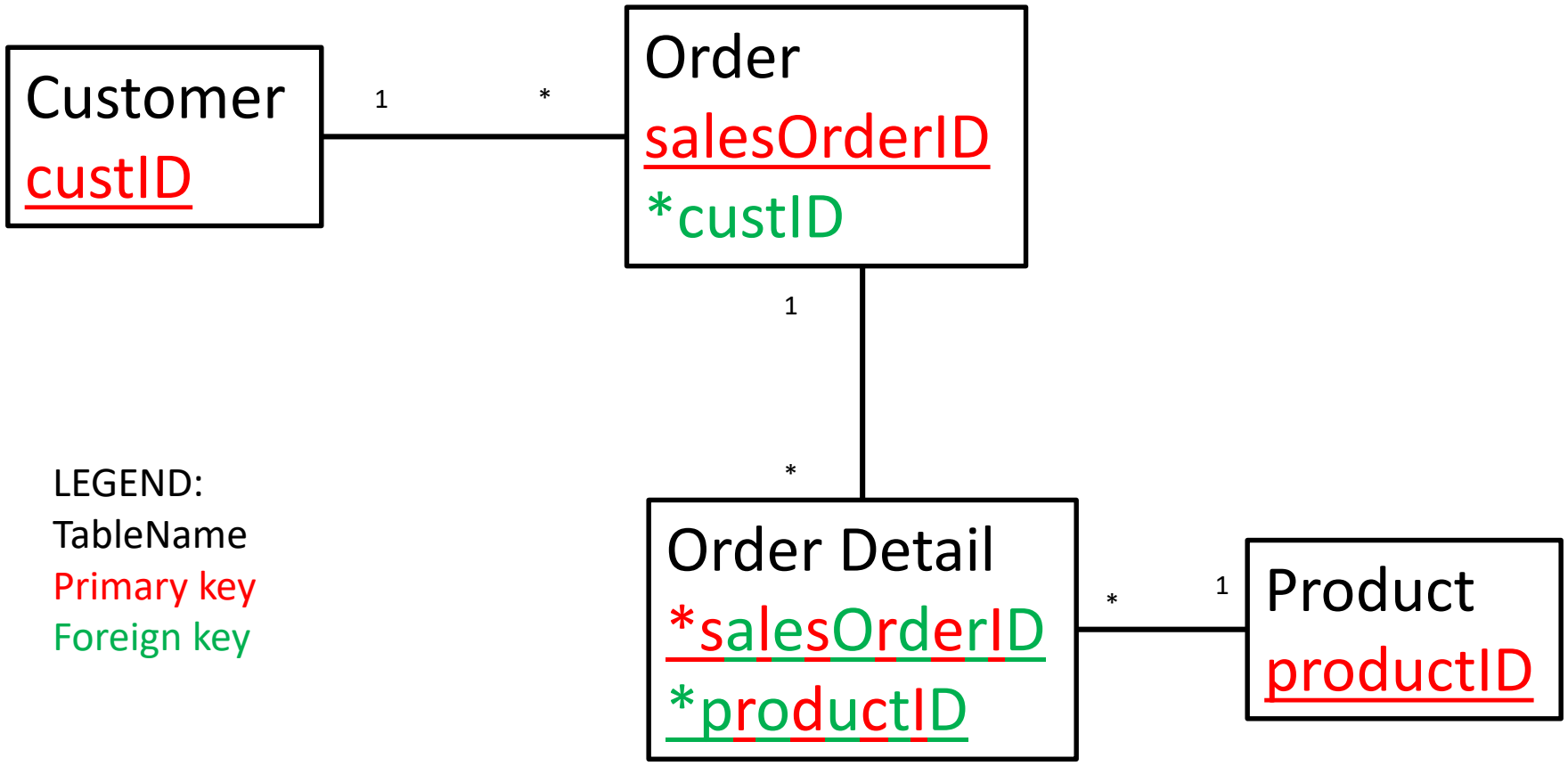
This week:

This lecture will provide an overview of

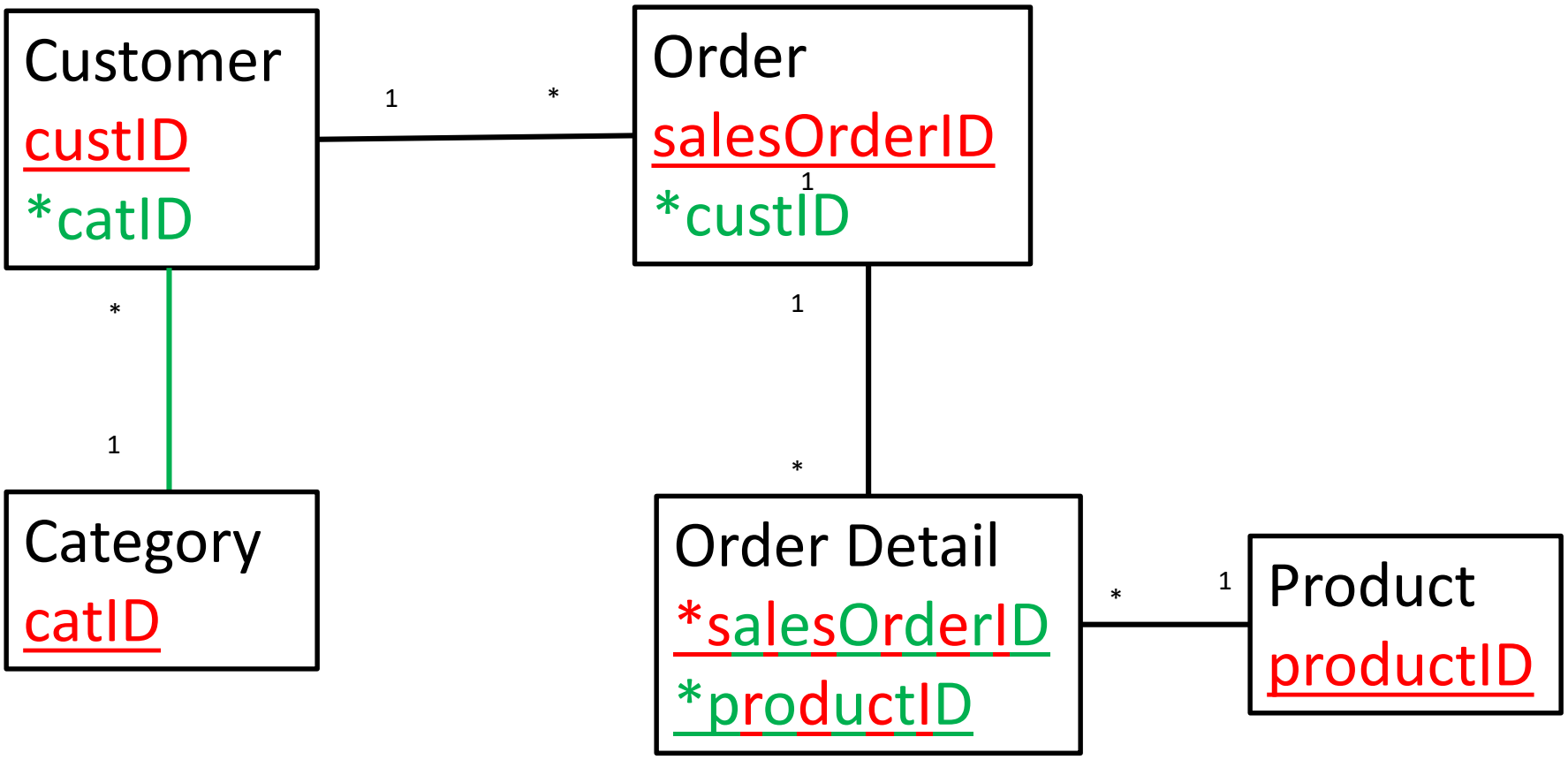
- Joins – reminder
- how to make new tables
- how to make a field a key (new and existing table)
- fields and datatypes

E.R. Diagram (key only) – needed for joins



SELECT * from customer INNER JOIN order on customer.custID = order.custID

E.R. Diagram (key only) – new table



Primary Keys

- tProduct - ProductID
- tCust - CustID
- tOrder - SalesOrderID

- tOrderLine - SalesOrderID, ProductID

- *Unique* identifier for the record in the table
- Look at tProduct [*query1*]

Primary Key – Why?

- Each table must have a unique primary key
  - productID (*primary key*) for tProduct (*table*)

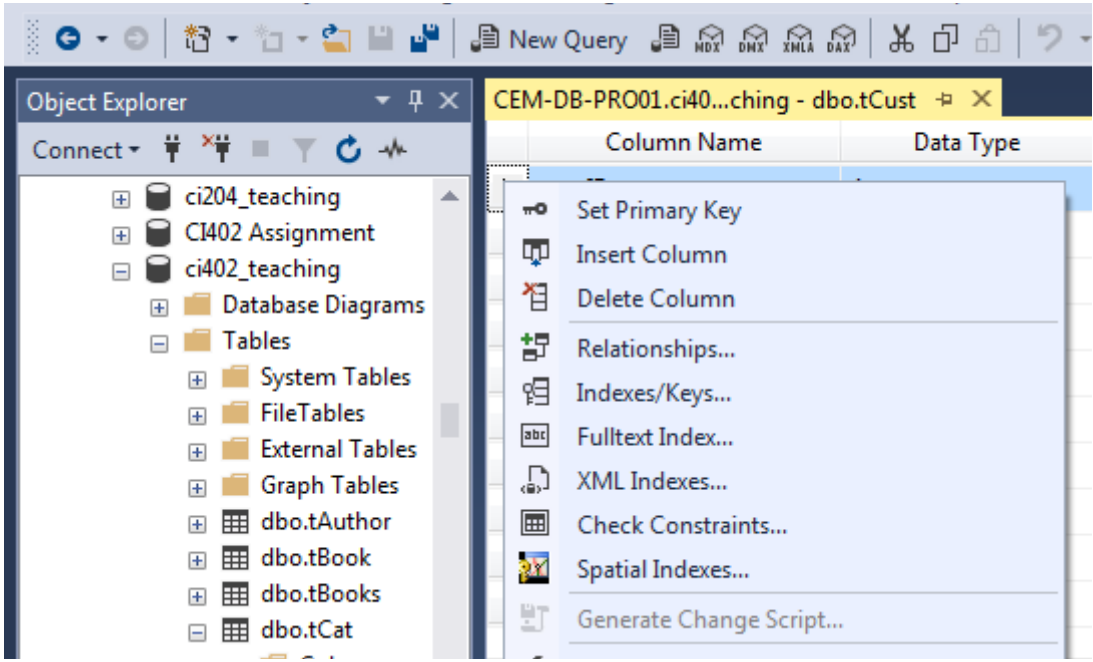
- Primary keys are used to identify one record for:
  - delete
  - update
  - select
  - join

PK is a Constraint (rule)

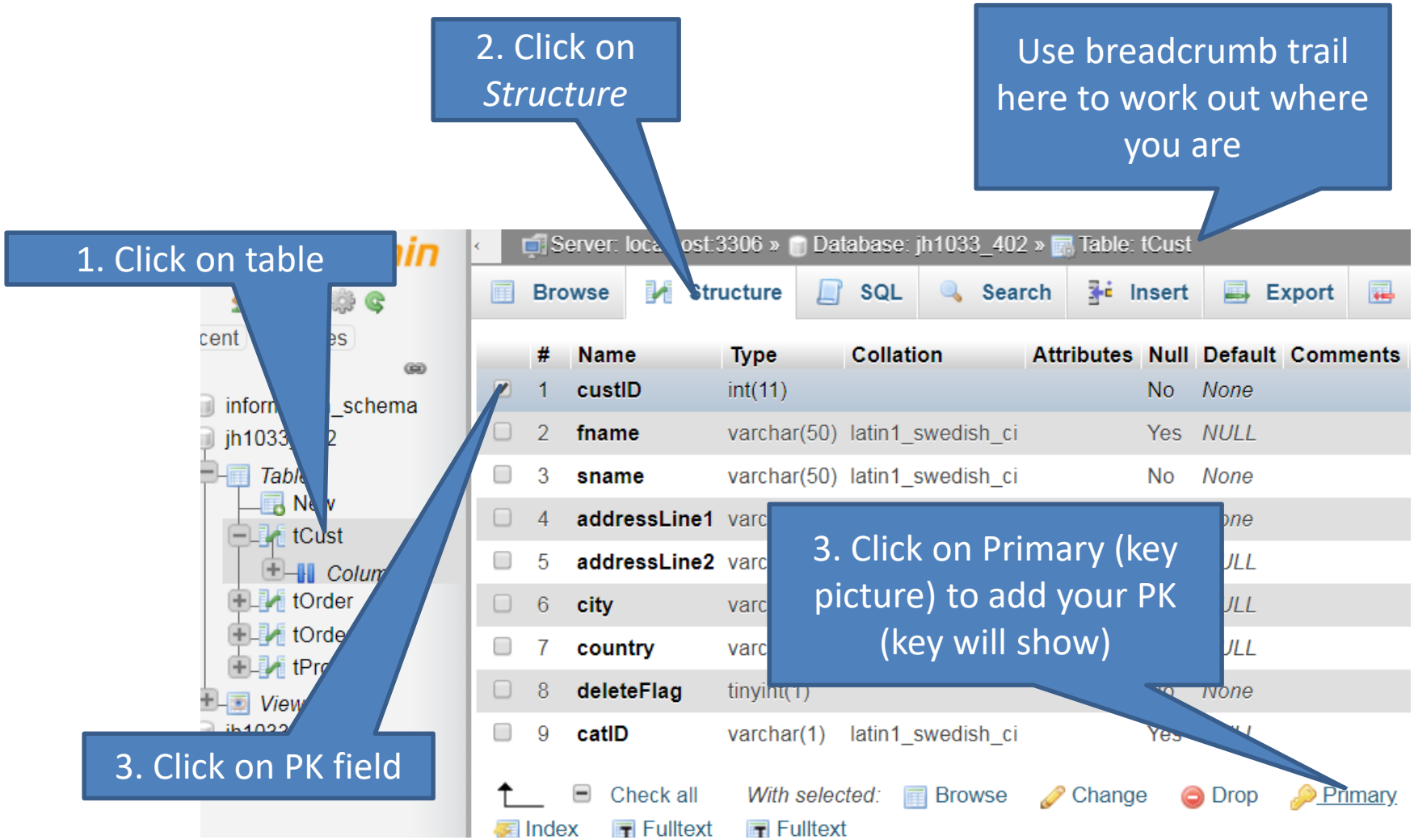
- Primary key must be unique
- DBMS will enforce this constraint

SQL Server
Adding key to existing table

- Right click on the table in *Object Explorer*, select *Design*
- Right click on the correct field and select *Set Primary Key*

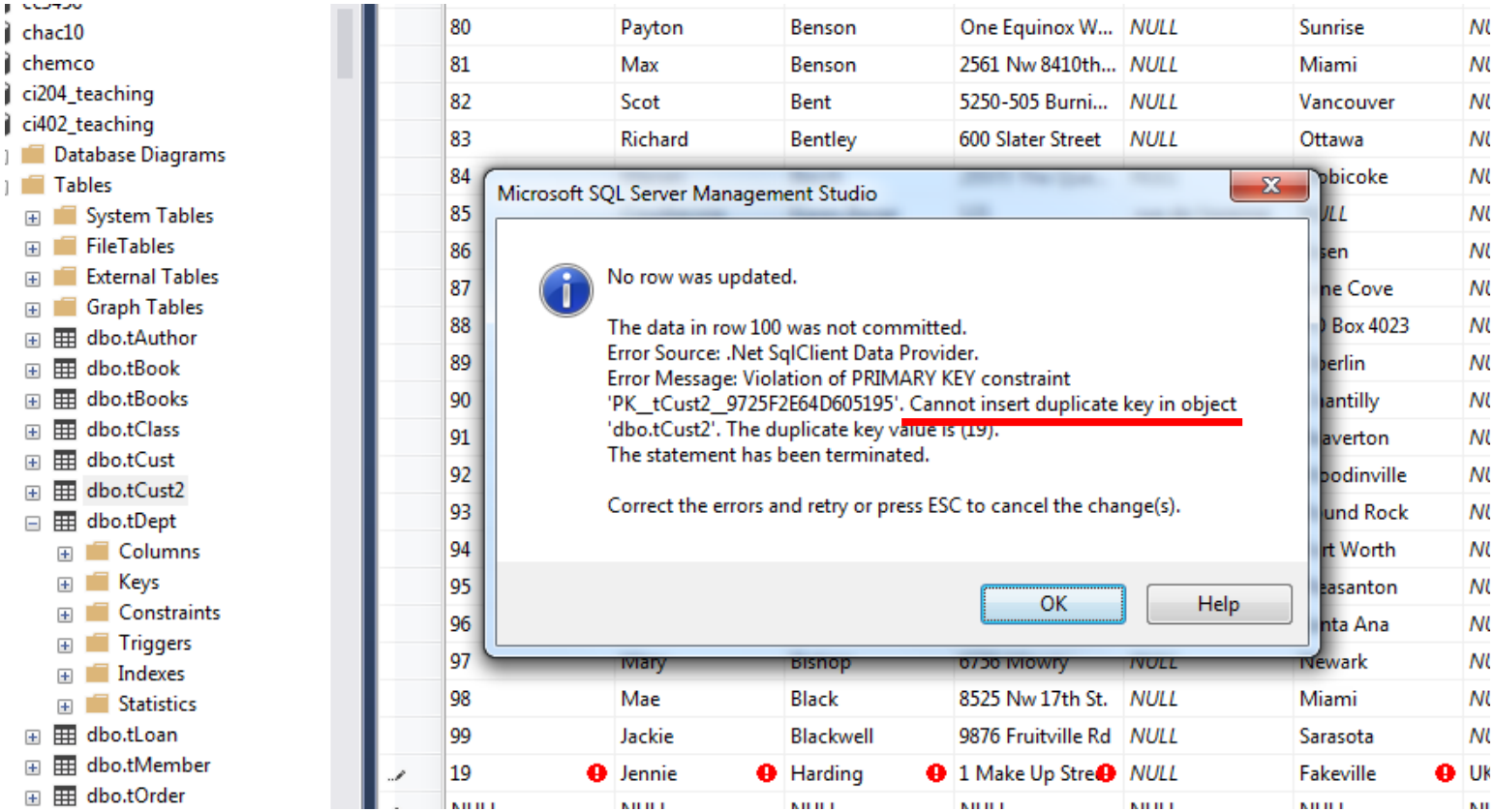


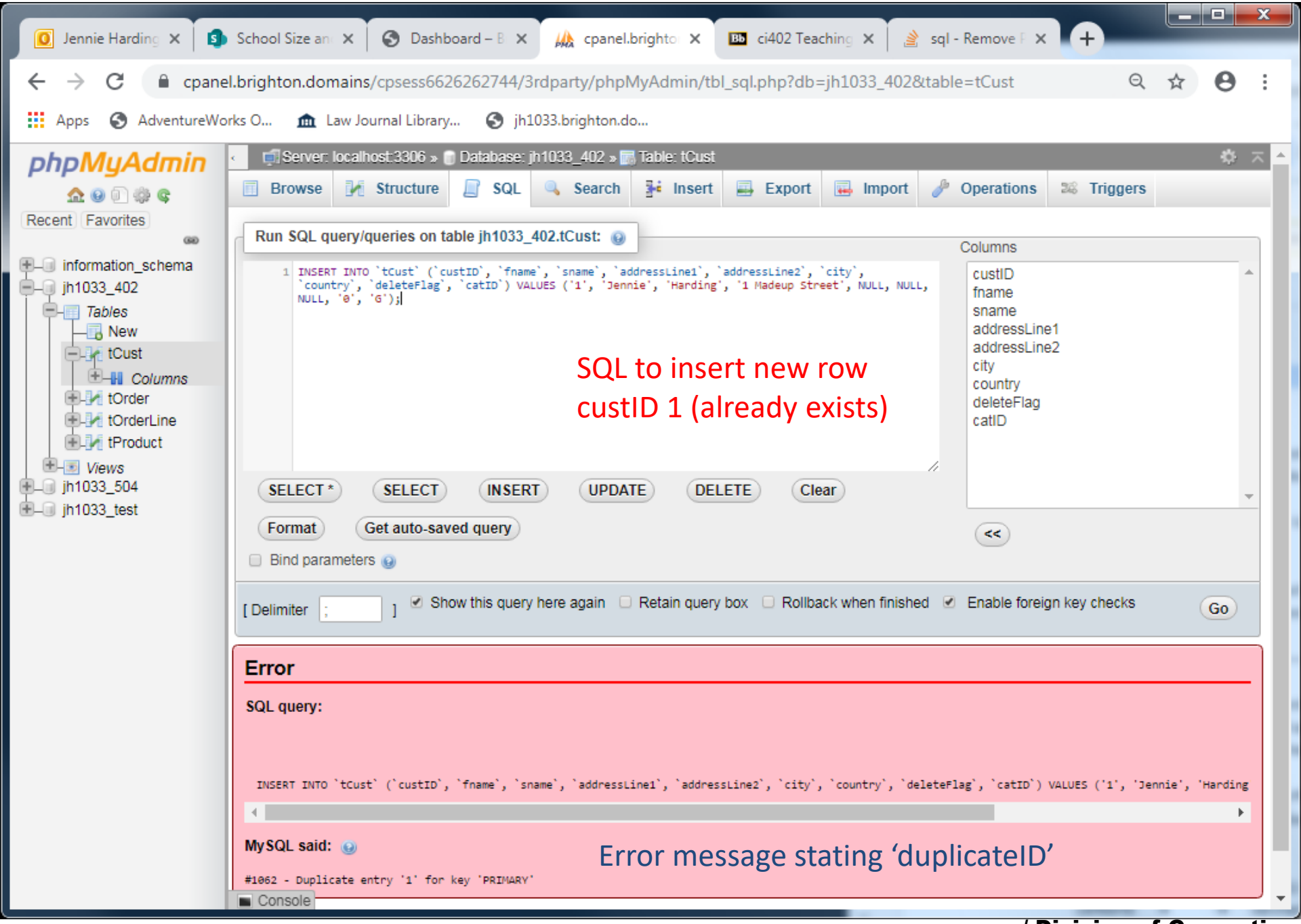
MySQL
Adding key to existing table



If you try to insert data with same PK … it will fail. Is this good?
Try this [step 5 in this week's tutorial]

SQL Server Errror Message for duplicateID




Jennie Harding
School Size an
Dashboard – B
cpanel.brighto
ci402 Teaching
sql - Remove
cpanel.brighton.domains/cpsess6626262744/3rdparty/phpMyAdmin/tbl_sql.php?db=jh1033_402&table=tCust
Apps
AdventureWorks O...
Law Journal Library...
jh1033.brighton.do...
phpMyAdmin
Recent
Favorites
information_schema
jh1033_402
Tables
New
tCust
Columns
tOrder
tOrderLine
tProduct
Views
jh1033_504
jh1033_test
Server: localhost:3306 » Database: jh1033_402 » Table: tCust
Browse
Structure
SQL
Search
Insert
Export
Import
Operations
Triggers
Run SQL query/queries on table jh1033_402.tCust:
INSERT INTO `tCust` (`custID`, `fname`, `sname`, `addressLine1`, `addressLine2`, `city`, `country`, `deleteFlag`, `catID`) VALUES ('1', 'Jennie', 'Harding', '1 Madeup Street', NULL, NULL, NULL, '0', 'G');
SQL to insert new row
custID 1 (already exists)
Columns
custID
fname
sname
addressLine1
addressLine2
city
country
deleteFlag
catID
SELECT *
SELECT
INSERT
UPDATE
DELETE
Clear
Format
Get auto-saved query
<<
Bind parameters
[Delimiter ;]
Show this query here again
Retain query box
Rollback when finished
Enable foreign key checks
Go
Error
SQL query:
INSERT INTO `tCust` (`custID`, `fname`, `sname`, `addressLine1`, `addressLine2`, `city`, `country`, `deleteFlag`, `catID`) VALUES ('1', 'Jennie', 'Harding
MySQL said:
#1062 - Duplicate entry '1' for key 'PRIMARY'
Error message stating ‘duplicateID’
Console

Foreign Keys

- CustomerID in tOrder
- ProductID in tOrderLine

- These keys represent the whole of the record from the master table e.g. tCustomer

- We can join tables based on key fields
- [We don't *have to* actively set the foreign keys]

tOrder

- Attributes *or* Columns *or* Fields:
  - SalesOrderID [Primary key - **unique**]
  - Orderdate
  - CustomerID [Foreign key – ***not unique*** *on tOrder* – unique in customer table]
  - Value

- Look at table data [query2]

tOrder

SalesOrderID	OrderDate	CustomerID	Value
49821	2003-04-01 00:00:00.000	4	10401789.46
49838	2003-04-01 00:00:00.000	41	796279.14
49846	2003-04-01 00:00:00.000	19	34008.15
49861	2003-04-01 00:00:00.000	7	176390.57
49868	2003-04-01 00:00:00.000	11	197347.99
49873	2003-04-01 00:00:00.000	11	167487.47
50189	2003-05-01 00:00:00.000	11	4015764.38
50203	2003-05-01 00:00:00.000	12	5348783.19
50210	2003-05-01 00:00:00.000	4	4906210.44

Foreign key CustomerID represents the customer – no need to repeat all the name and address fields – these would be redundant.

Which customer has the most orders here?

tCust

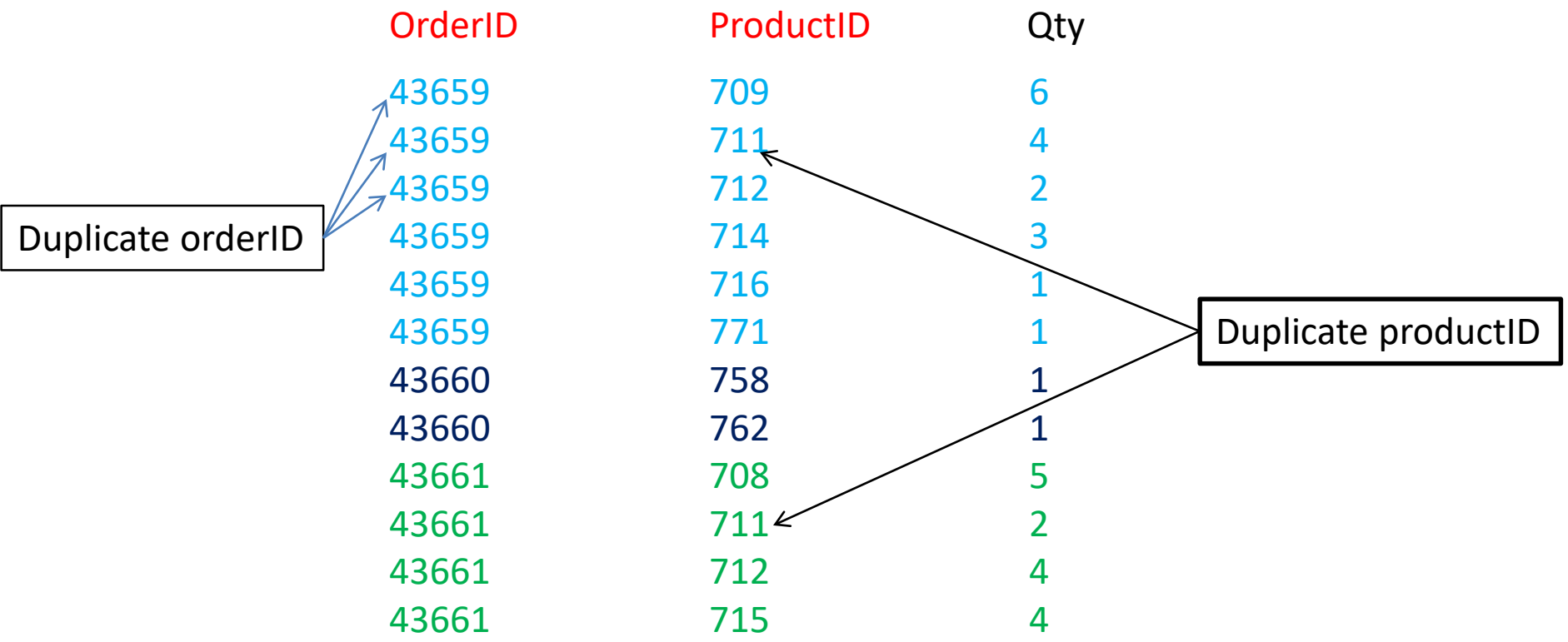
1	Eugene	Huang	2243 W St.	Seaford
2	Ruben	Torres	5844 Linden Land	Hobart
3	Christy	Zhu	1825 Village Pl.	North Ryde
4	Elizabeth	Johnson	7553 Harness Circle	Wollongong
5	Julio	Ruiz	7305 Humphrey Drive	East Brisbane
6	Janet	Alvarez	2612 Berry Dr	Matraville
7	Marco	Mehta	942 Brook Street	Warrnambool
8	Rob	Verhoff	624 Peabody Road	Bendigo
9	Shannon	Carlson	3839 Northgate Road	Hervey Bay
10	Jacquelyn	Suarez	7800 Corrinne Court	East Brisbane
11	Curtis	Lu	1224 Shoenic	East Brisbane

Compound primary key

- tOrderdetail
- Primary key is:
  - OrderID,
  - ProductID

- SQL Server Select both fields (CTRL+CLICK) and then click PK icon when both selected
- MySQL – click checkboxes

Compound Primary Key



Unique primary key is compound key: OrderID & ProductID

Explain to your neighbour how the orderID 43659 can occur six times

Using these primary keys to join tables…

[NOTE: we have only set the PK – we just need to make the values unique in the table, so that joins can link to one field]

Join tOrder with tCust

```
SELECT                                          //read data
SalesOrderID,                                   //which fields
OrderDate,
fname,
sname,
totalDue

FROM tCust                                      //which table(s)
INNER JOIN tOrder
ON tOrder.CustomerID = tCust.CustID             //how to join them
```

Run join [sel_join_torder_tcust.sql]

DBMS provides joins

[All part of the service!]

DBMS will find the customer details for each order

Each order record can then be displayed with customer names and addresses

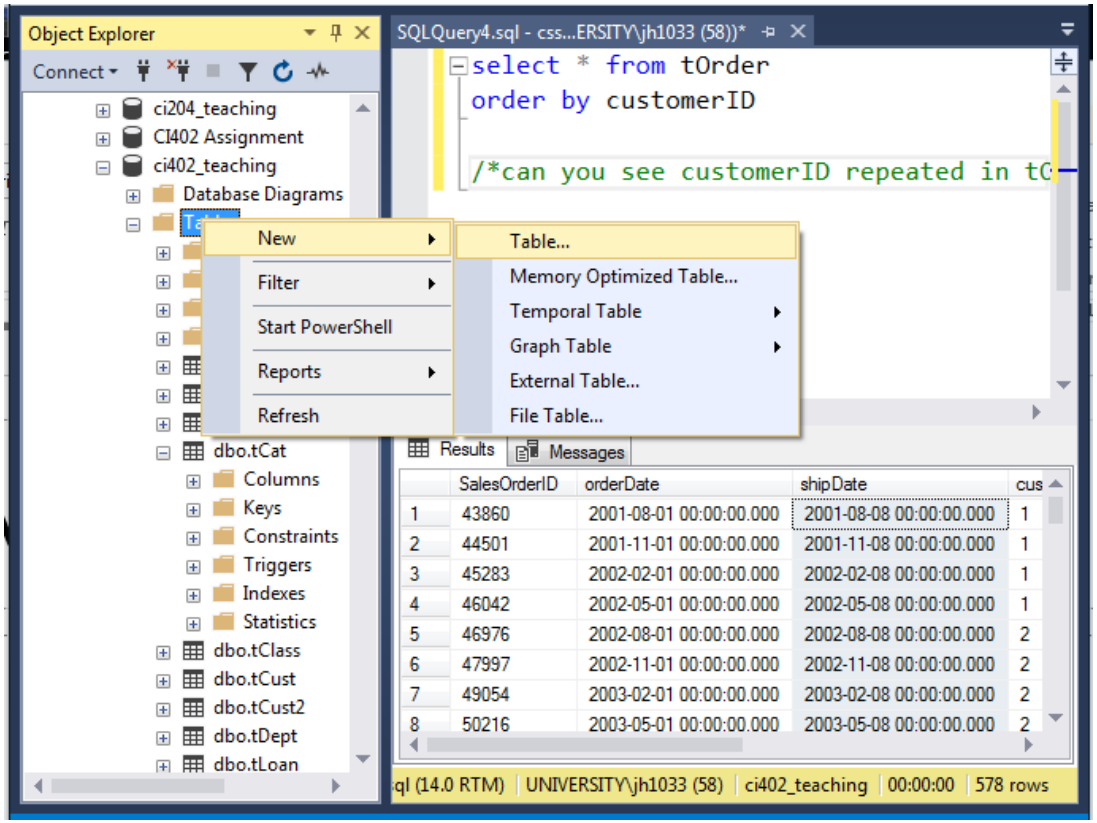
Show tOrder and tCust

Joins mean:

- We do not have to hold all the customer details on the order table
- We do not have duplicate data
- Customer details – name , address … held once

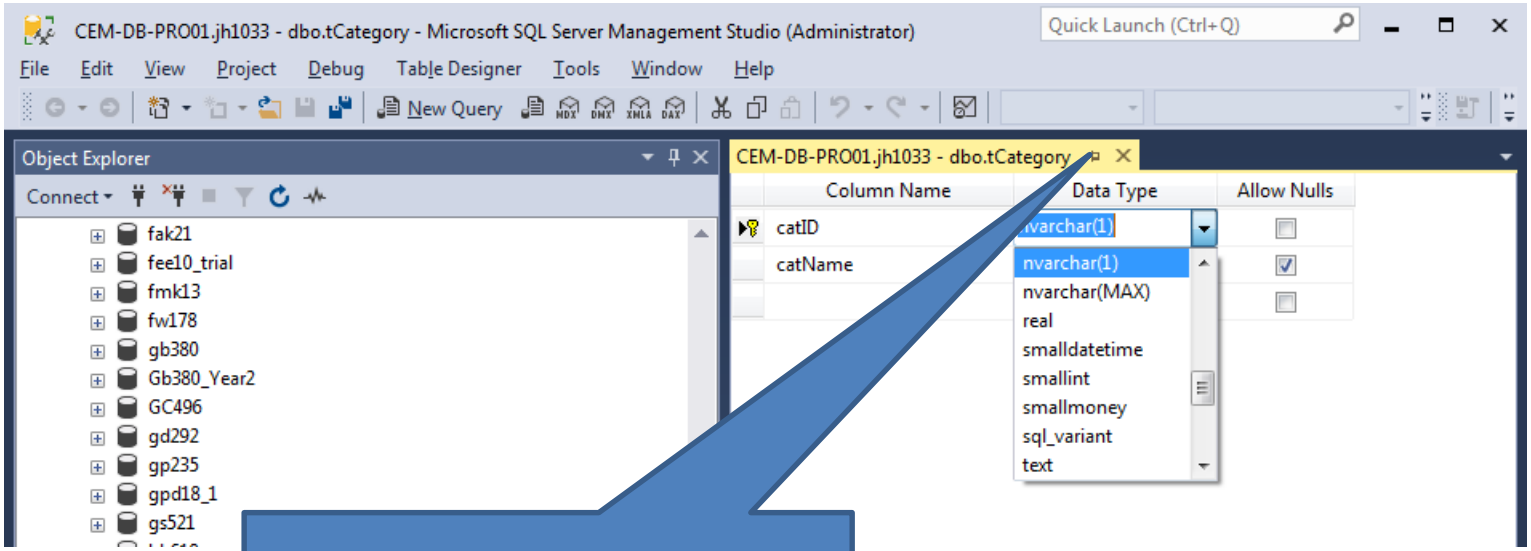
SQLServer – Making New Tables

- Right click on Table, select New > Table



SQLServer – Making New Tables

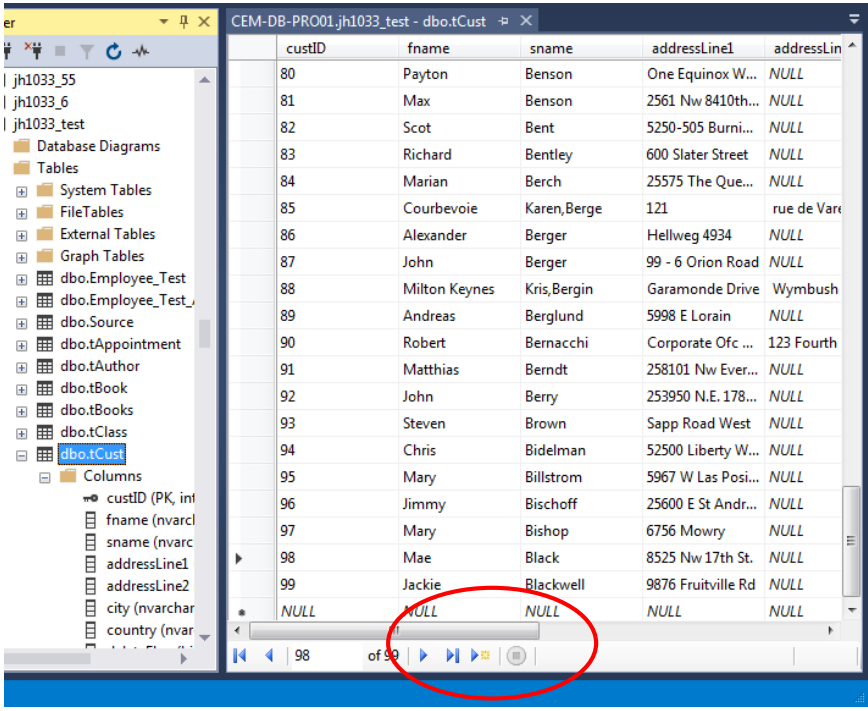
Name the fields, choose the datatype from drop down list. Select if allowed to be NULL.
Assigning a data type to a field – go to DESIGN view and see possible data types.



NOTE: table not saved / created until you CLOSE THIS WINDOW – then you'll be asked to name it

SQL Server - Adding Data To A Table

- Right-click on a table e.g. tCust and select *Edit Top 200 Rows*
- Will display table in editable form
- Click on star at bottom to take you to *New Record*
- Type in information
- Won't save record until all info in and validated



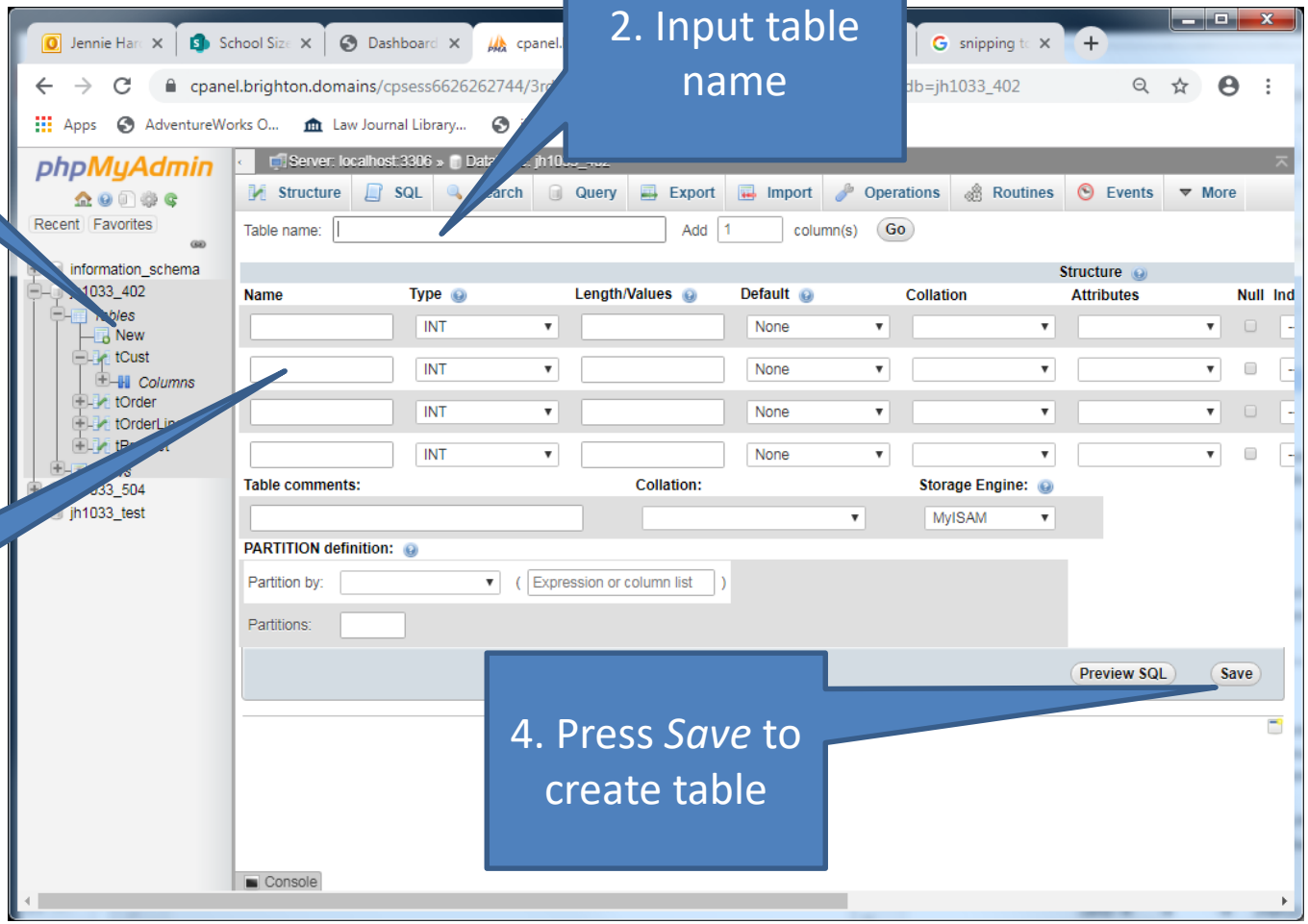
MySQL– Making New Tables

1. Click on *New*

2. Input table name

3. Choose field names, types etc.

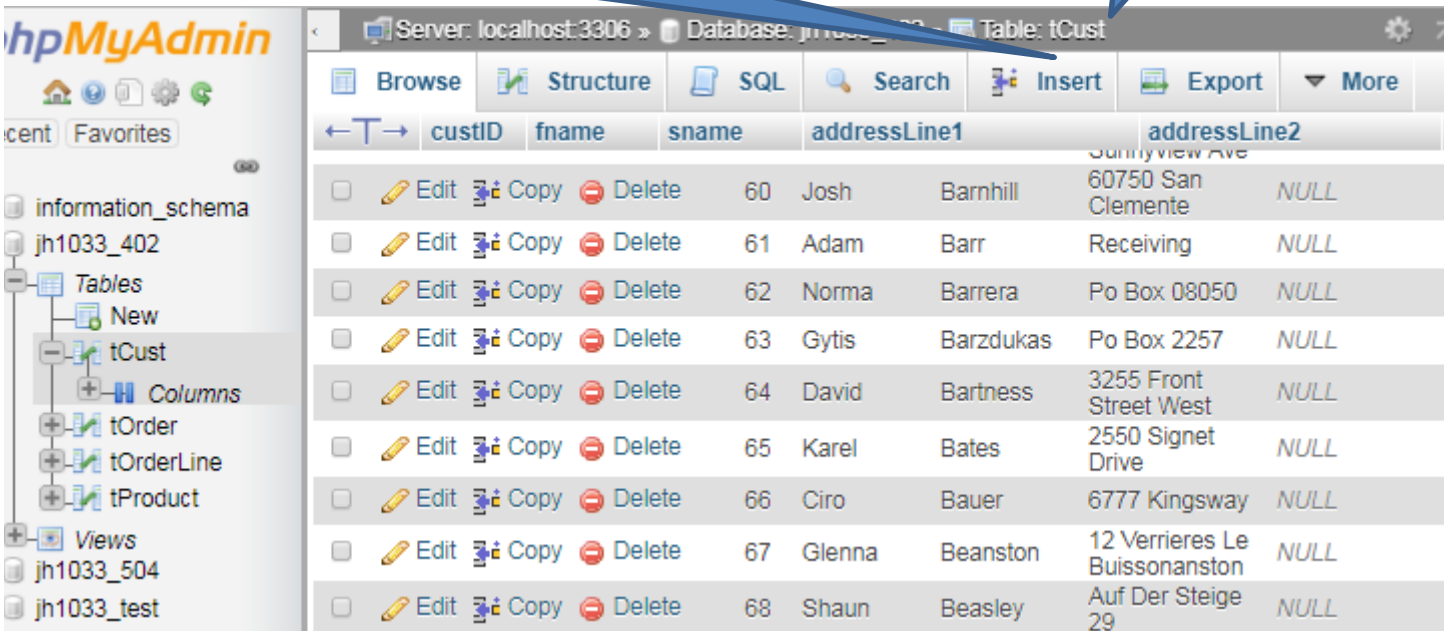
4. Press *Save* to create table



MySQL– Adding New Data

2. Click *Insert* – will bring up insert page

1. Make sure that you in the table that you want to add data to



Data types: char, varchar, nvarchar

- char(5), char(50)
  - early with simple use of storage
- varchar(50),
  - flexible efficient use of storage (doesn't set aside space if not being used – that's what the VAR means)
- nvarchar(50)
  - more expensive on storage but supports multiple character sets e.g. Mandarin

Numeric Data Types - Standard

Data type	Description	Bytes
Bit	1 or 0	1 bit
Tinyint	Integers 0 to 255	1 byte
Smallint	Integers -32768 to 32767	2 bytes
Int	Integers -2,147,483,648 to 2147483647	4 bytes
Bigint	Huge !!	8 bytes
Decimal	Decimal points – huge	varies

Use DBMS own help to find more info on their own datatypes / extensions

https://www.journaldev.com/16774/sql-data-types

Can be exact or approximate

http://devzone.advantagedatabase.com/dz/webhelp/advantage8.1/adssql/exact_numeric_vs_approximate_numeric.htm

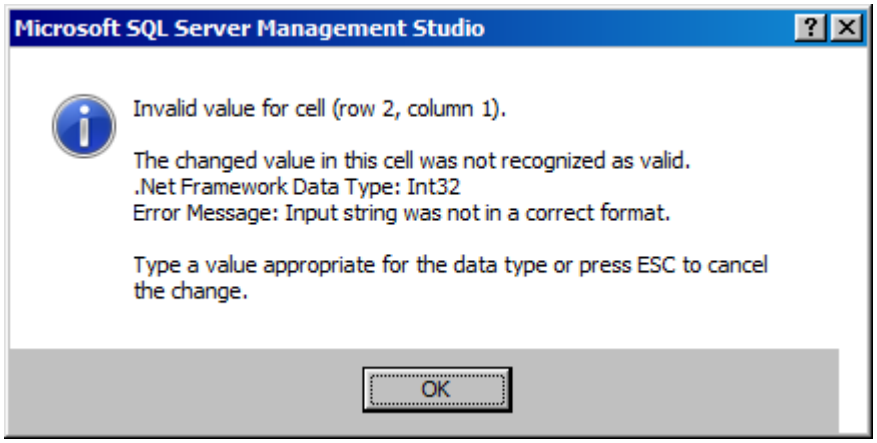
Decimal

- p (precision) The maximum total number of decimal digits that can be stored, both to the left and to the right of the decimal point. The precision must be a value from 1 through the maximum precision of 38. The default precision is 18.

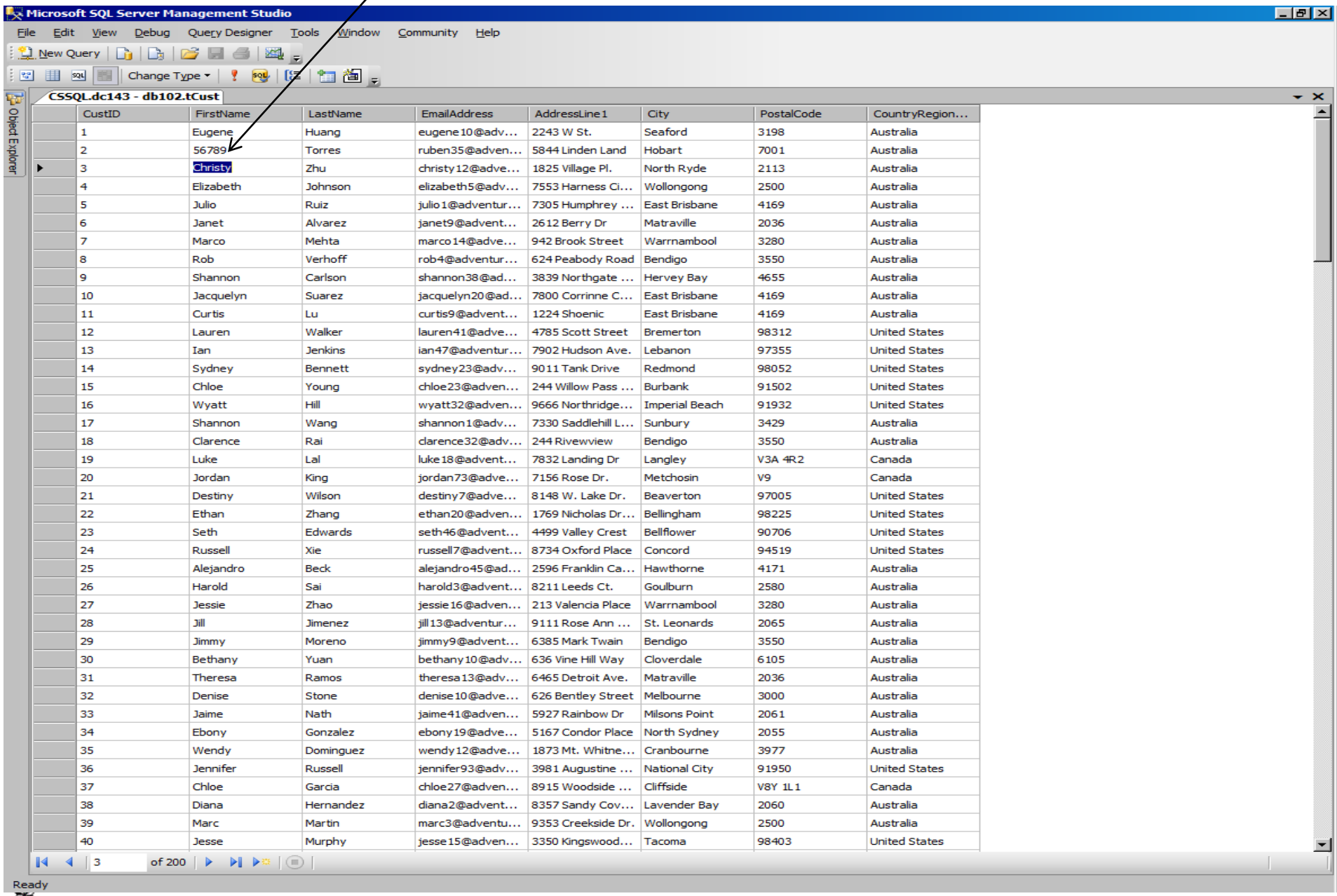
- (18.4)
  - 18 positions altogether
  - 4 after the decimal point
  - so 14 before the decimal point

Data Types as Constraints

- Try to insert “H” into the CUSTID int field:



Numbers in nvarchar field ??



CustID	FirstName	LastName	EmailAddress	AddressLine1	City	PostalCode	CountryRegion...
1	Eugene	Huang	eugene10@adv...	2243 W St.	Seaford	3198	Australia
2	56789	Torres	ruben35@adven...	5844 Linden Land	Hobart	7001	Australia
3	Christy	Zhu	christy12@adve...	1825 Village Pl.	North Ryde	2113	Australia
4	Elizabeth	Johnson	elizabeth5@adv...	7553 Harness Ci...	Wollongong	2500	Australia
5	Julio	Ruiz	julio1@adventur...	7305 Humphrey ...	East Brisbane	4169	Australia
6	Janet	Alvarez	janet9@advent...	2612 Berry Dr	Matraville	2036	Australia
7	Marco	Mehta	marco14@adve...	942 Brook Street	Warrnambool	3280	Australia
8	Rob	Verhoff	rob4@adventur...	624 Peabody Road	Bendigo	3550	Australia
9	Shannon	Carlson	shannon38@ad...	3839 Northgate ...	Hervey Bay	4655	Australia
10	Jacquelyn	Suarez	jacquelyn20@ad...	7800 Corrinne C...	East Brisbane	4169	Australia
11	Curtis	Lu	curtis9@advent...	1224 Shoenic	East Brisbane	4169	Australia
12	Lauren	Walker	lauren41@adve...	4785 Scott Street	Bremerton	98312	United States
13	Ian	Jenkins	ian47@adventur...	7902 Hudson Ave.	Lebanon	97355	United States
14	Sydney	Bennett	sydney23@adv...	9011 Tank Drive	Redmond	98052	United States
15	Chloe	Young	chloe23@adven...	244 Willow Pass ...	Burbank	91502	United States
16	Wyatt	Hill	wyatt32@adven...	9666 Northridge...	Imperial Beach	91932	United States
17	Shannon	Wang	shannon1@adv...	7330 Saddlehill L...	Sunbury	3429	Australia
18	Clarence	Rai	clarence32@adv...	244 Rivewview	Bendigo	3550	Australia
19	Luke	Lal	luke18@advent...	7832 Landing Dr	Langley	V3A 4R2	Canada
20	Jordan	King	jordan73@adve...	7156 Rose Dr.	Metchosin	V9	Canada
21	Destiny	Wilson	destiny7@adve...	8148 W. Lake Dr.	Beaverton	97005	United States
22	Ethan	Zhang	ethan20@adven...	1769 Nicholas Dr...	Bellingham	98225	United States
23	Seth	Edwards	seth46@advent...	4499 Valley Crest	Bellflower	90706	United States
24	Russell	Xie	russell7@advent...	8734 Oxford Place	Concord	94519	United States
25	Alejandro	Beck	alejandro45@ad...	2596 Franklin Ca...	Hawthorne	4171	Australia
26	Harold	Sai	harold3@advent...	8211 Leeds Ct.	Goulburn	2580	Australia
27	Jessie	Zhao	jessie16@adven...	213 Valencia Place	Warrnambool	3280	Australia
28	Jill	Jimenez	jill13@adventur...	9111 Rose Ann ...	St. Leonards	2065	Australia
29	Jimmy	Moreno	jimmy9@advent...	6385 Mark Twain	Bendigo	3550	Australia
30	Bethany	Yuan	bethany10@adv...	636 Vine Hill Way	Cloverdale	6105	Australia
31	Theresa	Ramos	theresa13@adv...	6465 Detroit Ave.	Matraville	2036	Australia
32	Denise	Stone	denise10@adve...	626 Bentley Street	Melbourne	3000	Australia
33	Jaime	Nath	jaime41@adven...	5927 Rainbow Dr	Milsons Point	2061	Australia
34	Ebony	Gonzalez	ebony19@adve...	5167 Condor Place	North Sydney	2055	Australia
35	Wendy	Dominguez	wendy12@adve...	1873 Mt. Whitne...	Cranbourne	3977	Australia
36	Jennifer	Russell	jennifer93@adv...	3981 Augustine ...	National City	91950	United States
37	Chloe	Garcia	chloe27@adven...	8915 Woodside ...	Cliffside	V8Y 1L1	Canada
38	Diana	Hernandez	diana2@advent...	8357 Sandy Cov...	Lavender Bay	2060	Australia
39	Marc	Martin	marc3@adventu...	9353 Creekside Dr.	Wollongong	2500	Australia
40	Jesse	Murphy	jesse15@adven...	3350 Kingswood...	Tacoma	98403	United States

Alphanumeric

- nvarchar is an alphanumeric data type
  - accepts numbers
  - will not process them as numbers e.g. add them

- Telephone number:
  - 020-8576-8965

- Postcode:
  - BN8-5TY

VarChar(MAX)

- Replacing old TEXT data type
- Can hold *huge* amount of text.
  - Complete essay, report …..
- Size is 2^31-1 bytes

Date Data Types

- DateTime 8 bytes

[Jan 1 1553 – Dec 31 9999]

- SmallDateTime 4 bytes

[Jan 1 1900 – Jun 6 2079]

- Date 3 bytes

[Date values Jan 1 0001 – Dec 31 9999]

How is datetime held by databases?

- https://www.sqlshack.com/sql-server-datetime-data-type-considerations-and-limitations/

Date Constraints

- Input data must be in a date format:
  - e.g. yyyy/mm/dd ISO 8601 standard
  - 2011/10/25
  - SQL Server displays dates in this format [query2]
- Date formats can become complex !!
- UK format is dd/mm/yyyy
  - 11/09/2001 …. September 11 2001
- US format mm/dd/yyyy
  - 09/11/2001 …. hence 9/11 …… September 11 2001

?

Visitors to a web site from varying locales may be confused by date formats. The format MM/DD/YY is unique to the United States. Most of Europe uses DD/MM/YY. Japan uses YY/MM/DD. The separators may be slashes, dashes or periods. Some locales print leading zeroes, others suppress them. If a native Japanese speaker is reading a US English web page from a web site in Germany that contains the date 03/04/02 how do they interpret it?

Test the DBMS yourself

- Does it accept:
  - YYYY-MM-DD
  - DD-MM-YYYY
  - MM-DD-YYYY
- What about:
  - YY-MM-DD
  - DD-MM-YY
  - MM-DD-YY

11 Sep 2001

- 11 Sep 2001 will work
  - DD MMM YYYY

- However this is locale specific - *Sep* is English

Images

- Latest data type: varbinary(MAX)

- Designed to be used by applications which can retrieve image from file system and insert into database

Tracking images

- Alternative is to track images:

- URL held in a database field – varchar(100)
- Others e.g SQL Server technology is *filestream*
  - Image held on file system
  - Field in database linked to the image
  - Streaming technology to support retrieval

Further data types

- Look at dropdown list in design view
- Use *help* to find explanations

- In reality ….. use:
  - int ….. or decimal or money
  - varchar(n) …. or nvarchar(n)
  - datetime or date

Summary

- Primary keys – unique identifiers - constraint

- Data defs:
  - int ….. or decimal [money?]
  - varchar(n) …. or nvarchar(n)
  - datetime or date

  - Varbinary(MAX) - images