一. Database Design

1.1. ODL

```
interface Country (key name)
{
        attribute string name;
        attribute int population;
        attribute string size;
        attribute string socialSystemType;
        relationship Set<Province> have
                    inverse Province:: belongTo
}

interface Province (key name)
{
        attribute string name;
        attribute int population;
        attribute string size;
        attribute Struct Range
           { string start, string end} latitude Range;
        relationship Country belongTo
                    inverse Country :: have;
        relationship Set <Deceased> govern
                    inverse Deceased:: come From;
}
```

```
interface Deceased (key ID)
{
        attribute    string    ID;
        attribute    string    name;
        attribute    string    birthdate;
        attribute    string    dateOfDeath;
        relationship Province  ComeFrom
                inverse  Province :: govern
}
```
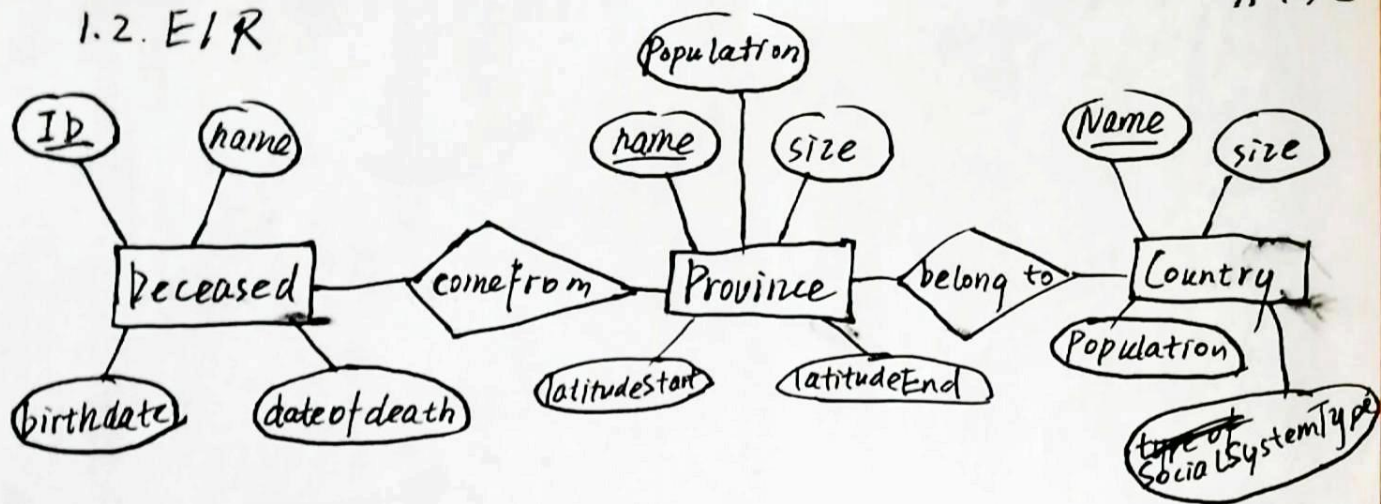
- Relational Schemas:

Country (<u>name</u>, population, size, socialSystemType)

Province (<u>name</u>, population, size, latitudeStart, latitude End,
                                                country Name)

Deceased (<u>ID</u>, name, birthdate, dateOfDeath, ProvinceName)

1.2. E/R

- Relational Set Schemas:

  Country (*Name*, population, size, social System Type)

  Province (*Name*, population, size, latitudeStart, latitude End)

  Deceased (*ID*, name, birthdate, dateOf Death)

  Come From (*ID*, Province Name)

  BelongTo (*Province Name*, Country Name)

1.3

$E_{1s} (\underline{A}, \underline{B}, C)$

$E_{2s} (\underline{D}, E, F)$

$E_{3s} (G, \underline{H}, 1, \underline{A}, \underline{B})$

$E_{4s} (\underline{D}, J, K)$

$R_1 (A, B, \underline{D})$

二. Normal Form of Relational Database

2.1.   key of R: $\{A, C\}$

4NF violations: $A \twoheadrightarrow C$, $AB \twoheadrightarrow D$, $B \to D$,

- Decomposition Process:
  1. use $A \twoheadrightarrow C$ to decompose R into:

      $R_1(A, C)$ and $R_2(A, B, D)$

      R_1 is in 4NF

      key of R_2: $\{A, B\}$

      4NF violations: $B \to D$

  2. use $B \to D$ to decompose R_2 into:

      $R_3(B, D)$ and $R_4(A, B)$

      R_3, R_4 are in 4NF.

- Final Result: $R_1(A, C)$ $R_3(B, D)$ $R_4(A, B)$

2.2.   b. compute the closure of each subset of $\{A, B, C\}$:

1. $\{A\}^+ = \{A\}$ $\{B\}^+ = \{B\}$ $\{C\}^+ = \{C, E, A\}$

   · add $C \to A$

2. $\{A, B\}^+ = \{A, B, C, D, E\}$ $\{B, C\}^+ = \{B, C, E, A, D\}$

   · add $AB \to C$ · add $BC \to A$

   $\{A, C\}^+ = \{A, C, E\}$

   · All the completely nontrivival functional dependencies:

      $C \to A$
      $AB \to C$
      $BC \to A$

   · In the form of minimal basis.

      $\{C \to A,$
       $AB \to C\}$

三. Relational Algebra

3.1

$$\pi_{Name}(Tourist \bowtie \sigma_{Name='Hubei'}(Province))$$

$$\pi_{Tourist.Name}(Tourist \bowtie_{Tourist.Pcode=Province.Pcode} \sigma_{Name='Hubei'}(Province))$$

3.2.

$$\pi_{Name}(Tourist \bowtie \sigma_{EXPense>3000}(Tourism Record))$$

四. T-SQL.

4.1
```
SELECT COUNT(*) AS totalNumber
FROM Destination D INNER JOIN Province P
ON D.PCode = P.PCode
WHERE P.Name = 'Hubei'
```

4.2. ①
```
SELECT COUNT(ArrivalTime) as totalNumber,
       MAX(Name) as Name,
       T.ID as ID
FROM Tourist T INNER JOIN TouristRecord TR
ON T.ID = TR.ID
Group BY T.ID
ORDER BY COUNT(ArrivalTime) DESC
```

② -- If show the information of expense

```sql
SELECT  COUNT(ArrivalTime) as totalNumber,
        AVG(Expense) as averageExpense,
        MAX(Name) as Name,
        T.ID as ID
FROM    Tourist T  INNER  JOIN  TouristRecord  TR
ON   T.ID = TR.ID
GROUP  BY  T.ID
ORDER  BY  COUNT(ArrivalTime)  DESC
```

4.3.
```sql
SELECT  MAX(T.ID) as ID,
        MAX(Name) as Name,
        AVG(Expense) as averageExpense
FROM    Tourist T  INNER  JOIN  Tourist Record  TR
ON   T.ID = TR.ID
GROUP  BY  T.ID
HAVING  AVG(Expense) > (SELECT  AVG(Expense)
                        FROM  Tourist Record)
```

附加题.　　出题

1. 背景 Back ground

本次大作业正值新冠疫情. 积极的队友叶紫琁已率先将自己的初步想法"关于口罩生产发布于讨论群. 我与另外的队友刘又萌认为这个主题切合热点. 有实际价值. 便一致同意立足于这个主题。

2. Requirement Analysis

由于初步想法是一张草图一设计的对象和联系较为冗杂. 为了贴合实际生产设计我认为确立一个立足点较为重要. 之后再围绕立足点将重要的信息纳入数据模型."你们想当卫健委呢? 还是国药集团的董事长?" 一个戏谑的发问. 希望能让我们更快拥有用色的代入感 —— 前者是对医疗资源的宏观调度. 后者是需要考虑口罩的实际生产. 她们认为"卫健委"比较有前途". 我们便在宏观的角度分析口罩资源调配所涉及到的对象、数据:

- 口罩 · 型号: 疫情期间类别很关键
- 工厂 · 生产能力规模: 疫情停工停产/复工时的最大生产力.
- 仓库 · 口罩储量: 停工停产状态下可供给能力.
- 物流公司 · 运输能力: 疫区需求最大. 物流业能否支撑
- 购买单位. 口罩的消耗方. (购买数量)
- 订单. · 购买信息.

3. 总结 Summary

上述的结果实际是在讨论、建模过程中逐渐完善得出的结果.

经过大家的修改. 基本符合实际需求.

并且柱ODL建模时. 将工厂、物流公司与购买单位进一步抽象.

得到基本单位. —— 包括. 地址. 联系电话等公共属性.

答题.

1. 且见我于笔记本写到的.条.

"4.6. 我的姐妹们太强了，今天题目刚出来，刘又萌一己之力完成了全部解答，并写成了word文档，叹服。
  一个高效率的组织多么重要！"

2. 看来在解题上我是无用武之地了，于是另辟蹊径。

参考刘作业中找到的"代码附上"。

仿造具体特题用用SQL建立数据库并实现呢？

说干就干，且说无独有偶。收到的题目四是 60-17 大背景下的
医药体系。。

要求分析 步骤如下。

   1. 导入地区数据

   2. 注册医院
    · 创建触发器生成默认科室

   3. 添加医护人员信息

   4. 患者就医（通过 Procedure 实现）
     a. 注册
     b. 充值
     c. 消费
     d. 注销.