

Relations

A **solution** to an equation in 2 variables is an ordered pair whose values make the equation a true statement (there may be more than 1).

A **relation** is any set of ordered pairs. For example, $\{(1, 2), (1, 1), (2, 2), (3, 4), (5, 7)\}$ is a relation. A relation may have a finite set of ordered pairs or an infinite set. When there is a finite set, all pairs are often listed individually or by a diagram with arrows connecting corresponding values. When there is an infinite set, the pairs are often listed implicitly using equations, set builder notation or a graph.

The **domain** of a relation is the set of all the x-values, first component, of the ordered pairs. The domain of the relation above is $\{1, 2, 3, 5\}$; the repeated x-value is not listed. We can also say that the domain is the set of x values such that the function makes sense. For example, if x is the denominator x cannot be 0.

The **range** of a relation is the set of all the y-values, second component, of the ordered pairs. The range of the relation above is $\{1, 2, 4, 7\}$; the repeated y-value is not listed. We can also say that the range is the set of y values that come out after we put in the x values.

Relations may also be written as equations, or illustrated with graphs and diagrams of the correspondence. If a relation is written as an equation, or drawn as a graph, the domain and range are normally intervals written in terms of x and y respectively.

Relations describe how pairs of data are related. They not only describe how numbers are related, but can be used for other items as well, such as a person and their birthday, US state and its capital $\{(PA, Harrisburg), (CA, Sacramento), \dots\}$.

| | Relations |
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| Equations | $x^2 + y^2 = 12$ (equation of a circle) |
| Graphs | |
| Diagrams | |

Graphs were made using WZGrapher from www.walterzorn.com