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<https://opentextbc.ca/dbdesign01/chapter/chapter-11-functional-dependencies/>

Chapter 11 Functional Dependencies -- Intro

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A *functional dependency* (FD) is a relationship between two attributes, typically between the PK and other non-key attributes within a table. For any relation R, attribute Y is functionally dependent on attribute X (usually the PK), if for every valid instance of X, that value of X uniquely determines the value of Y. This relationship is indicated by the representation below :

**X ———–> Y**

The left side of the above FD diagram is called the*determinant*, and the right side is the *dependent*. Here are a few examples.

In the first example, below, SIN determines Name, Address and Birthdate. Given SIN, we can determine any of the other attributes within the table.

**SIN   ———-> Name, Address, Birthdate**

For the second example, SIN and Course determine the date completed (DateCompleted). This must also work for a composite PK.

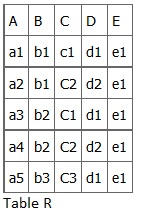
**SIN, Course  ———>     DateCompleted**

The third example indicates that ISBN determines Title.

**ISBN  ———–>  Title**

**Rules of Functional Dependencies**

Consider the following table of data r(R) of the relation schema R(ABCDE) shown in Table 11.1.

[](http://opentextbc.ca/dbdesign01/wp-content/uploads/sites/11/2013/12/Table-R-Functional-Dependency-example.jpg)Table 11.1. Functional dependency example, by A. Watt.

As you look at this table, ask yourself: *What kind of dependencies can we observe among the attributes in Table R?*Since the values of A are unique (a1, a2, a3, etc.), it follows from the FD definition that:

A → B,    A → C,    A → D,    A → E

* It also follows that  A →BC  (or any other subset of ABCDE).
* This can be summarized as   A →BCDE.
* From our understanding of primary keys, A is a primary key.

Since the values of E are always the same (all e1), it follows that:

A → E,   B → E,   C → E,   D → E

However, we cannot generally summarize the above with  ABCD → E  because, in general,   A → E,   B → E,   AB → E.

Other observations:

1. Combinations of BC are unique, therefore  BC → ADE.
2. Combinations of BD are unique, therefore  BD → ACE.
3. If C values match, so do D values.
   1. Therefore,  C → D
   2. However, D values don’t determine C values
   3. So C does not determine D, and D does not determine C.

Looking at actual data can help clarify which attributes are dependent and which are determinants.