

4.2 Terminology

The relational model is based on the mathematical concept of a **relation**, which is physically represented as a **table**. Codd, a trained mathematician, used terminology taken from mathematics, principally set theory and predicate logic. In this section we explain the terminology and structural concepts of the relational model.

4.2.1 Relational Data Structure

Relation

A relation is a table with columns and rows.

An RDBMS requires only that the database be perceived by the user as tables. Note, however, that this perception applies only to the logical structure of the database: that is, the external and conceptual levels of the ANSI-SPARC architecture discussed in [Section 2.1](#). It does not apply to the physical structure of the database, which can be implemented using a variety of storage structures (see Appendix F).

Attribute

An attribute is a named column of a relation.

In the relational model, **relations** are used to hold information about the objects to be represented in the database. A relation is represented as a twodimensional table in which the rows of the table correspond to individual records and the table columns correspond to **attributes**. Attributes can appear in any order and the relation will still be the same relation, and therefore will convey the same meaning.

For example, the information on branch offices is represented by the Branch relation, with columns for attributes branchNo (the branch number), street, city, and postcode. Similarly, the information on staff is represented by the Staff relation, with columns for attributes staffNo (the staff number), fName, IName, position, sex, DOB (date of birth), salary, and branchNo (the number of the branch the staff member works at). [Figure 4.1](#) shows instances of the Branch and Staff relations. As you can see from this example, a column contains values of a single attribute; for example, the branchNo columns contain only numbers of existing branch offices.

Domain

A domain is the set of allowable values for one or more attributes.

Domains are an extremely powerful feature of the relational model. Every attribute in a relation is defined on a **domain**. Domains may be distinct for each attribute, or two or more attributes may be defined on the same domain. **Figure 4.2** shows the domains for some of the attributes of the Branch and Staff relations. Note that at any given time, typically there will be values in a domain that do not currently appear as values in the corresponding attribute.

The domain concept is important, because it allows the user to define in a central place the meaning and source of values that attributes can hold. As a result, more information is available to the system when it undertakes the execution of a relational operation, and operations that are semantically incorrect can be avoided. For example, it is not sensible to compare a street name with a telephone number, even though the domain definitions for both these attributes are character strings. On the other hand, the monthly rental on a property and the number of months a property has been leased have different domains (the first a monetary value, the second an integer value), but it is still a legal operation to multiply two values from these domains. As these two examples illustrate, a complete implementation of domains is not straightforward, and as a result, many RDBMSs do not support them fully.

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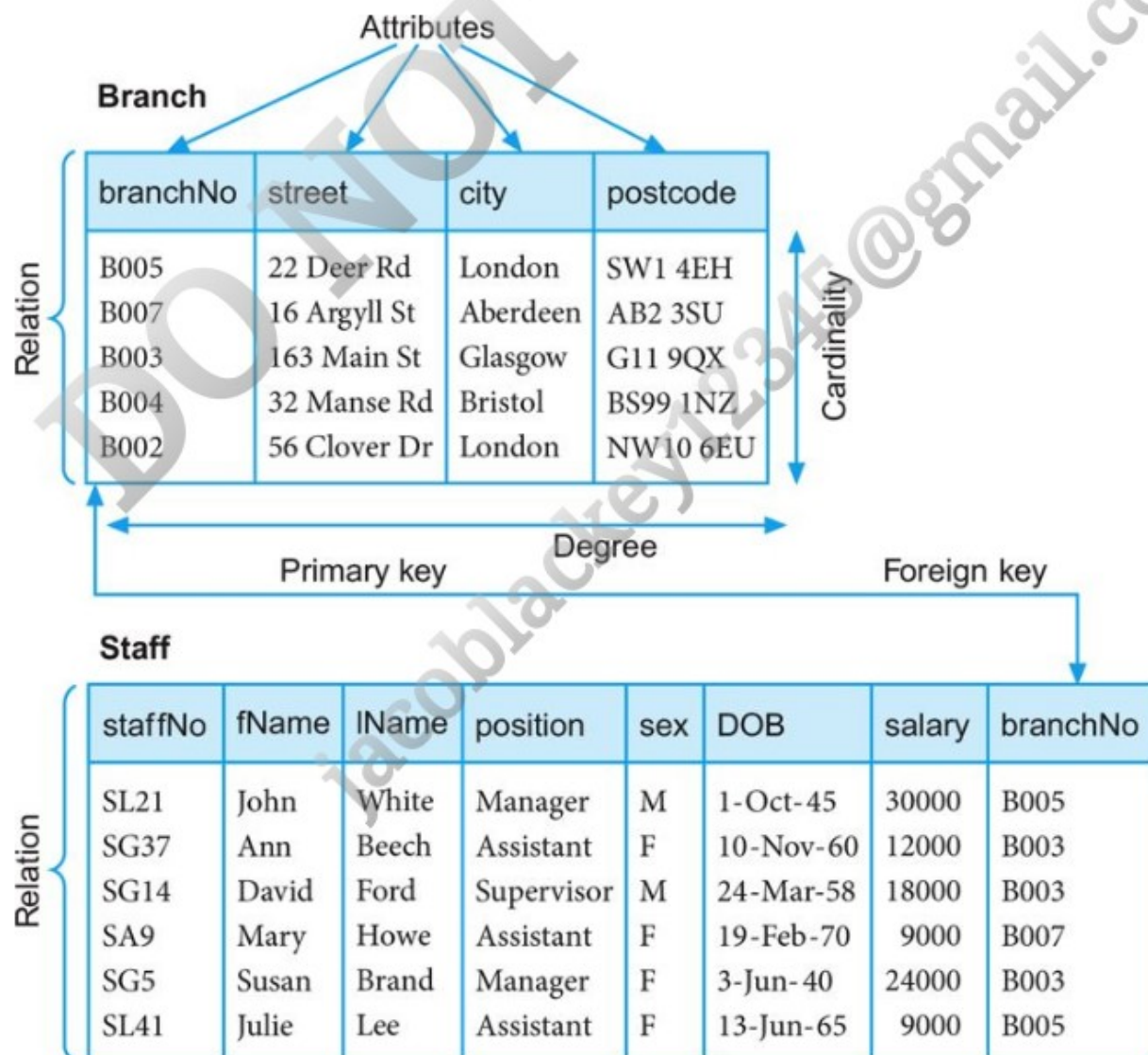


Figure 4.1 Instances of the Branch and Staff relations.

Attribute	Domain Name	Meaning	Domain Definition
branchNo	BranchNumbers	The set of all possible branch numbers	character: size 4, range B001–B999
street	StreetNames	The set of all street names in Britain	character: size 25
city	CityNames	The set of all city names in Britain	character: size 15
postcode	Postcodes	The set of all postcodes in Britain	character: size 8
sex	Sex	The sex of a person	character: size 1, value M or F
DOB	DatesOfBirth	Possible values of staff birth dates	date, range from 1-Jan-20, format dd-mmm-yy
salary	Salaries	Possible values of staff salaries	monetary: 7 digits, range 6000.00–40000.00

Figure 4.2 Domains for some attributes of the Branch and Staff relations.

Tuple

A tuple is a row of a relation.

The elements of a relation are the rows or **tuples** in the table. In the Branch relation, each row contains four values, one for each attribute. Tuples can appear in