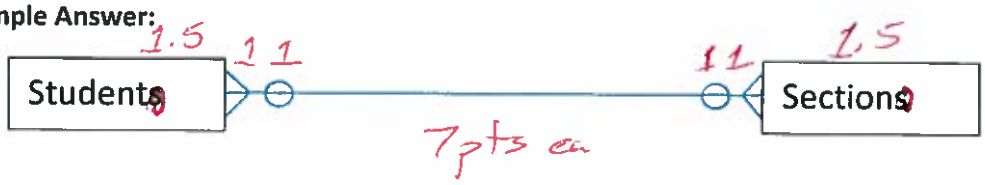
M&IS 64082 NAME Key

Entity-Relationship Diagramming In-Class Practicum (100 points total)

1. (28 points) The following set of brief scenarios describes the relationships between various entity classes. Draw the entity classes (only show entity name – no attributes or identifiers) and the relationship making sure to add notation (use crow's foot notation) that shows reasonable minimum and maximum cardinalities given the implied scenario. All scenarios will only have ***one*** relationship. The one relationship may be between a *maximum* of two entity classes (binary) or between an entity class and itself (recursive). *If you make any assumptions beyond what is stated be sure to note that in your answer. Since we are not concerned with identifiers at this point, notation to designate the relationship as ID-Dependent (or not) is not necessary.*

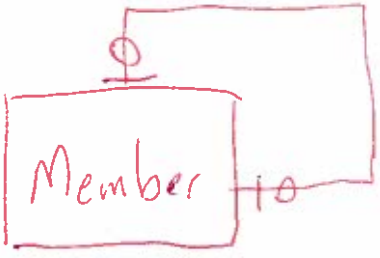
Example: *Students at a university enroll in sections of courses. Which students are enrolled in which course sections needs to be stored. Students can take no sections or may take any number of sections. Each section has anywhere from zero to an unlimited number of students.*

Example Answer:



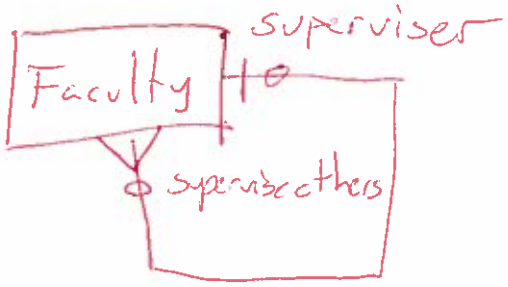
a. A firm sends shipments of items to their customers. Data on each shipment and the items contained in the shipment must be stored. A shipment contains at least one and possibly many items. Items are not tracked individually (example: candy bars), so each item can be in zero shipments or in many shipments.

b. A social club needs to store basic data about each of the club's members. The information that the database should be able to store includes any marital relationships between club members. The local laws limit individuals from being married to more than one individual. There is no requirement that club members are married.

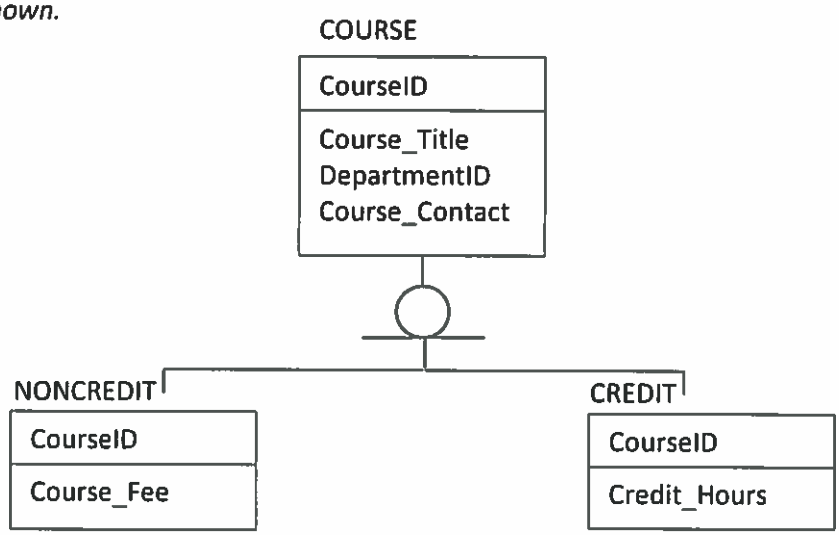


c. A database is being designed to hold data about food recipes. They also maintain a list of basic ingredients - 'basic' ingredients are those that are commonly used in many recipes such as salt, butter, ground beef, etc. Ingredients other than these basic ingredients may also be in a recipe – sea urchin, Fritos™, Peruvian pisco, etc. Each recipe may require any number of basic ingredients and it is possible that a recipe contains no ingredients that are in the 'basic ingredients' list. The ingredients in the database can belong in many recipes but some of the less common ingredients may not appear in any current recipes.

d. A database holds data about a university's faculty members. The hierarchy of authority is complex for faculty. Some faculty may be supervised by area directors, department chairs, deans, etc. (all these are also considered to be faculty). Therefore, the faculty member's immediate supervisor needs to be retrievable from the database. Each faculty member oversees zero to many other faculty members and each faculty member are supervised by zero or one immediate supervisor.



2. (30 points) Use only the information that you can derive from the diagram below to determine which of the statements below it are true or false. Read each statement very carefully as subtle variations can often make a large difference. *Assume the diagram below is correct and everything that should be shown is shown.*



Circle Answer (4 points each):

True / False **a)** There can be, at *most*, two **logical** subtypes of the supertype (COURSE) in this example.

True / False **b)** There are, at *least*, two **logical** subtypes of the supertype (COURSE) in this example.

True / False **c)** A record in the supertype (COURSE) *must* have a corresponding record in *each* of the subtypes shown (NONCREDIT, CREDIT).

True / False **d)** A record in the supertype (COURSE) *could* have corresponding records simultaneously in *both* of the subtypes shown (NONCREDIT, CREDIT).

True / False **e)** A record in the subtype (CREDIT) *must* have *a corresponding record* in the supertype (COURSE).

True / False **f)** A record in the subtype (CREDIT) *may* have *more than one corresponding record* in the supertype (COURSE).

g) (short answer – 6 points) If I disclose that there is a Boolean subtype discriminator called 'isCredit' in the supertype (do ***not*** go back and use this information in parts a-f) and it is able to discriminate between subtypes properly for this database, what does this tell you about the number of logical subtypes there are in this supertype? Would this change your answer for a and b above? Briefly explain. Again, do not actually go back and change your answer! Parts a-f should be answered ***without*** the information on the discriminator.

Number of logical subtypes: A single Boolean discriminator can only take on two values (True, False). Therefore it can discriminate between two logical subtypes, at most.

a) True (changes)

b) True (does not change)

3. (42 points)

This problem was inspired by a real-world database problem found in the news: *Rental-owner database seen as solution to problem properties.*

A municipality (city) is creating a new database to help manage problems with rental properties within the city. They need to keep track of basic information (description, address, etc.) on the properties being rented within the city. They will store information on two types of rental properties, houses and apartments. These have substantial overlap in the data being stored about them but each also has a couple of attributes that are specific to only that rental property type. Additionally, basic information is maintained on each property owner/landlord. One of the primary purposes of the database is to allow owners to be easier to find when needed; hence, the database should be able to store any number of phone numbers and mailing addresses that are or have been related to the property owners. Property owners and properties are related to each other in that an owner can have one to many properties and each property can be owned by one to many property owners. The date the property was purchased must also be stored. Finally, each property owner will receive a monthly statement listing the properties that the city considers them responsible for. Each owner would have zero to many statements (depending on how many statement cycles they have been in the database for) and each statement is for one and only one property owner. Each statement will contain one or more line items. Each line item is associated with one and only one rental property. Each property can appear on zero to many line items.

Draw an E-R diagram to represent this database.

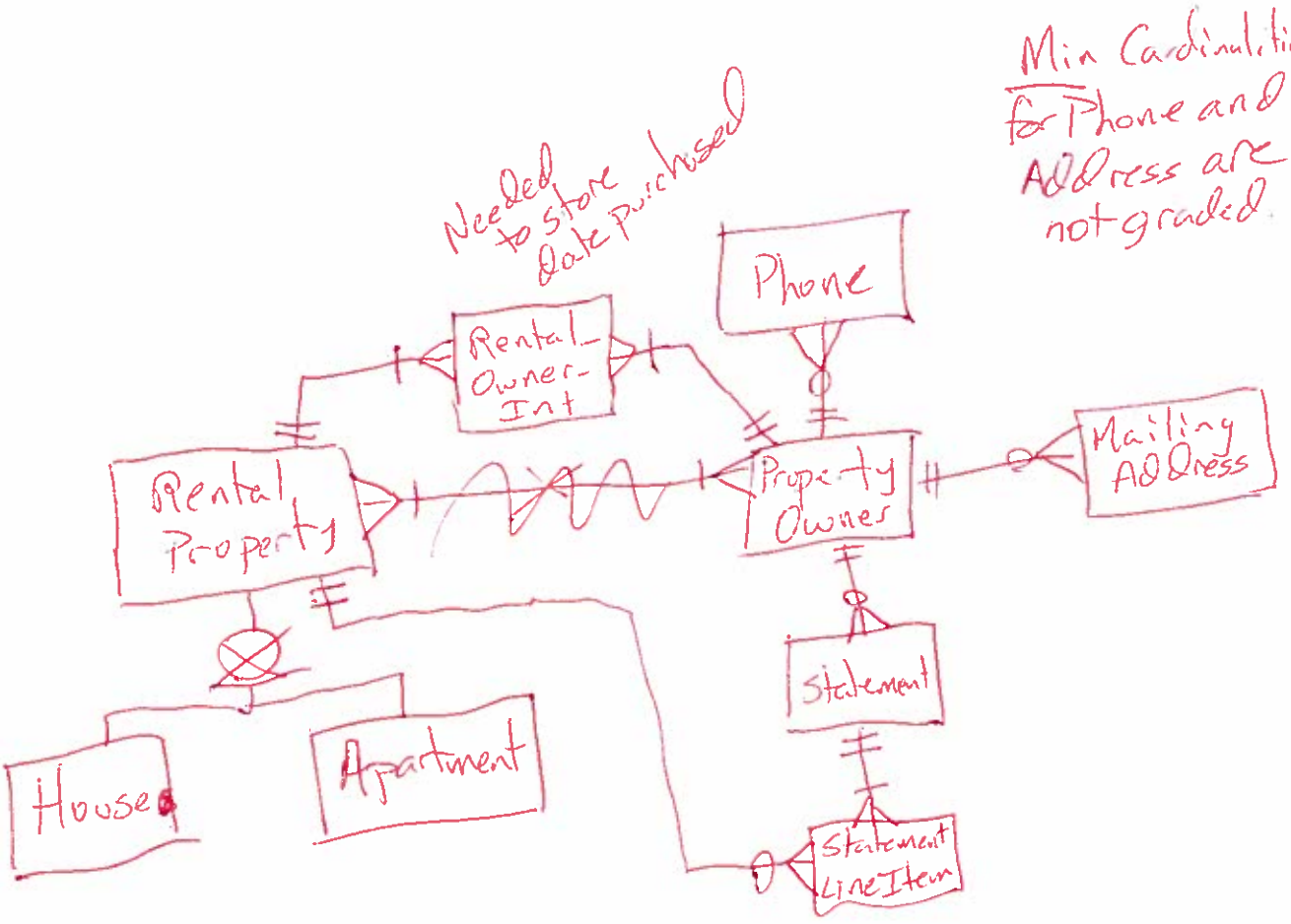
- If necessary, create an association pattern only if a relationship needs additional attributes other than foreign keys.
- Show all minimum and maximum cardinalities.
- Do not show attributes for entities. Some attributes are given as examples in the problem so that you understand what is being stored. These do not need to be shown on diagram.
- If there is information that would lead you to believe an attribute discussed will be multi-valued, be certain you add modifications that would eliminate this as a problem.
- List any non-obvious assumptions you made.
- *ID-Dependent vs non-ID-Dependent relationships do not have to be distinguished for this diagram (will not be a grading point).*

Draw your diagram on the next page.

You may remove the answer page (next page) to make things easier. If you choose to do this you must write your name on the separate sheet.

NAME_____

Solution to # 3:



Entities (9):	1/ea	9
Has-A Relationships (6):	2/ea	12
Is-A Relationship (1):	8/ea	8
Cardinalities (20):	.25/ea	5
Assoc. Entity (1):	8/ea	8
		42