

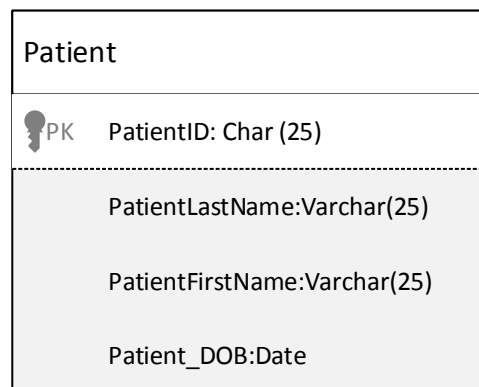
Submission Requirements

Create a MS Word document that includes your responses to all questions. Also, submit your working MS Access Database for questions 7-8.

1. (3 points) Identify appropriate attributes for the following entities in the personal healthcare context. Show your attributes for the three entities using the format in Figure 7.4 of UML for DB Design. (Note: You can also create the entities in Visio using the UML Database Notation template and paste into your submission document.)

The purpose of the data model is to capture all of the data needed for a person to measure and track their health over time.

- **Patient** is an entity that contains attributes that describe the person that is a patient, e.g, contact information. It will include one instance for every person that is using the database to keep track of their health related data.
- **HealthMeasure** is an entity that provides the list of health measures that are available from the system. It will include one instance for each thing a patient can measure on their own, e.g., weight, heart rate, blood pressure.
- **PatientMeasurements** is an entity that keeps track of every time a HealthMeasure is recorded for a patient. It will include many instances for each patient, e.g., one instance for each weight measurements recorded during a year, i.e., 52 instances if a person weighed weekly for one year. It will also include many instances for each instance of the HealthMeasure table, e.g., one instance for every time blood pressure was measured for a patient.



2. (3 points) Define the primary key for each of your entities/classes. To assign the primary key consider the rules for primary keys from the virtual lecture for assignment 1, most importantly that the attribute(s) must have a unique value for every instance of the entity/class. Indicate the primary keys using a PK notation. Define any foreign keys in your entities.

3. (3 points) Using UML DataBase Notation in Visio, create a diagram showing any relationships among your entities. (Use Figure 7.5 from UML for DB Design, appendix #1 and appendix #4 as examples of UML diagram notation). Paste this diagram into your submission document.
4. (3 points) Expand the UML diagram from question #3 by creating entities with attributes and keys (in the same format as question 1) that will allow a patient to keep track of any medications they take. Include at least two additional entities that you define/create to provide this capability. Note any assumptions. Extend the diagram you created in question 3. Paste this new diagram into your submission document.
5. (2 points) Convert the UML diagram (created in question #4) to a relational model. Note any assumptions. (Use appendix #2, #3 and #4 (below) as the basis of the expectation of the correct answer.)

Relational model format is:

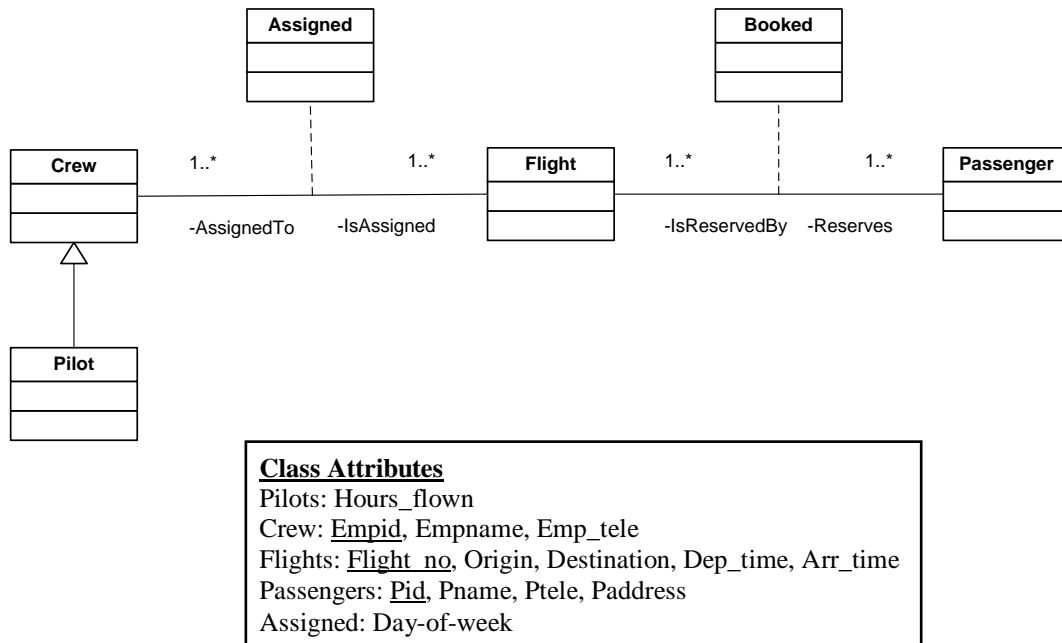
RelationName (Key Attribute *Foreign Key*, Attribute1, Attribute2, etc.)

6. (3 points) Compare your relations to the tables presented in Appendix #6. Briefly (a paragraph or so) describe any differences you observe in your submission document.
7. (3 points) Create the tables from appendix #5 in Access. Insert the instances given in appendix #6 into these tables. Submit your Access Database to show completion of this question and question 8.

8. (5 points) Using the tables from question #7 write simple queries to show the following:
- a. List the description, units, normal low range value, normal high range value, and health measure ID for all measures in the health measures table.
 - b. What is the average heart rate from the Patient_Measurements table?
 - c. How many different Patient Measurements (count) were made for patient id 1001?
 - d. Display the patient last name, first name, health measure description, date of the measurement, patient measurement value, and health measure units for any patients where their measure is greater than the high end of the normal range of the health measure. List these items for the patients alphabetically last name, then first name, then by measurement date.
 - e. Create a SQL statement named Measure_Units_View that consists of Health_Measure_ID, health measure description, and units from the Health_Measures_tbl. Use the Measure_Units_View query to list the measures that have units = "mmhg".

Appendix #1 – Class diagram (created using UML notation)

- **Airline Database ER Model**



Appendix #2 – Rules for Converting E/R model to Relational Model

- **Converting ER Models to Relational**
- **Entities:** All entities are converted to relations using the identifier for the entity as the primary key.
- **Relationships:**
 - M-N: Form a new relation with the primary keys of the related entity sets. These keys make up a composite key for the new relation. Add any attributes that may be connected to this relation.
 - 1-M: Add the primary key of entity(1) as a foreign key in entity(M).
 - (exception: if entity(1) is optional use rule for M-N)
 - 1-1: Add the primary key of one entity to the other as a foreign key (exception: If any entity is optional then add the primary key of the mandatory entity to the other. If both entities are optional use rule for M-N)
 - is-a/a kind of (ako)/generalization: Add the primary key of the super-class entity to the sub-class entity.

Appendix #3 – Converted Relational Model

Converted Relational Model

Pilots(Empid, Hours_flow)

Crew(Empid, Empname, Emp_tele)

Flights(Flight_no, Origin, Destination, Dep_time, Arr_time)

Passengers(Pid, Pname, Ptele, Paddress, *Flight_no*)

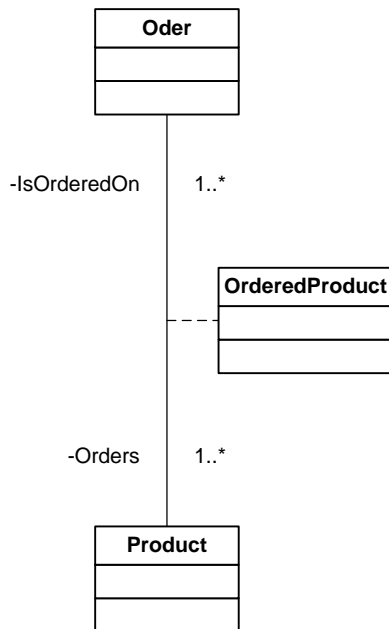
Assigned(Empid, Flight_no, Day-of-week)

- Underline – Primary Key
- Italics (or dashed line) – *Foreign Key*
- Underline Two or more attributes – Composite Key

Appendix #4 – UML Notation



A one-to-many relationship; One customer places many orders.



A many-to-many relationship; One order can order many products.

Appendix #5 – Pine Valley Clinic

The Pine Valley Clinic has the following entities (shown below). As manager of the clinic, you need to query your database to determine certain trends and relationships in various patient health measures. The relational model for the clinic lists all relevant relationships. The primary key fields are denoted in **bold letters**, and the foreign keys are denoted in *italics and underlined*.

Patient_tbl(**Patient_ID**, Patient_First_Name, Patient_Last_Name,
Patient_Address_Line_1, Patient_City, Patient_State, Patient_Postal_Code)

Health_Measures_tbl(**Health_Measure_ID**, Measure_Description, MeasureName,
Normal_Low_Range_Value, Normal_High_Range_Value, Measure_Units)

Patient_Measurements_tbl(**Patient_Measurement_Number**, *Patient_ID*,
Health_Measure_ID, Measurement_Date, Measured_Value)

Note that these relations do not need to be normalized any further.

Appendix #6 – Data for Pine Valley Clinic

Tables

Table Name: Patient_tbl

Patient_ID	Patient_First_Name	Patient_Last_Name	Patient_Address	City	State	Postal_Code
1001	Homer	Simpson	1355 S. Hines Blvd.	Gainesville	FL	32601
1002	Bart	Simpson	15145 S.W. 17th St.	Plano	TX	75094
1003	Marge	Simpson	1900 Allard Ave.	Albany	NY	12209
1004	Elmer	Fudd	1925 Beltline Rd.	Carteret	NJ	07008
1005	Porky	Pig	5595 Westcott Ct.	Sacramento	CA	94206
1006	Buggs	Bunny	325 Flatiron Dr.	Boulder	CO	80514
1007	Daffy	Duck	394 Rainbow Dr.	Seattle	WA	97954
1008	Daise	Duck	816 Peach Rd.	Santa Clara	CA	69615
1009	Mickey	Mouse	66789 College Ave	Carlisle	PA	17013
1010	Minnie	Mouse	4132 Main Street	Ogden	UT	84403

Table Name: Health_Measures_tbl

Health_Measure_ID	Description	Units	Normal Low	Normal High
1	LDL Cholesterol	mg/dL	40	130
2	HDL Cholesterol	mg/dL	65	130
3	Heart Rate	bpm	60	100
4	Blood Glucose	mg/dL	70	120
5	Blood pressure-systolic	mmHg	110	130
6	Blood pressure-diastolic	mmHg	75	85

Table Name: Patient_Measurements_tbl

Patient_Measurements_Number	Patient_ID	Health_Measure_ID	Measurement_Date	Measured_Value
119101	1001	1	07/05/11:13:39	140
119102	1001	2	07/05/11:13:39	60
119103	1001	4	07/05/11:13:39	125
119104	1002	3	07/05/11:13:50	104
119105	1003	3	07/05/11:14:20	90
119106	1004	5	07/05/11:14:39	119
119107	1004	6	07/05/11:14:39	84
119108	1005	4	07/05/11:15:01	180
119109	1006	4	07/06/11:09:31	105
119110	1006	1	07/06/11:09:31	145
119111	1006	2	07/06/11:09:31	100
119112	1007	1	07/06/11:10:01	170
119113	1007	2	07/06/11: 10:01	60
119114	1008	3	07/06/11:10:28	66
119115	1008	4	07/06/11: 11:28	165
119116	1009	5	07/06/11: 11:28	95
119117	1009	6	07/06/11: 11:28	70
119118	1001	1	07/09/11:13:39	140
119119	1001	2	07/09/11:13:39	60
119120	1001	4	07/09/11:13:39	125
119121	1002	3	07/09/11:13:50	104
119122	1002	4	07/09/11:14:20	100
119123	1004	6	07/09/11:14:39	119
119124	1004	8	07/09/11:14:39	84
119125	1005	4	07/09/11:15:01	180
119126	1006	4	07/09/11:09:31	105
119127	1006	5	07/09/11:09:31	145
119128	1006	7	07/09/11:09:31	100
119129	1007	1	07/09/11:10:01	170
119130	1007	2	07/09/11: 10:01	60