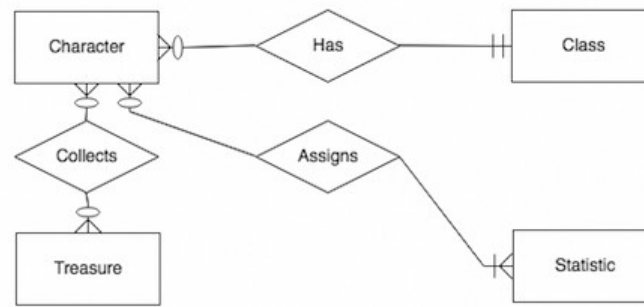


Jack Wilburn
Assignment 3

1. Identify the primary and foreign key(s) of each table in this database; if any is a composite key, say so.
 - CHARACTER
 - PK
 - CHAR_NUM
 - FK
 - CLASS_NUM
 - CLASS
 - PK
 - CLASS_NUM
 - FK
 - *None*
 - TREASURE
 - PK
 - TRSR_NUM
 - FK
 - *None*
 - CHARACTER_TREASURE
 - PK
 - (CHAR_NUM, TRSR_NUM) – This is a composite key, a key composed of 2 fields.
 - FK
 - CHAR_NUM, TRSR_NUM
 - STATISTIC
 - PK
 - (CHAR_NUM, STAT_NAME) – This is a composite key, a key composed of 2 fields.
 - FK
 - CHAR_NUM
2. Identify all relationships between entities in this database and classify their connectivity (1:M, 1:1, or M:N).
 - Entities
 - Character, Class, Treasure, Statistic
 - Relationships

- Each character has one class but each class may have many characters (1:M)
 - Each character can collect many treasures and each treasure can be collected by many characters (M:N)
 - Each character can assign many statistics and each statistic can be assigned by many characters (M:N)
3. Create an ERD for the database. Make sure your ERD reflects all the relationships you picked out above.



4. Answer the following questions about the data in this database.
- Who is highest in level? What level and class is this character?
 - Fizban the Fabulous has the highest level. He is a level 25 mage.
 - Which character wears a toupee?
 - Both Fizban the Fabulous and Raistlin Majere own the toupee of great magnificence so presumably they both wear it.
 - What is the class of the character with the highest strength (STR)?
 - Raistlin Majere has the highest strength with 11 STR points
 - Who has the most treasure? What is their treasure's total value?
 - Tasslehoff Burrfoot has the most treasure with 15 items. Their treasure is worth 2610.
5. For the CHARACTER table, list *all possible* non-composite candidate keys given the data here. Given your best judgement, which of these are not likely to be candidate keys in practice, i.e. as more data is added to the database? Fully explain your answer.
- Candidate keys
 - CHAR_NUM, CHAR_NAME, CHAR_LEVEL
 - Most probable choice
 - The most probable choice for primary key in this table is CHAR_NUM since we can create character numbers infinitely without having any problems with uniqueness. If we were to use CHAR_NAME we might run into issues as we add new characters. If 2 characters had the same name we'd lose uniqueness in this field and it would no longer be a superkey and thus couldn't be a primary key. The same issues crops up if we use CHAR_LEVEL. If a character levels up and

becomes the same level as another character then we would lose uniqueness and thus this field wouldn't be a superkey and thus not a primary key.

6. Write down the relations (i.e., tables — don't forget the column names) resulting from each of the relational algebra expressions.

○ $\sigma_{(charLevel > 15)}(character)$

CHAR_NUM	CHAR_NAME	CHAR_LEVEL	CLASS_NUM
422	Raistlin Majere	20	4
	Fizban the		
664	Fabulous	25	4
645	Kitiara Majere	18	1

○ $\pi_{classMainStat}(class)$

CLASS_MAIN _STAT
STR
CON
DEX
INT
WIS
WIS
DEX
CHA

○ $\pi_{(character1.charName, character2.charName)}(\sigma_{(character1.charLevel < character2.charLevel)}(character \times character))$

CHARACTER1. CHAR_NAME	CHARACTER2. CHAR_NAME
	Fizban the
Raistlin Majere	Fabulous
Sturm Brightblade	Raistlin Majere
	Fizban the
Sturm Brightblade	Fabulous
Sturm Brightblade	Kitiara Majere
Tasslehoff Burrfoot	Raistlin Majere
	Fizban the
Tasslehoff Burrfoot	Fabulous
Tasslehoff Burrfoot	Sturm Brightblade
Tasslehoff Burrfoot	Kitiara Majere
Kitiara Majere	Raistlin Majere
	Fizban the
Kitiara Majere	Fabulous

○ $\pi_{(charName, className, classMainStat)}(character \bowtie class)$

CHAR_NAME	CLASS_NAME	CLASS_MAIN_STAT
Raistlin Majere	Mage	INT
Fizban the Fabulous	Mage	INT
Sturm Brightblade	Paladin	CON
Tasslehoff Burrfoot	Thief	DEX
Kitiara Majere	Fighter	STR

- $\pi_{(statName, statValue)}(\sigma_{(charName=Raistlin Majere)})(character \bowtie statistic)$

STAT_NAME	STAT_VALUE
CON	13
DEX	13
CHA	11
STR	11
INT	4
WIS	8

7. Write relational algebra to pull the following information

- The name and level of each character
 - $\pi_{(charName, charLevel)}(character)$
- The name of every character whose class is mage
 - $\sigma_{(classNum=4)}(\pi_{(charName, classNum)}(character))$
- For every treasure possessed by a character: the name of the treasure, quantity and name of who holds it.
 - $\pi_{(tsrName, charTrsrQty, charName)}(characterTreasure \bowtie treasure \bowtie character)$
- The name of every treasure not possessed by any character
 - $\pi_{(tsrName)}((\pi_{(tsrNum)}(treasure)) - (\pi_{(tsrNum)}(characterTreasure))) \bowtie (treasure)$

8. Suppose we were going to add new entities, relationships, and/or attributes to the database in light of the following business rules:

- Monsters have names and hit points as well as levels and classes like characters do. A given treasure can be dropped by many monsters and a monster can drop many treasures. Monsters are found in dungeons; a dungeon has a recommended level and (of course) many monsters. A monster can appear in many dungeons. Every dungeon has a boss monster that appears only in that dungeon.
- At any given time each character is on a single quest, which can be shared among multiple characters. A quest has a reward — some collection of one or more treasures — and takes place in a dungeon. A dungeon can play host to many quests.
 - What new entities will need to be added to the database? As described by the business rules, what attributes (including PKs and FKs) will they have?
 - Monster
 - PK: MONS_NUM
 - Other attributes: MONS_NAME, MONS_HIT_POINTS, MONS_LEVEL, CLASS_NUM(FK)
 - Dungeon
 - PK: DUNG_NUM
 - Other attributes: DUNG_REC_LEVEL, DUNG_BOSS

- Quest
 - PK: QUEST_NUM
 - Other attributes: DUNG_NUM(FK)
- There would also be linking tables called QUEST_TREASURE, DUNGEON_MONSTER
- What new attributes (including PKs and FKs), if any, will need to be added to existing entities?
 - Character:
 - Add FK: QUEST_NUM to track quests
- What new relationships will be introduced? Be specific as to the meaning of the relationship, the entities it involves, and whether it is 1:1, 1:M, or M:N (and which entity is which).
 - A given treasure can be dropped by many monsters and a monster can drop many treasures (M:N)
 - A dungeon has ... many monsters. A monster can appear in many dungeons. (M:N)
 - Every dungeon has a boss monster that appears only in that dungeon. (1:1)
 - At any given time each character is on a single quest, which can be shared among multiple characters. (1:M)
 - A quest has a reward — some collection of one or more treasures. Conceivably these can be reused in multiple loot drops (M:N)
 - A quest takes place in a dungeon. A dungeon can play host to many quests. (1:M)
- Draw an updated ERD for the new version of the database. This ERD should include everything that was in your answer for #3 as well as the new entities and relationships.

