Relations and Dependency

A mathematical relation expresses a dependent relationship where one quantity depends in a systematic way on another quantity.

In some cases there is a cause and effect relationship where the cause is the independent variable and the effect is the dependent variable.

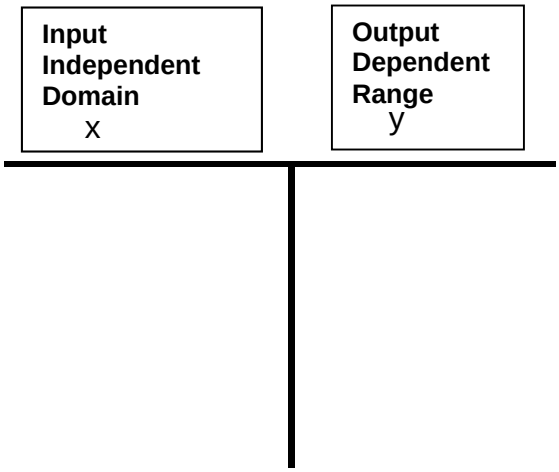
1. Example: Canyon Lake will rise 3 feet, if it rains 20 inches in the watershed.

In other cases there is not a cause and effect relationship, but there can still be an independent/dependent relationship. In this type of relationship either can be the independent variable, which then forces the other to be dependent.

2. Example: Mr. Green has an arm span of 62 inches and a height of 63 inches.

Some are generalized algebraic relationships.

3. Example: $y = 2x + 1$ is a function and expresses a dependency relationship.



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- The value of _____.
- The variable *x* is called the _____or _____.
  The set of permissible values for the independent variable is called the _____.
- The variable *y* is called the _____or _____.
  The set of permissible values for the dependent variable is called the _____.

Example	Independent	Dependent	Domain (value)	Range (value)
1. Canyon Lake will rise 3 feet, if it rains 20 inches in the watershed.				
2. Mr. Green has an arm span of 62 inches and a height of 63 inches.				
3. $y = 2x + 1$ is a function and expresses a dependency relationship.				

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Practice Problems

1. Jessie received a statement from her bank listing the balance in her money market account for the past four years. What is the independent quantity in this table?

Time (Years)	Balance
0	$2000
1	$2040
2	$2089
3	$2133
4	$2190

2. Gregorio is in charge of making 120 corsages for homecoming. He decides to ask some of his classmates for help. The number of corsages each person can make can be represented by the function $y = \frac{120}{x+1}$ where x is the number of classmates that help Gregorio make corsages. Which is the dependent quantity of this function?

3. The TM Tennis Team played a total of 162 matches last season. The number of matches the team lost, *l*, and the number of matches the team won, *w*, are represented by the formula below. What quantity does the dependent variable represent?

$$l = 162 - w$$

4. Pat hikes at an average rate of four miles per hour. The number of miles, *m*, she hikes is viewed as a function of the number of hours, *h*, she hikes. What is the independent variable?

5. A taxi driver charges an initial fee of $5.00 plus $0.50 per mile. What is the independent variable quantity in this situation?

6. A long distance telephone company charges $2.95 per month and $0.18 per minute for phone calls. What is the dependent variable quantity in this situation?

7. A plumber charges $40.00 to make a house call plus $35.00 an hour for labor. What are the independent and dependent variables?

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8. The table below represents the relationship between the number of gallons of gas in a gas tank and the number of miles that can be driven. Which quantity represents the dependent quantity in this table?

Gas in Tank (gallons)	Miles that Can Be Driven
0	0
1	25
2	50
3	75
4	100
5	125

9. Susan answered all twenty-five questions on a multiple-choice history exam. Her score was computed by multiplying the number of wrong answers by four and then subtracting the number from one hundred. What quantity represents the independent variable?

10. The cost for copying a document is a function of the number of pages in the document. In this situation, what is the dependent variable?

11. James partially filled a container with sand. The container was shaped like a box and had dimensions 3 feet long, 2.8 feet wide, and 8 inches high. If h represents the height of the sand (in inches), and the volume V (in cubic inches) of the sand is given by the formula $V = 3h$, which quantity is the independent variable?

    A. The height of the container
    B. The volume of the container
    C. The height of the sand in the container
    D. The volume of the sand in the container

12. In the situation below, there are three functional relationships. Identify at least one independent and dependent relationship. In that relationship, tell which one is the independent variable and which one is the dependent variable.

    The monthly cost of electricity for a home is based on the number of kilowatt-hours (kwh) of electricity used. The number of kilowatt hours used is based on the number of watts of electricity each light bulb or appliance uses and the amount of time it is used.