Week4: First Tutorial

- Reminder: access for Access
- Creating a database in Access
- Attributes
- Documenting a database
- DataSheet vs design view
- Creating graphical (data entry) forms
- Primary keys
- Foreign keys and multiplicity

Reminder

- Access may not be available via the student version of Office365
- You can run access via the 203 lab computers and likely from most any public campus lab.
  - If a particular lab doesn't have Access installed then you should of course try another lab unless it's the 203 lab ;)
- Typical students find the use of a database (such as Access) significantly more challenging than a spreadsheet.
  - You should be continuously learning the material as it is being taught (don't fall behind your studying/understanding more than a week or two).
  - Don't start the assignment at the last minute (even if you did this for the first assignment)
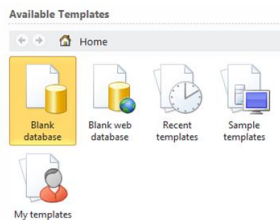
Author: James Tam

Some Resources

- Course website (of course!)
- Main course text book ("Computer Science Chop Suey" and not the VBA programming book)
- Microsoft (there's some tutorial videos such as the one below):
  - https://support.office.com/en-us/article/Design-and-build-tables-for-a-database-Access-basics-part-1-bff6e7b2-3055-419b-8751-1ade558ea31f?ui=en-US&rs=en-US&ad=US

Creating A New Access Database

- After starting Access
- Create a blank database

- As Tam indicated in lecture: switch the default view from 'DataSheet' to 'Design' view

The General Tab

- The contents of the 'general tab' (will vary depending upon the type of data specified for an attribute.
- Example:

General	Lookup
Field Size	9
Format	
Input Mask	>\ELL\-009
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Allow Zero Length	Yes
Indexed	Yes (No Duplicates)
Unicode Compression	No
IME Mode	No Control
IME Sentence Mode	None
Smart Tags	

Author: James Tam

General Tab: Common Properties

| General	Lookup
Field Size	9
Format	
Input Mask	>\ELL\-009
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Allow Zero Length	Yes
Indexed	Yes (No Duplicates)
Unicode Compression	No
IME Mode	No Control
IME Sentence Mode	None
Smart Tags	

- Field size: for text it's the maximum number of characters allowed for an attribute.
- Default value: it's the starting value seen in the datasheet view before the user enters information for a record
- Required: setting this property to 'yes' forces the user to enter a value for this attribute
  – When set to yes the field cannot be left blank)
- Text align: similar to the horizontal alignment option in Excel and the most commonly selected options allows data to be left, right or center aligned.
- Input mask, validation rule and validation text (error handling and prevention) : are properties that are very useful for specifying the format and type of information that can be entered for an attribute. More on this later.

Author: James Tam

Some Data Types For The Attributes

Data Type
AutoNumber
Text
Memo
Number
Date/Time
Currency
AutoNumber
Yes/No
OLE Object
Hyperlink
Attachment
Calculated
Lookup Wizard...

- Text
- Number
- Date/Time
- Currency
- AutoNumber
- Attachment: can be used to store images in an attribute (e.g. identification picture for students or employees)
- Calculated: deriving an attribute from other attributes in a table (not what students are supposed to do for A3 but still useful)
- Lookup Wizard: sets up primary-foreign key relationship to ensure data integrity (more on this later)
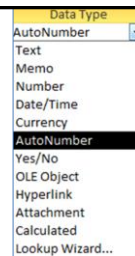
Author: James Tam


Documenting Attributes

- (From the A2 description):
  - For this assignment every time that there are restrictions on the format of the data (e.g., postal code must be in a specific pattern of alphanumeric and a dash) or range of data (e.g., no negatives) the description field should document the requirement.
  - Example from the database to be covered in tutorial

Employees

Field Name	Data Type	Description
EmployeeNumber	Text	Format: <3 capital letters - first letter will always be E>-<2 or 3 digits)
LastName	Text	
FirstName	Text	
Address	Text	
City	Text	
Province	Text	
HomePhone	Text	Format: Open bracket, Three digits, Closing bracket, Three Digits, Dash, Four Digits
BirthDate	Date/Time	Format (numerical): Month, Day, Year (Date must be between Jan 1 1900 and Oct 31 1989)
PayRate	Currency	Hourly rate in the range of $10 - $100

Author: James Tam

10/13/2017

Back To The DataSheet View

- After you have defined all the attributes for the data (as well fulfilled other requirements such as error prevention/handing, documentation) you will need to enter actual data e.g. once you define a `Students` table you will then need to enter actual student records into the database.
- Data entry can occur once you have switched from Design back the default DataSheet view.
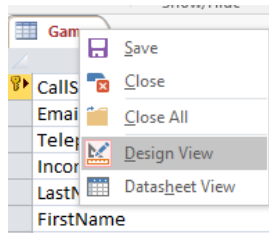
Author: James Tam

DataSheet View

- The database is shown in table form
  - Records are along the row: each row in this example is an instance of an Employee
  - Attributes are along the columns: pieces of information that is tracked for each record

Attributes

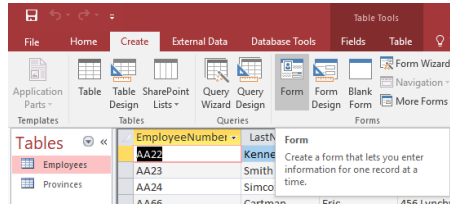| EmployeeNumber	LastName	FirstName	Address
AC50	Wolf	Claudia	66 Twisted View
AC999	Simpson	Homer	59 Evergreen Terrac
AD99	Williams	Amanda	25 Rodeo Drive
ZZ49	Edgar	Maureen	300, Lockinvar Road
*			

Records

Row to enter a new record

Author: James Tam

Create A Graphical (Data Entry) Form
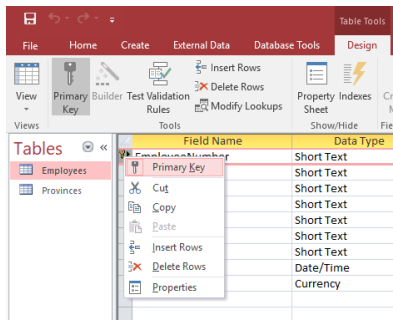
- Create->Form

- (A new form to enter information for records)

Author: James Tam

Defining Primary Keys

- Design View: Right-click on the attribute

Author: James Tam

What Is A Primary Key

- Uniquely identify one record from another
- Can consist of one attributes or multiple attributes (latter is a composite primary key)
- Must be 100% guaranteed to be unique
  - i.e. if there is 1 one in a billion chance where there are duplicate data in the attribute(s) then the attributes(s) cannot be used as a primary key
- If a primary key cannot be formed from the existing attributes then invent one e.g. Social Security Number, Student ID #
- Also Access will automatically generate an attribute and designate it as the primary key whenever a new table is created.

Field Name	Data Type
ID	AutoNumber

Auto number: a sequence starting at 1 and counting up by 1 i.e. 1,2,3...

Author: James Tam

Designating A Composite Primary Key

- Press shift to select multiple attributes and then right click

Field Name	Data Type
ID	AutoNumber
f1	Short Text
f2	Short Text

Author: James Tam

Foreign Key

- An Attribute in one table that refers to instances of attributes in another table.
- Example:
  - The 'province' attribute in the Employees table refers to the 'province code' attribute of the Provinces table

EmployeeNumber ▾	LastName ▾	FirstName ▾	Address ▾	City ▾	Province ▾	
AA22	Kennedy	Leon	808, 4900 Wildman A	Racoon City	Alberta	
AA23	Smith	John	123 Peanut Lane	Calgary	Alberta	
AA24	Simcox	Cole	311 Ocean View Driv	Vancouver	British Columb	
AA66	Cartman	Eric	456 Lynchview Road	Southpark	Alberta	

ProvinceCode	Abbreviation ▾	Click to Add ▾
⊞ Alberta	AB	
⊞ British Columbia	BC	

Author: James Tam

Multiplicity

- Specifies relationships between tables
- The multiplicity specifies the number of instances that participate in the relationship
  - 1 to 1
  - 1 to Many (or 1:*)
  - Many to many (or *:*)
- An example illustrating relationship types:
  - https://msdn.microsoft.com/library/ee382826(v=vs.100).aspx

Author: James Tam

One To One

- Rare but possible
- Typically use to split up a large table
  - E.g, Employee:SINOr 1:1 may exist for special cases
  - e.g. 1 to many for employees:departments,
 - 1:1 is for department head:department

One To Many

- Publisher: Book
  - 1:*
  - Primary key is on the 'one' side
  - Foreign key is on the 'many side'

Many To Many

- Publishers: can have many authors, Authors can publish with multiple publishers (many to many)
- Create a connector table in the example below (min attributes includes primary keys of both tables)
  - A new row created in the table as a particular author publishes with a particular publisher
  - *:* relationship becomes two 1:* relationships
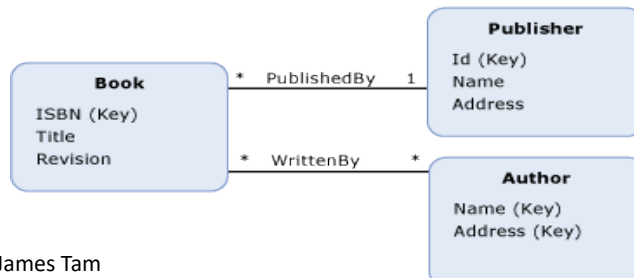
Author: James Tam
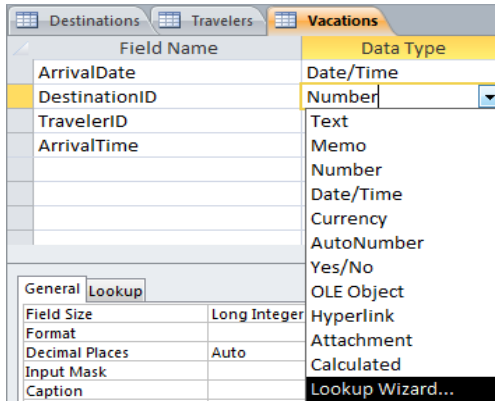
One To Many: Tutorial Example Again

- Foreign-Primary key relationship between Provinces and Employees (each employee lives in one province; a province can have many employees living there)
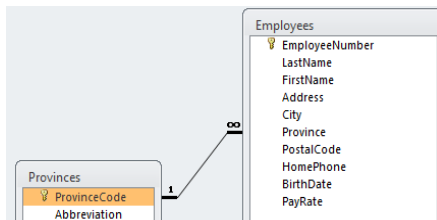
Author: James Tam

Setting Up The Foreign:Primary Key Relationship

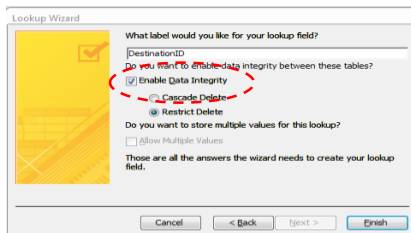- Start: specify the data type as 'Lookup' (via the "Lookup Wizard")

- Full set of steps in the lecture notes

Author: James Tam

Relationships: Important!

- Make sure you 'ensure referential integrity'

- (Ensuring this integrity prevents errors)
  - Only a valid province can be selected from the Employees table

Author: James Tam

Week4: Second Tutorial

- Input masks for data prevention
- Entity-Relation diagrams (ERDs)
- Student exercises

Dealing With Errors

- Error prevention: preventing erroneous data from being entered. Use input masks
- Error handling: provide a helpful error message after the erroneous data has been entered. Use a validation rule.

Author: James Tam

Defining An Input Mask

- Switch to DesignView
- An input mask can be defined for "Short text' data types

Field Name	Data Type
EmployeeNumber	Short Text
LastName	Short Text
FirstName	Short Text
Address	Short Text
City	Short Text
Province	Short Text
HomePhone	Short Text
BirthDate	Date/Time
PayRate	Currency

Field Properties

General | Lookup

Field Size	9
Format	
Input Mask	

Specifying an Input Mask here will put restrictions on the type and format of data that can be entered in the DataSheet view

Author: James Tam

General | Lookup

Field Size	9
Format	
Input Mask	009

Input Mask: Allowing **Only Numeric** Input

- **0**: a digit is mandatory
- **9**: a digit is optional

- Examples:

Input mask	Effect
0	Exactly one digit must be entered
99	Up to two digits may be entered
009	Two to three digits must be entered

Author: James Tam

Input Mask: Allowing **Only Alphabetic** Input

- **L**: an alphabetic character must be entered
- **?**: an alphabetic character may be entered

- Examples:

Input mask	Effect
L	Exactly one alpha must be entered
??	Up to two alphabetic characters may be entered
LLLL	Exactly three alphabetic characters must be entered
LLL??	3 – 5 alphabetic characters must be entered

Author: James Tam

Note: Input Masks Can Be Mixed

- Example input: the user must enter 1 alpha followed by 1 numeric and then 1 alpha
- Input Mask: L0L Ha-ha!

Author: James Tam

Other **Input Masks**

Input mask	Effect
A	Exactly one alpha or digit must be entered
a	Exactly one alpha or digit may be entered
#	Digit, space, plus or minus sign may be entered
>	Input that follows is capitalized
<	Input that follows converted to lower case

Case conversion examples

Input Mask	> LL

User must enter two alpha which are automatically capitalized

Format	
Input Mask	< LLL
Caption	

User must enter three alpha which are automatically converted to lower case

Author: James Tam

Requiring Characters To Appear During Data Entry

- Can be used to specify the format and length of information
- Example: an serial number must be in this format
  - *<2 alpha>* & *<3 digits>*
  - Input mask: LL\&000
  - The character that follows the dash will appear during data entry but as specified in the lecture notes this character will not be stored in the database

2 inputs   3 inputs
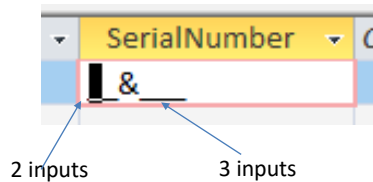
Author: James Tam

Reminder: From Lecture Notes

- The character immediately following the 'slash' appears during data entry in the DataSheet view but is not stored in the database.

Data entry

SerialNumber	▼
nx&010	

Actual data stored

	A	B	C	D	E
	ID	Cap	Lower	SerialNumber	
	1	AB	aaa	nx010	

Author: James Tam

Input Mask Examples: Slash (TA Goes Over)

- **Example 1:**
  - **Required format**: *<3 capital letters - first letter will always be E>-<2 or 3 digits*)
  - **Example**: EAA-23

- **Example 2:**
  - **Required format**: {*<Two digits>*} *<2 alpha>_ <Four Digits>*
  - **Example**: {23}ab_7777
- **Example 3 (Province code)**
  - **Required format**: Two alphabetic letters capitalize
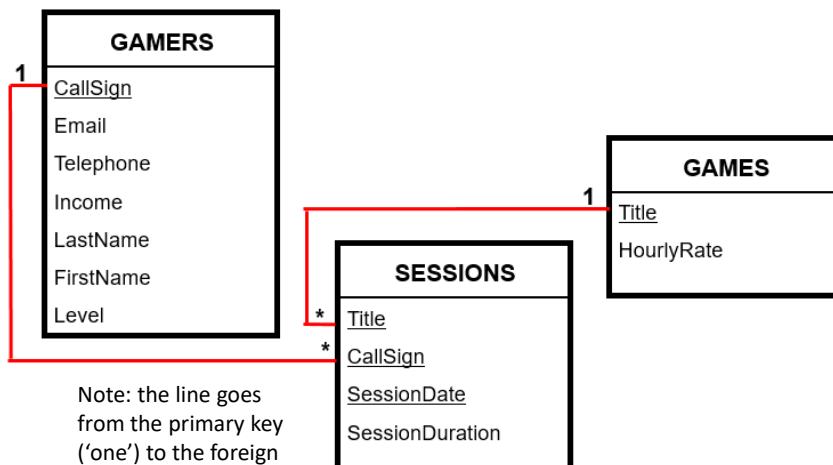 - **Example**: AB

Author: James Tam

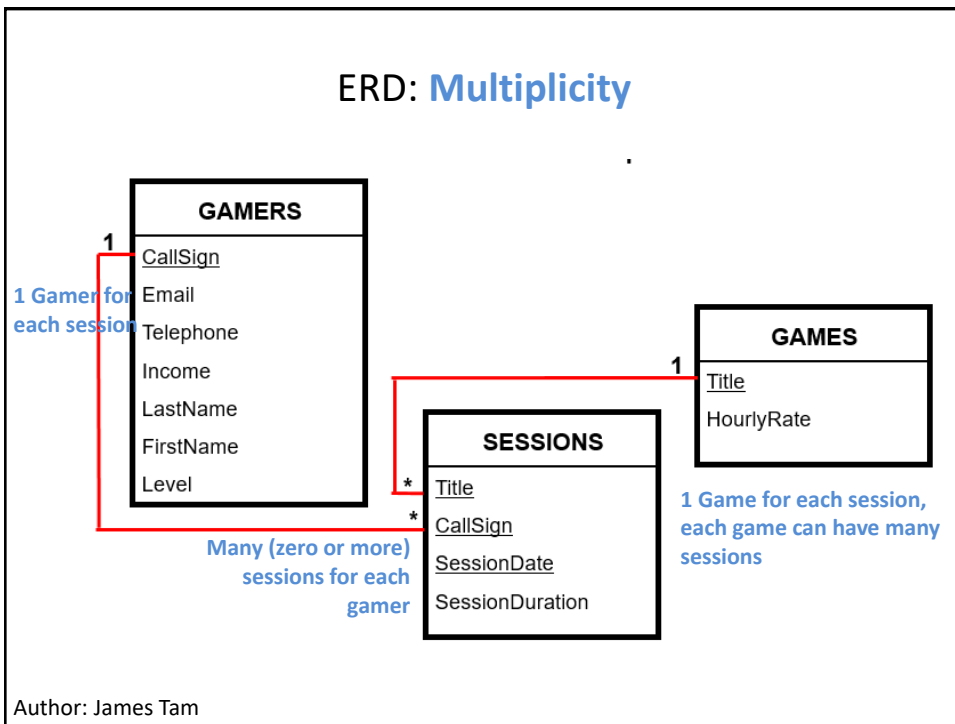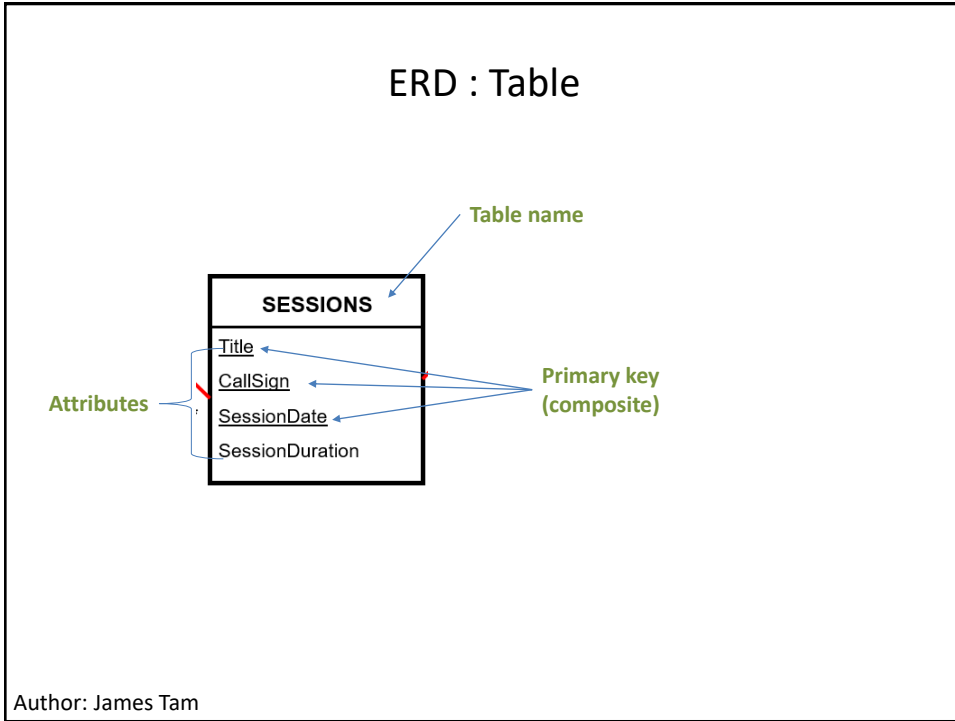## Input Mask Exercises: Students Do As Tutorial Exercise

- **Exercise 1**: The 'foot' component of height e.g. 5' (I'm five feet tall)
- **Exercise 2**: Inches component of height e.g. 8.5"
- **Exercise 3**: Visa number
  - Format: *4 digits<SP>4 digits<SP>4 digits<SP>4 digits*
- **Exercise 4**: Credit card expiry number
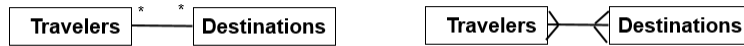 - *1 or 2 digits<forward slash>2 digits*

Author: James Tam

ERD Database Representations (Lecture Example)

.

Note: the line goes from the primary key ('one') to the foreign key ('many')

Author: James Tam

ERD : Table

Table name

SESSIONS

Title
CallSign
SessionDate
SessionDuration

Attributes

Primary key (composite)

ERD: **Multiplicity**

GAMERS

1 CallSign
Email
Telephone
Income
LastName
FirstName
Level

1 Gamer for each session

GAMES

1 Title
HourlyRate

SESSIONS

* Title
* CallSign
SessionDate
SessionDuration

Many (zero or more) sessions for each gamer

1 Game for each session, each game can have many sessions

Aceptable 'Many' Representation

| Travelers | * * | Destinations |

| Travelers >——< Destinations |

Not A Valid ERD

- No credit awarded if this format is submitted for the assignment.
- The notation is not valid.
  - Also this isn't a class to evaluate your ability to make "screen grabs" >)

Provinces
- ProvinceCode
- Abbreviation

Employees
- EmployeeNumber
- LastName
- FirstName
- Address
- City
- Province
- HomePhone
- BirthDate
- PayRate