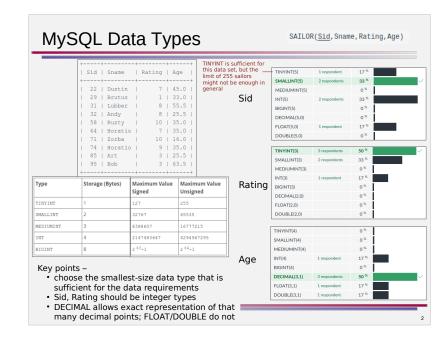
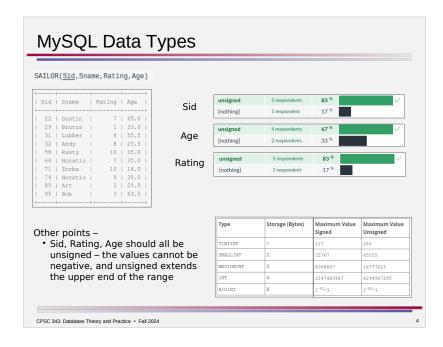
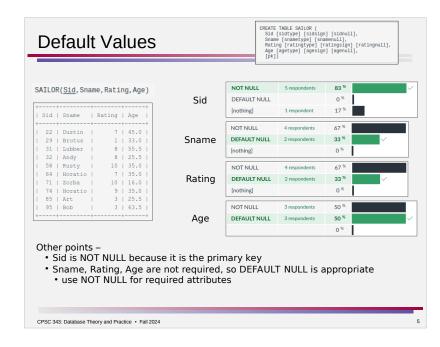
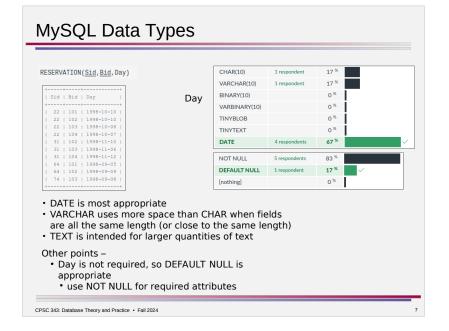
Database Implementation

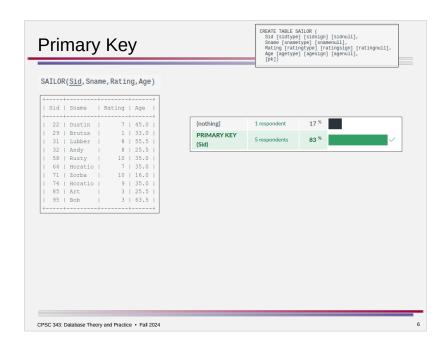
MySQL Data Types SAILOR(Sid, Sname, Rating, Age) Sid | Sname | Rating | Age CHAR(45) 17 % 7 | 45.0 67 % 29 | Brutus | VARCHAR(45) 31 | Lubber | 8 | 55.5 BINARY(45) 0 % 32 | Andy | 8 | 25.5 VARBINARY(45) 17 % 58 | Rusty | 10 | 35.0 0 % 64 | Horatio | 71 | Zorba | 10 | 16.0 0 % 74 | Horatio | 9 | 35.0 85 | Art | 95 | Bob Key points - CHAR/VARCHAR are for text • CHAR is fixed length – CHAR(L) takes up L bytes • VARCHAR is variable length - VARCHAR(L) takes up data+1 or data+2 bytes (must also store the actual length) · BINARY/VARBINARY are for binary data • TEXT/BLOB are intended for larger quantities of text/binary data CHAR is limited to 255 characters • VARCHAR is limited to 65,535 characters • there are some differences in how indexing is done CPSC 343: Database Theory and Practice • Fall 2024

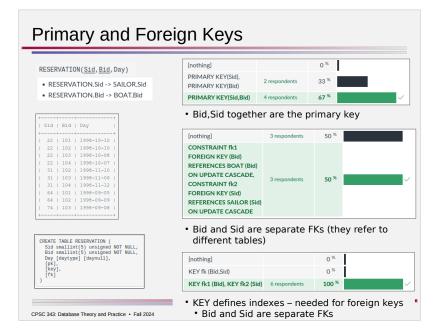












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Constraints

OOK(<u>Book_id</u>, Title, Publisher_na BOOK_AUTHORS(Book_id,Author_name) PUBLISHER (Name, Address, Phone) BOOK COPIES (Book id, Branch id, No of copies) BOOK_LOANS(Book_id, Branch_id, Card_no, Date_out, Due_date LIBRARY_BRANCH(Branch_id,Branch_name,Address) BORROWER (Card no, Name, Address, Phone) NOT NULL A book's title is required By default, the check out date for a book is the date on which the BOOK LOANS entry is recorded. The card number is an alphanumeric string (can column data type contain letters and digits). A particular borrower can't have more than 5 trigger books checked out at a time. trigger on the same day. A book must have at least one author recorded can't be enforced can't be enforced - the constraint itself creates a circular dependency with the FK in BOOK AUTHOR; while a trigger can insert an author when a book is inserted, what name should be used?

not PK – PK does imply NOT NULL, but it is primarily about uniquely identifying rows

DEFAULT allows functions like CURDATE() for MvSOL 8+

not FK – there's not another table with valid dates for Date_out; "default value" is about what happens when an INSERT doesn't include Date out

CHAR/VARCHAR is the best (but not exact) match for the column data type CHECK constraint is also valid (can specify regex)

not CHECK constraint – CHECK constraints can only involve a single row (and no subqueries)

not NOT NULL – the constraint says that an entry in BOOK requires an entry in BOOK_AUTHOR; the FK BOOK_AUTHORS.Book_id → BOOK_Book_id goes in the wrong direction

Constraints

BOOK (Book id, Title, Publisher name BOOK AUTHORS (Book id, Author name) PUBLISHER(<u>Name</u>,Address,Phone BOOK LOANS (Book id, Branch id, Card no, Date out, Due date JBRARY_BRANCH(Branch_id,Branch_name,Address) ORROWER (Card no, Name, Address, Phone) The name uniquely identifies publishers By default, the number of copies of a book at a DEFAULT branch is 1. The number of copies can't be negative. unsigned • The due date cannot be before the date the book CHECK constrain was checked out The combination of name and phone number also UNIQUE uniquely identify particular borrowers. Phone numbers must be of the form XXX-XXX-CHECK constrain XXXX. Only borrowers that are in the database can foreign key constrain check out books. By default, books are due two weeks after they are checked out. DEFAIL T

UNIQUE also specifies no duplicates, but PK is the best match for *uniquely identifies*

not taking space for unnecessary sign (unsigned) is better than adding another check to perform (CHECK constraint)

not FK – borrower Name and Phone are only attributes of BORROWER – no reference to another table not "can't be enforced" – ER diagrams, relational schemas don't have a notation for additional keys ,but this info can be stated separately

not column data type – can't be more specific than CHAR(10) or CHAR(12)

prefer FK to triggers when possible (borrowers are in BORROWERS and are referenced in BOOK_LOANS) CHECK constraints can only be simple conditions – no subqueries

expressions are allowed for DEFAULT in MySQL 8+ prior to MySQL 8+ allowed only constant literals and CURRENT TIMESTAMP

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Questions

What is the difference between "can't be enforced" and a CHECK constraint?

• "can't be enforced" means there isn't a way to enforce the requirement [BOOK (BOOK 10, 71t1e, Publisher_name)]

- e.g. a book must have at least one author
 - B00K doesn't have author info, so can't use NOT NULL – what column would it apply to?

- must insert book before any authors (due to FK B00K_AUTHORS.Book_id
 → B00K.Book_id) so can't deny B00K insertion, and no way to require a subsequent insertion of an author
- a CHECK constraint allows constraints on column values

- e.g. Due date >= Date out

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Questions

What's the difference between a trigger and just using INSERT, DELETE, UPDATE?

- the trigger performs an operation in addition to the insert/delete/update operation
- can be used to check/enforce complex constraints not possible by other means
- · can be used to perform other bookkeeping
 - not limited to checking constraints

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Questions

When should you use a trigger instead of a CHECK (UNIQUE, NOT NULL, or other) constraint?

- use a trigger when other mechanisms are insufficient
 - e.g. a CHECK constraint cannot involve a subquery

```
Students are not allowed to enroll in more than four courses:

CREATE TRIGGER maxenroll
BEFORE INSERT

ON EnrolledIn FOR EACH ROW

IF (SELECT COUNT(*)
FROM EnrolledIn = NEW.studentid ) >= 4
THEN SIGNAL SQLSTATE '45000'
SET MESSAGE.TEXT = 'Cannot enroll in more than four courses'

END

END

The error code '45000' is a generic value meaning "unhandled user-defined exception".
```

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