Relation

A **relation** can be narrowly defined as a tool for establishing a connection between two sets. Let A and B be two sets. The relation R creates a connection between these two sets. Let:

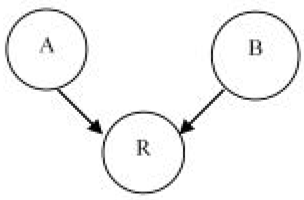
$$C = A \times B = \{(a, b) \mid a \in A, b \in B\}$$

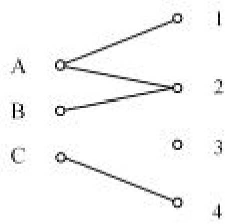
Here, C is the **Cartesian product** of sets A and B. The elements of set C are ordered pairs from A and B. The relation R itself is a set, which is a **subset** of C.

For example, the relation describing the connection between sets A and B, or the connection between $A, B, C \to 1, 2, 3, 4$, can be represented using a **graph** or a **matrix**.

Example

The relation between the sets A, B, C and $1, 2, 3, 4$ is shown in the middle diagram. This relationship can also be written using a **matrix**, as shown in the third diagram. Note that there are 1's where the row and column sets are related. The set without a connection will have only 0's in its row.





$$\begin{array}{c c} & \begin{array}{ccc} A & B & C \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \end{array} & \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \end{array}$$

Important!

A relation is **homogeneous** if it is defined on a single set. Relations are generally **binary**, which means that the relation set contains pairs of two elements. Relations are often expressed in the form of statements. For example, “Peter and Irma are married.”

A relation can also have an **inverse**. The following diagram shows how a direct relationship can be transformed into its inverse:

DIREKT

	T1	T2
a	1	2
b	2	
c	4	

INVERZ

	T1	T2
1	a	
2	b	a
3		
4	c	