

Data Modeling Software

- Drawing a Model
 - Entities, attributes, relationships, cardinality, optionality
 - Physical characteristics like data type & length
 - Constraints like PK, FK, Nullable
- Different tools support different capabilities
 - Some can only DRAW
 - Some capture the intelligence behind the drawing
 - Some can generate SQL DDL
 - Forward and reverse engineering

Data Modeling Software

- Different tools have different licensing models
 - Industrial Strength = Expensive
 - PowerDesigner from SAP
 - ERWin
 - ER/Studio from Idera
 - SPARX Enterprise Architect
 - IBM InfoSphere
 - TOAD Data Modeler
 - Visio Professional(?)
- Let's take a look
 - <https://www.datasciencecentral.com/profiles/blogs/top-6-data-modeling-tools>
 - http://www.databaseanswers.org/modelling_tools.htm

Data Modeling Software

- Different tools have different licensing
 - Free = less capable (mostly)
 - LucidChart – lovely drawings, but no intelligence
 - Free Trial – 15 or 30 days, then you pay
- Other concerns
 - Windows, Mac, Linux
 - Local install or cloud
 - Drawing Technique: CROWS FOOT (IE) versus IDEF1X versus UML
 - Data Modeling versus full blown Database Administration Console versus SQL Editor



Data Modeling Software

Drawing your data models

- Reasonable Free Tools:
 - MySQLWorkbench Free, local install
 - Full capabilities
 - LucidChart – Free Trial, cloud
 - Drawing only, limited time
 - TOAD Modeler – Free Trial
 - Full capabilities, limited time, local install
 - Oracle SQL Developer – Free, local executable
 - Full capabilities (* but you need a database connection)
 - Astah ? Good reviews, free to students

Data Modeling Software

Drawing your data models

- My Recommendation:
 - MySQLWorkbench Free, local install
 - Full capabilities (for MySQL)

Link:

<https://www.mysql.com/products/workbench/>

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Prerequisites:

To be able to install and run MySQL Workbench on Windows your system needs to have libraries listed below installed. The listed items are provided as links to the corresponding download pages where you can fetch the necessary files.

- [Microsoft .NET Framework 4.5](#)
- [Visual C++ Redistributable for Visual Studio 2015](#)

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Step-By-Step

1. Draw each TABLE
2. Double-Click to bring up COLUMN dialog
3. Add each column, data type, constraints
4. Create relationships
 - Click on child key, then on parent key
 - This duplicates keys in the model
5. Export DDL

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- **11.1:** When a model is exported using the main menu item **File**, **Export**, **Forward Engineer SQL CREATE Script**, some server variables are temporarily set to enable faster SQL import by the server. The statements added at the start of the code are:

```
SET @OLD_UNIQUE_CHECKS=@@UNIQUE_CHECKS, UNIQUE_CHECKS=0;
SET @OLD_FOREIGN_KEY_CHECKS=@@FOREIGN_KEY_CHECKS, FOREIGN_KEY_CHECKS=0;
SET @OLD_SQL_MODE=@@SQL_MODE, SQL_MODE='TRADITIONAL';
```

These statements function as follows:

- `SET @OLD_UNIQUE_CHECKS=@@UNIQUE_CHECKS, UNIQUE_CHECKS=0;` : Determines if an InnoDB engine performs duplicate key checks. Import is much faster for large data sets if this check is not performed.
- `SET @OLD_FOREIGN_KEY_CHECKS=@@FOREIGN_KEY_CHECKS, FOREIGN_KEY_CHECKS=0;` : Determines if the server should check that a referenced table exists when defining a foreign key. Due to potential circular references, this check must be turned off for the duration of the import, to allow defining foreign keys.
- `SET @OLD_SQL_MODE=@@SQL_MODE, SQL_MODE='TRADITIONAL';` : Sets `SQL_MODE` to `TRADITIONAL`, causing the server to operate in a more restrictive mode.

These server variables are then reset at the end of the script using the following statements:

```
SET SQL_MODE=@OLD_SQL_MODE;
SET FOREIGN_KEY_CHECKS=@OLD_FOREIGN_KEY_CHECKS;
SET UNIQUE_CHECKS=@OLD_UNIQUE_CHECKS;
```

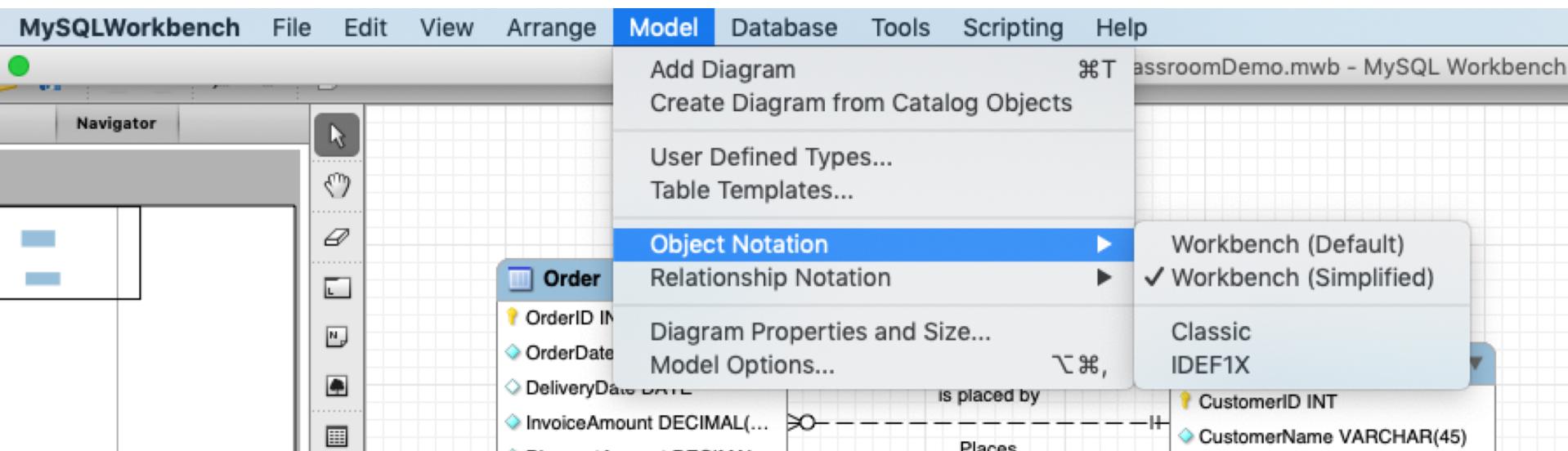
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Tips for MySQL Workbench

1. Creating Foreign Keys by drawing relationships
2. Set config for “Crows Feet” notation
3. Set Cardinality and Optionality
4. Set captions on relationships
5. Set config for displaying captions

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Setting Model Notation Style:



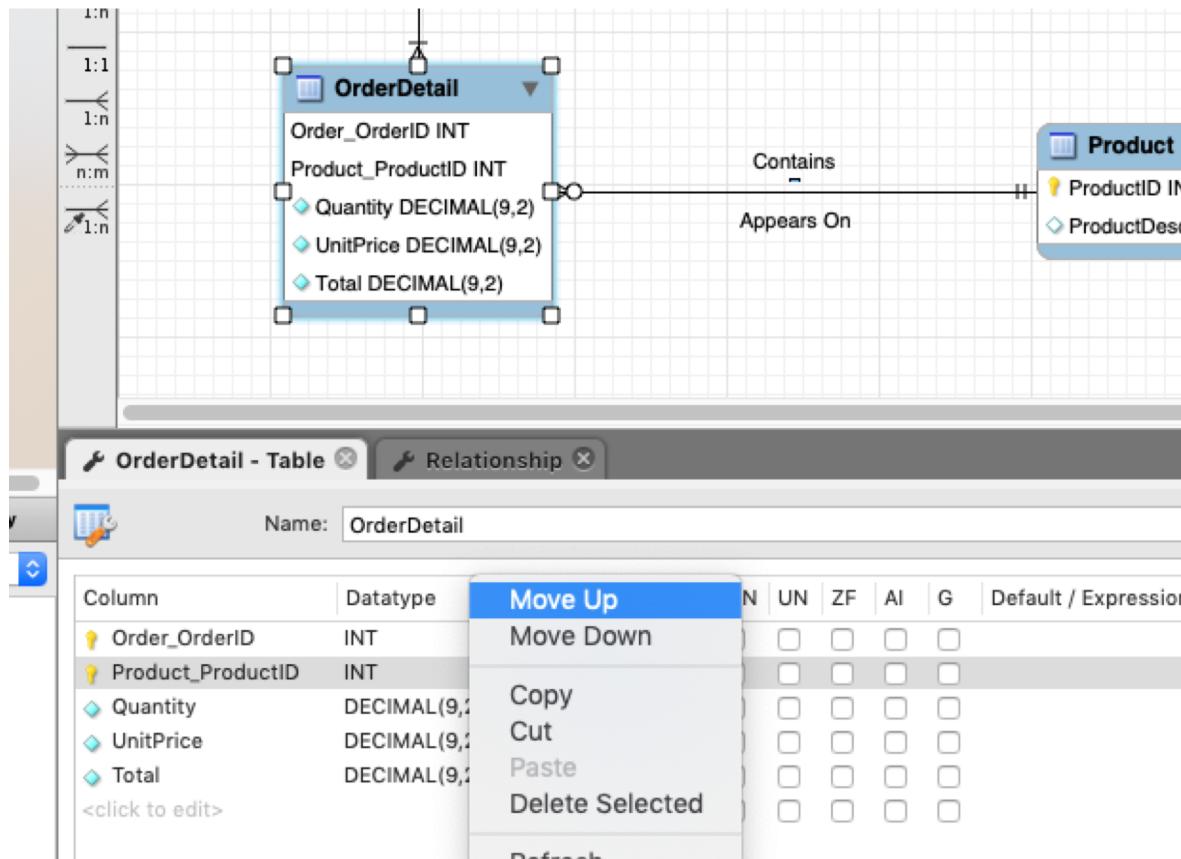
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To create a foreign key:

1. Click on the relationship type tool (non-identifying, one-to-many...)
2. Click on the **child** entity
3. Click on the **key column** in the **parent** entity
4. Workbench will draw the relationship for you

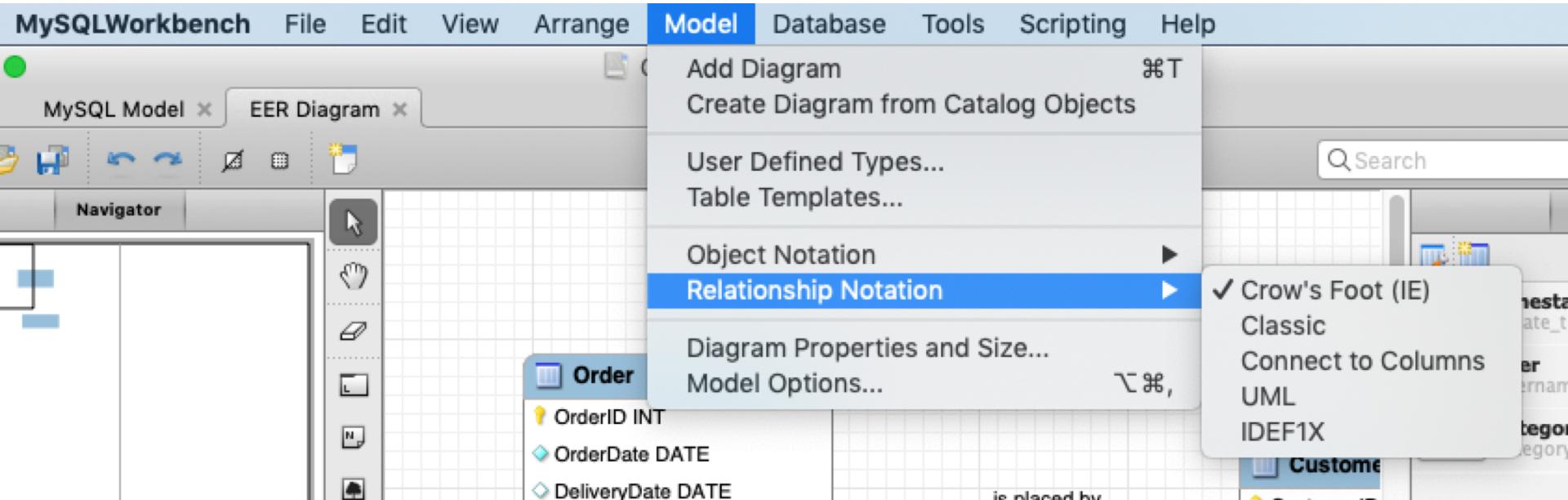
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To move a column up in the ERD:



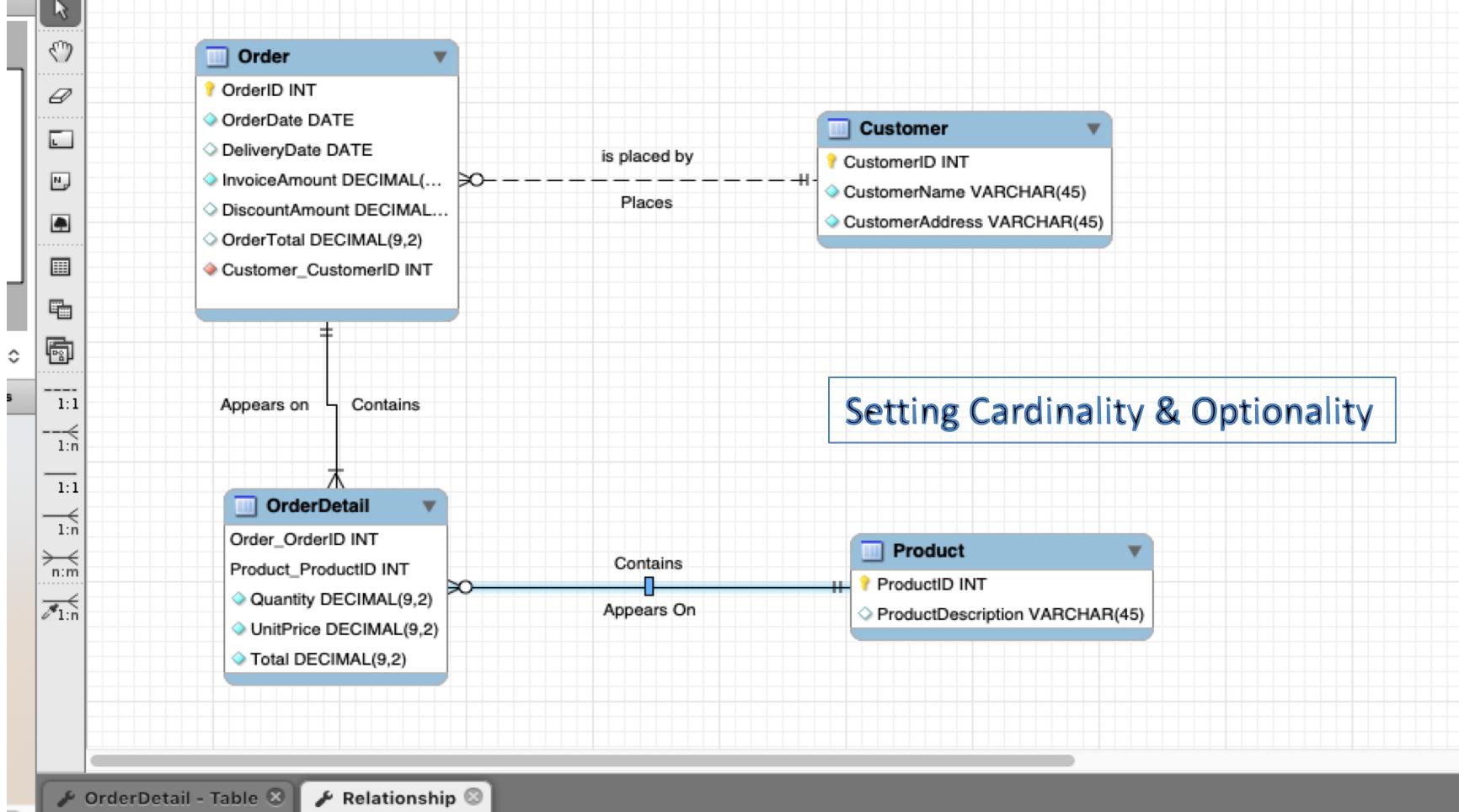
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Setting “Crows’ Feet Notation Style:



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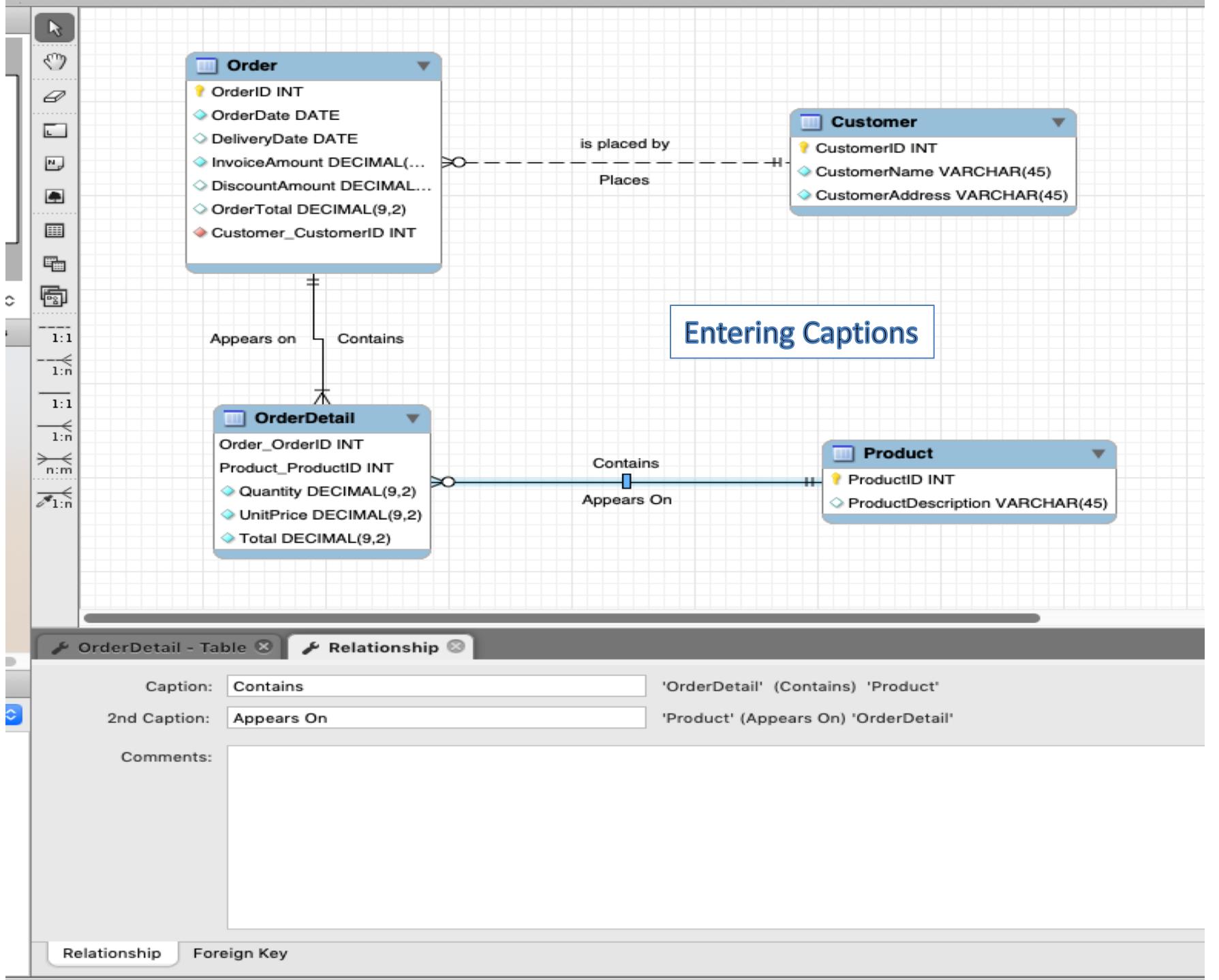
<https://bugs.mysql.com/bug.php?id=92141>

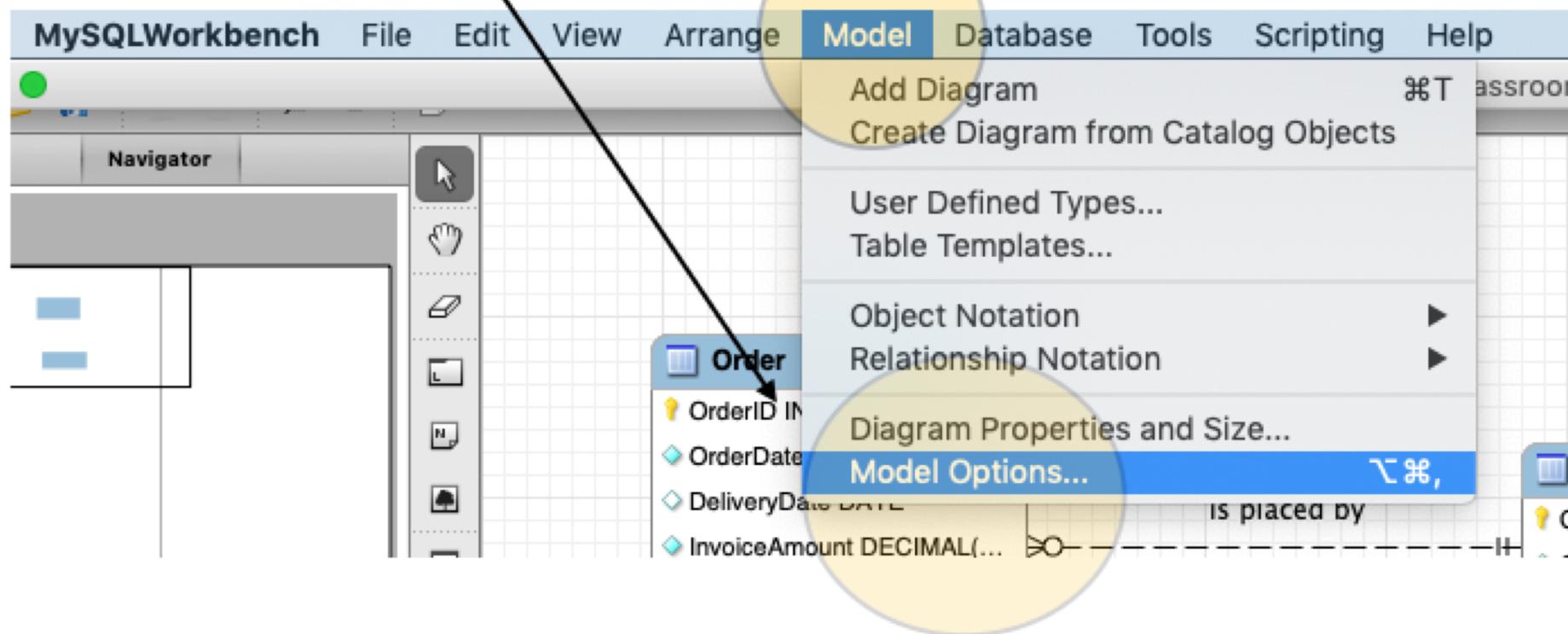


Setting Cardinality & Optionality

OrderDetail - Table X Relationship X

Referencing Table	Cardinality	Referenced Table
OrderDetail Foreign Key: fk_OrderDetail_Product1 Product_ProductID: INT (PK)	<input checked="" type="radio"/> One-to-Many (1:n) <input type="radio"/> One-to-One (1:1)	Product ProductID: INT (PK)
<input type="checkbox"/> Mandatory Edit Table...		<input checked="" type="checkbox"/> Mandatory <input checked="" type="checkbox"/> Identifying Relationship
Relationship Foreign Key		





Model Options

Defaults
MySQL
Diagram

All Objects

- Expand New Objects
- Propagate Object Color Changes to All Diagrams

Tables

- Show Column Types

- Show Schema Name

Max. Length of ENUMs and SETs to Display:

- Show Column Flags

Max. Number of Columns to Display: Larger tables will be truncated.

Routines

Trim Routine Names Longer Than characters

Relationships/Connections

- Draw Line Crossings (slow in large diagrams)

- Show Captions

- Center Captions Over Line

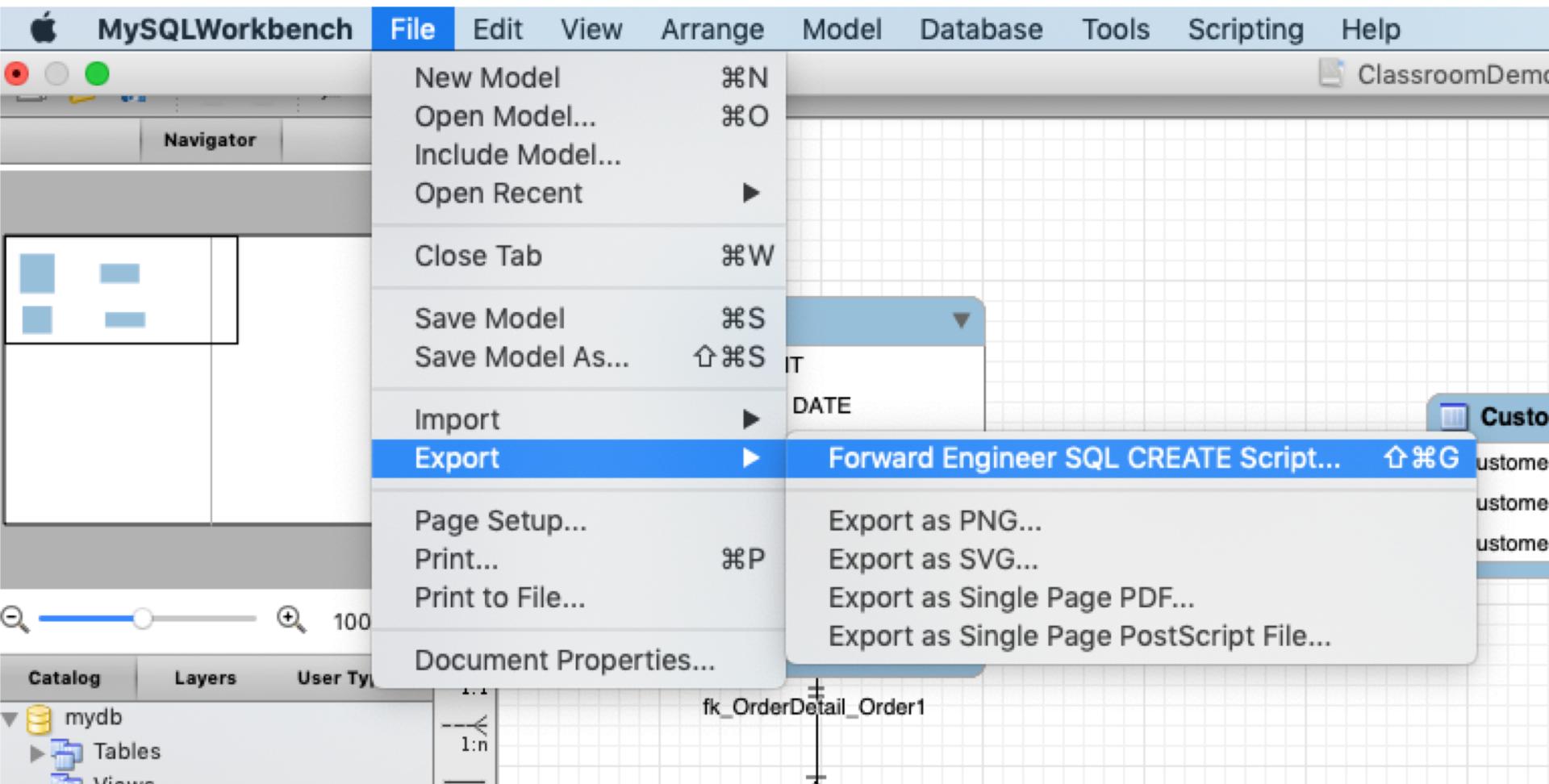
- Use defaults from global settings

Cancel

OK

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Generating DDL:



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Forward Engineer SQL Script

SQL Export Options
 Filter Objects
 Review SQL Script

SQL Export Options

Output SQL Script File:
Leave blank to view generated script but not save to a file.

SQL Options

- Generate DROP Statements Before Each CREATE Statement
- Generate DROP SCHEMA
- Skip Creation of FOREIGN KEYS
- Skip creation of FK Indexes as well
- Omit Schema Qualifier in Object Names
- Generate USE statements
- Generate Separate CREATE INDEX Statements
- Add SHOW WARNINGS After Every DDL Statement
- Do Not Create Users. Only Export Privileges
- Don't create view placeholder tables.
- Generate INSERT Statements for Tables
- Disable FK checks for inserts
- Create triggers after inserts

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Forward Engineer SQL Script

Review Generated Script

- SQL Export Options
- Filter Objects
- Review SQL Script

```
1 -- MySQL Script generated by MySQL Workbench
2 -- Wed Feb 13 09:31:46 2019
3 -- Model: New Model    Version: 1.0
4 -- MySQL Workbench Forward Engineering
5
6 SET @OLD_UNIQUE_CHECKS=@@UNIQUE_CHECKS, UNIQUE_CHECKS=0;
7 SET @OLD_FOREIGN_KEY_CHECKS=@@FOREIGN_KEY_CHECKS, FOREIGN_KEY_CHECKS=0;
8 SET @OLD_SQL_MODE=@@SQL_MODE, SQL_MODE='TRADITIONAL,ALLOW_INVALID_DATES';
9
10
11 -- Schema mydb
12
13
14
15 -- Schema mydb
16
17 CREATE SCHEMA IF NOT EXISTS `mydb` DEFAULT CHARACTER SET utf8 ;
18 USE `mydb` ;
19
20
21 -- Table `mydb`.`Customer`
22
23 DROP TABLE IF EXISTS `mydb`.`Customer` ;
24
25 CREATE TABLE IF NOT EXISTS `mydb`.`Customer` (
26     `CustomerID` INT NOT NULL AUTO_INCREMENT,
27     `CustomerName` VARCHAR(45) NOT NULL,
28     `CustomerAddress` VARCHAR(45) NOT NULL,
29     PRIMARY KEY (`CustomerID`)
30 ) ENGINE = InnoDB;
```

100%

1:1