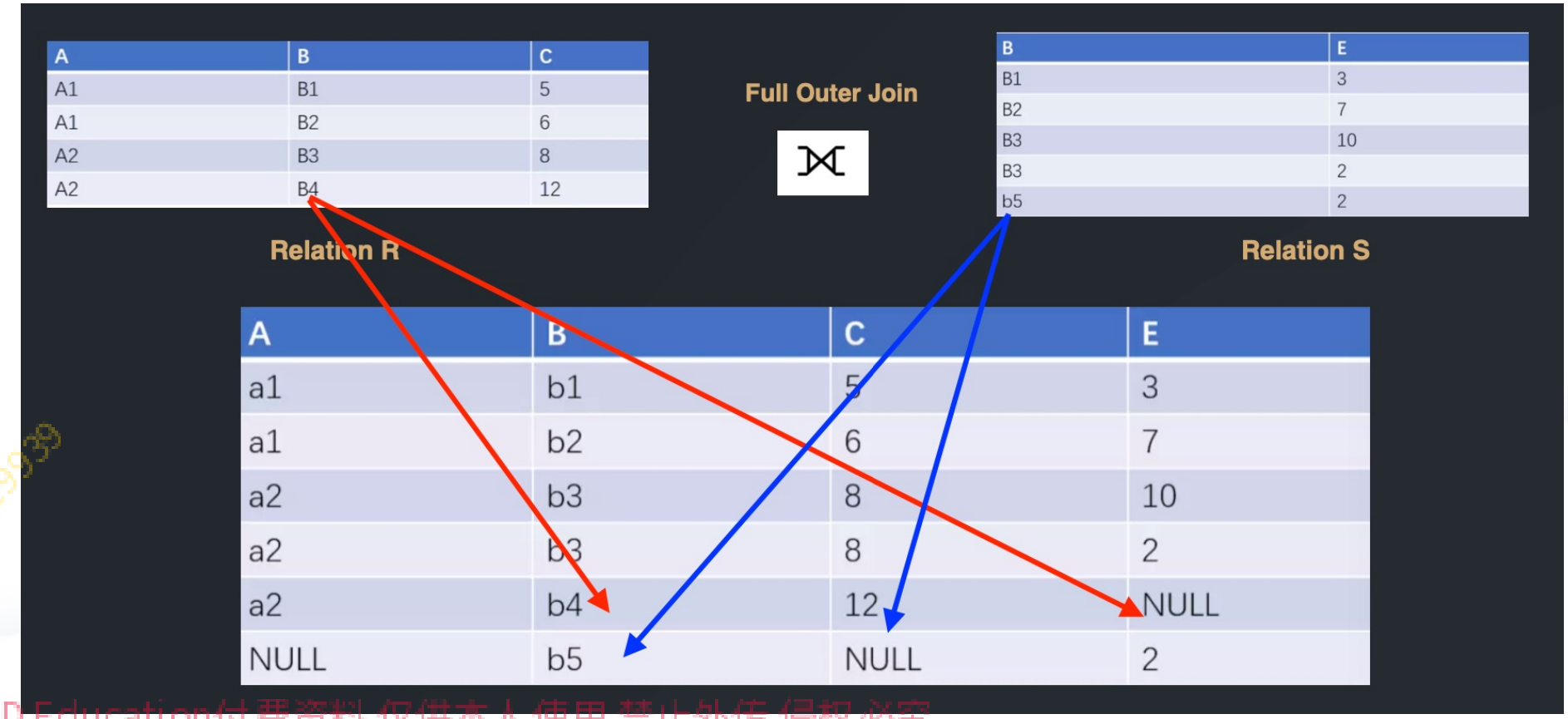
重要程度：⭐⭐⭐⭐
难易程度：⭐⭐⭐

- **Natural Join 等值连接**
  - 选取带有相同意义属性间相同值的**tuples**进行连接(然后删除其中一个重复列)
  - 无法合并的行会被删除

Relational Algebra -- Join

重要程度：⭐⭐⭐⭐
难易程度：⭐⭐⭐

- **FULL Outer Join**
  - 根据选定的列进行合并，无论两个表的那一列是否存在相同的值
-



A	B	C
A1	B1	5
A1	B2	6
A2	B3	8
A2	B4	12

B	E
B1	3
B2	7
B3	10
B3	2
b5	2

A	B	C	E
a1	b1	5	3
a1	b2	6	7
a2	b3	8	10
a2	b3	8	2
a2	b4	12	NULL
NULL	b5	NULL	2

Relational Algebra -- Join

重要程度：⭐⭐⭐⭐
难易程度：⭐⭐⭐

- **LEFT Outer Join**
  - 保留左边选定列的所有数据，与右边进行连接

A	B	C
A1	B1	5
A1	B2	6
A2	B3	8
A2	B4	12

Relation R

Left Outer Join

⟕

B	E
B1	3
B2	7
B3	10
B3	2
b5	2

Relation S

A	B	C	E
a1	b1	5	3
a1	b2	6	7
a2	b3	8	10
a2	b3	8	2
a2	b4	12	NULL

Relational Algebra -- Join

重要程度：⭐⭐⭐⭐
难易程度：⭐⭐⭐

- **RIGHT Outer Join**
  - 保留右边选定列的所有数据，与左边进行连接

A	B	C
A1	B1	5
A1	B2	6
A2	B3	8
A2	B4	12

Relation R

Right Outer Join

B	E
B1	3
B2	7
B3	10
B3	2
b5	2

Relation S

A	B	C	E
A1	b1	5	3
A1	b2	6	7
A2	b3	8	10
A2	b3	8	2
NULL	b5	NULL	2

例题讲解

重要程度：★★★★
难易程度：★★★

HOTEL (HOTEL_NO, HOTEL_NAME, HOTEL_CITY)
ROOM (ROOM_NO, HOTEL_NO, ROOM_TYPE, ROOM_PRICE)
BOOKING (HOTEL_NO, GUEST_NO, BDATE_FROM, BDATE_TO, ROOM_NO)
GUEST (GUEST_NO, GUEST_NAME, GUEST_ADDRESS)

List the names and cities of all hotels

List all single rooms with a price below $50

List the price and type of all rooms at the Grosvenor Hotel

例题讲解

重要程度：
难易程度：

HOTEL (HOTEL_NO, HOTEL_NAME, HOTEL_CITY)
ROOM (ROOM_NO, HOTEL_NO, ROOM_TYPE, ROOM_PRICE)
BOOKING (HOTEL_NO, GUEST_NO, BDATE_FROM, BDATE_TO, ROOM_NO)
GUEST (GUEST_NO, GUEST_NAME, GUEST_ADDRESS)

List the names and cities of all hotels

$$\text{Answer1} = \pi \text{ hotel\_name, hotel\_city HOTEL}$$

List all single rooms with a price below $50

$$\text{Answer2} = \sigma_{\text{room\_type='single' and room\_price < 50}} \text{ ROOM}$$

List the price and type of all rooms at the Grosvenor Hotel

$$\text{PSuiteNo} = \pi_{\text{hotel\_no}} (\sigma_{\text{room\_type = 'presidential suite'}} \text{ ROOM})$$

$$\text{Answer4} = \pi_{\text{hotel\_name}} (\text{PSuiteNo} \bowtie (\pi_{\text{hotel\_no, hotel\_name}} \text{HOTEL}))$$

重难点总结

重难点总结

1、Relational Model Property

- NO duplicate tuples
- Tuples have no order within a relation
- Attributes have no order
- Tuple values are atomic

2、Keys

- **Superkey**: 能标识唯一tuple的属性的集合
- **Candidate key**: 不含多余attribute的superkey
- **Primary key**: 从candidate key中选一个，每个表中有且仅有一个pk (但有可能由多于一个的attribute组成 --> composite pk)
- **Foreign key :**某个表的fk是另一表的pk (两表有关联的前提下) 或为NULL

重难点总结

1、Relational Algebra

- **SELECT 选择运算**
- 选行的时候用（筛选条件）

$$\sigma_{expr}(Rel)$$

- **PROJECT 投影运算**
- 选列的时候用

$$\pi_{A,B,C}(Rel)$$

- **JOIN 连接运算**

同时需要多个表的时候用

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课后作业

课后作业

HOTEL (HOTEL_NO, HOTEL_NAME, HOTEL_CITY)
ROOM (ROOM_NO, HOTEL_NO, ROOM_TYPE, ROOM_PRICE)
BOOKING (HOTEL_NO, GUEST_NO, BDATE_FROM, BDATE_TO, ROOM_NO)
GUEST (GUEST_NO, GUEST_NAME, GUEST_ADDRESS)

List the price and type of all rooms at the Grosvenor Hotel

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下节课预告

下节课预告

WEEK 4： Normalisation

1、 UNF, 1NF, 2NF, 3NF

2、 例题讲解

收集反馈

分享问卷

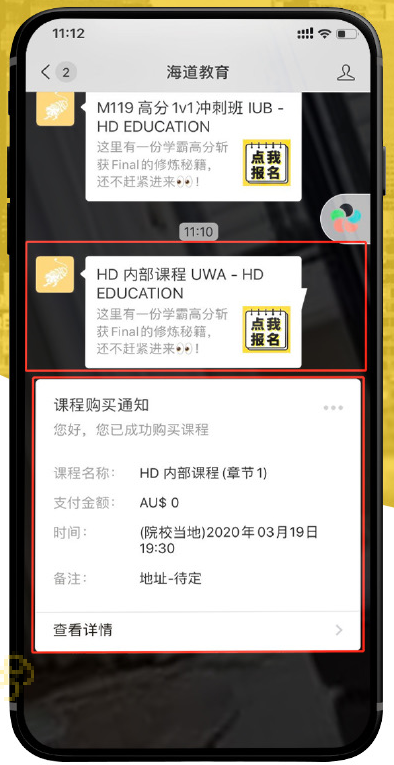
长按保存问卷二维码 或
者点击复制问卷链接

发送提醒　复制链接

课程结束后，如果您对课程或者服务的任何建议和意见

请给予我们提高和改进的机会，感谢您对 HD•EDUCATION 课程和服务的信任！

· 填写问卷操作流程 ·



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