

Glossary

Factor (*noun*) Each of the numbers multiplied to form a product is called a factor of the product. (*verb*) To write a given number as a product.

Factor tree The representation of a composite number showing the steps of successive factoring by writing each new pair of factors under the composite.

Factorial For a natural number n , the product of all the positive integers less than or equal to n . It is denoted by $n!$ and is defined by

$$n! = n(n - 1)(n - 2) \cdot \cdots \cdot 4 \cdot 3 \cdot 2 \cdot 1$$

Also, $0! = 1$.

Factoring The process of determining the factors of a product.

Factorization The result of factoring a number or an expression.

Fahrenheit A unit of measurement in the United States system for measuring temperature based on a system where the freezing point of water is 32° and the boiling point of water is 212° .

Fair coin A coin for which heads and tails are equally likely.

Fair game A game for which the mathematical expectation is zero.

Fair voting principles See *Fairness criteria*.

Fairness criteria Properties that would seem to be desirable in any voting system.

Majority criterion: If a candidate receives a majority of the first-place votes, then that candidate should be declared the winner.

Condorcet criterion: If a candidate is favored when compared one-on-one with every other candidate, then that candidate should be declared the winner.

Monotonicity criterion: A candidate who wins a first election and then gains additional support, without losing any of the original support, should also win a second election.

Irrelevant alternatives criterion: If a candidate is declared the winner of an election, and in a second election one or more of the other candidates is removed, then the previous winner should still be declared the winner.

Fallacy An invalid form of reasoning.

Fallacy of exceptions Reasoning or forming a conclusion by looking at one particular case, which may be an exception.

Fallacy of the converse An invalid form of reasoning that has the form $[(p \rightarrow q) \wedge q]$ and reaches the incorrect conclusion p .

Fallacy of the inverse An invalid form of reasoning that has the form

$$[(p \rightarrow q) \wedge (\sim p)]$$

and reaches the incorrect conclusion $\sim q$.

False chain pattern An invalid form of reasoning that has the form

$$[(p \rightarrow q) \wedge (p \rightarrow r)]$$

and reaches the incorrect conclusion $q \rightarrow r$.

Feasible solution A set of values that satisfies the set of constraints in a linear programming problem.

Fibonacci sequence The sequence 1, 1, 2, 3, 5, 8, 13, 21, \dots . The general term is $s_n = s_{n-1} + s_{n-2}$, for any given s_1 and s_2 .

Fibonacci-type sequence A sequence with general term $s_n = s_{n-1} + s_{n-2}$, for any given s_1 and s_2 . *The* Fibonacci sequence has first terms 1, 1, \dots , but *a* Fibonacci-type sequence can have any two first terms.

Field A set with two operations satisfying the closure, commutative, associative, identity, and inverse properties for both operations. A field also satisfies a distributive property combining both operations.

Finance charge A charge made for the use of someone else's money.

Finite series A series with n terms, where n is a counting number.

Finite set See *Set*.

First component See *Ordered pair*.

First-degree equation With one variable, an equation of the form $ax + b = 0$; with two variables, an equation of the form $y = mx + b$.

Five-percent offer An offer made that is 105% of the price paid by the dealer. That is, it is an offer that is 5% over the cost.

Fixed-point form The usual decimal representation of a number. It is usually used in the context of writing numbers in scientific notation or in floating-point form. See *Floating-point form*.

Floating-point form It is a calculator or computer variation of scientific notation in which a number is written as a number between one and ten times a power of ten where the power of ten is understood. For example, 2.678×10^{11} is scientific notation and 2.678E 11 or 2.678 + 11 are floating point representations. The fixed-point representation is the usual decimal representation of 267,800,000,000.

Floor-plan problem Given a floor plan of some building you wish to find a path from room to room that will proceed through all of the rooms exactly once.

Floppy disk Storage medium that is a flexible platter ($3\frac{1}{2}$ or $5\frac{1}{4}$ inches in diameter) of mylar plastic coated with a magnetic material. Data are represented on the disk by electrical impulses.

Foci Plural for *focus*.

Focus See *Parabola*, *Ellipse*, and *Hyperbola*.

FOIL (1) A method for multiplying binomials that requires First terms, Outer terms + Inner terms, Last terms:

$$(a + b)(c + d) = ac + (ad + bc) + bd$$

(2) A method for factoring a trinomial into the product of two binomials.

Foot A unit of linear measure in the United States system that is equal to 12 inches.

Foreclose If the scheduled payments are not made, the lender takes the right to redeem the mortgage and keeps the collateral property.

- Formula** A general answer, rule, or principle stated in mathematical notation.
- Fractal** A family of shapes involving chance whose irregularities are statistical in nature. They are shapes used, for example, to model coastlines, growth, and boundaries of clouds. Fractals model curves as well as surfaces. The term *fractal set* is also used in place of the word *fractal*.
- Fractal geometry** The branch of geometry that studies the properties of fractals.
- Fraction** See *Rational number*.
- Frequency** See *Classes*.
- Frequency distribution** For a collection of data, the tabulation of the number of elements in each class.
- Function** A rule that assigns to each element in the domain a single (unique) element.
- Function machine** A device used to help us understand the nature of functions. It is the representation of a function as a machine into which some number is input and “processed” through the machine; the machine then outputs a single value.
- Functional notation** The representation of a function f using the notation $f(x)$.
- Fundamental counting principle** If one task can be performed in m ways and a second task can be performed in n ways, then the number of ways that the tasks can be performed one after the other is mn .
- Fundamental operators** In symbolic logic, the fundamental operators are the connectives *and*, *or*, and *not*.
- Fundamental property of equations** If P and Q are algebraic expressions, and k is a real number, then each of the following is equivalent to $P = Q$:
- Addition* $P + k = Q + k$
- Subtraction* $P - k = Q - k$
- Nonzero multiplication* $kP = kQ, k \neq 0$
- Nonzero division* $\frac{P}{k} = \frac{Q}{k}, k \neq 0$
- Fundamental property of fractions** If both the numerator and denominator are multiplied by the same nonzero number, the resulting fraction will be the same. That is,
- $$\frac{PK}{QK} = \frac{P}{Q} \quad (Q, K \neq 0)$$
- Fundamental property of inequalities** If P and Q are algebraic expressions, and k is a real number, then each of the following is equivalent to $P < Q$:
- Addition* $P + k < Q + k$
- Subtraction* $P - k < Q - k$
- Positive multiplication* $kP < kQ, k > 0$
- Positive division* $\frac{P}{k} < \frac{Q}{k}, k > 0$
- Negative multiplication* $kP > kQ, k < 0$
- Negative division* $\frac{P}{k} > \frac{Q}{k}, k < 0$
- This property also applies for \leq , $>$, and \geq .
- Fundamental theorem of arithmetic** Every counting number greater than 1 is either a prime or a product of primes, and the prime factorization is unique (except for the order in which the factors appear).
- Future value** See *Compound interest formula*.

Future value formula For simple interest: $A = P(1 + rt)$; for compound interest:

$$A = P(1 + i)^N$$

Fuzzy logic A relatively new branch of logic used in computer programming that does not use the law of the excluded middle.