

Student Name **Sivaranjani Prabasankar**

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Instructor **Luke Papademas**

Due Date **2/16/19**

Part	1	2	3	4	TOTAL	Score
Maximum Points	25 points	25 points	25 points	25 points	100 points	

**Textbook Reading Assignment** Thoroughly read Week 1 - 4 course lecture notes and course textbook Chapter(s) 1 - 4 .

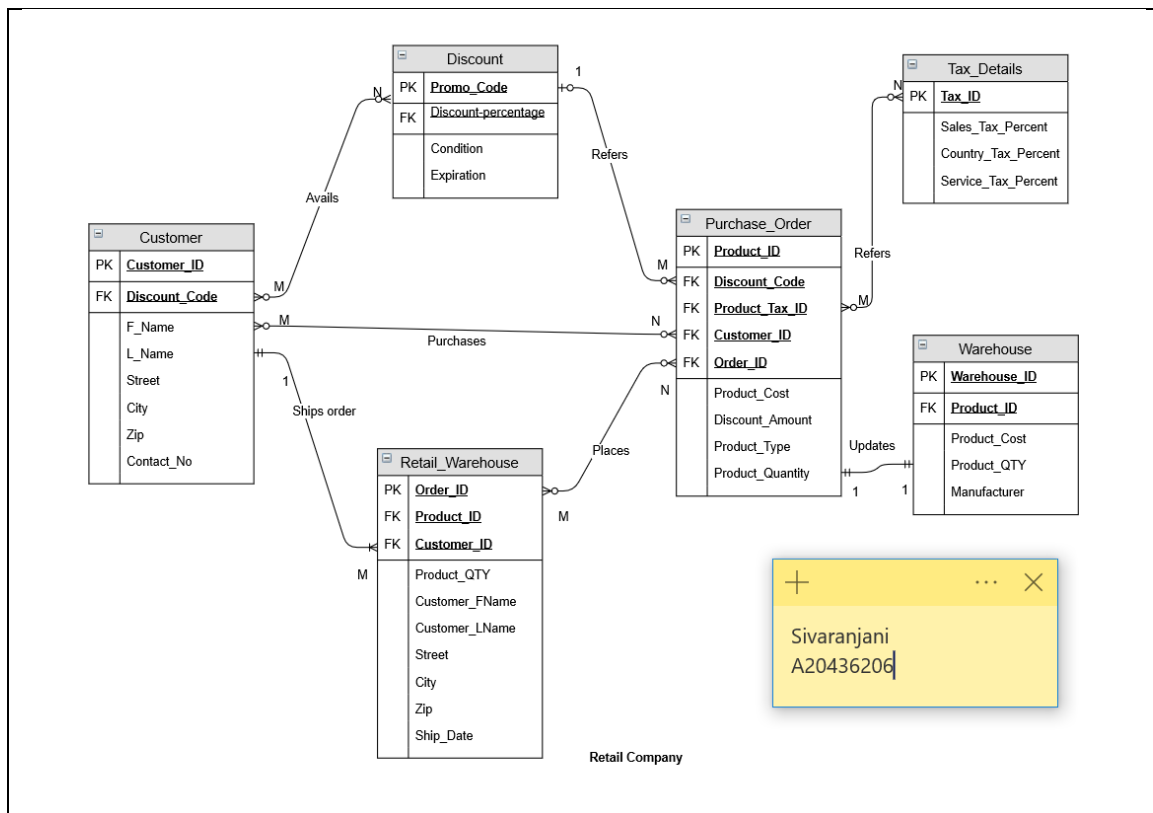
## Part 1 Concept Check - Advanced Topics in Data Management

### (1) (Data Models and Business Rules)

Consider the following business facts that a retail company requires to represent in its data model:

- customers purchase products and goods
- products are subject to various types of sales / county taxes
- retail store members receive special discounts
- products are stored in both the retail stores and in the company warehouse
- products can be shipped from the retail warehouse directly to the customer

Based on the above business rules, construct a data model in the form of a database table that can be used to provide information as to the transactional operation of the company.



Student Name Sivaranjani Prabasankar

Section \_\_\_\_\_

**(2) (Sources of Business Rules)**

Business rules are essential to create an accurate data model.

Within an enterprise, the sources of business rules include these categories:

- Company Managers
- Department Managers
- Direct interviews with End Users
- Written documentation Policy Makers

Reflect on the business rules of a typical employee staffing agency. Choose one of the above business rule sources and, from the point of view of your source, discuss five important business rules that would be critical for the agency's data model.

Employee Staffing Agency business rules from Department Managers. Each department manager will be having database listing all employees of the department and their respective details. He/ She should ensure following rules in database.

S. No	RULES	DATABASE
1	All employee should have valid ID card with access code.	There shouldn't be any employee with INVALID ACCESS details.
2	They should complete the training course or eligibility test	There shouldn't be any employee with ELIGIBILITY TEST STATUS as FAIL or BLANK
3	They should clock minimum of 40Hrs per week.	There shouldn't be any employee with less than 40hrs in TIMESHEET ENTRY.
4	Performance Monitoring and Pay scale	PERFORMANCE INDEX and SALARY of employee should be updated by department managers periodically
5	Everyone should have their contact details (Mobile No) and emergency contact details.	There shouldn't be any employee with BLANK CONTACT DETAILS.
6	Their stay location should be within 5 Miles of radius from Office Location	Each department manager should recruit employee with PROXIMITY RANGE of 5Miles

**Part 2 DBMS Concepts - Advanced Topics in Data Management****(1) (Business Rules)**

Business rules define one or more of the following modeling components:

- entities
- relationships
- attributes
- connectivity
- cardinalities

Some examples of business rules are:

- An invoice contains one or more invoice lines.
- Each invoice line is associated with a single invoice.

Student Name **Sivaranjani Prabasankar**

Section \_\_\_\_\_

- A store employs many employees.

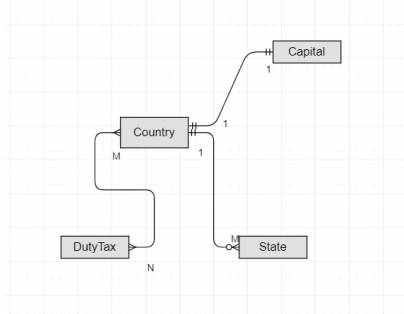
List FIVE other examples of business rules from various forms of businesses.

- All passenger at immigration must have valid passport.
- A student in college record must have unique student id.
- A Book can have one and only one ISBN.
- A Ship Date cannot be prior to an Order Date for any given order.
- An order must be placed in Point sale of currency.
- Each Patient can have one or many Patient Records.
- An Order must be associated with one and only one Customer.

## (2) (Types of Relationships)

Give an example of each of the three types of relationships: 1:1, 1:M, M: N  
Why is an M: N relationships not appropriate in a relational model?

- 1:1 relationship → COUNTRY: CAPITAL
- 1: Many relationship → COUNTRY: STATES
- Many: Many relationship → COUNTRY: DUTY TAX



A many to many (M: N) relationship is not supported directly in the relational environment. They are usually implemented by creating a new entity in 1:M relationships with the original entities. Because M: N relations

- ✗ Create a lot of redundancy, leading to errors - The same tuple occurs many times in a given table, so tuples and their attributes are repeated many times
- ✗ Occupying space
- ✗ Efficiency problems

## Part 3 Data Models / Analytics - Advanced Topics in Data Management

### (1) (Data Modeling)

Given the following group of tables, list FIVE written business rules that are reflected in the tables and their contents.

#### Artists

ArtistNum	LName	FName	MI
100	Jennings	Joyce	D

Student Name **Sivaranjani Prabasankar**

Section \_\_\_\_\_

101	Matthews	Shruti	F
102	Sims	Silas	
103	Dean	Daisy	H

**Galleries**

GalleryNum	GalleryName	ZipCode
22	Lawrence ArtWorks	60625
25	Cragin Corners	60651
27	Bronzeville Galleries	60616
28	Harlem HangUps	60634

**Paintings**

PaintNum	Title	ArtistNum	GalleryNum
100	Morning	100	22
101	Outer Space	100	25
102	The Poet	101	28
103	Jane	102	28

**Business Rules**

- 1) ArtistNum, GalleryNum and PaintNum should be
  - i. Integer,
  - ii. Unique and
  - iii. Not null
- 2) Each Painting must be associated with
  - i. only one Artist Number
  - ii. only one Gallery Number
- 3) Each Artist should have
  - i. First and Last name
  - ii. Middle Name is an optional element.
- 4) Each Gallery
  - i. may or may not associate with painting.
  - ii. can be associate with more than 1 painting.
- 5) Each Artist
  - i. may or may not associate with painting.
  - ii. can be associate with more than 1 painting.
- 6) Each Painting should have Title
- 7) Each Gallery must have gallery name.

**(2) (Data Analytics / Predictive Analytics: The Standard Deviation)**

In Oracle and SQL the standard deviation is used as an aggregate group function as well as an analytical function. The following data illustrates company sales for the first half of the year. For the data below, compute both the population standard deviation and the sample standard deviation.

**tblValues Table**

Student Name **Sivaranjani Prabasankar**

Section \_\_\_\_\_

index	month	values
1	January	\$20
2	February	\$26
3	March	\$28
4	April	\$31
5	May	\$33
6	June	\$30

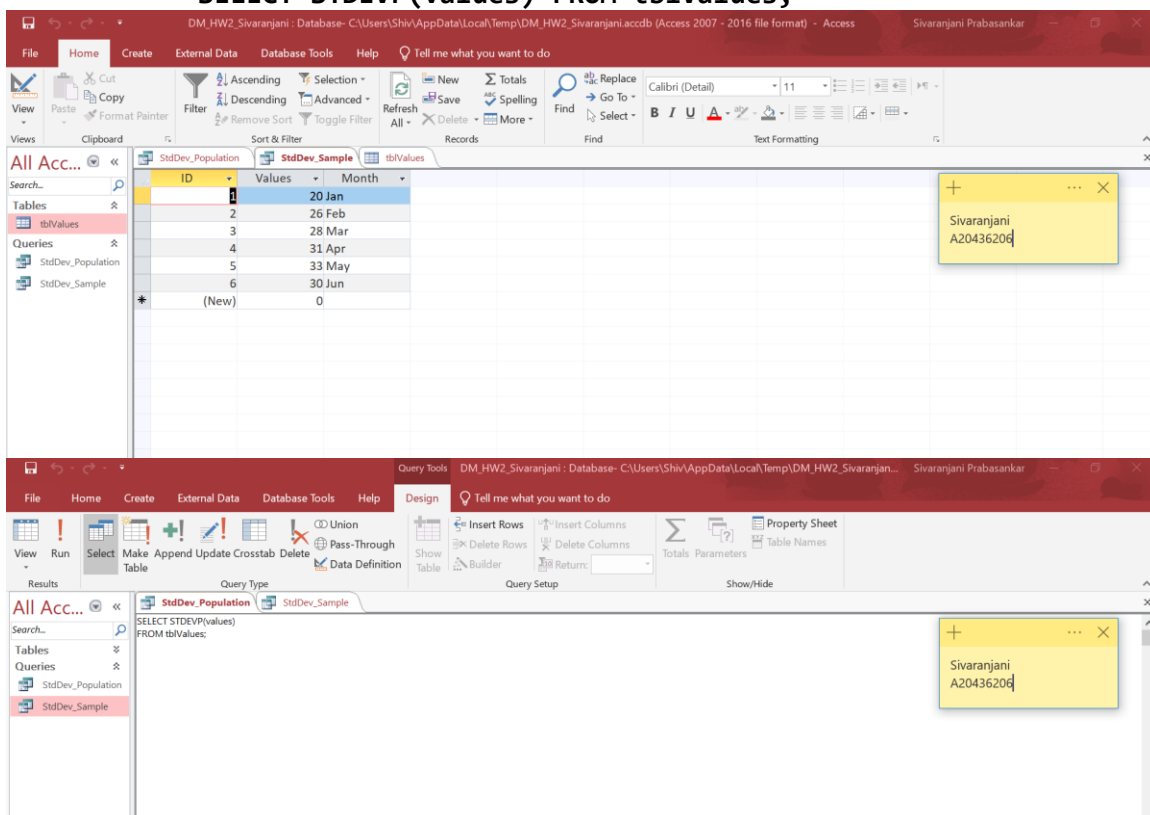
Hints: examine the MS Access SQL statements given below or use equivalent Oracle statements.

Sample Standard Deviation

**SELECT STDEV(values) FROM tblValues;**

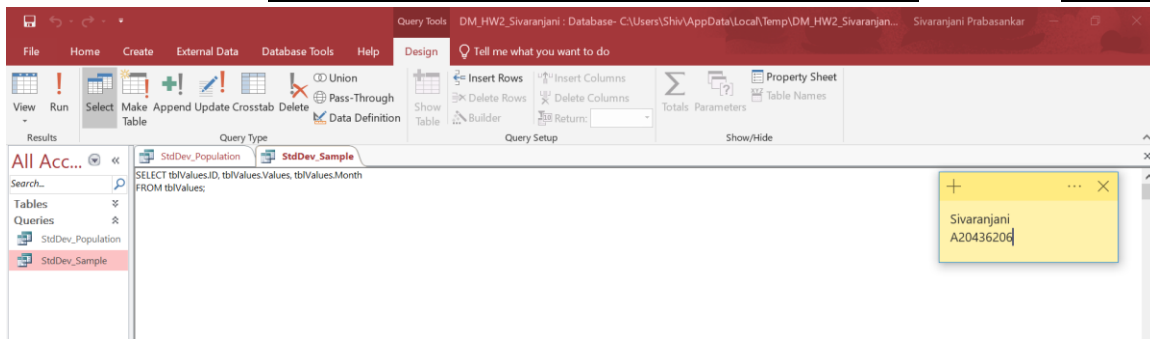
Population Standard Deviation

**SELECT STDEVP(values) FROM tblValues;**



Student Name **Sivaranjani Prabasankar**

Section \_\_\_\_\_



- Standard Deviation Sample: 4.60434577328853
  - Standard Deviation Population: 4.20317340430616.
- Please refer DB file attached for more details



## Part 4 Data Design Concepts - Advanced Topics in Data Management

### (1) (Database Models)

Compare and contrast the hierarchical and network database models.  
Which of these database models was historically implemented first?  
List some advantages and disadvantages of each of these models.  
Provide some examples of types of enterprises that would favor hierarchical database models as well as some types of enterprises that are best suited for network database models.

	Hierarchical Database Model	Network Database Model
<b>Relationship</b>	1: M	M: N
<b>Data Structure</b>	Parent - Child	Form of links & Pointers
	Single Parent	Single / Multi Parent
<b>Data Manipulation</b>	Independent query interface not applicable	Uses CODASYL (Conference on Data System Language)
<b>Duplication of Records</b>	High	Minimal
<b>Data Access</b>	Complex and Asymmetric	Complex and Symmetric
<b>Example</b>	Store – Department	Store – Users

#### Advantages of Hierarchical Model

- ✓ Promotes data sharing
- ✓ Parent/child relationship promotes conceptual simplicity and data integrity
- ✓ Database security is provided and enforced by DBMS
- ✓ Efficient with 1:M relationships

#### Dis-Advantages of Hierarchical Model

- ✗ Requires knowledge of physical data storage characteristics
- ✗ Navigational system requires knowledge of hierarchical path

Student Name **Sivaranjani Prabasankar**

Section \_\_\_\_\_

- ✗ Changes in structure require changes in all application programs
- ✗ Implementation limitations
- ✗ No data definition
- ✗ Lack of standards

**Advantages of Network Model**

- ✓ Conceptual simplicity
- ✓ Handles more relationship types
- ✓ Data access is flexible
- ✓ Data owner/member relationship promotes data integrity
- ✓ Conformance to standards
- ✓ Includes data definition language (DDL) and data manipulation language (DML)

**Dis-Advantages of Network Model**

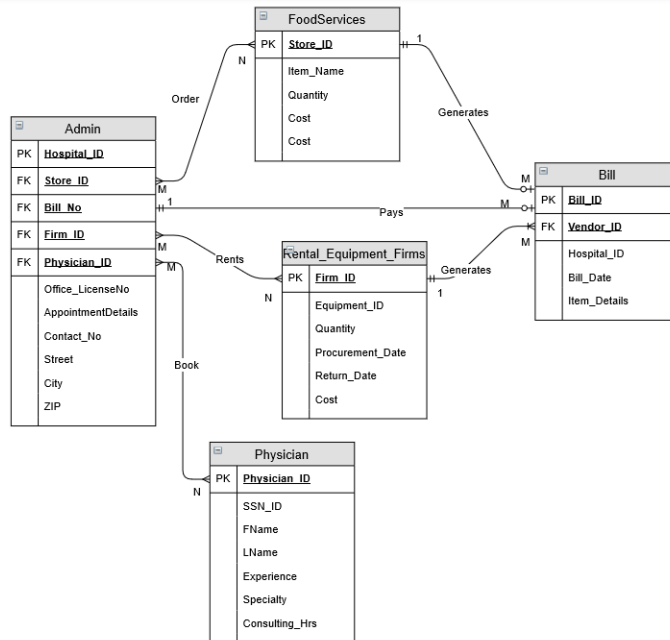
- ✗ System complexity limits efficiency
- ✗ Navigational system yields complex implementation, application development, and management
- ✗ Structural changes require changes in all application programs
- ✚ **Hierarchical model was the first database model created by IBM in the 1960s where Network model was devised by Charles Bachman in late 60's and implemented in 1980's.**
- ✚ **Enterprise Example:**
  - Hierarchal Model → ERP (Enterprise Resource Planning, CRM (Customer Relationship Model)
  - Network Model → SCM (Supply Chain Management)

**(2) (Data Models and e-Commerce)**

Design a Data Model for a database application on behalf of an Office Administrative Services enterprise. This type of enterprise forms the backbone of business operations across a variety of industries, such as physicians' offices, rental equipment firms, food services by providing them the day - to - day administrative services including record keeping, financial planning and billing.

Student Name **Sivaranjani Prabasankar**

Section \_\_\_\_\_



Administrative Services enterprise

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