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Taken from:

Further Examples 1: Database Fundamentals

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The full *Further Examples 1* contents are:

Example 1: Domain (Universe) of Discourse

Example 2: Defining a Database: Codd's 12 Rules

Example 3: Persistent and Non-Persistent Data

Example 4: Meta Data

Example 5: Data, Data Types & Domains

Example 6: Program-Data Dependence

Example 7: Data Redundancy

Example 8: Data Integrity

Example 9: Data, Information & Presentation

Example 10: Security & Interfaces

Solutions

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Below is an example...

Example: Data, Data Types & Domains

Each piece of data to be stored in a database has two aspects: the *value* and the *type*. The type is specified at table-creation time and we may use either a built-in data type or a user-defined domain. Domain-creation is covered in a later SQL e-book.

There are five main data types that come built into SQL and most database products:

- *Variable* length character strings (between 1-N characters in length, where N is any number, including 1). Examples include:
 - Names ('Stuart', 'Sam Smithson' etc)
 - Addresses ('100 The High Street', 'The Orchard, Apple Lane' etc)
 - Product descriptions ('Deluxe Dirt Destroyer', 'Carpet Cleaner' etc)
 - Confirmation ('Y' or 'N' or 'Yes' or 'No')

- *Fixed* length character strings (exactly N characters in length, where N is any number, including 1). Examples include:
 - National Insurance numbers ('AB 12 34 56 78 B' etc)
 - ISBN book numbers ('0-06-345531-6' etc)
 - Student Identifiers ('HUT123456', 'BRO776542' etc)
 - Sex ('M' or 'F')

- Whole numbers (also known as integers). Examples include:
 - Grades (76, 82, 44 etc)
 - Ages (18, 21, 50 etc)
 - Numbers of students on a course (78, 90, 120 etc)
 - Number of products ordered (2, 5, 99 etc)

- Decimal numbers (these have a size and a precision – the number of digits after the decimal point). Examples include:
 - Averages (67.66, 12.887 etc)
 - Distances (123.00 km, 1.2345 m etc)
 - Weights (0.976112 kg, 2.35 lbs etc)
 - Money (£12.99, \$49.50 etc)

- Dates (these can be stored as variable length character strings but most database systems have a DATE data type). Examples include:
 - Tax Year Deadlines ('05-APR-2006', '30-SEPT-2006' etc)
 - Course Deadlines ('15-SEPT-2006', '31-DEC-2006' etc)

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The type (explicitly) specifies the kind of values to accept – such as words, dates, whole or decimal numbers - but it also (implicitly) specifies what operations are applicable to these pieces of data (so a character data type will allow concatenation of other character strings but not arithmetic operations such as addition or multiplication – which would be applicable to a decimal or integer data type).

The actual value of the data item is supplied after the table has been created (and the data type allocated) via an insertion or updating process. Consider these examples:

Data Item: **'Employment Day'**

Data Values: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

Suitable Built-in Data Type: Variable Character field (VARCHAR) of length 9 characters

Possible User-Defined Domain:

DaysOfWeek AS Varchar(9)

(CHECK VALUE IN

(Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday))

Data Item: **'Gender'**

Data Values: 'M' or 'F'

Suitable Built-in Data Type: Fixed Character Field (CHAR) of length 1 character

Possible User-Defined Domain:

Sex AS Char(1) (CHECK VALUE IN 'M' or 'F')

Data Item: **'Grade'**

Data Values: 0% - 100%

Suitable Built-in Data Type: Whole number (INTEGER) between 0 and 100

Possible User-Defined Domain:

StudentGrade AS Integer (CHECK VALUE BETWEEN 0 and 100)

Data Item: **'Payment'**

Data Values: Any non-negative decimal number (£0.00+)

Suitable Built-in Data Type: Decimal number with precision of 2 decimal places

Possible User-Defined Domain:

Currency AS Decimal(5,2) CHECK VALUE > 0.00

Data Item: **'Increment Date'**

Data Values: Any valid date of format 'DD-MTH-YYYY' (e.g. '21-MAY-2006')

Suitable Built-in Data Type: DATE

Possible User-Defined Domain:

ValidDay AS DATE