



# HD EDUCATION

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## FIT2094

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

#

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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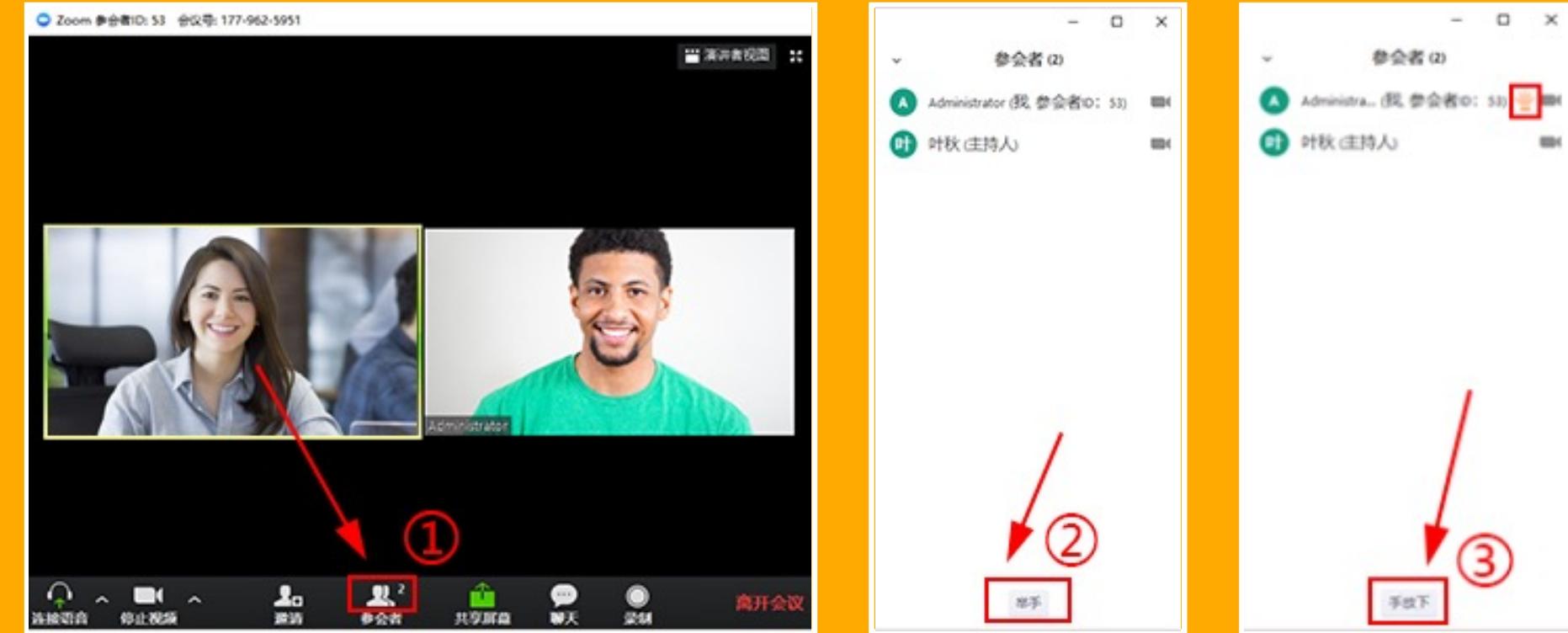


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同学们  
有问题  
怎么办?

方法一：  
举手

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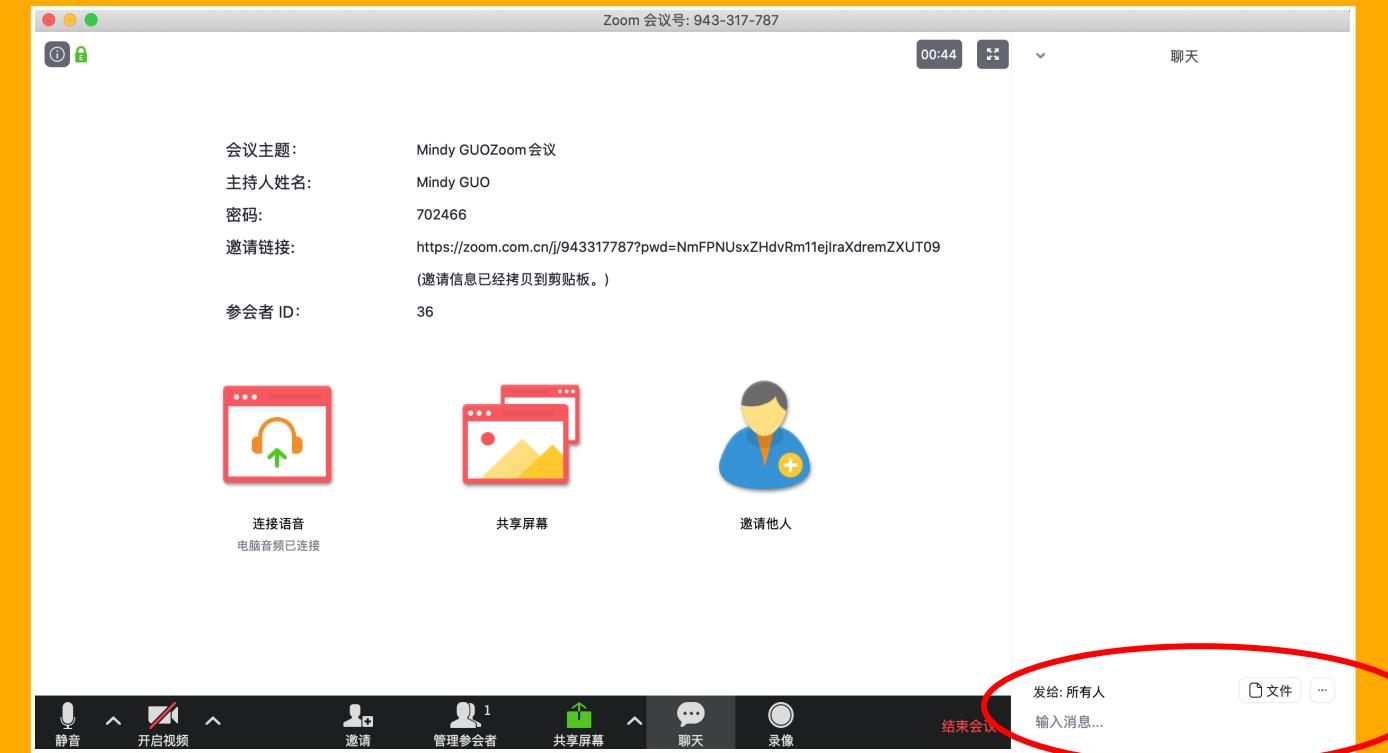


- 1.点【参会者】
- 2.点【举手】即可与老师实时互动
- 3.问题被解答了还可以【手放下】

同学们  
有问题  
怎么办?

方法二：  
文字提问

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红圈处输入问题提问

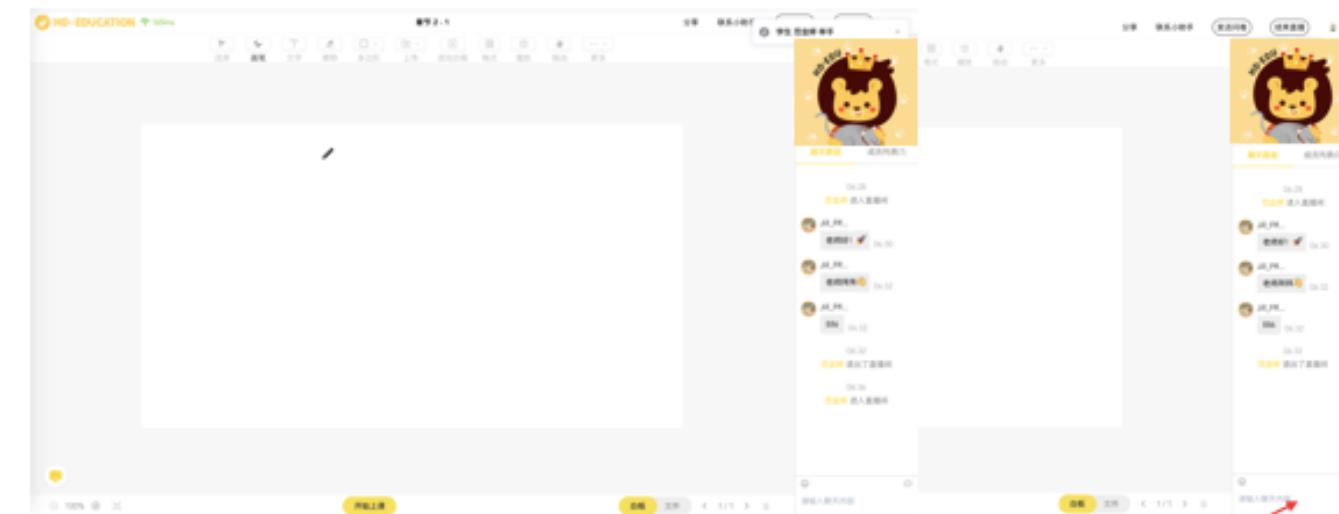
同学们  
有问题  
怎么办?

直播平台

互动方法

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### 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】

# 学科特点及学习方法

## 学科特点：

1. 考试题量大，题目长
2. 知识点清晰，相互关联性大
3. 注重细节

## 学习方法：

1. 养成计时答题的习惯
2. 充分利用学校tutorial资料

## 备考方法 & Tips:

1. 多读材料，养成能快速在材料定位关键信息的能力
2. 多练代码，保持手感
3. 做题一定要计时！！！

# CONTENT

## 课程目录

- ✓ 1 What is Database? Database Element
- ✓ 2 Database Design I (Conceptual Model)
- ✓ 3 Relational Model (Relational Algebra)
- ✓ 4 Normalisation
- ✓ 5 Database Design II (Logical Model)
- ✓ 6 Basic SQL & Transaction Management
- ✓ 7 SQL & Advanced SQL
- ✓ 8 Web Database / NoSQL

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# 上周回顾

重要程度: ★★★★  
难易程度: ★★★★★

## 1、DDL

Creating database structure

- Define 每个table的特性
- e.g. CREATE TABLE, ALTER TABLE, DROP TABLE

先**create strong entity**, 再**create weak entity**

**Delete (Referential Integrity)**

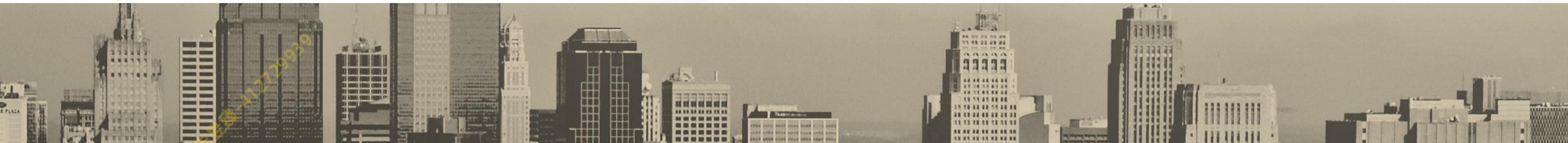
**RESTRICT: not allowed to delete**

**CASCADE: delete at the same time**

**NULIFY: change to null if not exist**

# 本章节知识点

## 知识点1 Transaction Management



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# 知识点讲解

# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

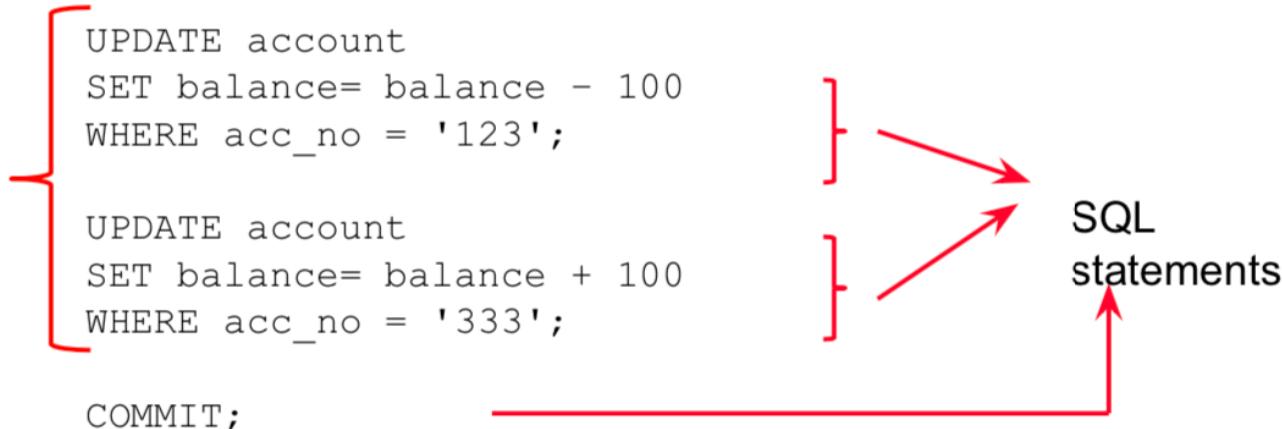
*Sam is transferring \$100 from his bank account to his friend Jim's.*

- Sam's account should be reduced by 100.
- Jim's account should be increased by 100.

TRANSACTION

```
UPDATE account  
SET balance= balance - 100  
WHERE acc_no = '123';  
  
UPDATE account  
SET balance= balance + 100  
WHERE acc_no = '333';  
  
COMMIT;
```

SQL statements



# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

- **Atomicity 原子性**
  - All database operations of a transaction must be entirely completed or entirely aborted
  - transaction的操作要么都发生，要么全都不发生，如果发生错误，会rollback
- **Consistency 一致性**
  - It must take the database from one consistent table to another
  - 系统从一个完整的状态转换到另一个完整的状态，不能破坏数据的完整性
  - e.g. 在某次AB转账中，A转出100，B收入50，破坏了完整性
- **Isolation 独立性**
  - It must not interfere with other concurrent transactions
  - Data used during execution of a transaction cannot be used by a second transaction until the first one is completed
  - 多个transaction并行访问时，每个transaction之间都是独立不受影响的
  - 不同的transaction利用同一组数据进行操作时，每个transaction都有完整的数据空间
- **Durability 持久性**
  - Once completed the changes the transaction made to the data are durable, even in the event of system failure
  - transaction 结束后，更改的数据会持久保存在database中

# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

Time: ↓

T0	T1
Read(X) X=X+1 Write(x)	Read(Y) Y=Y*2 Write(Y) Read(x) X=X+2 Write(X)

*Serial*

- ❖ 每个时刻只有一个transaction能对这组数据进行操作

T0	T1
Read(X)  X=X+1 Write(x)	Read(Y)  Y=Y*2  Write(Y) Read(x) X=X+2 Write(X)

*Interleaved (non Serial)*

- ❖ 多个transaction交叉运行

# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

## ❖ Lost Update

时间	转账事务A	取款事务B
T1		开始事务
T2	开始事务	
T3		查询账户余额为1000元
T4	查询账户余额为1000元	
T5		取出100元把余额改为900元
T6		提交事务
T7	汇入100元	
T8	提交事务	
T9		把余额改为1100 元 (丢失更新)

Transaction B 未能及时更新，被Transaction A结果覆盖

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# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

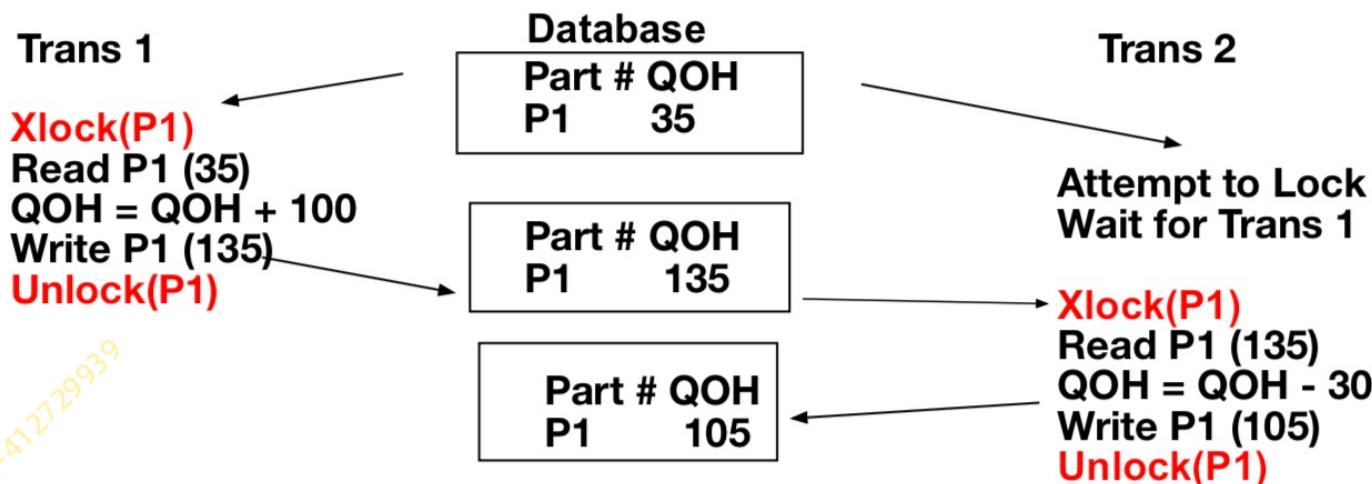
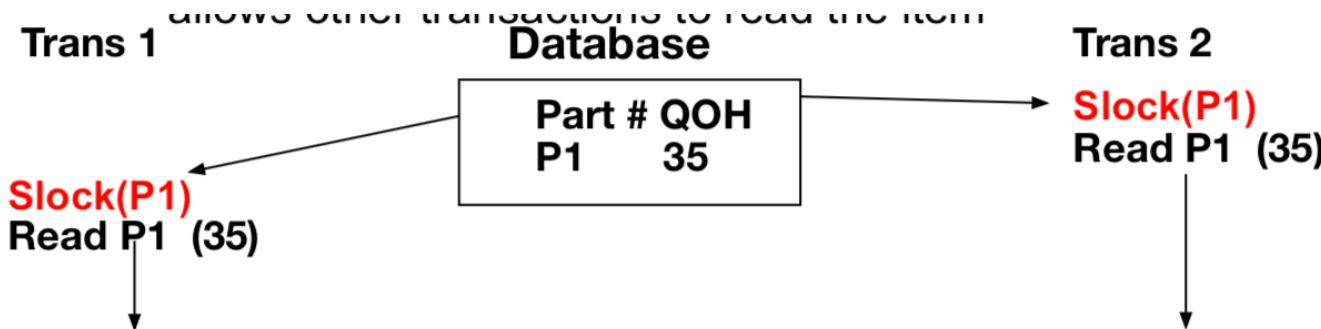
## ❖ Lock

- A lock is an indicator that some part of the database is temporarily unavailable for update
- Level
  - Database Level
  - Table level
  - Page level
  - Record level (allow access different rows)
  - Attribute level (allow access different attributes in a row)
- Type
  - **Shared Lock**
    - Allows other transaction to read item
    - T1对A上S锁, T1只可以read不能write, 其他T也能对A上S锁
    - 保证了其他transaction也能access A, 但在T1释放前, 都不能write
  - **Exclusive Lock**
    - Required an exclusive lock
    - A single transaction exclusively holds the lock on the item
    - T1对A上x锁, T1可以read&write, 其他T不能进行任何操作

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# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★



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# Transaction Management

重要程度:   
难易程度: 

## Deadlock

- T1 has an exclusive lock on data item A, and requests a lock on data item B
- T2 has an exclusive lock on data item B, and requests a lock on data item A
- T1访问表A (锁住A) A然后又访问B, T2 访问B(锁住B),然后去访问A

## Deadlock prevention

- A transaction must acquire all the locks it requires before it updates any record - If it cannot acquire a necessary lock, it releases all locks, and tries again later
- Deadlock detection and recovery
- Detection involves having the Lock Manager search the Wait-for tables for lock cycles
- Resolutions involves having the Lock Manager force one of the transactions to abort, thus releasing all its locks

# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

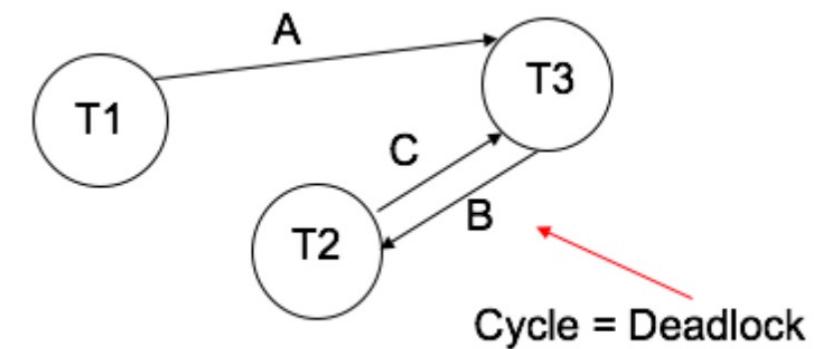
TIME	TX	ACCESS	A	B	C
0	(T1)	READ A			
1	(T2)	READ B			
2	(T3)	READ A			
3	(T1)	UPDATE A			
4	(T3)	READ C			
5	(T2)	READ C			
6	(T2)	UPDATE B			
7	(T2)	READ A			
8	(T2)	UPDATE C			
9	(T3)	READ B			

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# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

TIME	TX	ACCESS	A	B	C
0	(T1)	READ A	S(T1)		
1	(T2)	READ B		S(T2)	
2	(T3)	READ A	S(T3)		
3	(T1)	UPDATE A	Wait(T3)		
4	(T3)	READ C			S(T3)
5	(T2)	READ C			S(T2)
6	(T2)	UPDATE B		X(T2)	
7	(T2)	READ A	S(T2)		
8	(T2)	UPDATE C			Wait(T3)
9	(T3)	READ B		Wait(T2)	



# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

## Q6. Transaction Management (5 + 5 = 10 marks)

- a. Given two transactions:

T1 – R(X), W(X)

T2 – R(Y), W(Y), R(X), W (X)

Where R(X) means Read(X) and W(X) means Write(X).

- i. If we wish to complete both of these transactions, explain the difference between a *serial* and *non-serial* ordering of these two transactions. Provide an example of each as part of your answer.
- ii. What transaction ACID property does a non-serial ordering of these two transactions potentially violate.

[ 4+ 1 = 5 marks]

# Transaction Management

重要程度: ★★★★  
难易程度: ★★★★

i.

**Serial – all of one transaction followed by all of the other**

T1 R(X), T1 W(X), T2 R(Y), T2 W(Y), T2 R(X), T2 W(X)

**Non-Serial – interleaving of the transactions**

T1 R(X), T2 R(Y), T2 W(Y), T1 W(X), T2 R(X), T2 W(X)

ii.

**Isolation or Consistency**

# 重难点总结

# 重难点总结

## 1、Transaction Management

- Atomicity
- 要么全发生，要么全不发生
- Consistency
- 要从一个完整状态转到另一个完整状态
- Isolation
- 多个transaction之间的状态互不干扰
- Durability
- Transaction结束后，结果应一段时间停留，直到下一次transaction

- Shared lock
- 所有transaction都只能读，不能写
- Exclusive lock
- 某一个transaction上此锁后只能它写和读，其他transaction不能进行任何读写操作

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## 课后作业

## Q6. Transactions (5 + 5 = 10 marks)

(a) Given the following transaction sequence, complete the table by clearly indicating what locks are present at each of the indicated times (Time 0 to Time 9).

Cell entries must have the form:

- **S(Tn)** - for a shared lock by Tn,
- **X(Tn)** - for an exclusive lock by Tn or
- **Tn wait Tm** - for a wait of Tn due to Tm (where n and m are transaction numbers).

TIME	TRANS	ACTION	A	B	C	D
0	T1	UPDATE A				
1	T1	UPDATE B				
2	T2	READ C				
3	T2	READ D				
4	T3	UPDATE A				
5	T2	UPDATE C				
6	T1	ROLLBACK				
7	T3	UPDATE C				
8	T2	UPDATE B				
9	T2	UPDATE A				

# 下节课预告

# 下节课预告

WEEK 8: SQL II

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# 收集反馈

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