GLOSSARY

a posteriori
from the latter; reasoning based upon experience of the senses. See **empiricism.**

a priori
from the former; reasoning independence of the experience of the senses. See **intuitionism**.

Abscissa
1) The x-coordinate in the Cartesian coordinate system. See **ordinate**.
2) I don't like it when a dentist does that in my mouth.

Absolute value
1) The absolute value of a real number *a*, written $|a|$, is:
$|a| = a$ if $a \geq 0$
$|a| = -a$ if $a < 0$
2) In the complex number plane, equivalent to the radius vector in Polar coordinates. Also called modulus.

Never absolutize the relative and never relativize the absolute.

Absolutization
When a person absolutizes any created thing (idea or physical category or relationship), he is making, in terms of God's view on things, the relative absolute (i.e., making a portion of creation the starting point and the ending point of all reasoning).

Abstract
A theoretical concept or model; drawn from the concrete physical creation. See **concrete**.

Abundant number
Ancient Greek classification reflecting the situation when the sum of the factors of a given number (excluding the number itself) is greater than the given number. See **deficient number** and **perfect number**.

Acceleration
1) Rate of change of velocity; the second derivative of position.
2) What you did a lot with cars when you were a teenager.

Acute angle
1) A positive angle smaller than a 90° angle.
2) An angle that is pretty.

Addend
One of a group of numbers to be added; in 5 + 6 = 11, 5 and 6 are the addends.

Addition
The arithmetical operation of combining two numbers to form a sum.

Addition property of equality
If a = b, then a + c = b + c.

Additive identity
The number zero is the additive identity for addition because for all real numbers *a*, 0 + a = a.

Additive inverse
For any real number *a*, the additive inverse of *a* is called the opposite or negative of *a:* a + (-a) = 0.

Adjacent angles
Two angles that share the same vertex and have one side in common between them.

Algebra
A generalization of arithmetic in which symbols (usually letters) are used to stand for numbers. From the title of a book written by Mohammed ibn Musa al-Khowarizmi (ca. 780 – ca. 850) entitled *Hisab al-jabr w'al-muqabalah. Al-jabr*, in Arabic, means transposition or setting (taken from the Arabic medical practice of setting broken bones).

Algorithm
A rule or set of rules that can be used to solve a problem in a finite number of steps. Medieval scholars coined this word and it represents a slight change in the name al-Khowarizmi..

Alternate interior angles
When a transversal intersects two lines it forms two pairs of alternate interior angles.

Altitude
1) The angular measure of an object above the horizon.
2) The perpendicular distance from a vertex of a polygon to an opposite side.

Amplitude
See **argument**.

Analog

A system in which numbers are represented by a device that can vary continuously (e.g., a clock with hands that move around a circle). See **digital**.

Analogy
Making comparisons based upon likeness.

Analysis
A branch of mathematics that studies limits and convergence; the calculus is part of analysis.

Analytic geometry
Also called Cartesian coordinate geometry; a branch of mathematics that uses algebra in the study of geometry.

Angle
1) The union of two rays with a common endpoint.
2) What you try to get on people who are a bit strange.

Angle bisector
Divides an angle in half.

Antiderivative
A function f(x) whose derivative equals f′(x). Also called anti-differentiation.

Apex
The sharp point or tip at the top of a cone.

Apothem
In a regular polygon, a perpendicular from its center to one of its sides.

Arabic numerals
The 10 numerals (symbols) that we use in our number system (0, 1, 2, 3, 4, 5, 6, 7, 8, 9). This number system arrived in medieval Europe from Arabia and probably originated in India. Sometimes called Hindu-Arabic numerals.
See **decimal number.**

Arc
1) An arc of a circle is the set of points on the circle that lie in the interior of a particular central angle (the degree measure of an arc is the same as the degree measure of the angle that defines it).
2) What Noah built.

Area
In two-dimensional figures, it measures how much of a plane it fills up.

Argument
In the complex number plane, equivalent to the polar angle in Polar coordinates. Also called the amplitude.

Arithmetic
The branch of mathematics that explores the basic calculation operations of addition, subtraction, multiplication, and division.

Arithmetic mean
Given a list of *n* numbers, it is the sum of these numbers divided by *n.* Also called the **average**.

Arithmetic sequence
A sequence of *n* numbers of the form:
a, a + b, a + 2b, a + 3b, ..., a + (n – 1)b
The formula to find the n^{th} term, a_n, is $a_n = a_1 + (n – 1)d$ where d is the common difference between terms.

Arithmetic series
The sum, S, of an arithmetic sequence:
S = a + (a + b) + (a + 2b) + (a + 3b) + ... + [a + (n – 1)]

Associative property
An arithmetic operation obeys this property if the grouping of the numbers involved does not change the result of the operation. For addition, a + (b + c) = (a + b) + c. For multiplication, a(bc) = (ab)c.

Astrolabe
A medieval instrument, now replaced by the sextant, which was once used to determine the altitude of the sun or other celestial bodies.

Astronomical unit (AU)
A unit of length used in measuring astronomical distances within the solar system equal to the mean distance from Earth to the sun, approximately 150 million kilometers (93 million miles).

Asymmetric cryptosystem
When the sender and receive use the different keys. See **symmetric cryptosystem.**

Asymptote
A straight line that is a close approximation to a particular curve (without touching the curve) as the curve continues to infinity in one direction.

Average

1) Given a list of numbers; it is the same as the **arithmetic mean**.
2) Baseball players with a batting average of .300 are considered good (even if they fail seven times out of ten).

Axiom

A statement assumed to be true without proof.

Axiomatic-Deductive Systems

A group or set of axioms upon which a branch of mathematical study is based. These axioms must be *consistent, independent, and complete.*

The set of axioms must be *consistent* in that they do not contradict each other and that it is impossible to derive from these axioms results that will contradict each other.

Each axiom in the set must be *independent* of the other axioms in the set. In other words, an axiom in the set cannot be derived from the other axioms in the set. This stipulation guarantees that the set of axioms are minimal.

The set of axioms must be *complete* in that they are sufficient to generate all possible results concerning the given field of knowledge they seek to encompass.

Axis

1) In the Cartesian coordinate system, the x-axis is the line $y = 0$; the y-axis is the line $x = 0$.
2) The Germans, Italians, and Japanese in World War II.

Bar graph

A graph consisting of parallel, usually vertical bars or rectangles with lengths proportional to the frequency with which specified quantities occur in a set of data.

Base

1) In the equation $x = \log_a y$, the quantity a is the base. See **logarithm**.
2) The number of digits a positional number system contains.
3) In a polygon, it is one of the sides of the polygon.
4) In a solid, it is one of the faces of the solid.
5) There are four in baseball.

Binary numbers

Base 2 numbers written in a positional system that uses the digits 0 and 1.

Binomial

The sum of two terms; e.g., $ax + b$ is a binomial.

Binomial theorem

A formula for determining how to expand the expression $(a + b)^n$.

Bisect

To cut something in half. Do not perform on humans.

Boundary

"That which is an extremity of anything" or something that surrounds something else.

Calculus

A branch of mathematics divided into the differential calculus and the integral calculus. It deals with the analysis of the instantaneous rate of change of functions and the calculation of areas under a curve.

Cancel

1) In fractions, to divide the same number out of the numerator and the denominator.
2) The result of adding to numbers of opposite sign.
3) What God does in Christ with our debt of sin.

Cardinal

1) Indicates quantity (without regard to order).
2) A member of a baseball team from St. Louis.

Cardinality

In infinite sets: two sets that have the same number of elements have the same cardinality.

Carrying a digit

In columnar addition or multiplication, if a column adds (or multiplies) up to 10 or more, the ones digit is written under the line and the tens digit is transferred to the top of the column immediately to the left.

Cartesian coordinate system

A system whereby an ordered pair of numbers identifies points on a plane representing the distances to two perpendicular axes.

Casting out nines

A method that can be used to check arithmetic by removing the sums of nine.

Center

1) Of a circle: the point that is the same distance from all of the points on the circle.
2) Of a sphere: the point that is the same distance from all the points on the sphere.

3) Of an ellipse: the point where the major an minor axis intersect.
4) Of a regular polygon: the center of the circle that can be inscribed in that polygon.
5) Of a basketball team: the guy who is the tallest.

Centrifugal force
Force directed or pulling outward from the center.

Centripel force
Force directed or pulling toward the center.

Characteristic
The number *n* in scientific notation, $a \times 10^n$.

Characteristic triangle
An infinitesimally small triangle used in the differential calculus to quantify the slope of the tangent line to a point on a continuous curve.

Check digit
A digit added to an account number or other identifying key value and then recomputed when the number is used. This process determines whether an error occurred when the number was entered.

Chord
1) A line segment that connects two points on a curve.
2) A nice, harmonious blend of musical tones.

Circle
1) A conic section; a set of points in a plane that are all a constant distance from a given point. This means that the measure of the radii (plural of radius) of a circle all equal.
2) Area = πr^2 where r = radius
3) Circumference = $2\pi r = \pi d$ where r = radius and d = diameter
4) What Indians do to covered wagons.

Circular functions
1) Same as trigonometric functions.
2) The rides that make you dizzy at the fair.

Circumference
The total distance around a closed curve; e.g., the distance around your waist that seems to get greater and greater with age.

Circumscribed
A figure that surrounds another figure, touching it at as many points as possible.

Clock arithmetic
See **finite arithmetic**.

Closed curve
A curve that completely encloses an area.

Closed surface
A surface that completely encloses a volume of space.

Closure
The property that a set of numbers reflects when that set is closed with respect to a particular arithmetic operation; i.e., an arithmetical operation on two numbers in a given set generates a number that is in that given set.

Coefficient
In algebra, it represents a number that multiplies something else (a constant multiplying a variable). The coefficient of ax^2 is the number *a*.

Collinear
In geometry, two or more points that lie on the same line.

Combinations
The number of possible ways of arranging objects chosen from a total number sample size if the order of arranging the objects is of no concern. See **permutations** and safe crackers.

Common denominator
In order to add or subtract fractions of unlike denominators, you must first convert one or both fractions into equivalent fractions that have the same denominator.

Common divisor
A number that divides evenly each of two or more other numbers; e.g., the common divisor of 15 and 27 is 3.
See **common factor.**

Common factor
See **common divisor** (how do you like that looping definition?).

Common fraction

A fraction whose numerator and denominator are both integers; e.g., $\frac{3}{5}$.

Common logarithm

Logarithm to the base 10. By the way, what is an uncommon logarithm?

Common multiple

A number that is a multiple of each of two or more numbers; e.g., the common multiple of 6 and 7 is 42.

Commutative property

An arithmetic operation obeys this property if the order of the numbers involved does not change the result of the operation. For addition, a + b = b + a. For multiplication ab = ba.

Compass

1) A device consisting of two adjustable legs used for drawing circles and measuring equal distances.
2) What you use when you are lost in the woods.

Complementary angles

1. Two angles whose sum equals 90°.
2. Two angles that say nice things to each other.

Completing the square

Simplifying an algebraic equation by adding an expression to both sides that makes one part of the equation a perfect square.

Complex fraction

A fraction whose numerator and denominator is a fraction; e.g., $\frac{\frac{2}{3}}{\frac{4}{5}}$.

See **common fraction.**

Complex number

Formed by adding a imaginary number to a read number. The general form is a + bi, where *a* and *b* are both real numbers and *i* is the imaginary unit, $\sqrt{-1}$.

Complex number plane

A grid in which a complex number can be plotted. The x-axis is the real number axis and the y-axis is the imaginary number axis.

Composite number

Ancient Greek classification denoting a natural number that is not a prime number. See **prime number.**

Compound interest

If *p* dollars are invested in an account paying compound interest at an annual rate *r*, then the balance of the account after *n* years is:

$p(1 + r)^n$.

Concave

A set of points in which it is possible to draw a line segment that connects two points that are in the set but also includes some points that are not in the set. See **convex**.

Concentric

Two or more circles that share a common center.

Conclusion

The phrase in a logical argument or conditional statement that follows as a result of the premises or assumptions of the argument. See **statement** and **hypothesis**.

Concrete

The created reality; particular things of existence in God's universe. See **abstract.**

Condensation point

Another word for every distinct rational number.

Conditional statement

A statement of the form, "If a is true, then b is true."

Cone

1) A figure formed by the union of all line segments that connect a given point (vertex) and the points on a closed curve that is not in the same plane as the vertex (if you don't understand this, picture the traditional ice cream cone).
2) Volume = $\frac{\pi r^2 h}{3}$ where r = radius of the base and h = height

3) Area of curved surface = $\pi r\sqrt{r^2 + h^2}$ where r = radius of the base and h = height

Congruent

1) Two polygons are congruent if they have exactly the same shape and exactly the same size.
2) Equivalence in modular arithmetic.
3) The basis for friendship between two people. "Can two walk together, unless they are congruent?" (Amos 3:8, New Mathematical Translation).

Conic sections

The four curves (circle, ellipse, parabola, and hyperbola) formed by the intersection of a plane with a right circular cone. See **right circular cone.**

Conjunction

A compound proposition that is true if and only if all of its component propositions are true or the relation among the components of such a proposition, usually expressed by AND. See **logic** and **disjunction**.

Conjugate

One of a pair of complex numbers differing only by the sign of the imaginary parts; i.e., a + bi and a – bi are conjugates where $i = \sqrt{-1}$.

Constant

Represents a quantity that does not change.

Continued Fraction

A fraction whose denominator contains a fraction whose denominator contains a fraction, etc., forever. Oh my!

Continuity

See **continuous**.

Continuous

A curve with no breaks in it; you can trace the curve without lifting your pencil from the paper.

Continuum

The union of the set of rational numbers with the set of irrational numbers; also called the real numbers.

Contradiction, Law of

A formal statement cannot be both true and false at the same time.

Contrapositive

If a conditional statement is in the form a $\rightarrow$ b (a implies b or if a, then b), then the contrapositive is not b $\rightarrow$ not a (not b implies not a or if not b, then not a). See **statement**, **converse,** and **inverse**.

Convergent series

A infinite series that has a finite sum. See **divergent series**.

Converse

If a conditional statement is in the form a $\rightarrow$ b (a implies b or if a, then b), then the converse is a $\rightarrow$ b (b implies a or if b, then a). See **statement**, **contrapositive,** and **inverse**.

Convex

A set of points if, for any two points in the set, all the points on the line segment joining them are also in the set. See **concave**.

Coordinates

Of a point in the plane: the set of numbers (ordered pairs) that identify the location of that point in a plane.

Corresponding angles

When a transversal intersects two lines, it forms four pairs of corresponding angles.

Cosecant

A circular function; an angle that is the reciprocal of the sine function. Given the angle θ, then csc θ = 1/sin θ.

Cosine

A circular function; an angle giving the ratio of the length of the adjacent leg to the length of the hypotenuse of a right triangle.

Cotangent

A circular function; an angle that is the reciprocal of the tangent function. Given the angle θ, then cot θ = 1/tan θ.

Countable

A set of numbers that can be counted sequentially in one-to-one correspondence with the natural numbers.

Counting numbers

Also called the natural numbers (1, 2, 3, 4,...). They are the numbers you use to count something.

Cross-multiplying

If $\frac{a}{b} = \frac{c}{d}$, then ad = bc.

Cryptanalysis

The science of breaking codes and ciphers.

Cryptography

The science of codes and ciphers.

Crystallography

The study of crystal structure.

Cube

1) a solid with six congruent square faces.
2) raising a number to the power of 3.
3) the solid that you put in water to make it cold.

Cube root

Of a number: the number that, when multiplied together three times, gives that number.

Cubic

A polynomial of degree 3.

Curve

A path traced out by a point as it moves through space.

Cylinder, Right

1) The surface generated by a straight line intersecting and moving along a closed plane curve, the directrix, while remaining parallel to a fixed straight line that is not on or parallel to the plane of the directrix. If that confuses you, just envision the standard Campbell's soup can.
2) Volume = $\pi r^2 h$ where r = radius and h = height
3) Lateral surface area (excluding the area of the circle on both bases) = $2\pi rh$ where r = radius and h = height

Decimal fraction

See **decimal number.**

Decimal number

The way of representing numbers in the base 10 system. Each digit represents a multiple of the power of 10. Also called a **decimal fraction**.

Decimal place

The position of a digit to the right of the decimal point; e.g., in 5.23, 2 is in the first decimal place and 3 is in the second decimal place.

Decimal point

A symbol (normally a dot or a period) that separates the units position from the tenths position in a decimal fraction.

Decimal system

A number system that uses 10 as the base.

See **arabic numerals.**

Decryption

To decode a cipher or secret code into plain text. See **encryption**.

Deduction

1) A conclusion arrived at by logical reasoning based upon given premises.
2) What Sherlock Holmes is real good at.

Deficient number

Ancient Greek classification reflecting the situation when the sum of the factors of a given number (excluding the number itself) is less than the given number. See **abundant number** and **perfect number**.

Definite integral

Given a function f(x) that is always nonnegative, the definite integral of f(x) between *a* and *b* represent the area under the curve y = f(x), above the x-axis, to the right of the line x = a, and to the left of the line x = b. It is represented by the expression:

$$\int_a^b f(x)dx$$

Degree

1) A unit of measure for angles. One degree is equal to 1/360 of a full circular rotation. See **angle**; **radian measure**.
2) Of a polynomial: the highest power of the variable that appears in the polynomial. See **polynomial**.
3) What colleges and universities are supposed to give you in exchange for all that tuition, room/board, and book fees.

Delta (Δ)

The Greek letter capital delta is used in expressions like Δx to mean "a small increment of x."

Denominator

The bottom number in a fraction. It tells you how many equal parts a whole has been divided into.

Denumerable

A set that can be placed in a one-to-one correspondence with the set of natural numbers.

Dependent variable

The output number of a function. In the equation $y = f(x)$, *y* is the dependent variable and *x* is the independent variable. See **function**.

Derivative

A mathematical description of the instantaneous rate of change of a function. It is characterized geometrically as the slope of the tangent line to a point on a curve. The derivative of the function f(x) is written f′(x) and is formally defined as:

$$\lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

Diagonal

A line segment connecting two nonadjacent vertices of a polygon.

Diameter

Of a circle: the length of a line segment joining two points on the circle and passing through the center.

Difference

1) Subtracting one number from another.
2) The opinion of when husbands and wives have an argument.

Difference of two squares

In algebra, an expression of the form $a^2 - b^2$. It is equal to $(a + b)(a - b)$.

Difference quotient

The ratio of $\Delta y / \Delta x$ on the characteristic triangle in the differential calculus.

Differentiation

The process of finding the derivative of a given function f(x).

Digit

A number symbol. There are 10 digits in the decimal, base 10, number system.

Digital

A system where numerical quantities are represented by a device that shifts between discrete states rather than varying continuously. Pocket calculators and computers are digital devices. See **analog**.

Dimension

The number of coordinates needed to identify a location in a given space.

Direct Proof

A direct proof conists of a chain of statements inferred one from another, staring with the hypothesis and ending with the conclusion of the theorem. Each step in the proof is justified by means of axioms, definitions, or previously proved theorems.

Directrix

A line that helps to define a geometric figure.

Discrete

A situation where the possibilities are distinct and separated from each other. See **continuous**.

Discriminant

The value of $b^2 - 4ac$ in the quadratic equation $ax^2 + bx + c = 0$.

Disjunction

A proposition that presents two or more alternative terms, with the assertion that only one is true or the relation among the components of such a proposition, usually expressed by OR. See **logic** and **conjunction**.

Distance

1) A unique positive number that represents measurable separation between any two points in space.
2) What you should keep when you encounter someone with bad breath.

Distance formula

Given two points, (x_1, y_1) and (x_2, y_2), in the Cartesian coordinate plane, the distance, *c*, between them is defined as follows:

$$c = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$$

Distributive rule

For any numbers *a*, *b*, and *c*, $a(b + c) = ab + ac$.

Divergent series

An infinite series with no finite sum; also called an indefinite series.

Diversity

The many things of God's created order. See **particular**.

Dividend

1) In the equation a ÷ b = c, *a* is the dividend.
2) What you get as a stockholder in a company that is making a profit (getting that is a lot better than doing long division problems).

Divisible

A number capable of being divided with a remainder of 0.

Division

Arithmetic operation that is the inverse of multiplication. If ab = c, then c/b = a.

Divisor

In the equation a ÷ b = c, *b* is the divisor.

Dodecahedron

A polyhedron with 12 faces. See **polyhedron**.

Domain

1) Given a function f(x), it is the set of all possible values for *x*.
2) The "house" where the variable x "lives."
3) What is mine and what you should not cross when I'm upset.

Double negativeproperty

-(-a) = a.

Duality

A symmetry within a mathematical system such that a theorem remains valid if certain objects, relations, or operations are interchanged, such as the relationship between vertices and edges between a cube and an octahedron.

e

The base of the natural logarithms. It is defined as:

$$\lim_{n\to\infty}\left(1+n\right)^{\frac{1}{n}}$$

Eccentricity

1) Indicates the shape of a conic section.
2) What happens to people after reaching the age of 50.

Edge

1) Of a polyhedron: a line segment where two faces meet. A cube has 12 edges.
2) What you are on when your children or grandchildren are rowdy.

Element

1) A member of a group or set of numbers.
2) One of those chemistry "things."

Ellipse

A conic section; the set of all points in a plane such that the sum of the distances to two fixed points (called the foci) is a constant.

Empiricism

The derivation of knowledge from external or sense observations. See **a posteriori**.

Encryption

To put plain text into a cipher or secret code. See **decryption**.

Enumerated

See **countable**.

Epistemology

The study of the nature of knowledge; its presuppositions and foundations, and its extent and validity. The fear of the Lord is the bedrock superstructure of knowledge (Proverbs 9:10).

Equality, Properties of

Basic properties that govern algebraic solutions to equations.

Equation

A statement that says that two mathematical expressions are equal to each other (have the same value); e.g., 4 × 5 = 20.

Equilateral triangle

A triangle with three equal sides.

Equivalent equations

Two equations that give the same solution.

Equivalent fractions

Two fractions that have the same value.

GLOSSARY

Ethics
The study of the nature of moral decisions; the nature of right and wrong; the motivating factors that govern choices. The standard for ethical motivations and decisions is God's character and His word (Leviticus 20:7).

Etymology
Study of word meanings.

Euclidean geometry
Plane and solid geometry based upon the axioms and postulates of the ancient Greek mathematician Euclid.

Euler characteristic
In each of the five regular polyhedra, the sum of the number of faces (F) and vertices (V) is two less than the number of edges (E) or, in symbols, $F + V = E + 2$.

Even number
A natural number evenly divisible by 2.

Evenly
A number that divides into another number without a remainder.

Everywhere dense
The packing nature of rational numbers on the number line.

Excluded Middle, Law of
For every formal statement S, either S is true *or* S is false. There is no "middle" option.

Exhaustion
1) A geometric technique developed by the ancient Greeks by which formulas for areas of different shapes could be confirmed through better and better approximations.
2) What happens if you work or exercise too hard.

Exponent
Of a number: indicates the operation of repeated multiplication.

Exponential function
A function f(x) of the form $f(x) = a^x$ where *a* is a constant known as the base; reflects patterned growth or decay.

Exponential notation
See **scientific notation**.

Face
1) An individual polygon that bounds a polyhedron. A cube has six faces.
2) What you see in the mirror after you wake up in the morning.

Factor
1) As a noun: a factor of a whole number is a number which, when multiplied by another number, yields the first number as a product.
2) As a verb: to factor a whole number is to break it down into factors; e.g., to factor 27 is to break it down into 9×3 or $3 \times 3 \times 3$.
3) For an algebraic expression: to express it as a product of several factors. See **factoring**.

Factorial
Of a positive integer; the product of all the integers from 1 up to the given integer.

Factoring
1) The process of factoring a whole number into its factors.
2) The process of splitting a complicated algebraic expression into the product of two or more simpler expressions; e.g., $x^2 - 2x - 15$ can be factored to $(x - 5)(x + 3)$.

Factorization theorem
Any whole number can be expressed in one and only one way as a product of its *prime* factors; e.g., $36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$.

Fermat's Little Theorem
If *p* is a prime number and *n* is any integer that does not have *p* as a factor, then $n^{p-1} \equiv 1 \bmod p$

Fibonacci sequence
The first two numbers of this sequence are 1; every other number is the sum of the two numbers that immediately precede it.

Figure
1) "That which is contained by a boundary or boundaries."
2) What you do when you calculate something.

Finite
Something that it doesn't take forever to count or measure. See **infinite**.

Finite arithmetic
A counting system that cycles back on itself; also called clock or modular arithmetic.

Focus (pl. foci)

1) In a parabola: a fixed point, the parabola is the set of points that are the same distance from this point and the directrix.
2) In an ellipse: two points, an ellipse is the set of points such that the sum of the distances to these two points is a constant.
3) What you should do when you study mathematics.

Force

What causes an object to move or what restrains an object's motion.

Formalism

Abstract systems or structures in mathematics that are carefully defined.

Formula

A mathematical statement, written usually as an equation, the states a fact, a rule, a principle, a pattern, or a logical relation.

Fourier series

An infinite series of sines and cosines typically used to approximate a periodic function.

Fraction

A number a/b defined by the equation:

$$\frac{a}{b} \times b = a$$

Fractional exponent

An exponent that is a fraction.

Frequency distribution

The correspondence of a set of frequencies (or tallies) with the set of categories, intervals, or values into which a population or group is classified.

Function

A rule that describes the mathematical dependency; a rule that provides exactly one output value for each input value.

Fundamental Counting Principle

To count the number of ways to do something in succession, multiply the number of possibilities in each instance.

Fundamental property of decimal expansions

If a number has an infinite decimal expansion, no other infinite decimal expansion can represent that number.

Fundamental Theorem of Algebra

An *n*th-degree polynomial equation has exactly *n* roots (solutions) when you include complex numbers as roots and you realize that a root may occur more than once.

Fundamental Theorem of Arithmetic

Any natural number can be expressed as a *unique* product of prime numbers.

Fundamental Theorem of the Calculus (FTC)

Demonstrates the reciprocal relationship between the derivative and the integral. If f(x) is a given function, and f′(x) is the derived function or derivative, then the area under the curve defined by f′(x) between the two bounds *a* and *b* is:

$$\int_a^b f'(x)dx = f(b) - f(a)$$

G.M.T.

Greenwich mean time.

Generatrix

A geometric element that generates a geometric figure, especially a straight line that generates a surface by moving in a specified fashion.

Geometric construction

The process of drawing geometric figures using only a straightedge (ruler) and a compass.

Geometric mean

Given any two positive numbers *a* and *b* the harmonic mean, G, is calculated as follows:

$$G = \sqrt{ab}$$

Geometric sequence

A sequence of the form $a, ar, ar^2, ar^3, ..., ar^{n-1}$ where the ratio between any two consecutive terms is a constant.

The formula for finding the n^{th} term, a_n, is: $a_n = a_1 r^{n-1}$ where r is the common ratio between each term.

Geometric series

The sum, S, of a geometric sequence:
$S = a + ar + ar^2 + ar^3 + ... + ar^{n-1}$

Geometry
A branch of mathematics that studies the shape and size of figures.

Gnomon
1) The raised part of a sundial that casts the shadow.
2) A carpenter's square.

Golden Ratio
The proportion of the division of a line segment such that the smaller segment is to the larger segment as the larger segment is to the whole segment. As computed, the Golden Ratio is an irrational number denoted as $\phi = \frac{\sqrt{5}-1}{2} \approx 0.618033988$

Grad
Circular measure: One grad is equal to $\frac{1}{400}$ of a circle.

Gradient
See **slope**.

Graph
A geometric representation of a function, showing the correspondence between pairs of points and drawn on the Cartesian coordinate system.

Gravitational force
The force exerted by the pull of the Earth's gravity upon an object.

Great circle
A circle on a spherical surface such that the plane containing the circle passes through the center of the sphere.

Greatest common factor
Of two natural numbers *a* and *b*; the largest natural number that divides both *a* and *b* evenly (abbreviated GCD); e.g., the GCD of 16 and 28 is 4.

Harmonic mean
1) Given any two positive numbers *a* and *b* the harmonic mean, H, is calculated as follows:
$$H = \frac{2ab}{a+b}$$
2) It is the inverse (or reciprocal) of the average of the inverses of a given set of numbers.

Harmonic sequence
1) A sequence of numbers whose reciprocals form an arithmetic sequence.
2) That portion of a musical composition that sounds real good.

Heptagon
A polygon with seven sides.

Heron's (Hero's) Formula
The area *A* of a triangle of sides *a*, *b*, and *c* with semiperimeter (half the perimeter) *s* is given by $A = \sqrt{s(s-a)(s-b)(s-c)}$

Hexagon
A polygon with six sides.

Hexahedron
A polyhedron with six faces. The alias for a regular hexahedron is the cube.

Hindu-Arabic numerals
See **Arabic numerals.**

Homogeneous
Of the same kind or of similar nature.

Hyperbola
A conic section; the set of all points in a plane such that the difference between the distances to two fixed points is a constant.

Hypotenuse
The side of a right-angled triangle that is opposite the right angle.

Hypothesis
In a conditional statement, the hypothesis is the "if" clause. See **statement**.

i

The imaginary unit equal to $\sqrt{-1}$.

Icosahedron

A polyhedron with 20 faces.

Identity element

Given any number *a*, the identity element is the number that returns *a* after an arithmetic operation has been performed on *a* and the identity element.

Imaginary number

A number of the form *ni* where *n* is a real number that is being multiplied by the imaginary unit $i = \sqrt{-1}$.

Imminent

Within human comprehension.

Impetus

See **inertia**.

Improper fraction

A fraction whose numerator is greater than its denominator.

Incommensurable

A geometric length that cannot be represented as the ratio of two integers.

Increment

Means "change in." An increment in variable *x* is symbolized as Δx.

Indefinite integral

Also called the primitive function. If f(x) is a given function and f′(x) is the derived function or derivative, then indefinite integral is symbolized as follows:

$$\int f'(x)dx = f(x) + c$$

The number *c* is called the arbitrary (or indefinite) constant of integration.

Indefinite series

See **divergent series**.

Independent variable

The input number to a function. In the equation y = f(x), *x* is the independent variable and *y* is the dependent variable. See **function**.

Indeterminate

Division by zero.

Index

The index of a radical is the small number that tells what root is to be taken. If the number is 3, then the following expression means "take the cube root of 81:

$$\sqrt[3]{81}$$

Indirect proof

Logical reasoning that assumes that a theorem is false and then proceeds to show that a contradiction results. Therefore, the theorem must be true. Also called the *reductio ad absurdum* argument.

Induction

1). The process of reasoning from a particular circumstance to a general conclusion.
2). A logical process of mathematical thinking that allows one to prove things about all numbers in a sequence even though there is an *infinite* number of them.

Inertia

The tendency of a body to resist acceleration; the tendency of a body at rest to remain at rest or of a body in motion to stay in motion in a straight line unless acted on by an outside force. Also called momentum or impetus.

Inequality

A mathematical expression that compares two numbers or expressions using symbols < (less than), ≤ (less than or equal to), > (greater than), or ≥ (greater than or equal to).

Infinite

Limitless. The natural numbers are infinite in scope. See **finite**.

Infinite series

The sum of an infinite number of terms.

Infinitesimal

A variable quantity that approaches very close to zero. In the calculus, Δx is usually used to represent an infinitesimal change in the variable *x*.

Initial velocity

The beginning speed and direction of a moving projectile.

Inorganic
Non-living. See **organic**.

Inscribed
1) For a polygon: a polygon placed inside a circle so that each vertex of the polygon touches the circle.
2) For a circle: a circle located inside a polygon with each side of the polygon tangent to the circle.

Integer
A whole number (positive, zero, or negative): ... –3, -2, -1, 0, 1, 2, 3, ...

Integral
Finding it is the inverse process of finding a derivative. By it you can calculate the area under a curve and the distance of a position function.

Integration
The process of finding an integral.

Intercept
1) The y-intercept of a curve is the value of *y* where it cross the y-axis, and the x-intercept is the value of *x* where the curve crosses the x-axis.
2) The bane of football quarterbacks.

Interior
1) Of an angle, the set of all points not on an angle having the property that if a line segment joins any two, the segment will not intersect the angle.
2) Of Africa, where David Livingstone (1813-1873) explored.

Intuitionism
The derivation of knowledge from within (i.e., internally by man knowing because he simply "is") irrespective of external observations. See **a priori**.

Invariant
A value (or relationship) that remains unchanged under some operation.

Inverse
1) An operation that nullifies a previous operation; e.g., the subtraction of a number nullifies the previous addition of that same number and division by a number reverses multiplication by that number.
2) Let the symbol o represent an operation (like multiplication). Given any number *a* the identity element I. The inverse of a number *x* is the number such that x o y = I.
3) If a conditional statement is in the form a $\rightarrow$ b (a implies b or if a, then b), then the inverse is not a $\rightarrow$ not b (not a implies not b or if not a, then not b). See **statement**, **contrapositive,** and **inverse**.
4) The love letters of a poet.

Inversely proportional
If *y* and *k* are related by the equation y = k/x, where *k* is a constant, then *y* is said to be inversely proportional to *x*.

Irrational number
1) A number that cannot be written as the ratio of two integers.
2) A number that gets mad for no reason.

Isosceles trapezium
A quadrilateral that has exactly two sides parallel and two sides equal in length.

Isosceles triangle
A triangle with two equal sides.

Key
1) In cryptography, a method or formula used to encrypt plain text or decrypt ciphered text.
2) As you get older, you seem to lose or misplace the plural form quite often.

Latitude
Te angular distance north or south from the equator of a point on the earth's surface, measured by the meridian of that point.

Law of cooling
A rule that quantifies the proportional rate at which the temperature of a warm object cools in a colder environment.

Least Common Denominator
Of two fractions a/b and c/d; the smallest integer that contains both *b* and *d* as a factor.

Least Common Multiple
Of two natural numbers; the smallest natural number that has both of them as a factor (abbreviated LCM); e.g., the LCM of 2, 3, and 4 is 12.

Leg
1) A side of a right-angled triangle that is not the hypotenuse.
2) Of a lamb … um, delicious.

Like terms

1) Two terms of a polynomial are like terms if all parts of both terms except for the numerical coefficients are the same; e.g., 3ab and 7ab are like terms.
2) Two terms that are affectionate with each other.

Limit

(simple definition): The result of an infinite process that converges to a finite answer.
(rigorous definition as formulated by Karl Weierstrass in 1854):
Given a continuous function f(x),

$\lim_{x \to c} f(x) = L \Rightarrow \forall \varepsilon > 0, \exists \delta > 0 \ni \text{if } |x - c| < \delta, \text{ then } |f(x) - L| < \varepsilon$

$\Rightarrow$ means "implies," $\forall$ is means "for every," ε is the Greek lower case letter epsilon, $\exists$ means "there exists," δ is the Greek lower case letter delta, $\ni$ means "such that," and the expressions between the two | symbols means "absolute value of." How's that for an example of mathematical "rigor"? In the multitudinous decades that have come and gone since the conceptualization of this definition, it has often been asserted that only about five students have understood it.

Line

1) A straight set of points that extends to infinity in two directions.
2) "Length with no width."
3) One dimension.
4) King of the jungle.

Line graph

A diagram that exhibits a relationship, often functional, between two sets of numbers as a set of points having coordinates determined by the relationship; also called plot.

Line segment

A straight set of points that has two end points.

Linear equation

An equation of the form $y = mx + b$. The graph of a linear equation is a straight line.

Linear function

See **linear equation**.

Linguistic convention

What a culture (based upon language) agrees to be true.

Literal part

Of the general expression of a monomial ax^n, x^n is called the literal part.

Locus

A set of points.

Log

The abbreviation of logarithm.

Logarithm

The inverse of an exponential. The equation $x = a^y$ can be written as $y = \log_a x$ meaning "*y* is the logarithm to the base *a* of *x*.

Logic

The study of sound reasoning.
In *symbolic* (or *propositional*) logic, statements are replaced by symbols and then these symbols are logically manipulated to generate what are called "truth tables."

Logically equivalent

Two statements are logically equivalent (if one is true, then the other *must* be true. Or, if one is *false*, then the other *must* be false). See **statement, converse, inverse, contrapositive**.

Longitute

the angular distance east or west on the Earth's surface, measured by the angle contained between the meridian of a particular place and some prime meridian and expressed either in degrees or by some corresponding *difference in time.*

Lowest terms

1) Reducing a fraction to an equivalent fraction that cannot be reduced any further.
2) A fraction in which the common divisors of the numerator and denominator have been divided out; e.g., 2/3 is in lowest terms while 4/6 is not since the numerator and denominator can be divided by 2.

Lucas number sequence

Starting with any two numbers, every other number in the sequence is the sum of the two numbers that immediately precede it.

Lune

A crescent-shaped portion of a plane or sphere bounded by two arcs of circles.

Major axis

In an ellipse, the line segment joining two points on the ellipse that passes through the two foci; it is the longest possible distance across the ellipse.

Mantissa

The number *a* in scientific notation, $a \times 10^n$.

Map

1) Another name for a function. See **function**.
2) You use this to find your way around the streets of a city.

Mathematical induction

A method for proving that a proposition is true for all whole numbers. First, show that the proposition is true for a few small numbers (e.g., 1, 2, or 3). Then show that, if the proposition is true for an arbitrary number *j*, then it must be true for the next number *j + 1*. Validating these two steps confirms the truth of the proposition.

Mathematics

A mental discipline that makes use of the *abstract* formulation of ideas suggested by the patterned structure of God's creation. It is the artful use of the God-given reasoning processes to make connections (find unity in diversity) and then to infer and deduce new facts about creation; i.e., to discover the wisdom of God in Christ hidden in creation (see Proverbs 25:2). It is a series of significant assertions about the nature of creation and its conclusions impact almost all the arts and sciences (either in the context of aesthetical beauty or dominion mandate applications).

Maximum

The largest value of the outputs of a function or the y-value of the highest point on the graph of a function. It does not always exist.

Mean

1) The same as the average or arithmetic mean.
2) A number that is selfish in an unkind way; cruel, spiteful, and malicious. The next time you take the average of a group of numbers, you better realize what kind of number you have produced!

Mean solar day

The average length of all the individual solar days throughout the year.

Metaphysics

The study of the nature of reality, including the relationship and connections between the created reality of the human mind and the external physical universe. God's existence is the foundation for all existence (Acts 17:28; Revelation 4:11).

Minimum

The smallest value of the outputs of a function or the y-value of the lowest point on the graph of a function. It does not always exist.

Median

1) Of a group of *n* numbers; the number such that just as many numbers are greater than it as are less than it.
2) That line partially painted in the middle of the road that says, "Do not cross me unless you have to pass that slow poke in front of you. If I'm solid, you better slow down and be patient and wait for my dotted signal."

Meridian

1) Literally means "mid day" or "noon."
2) A "line" (called a great circle in spherical geometry) of the earth passing through the poles and any given point on the earth's surface. See **great circle**.

Method of exhaustion

See **exhaustion**.

Method of increments

See **increment**.

Midpoint

Given a line segment AC, then point B is the midpoint of this line segment if AB = BC.

Mil

Circular measure. One mil is equal to $\frac{1}{6400}$ of a circle.

Minerals

Homogeneous, inorganic solid substances having a definite chemical composition and characteristic crystalline structure, color, and hardness.

Minor axis

In an ellipse, the line segment that passes through the center of the ellipse that is perpendicular to the major axis.

Minuend

The number from which another number is being subtracted; e.g., in 15 – 7 = 8, 15 is the minuend, 7 is the subtrahend, and 8 is the difference.

Minute

1) A unit of measure for small angles; equal to 1/60 of a degree.
2) There are 60 of these intervals in an hour.

Mixed number

A number written as a combination of an integer and a fraction; e.g., $5\frac{2}{3}$.

Mode

Of a group of numbers: the number that occurs most frequently in that group.

Modular arithmetic

See **finite arithmetic**.

Modulus

See **absolute value**, definition 2.

Momentum

See **inertia**.

Monomial

An algebraic expression that does not involve any additions or subtractions. See **term**.

Multiple

A number that may be divided by another number with no remainder; e.g., 10 is a multiple of 2.

Multiplicand

In the equation ab = c, both *a* and *b* are multiplicands.

Multiplication

The arithmetical operation of repeated addition.

Multiplication property of equality

If a = b, then ac = bc when $c \neq 0$.

Multiplication property of zero

a(0) = 0 and (0)a = 0.

Multiplicative identity

The number 1 is the multiplicative identity because for all a, $1 \times a = a$.

Multiplicative inverse

Of a number *a*; the number that, when multiplied by *a*, gives the result of 1:

$$a \times \frac{1}{a} = a$$

Nappe

Either of the two parts into which a cone is divided by the vertex.

Natural logarithm

The logarithm of a number *x* to the base *e* where *e* equals:

$$\lim_{n \to \infty} \left(1+n\right)^{\frac{1}{n}}$$

What do unnatural logarithms look like?

Natural numbers

See **counting numbers** but don't expect to find an entry for unnatural numbers.

Negation

The negation of a formal statement is its denial. See **excluded middle, law of**.

Negative

Any real number less than zero.

Newton-Raphson method

1) An algorithm for extracting the root of a number.
2) An algorithm for finding the roots or the zeros of an equation.

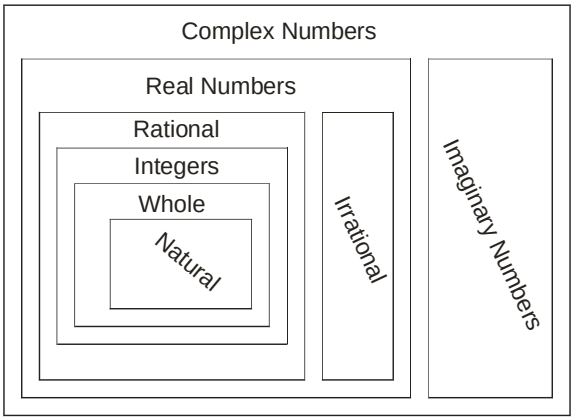
Number

The God-given sense of counting objects.

Number line

A straight line on which each point represents a real number.

GLOSSARY



Number systems
The structure of variety of the different classifications of number: natural numbers, whole numbers, integers, rational numbers, irrational numbers, real numbers, imaginary numbers, and complex numbers.

Number theory
The branch of mathematics that studies the properties and patterns of natural numbers.

Numeral
The symbol that stands for a number.

Numerator
The number above the bar in a fraction.

Obtuse angle
1) A positive angle greater than a 90° angle.
2) An angle that is fat.

Obtuse triangle
A triangle containing one obtuse angle.

Octagon
An eight-sided polygon.

Octahedron
A polyhedron with eight faces.

Odd number
A whole number that is not evenly divisible by 2. See **even number** and **eccentricity** (definition 2).

One-to-one correspondence
The unique matching (one to one) of the elements in a set with the set of natural numbers.

Operation
1) For the mathematician: the process of carrying out a particular rule on a set of numbers.
2) For the doctor: the process of carrying out a particular cut on a set of people.

Optimization
Finding the minimum or maximum values of a function by means of the differential calculus.

Ordered pair
1) For the mathematician: a set of two numbers in which the numbers written has an agreed-upon meaning and purpose.
2) For marriage: a set of two people, male and female, in which both agree to one meaning and purpose.

Ordinal
A number that indicates order.

Ordinate
The y-coordinate in the Cartesian coordinate system. See **abscissa**.

Organic
Living. See **inorganic**.

Origin
The point (0, 0) in the Cartesian coordinate system. It is the point where the x-axis and y-axis intersect.

Parabola
A conic section; the set of all points in a plane that are equally distant from a fixed point (the focus) and the directrix.

Paradox
Two compelling arguments about the same situation that lead to two opposite conclusions.

Parallax
An apparent change in the direction of an object, caused by a change in observational position that provides a new line of sight.

Parallel
Two lines are parallel if they are in the same Euclidean plane but never intersect.

Parallelogram
A quadrilateral with opposite sides equal and parallel.
The area of a parallelogram is its altitude (height) multiplied by its base (length).

Parallelogram law of addition
The sum of two vectors in the complex plane, $a + bi$ and $c + di$, equals $(a + c) + (b + d)i$.

Parenthesis
Indicates that the operation in the parenthesis is to be done first.

Parsec

A unit of astronomical length based on the distance from Earth at which stellar parallax is one second of arc and equal to 3.258 light-years, 3.086×10^{13} kilometers, or 1.918×10^{13} miles.

Particulars

Belonging to or associated with a specific person, group, thing, or category; not general or universal. See **diversity.**

Pascal's triangle

A triangular array of numbers in which each number is equal to the sum of the two numbers above it (one is above and left and the other is above and right).

Pentagon

A five-sided polygon.

Percent

1) Parts per hundred (denoted by %); e.g., 15% of a number is $\frac{15}{100}$ of it.
2) A fraction whose denominator is assumed to be 100.

Perfect number

Ancient Greek classification reflecting the situation when the sum of the factors of a given number (excluding the number itself) is equal to the given number. See **abundant number** and **deficient number**.

Perimeter

Of a polygon: the sum of the lengths of all the sides.

Period of Digits

A group of digits that repeat in a decimal fraction.

Periodic function

A function that keeps repeating the same values.

Permutations

The number of different ways of choosing things from a group of *n* objects where order is important and the selection is made without replacement. See **combinations**.

Perpendicular

Two lines are perpendicular if the angle between them is 90°.

Perpendicular bisector

A line that divides a given line segment in half at a 90° angle.

Phi-function (φ-function)

Given any natural number *n,* φ(n) represents the number of natural numbers less than *n* that have no factor in common with *n.*

Phyllotaxis

A study of the arrangement of leaves in trees and plants.

Pi (π)

1) A Greek letter; stands for an irrational number that represents the ratio between the circumference of a circle and its diameter.
2) When momma makes this with apples, its "yum."

Pitch

See **slope.**

Place value

The value of a digit based upon its position in the written form of a number. See **positional notation**.

Plain text

Information consisting of text or numbers that is not in secret code.

Plane

A flat surface that stretches to "infinity" in Euclidean geometry.

Point

1) That "which has no part."
2) Zero dimensions.

Polar angle

The angle the radius vector makes with the polar axis in Polar coordinates.

Polar axis

The "x-axis" in Polar coordinates.

Polar coordinates

1) An ordered pair of coordinates of the form (r, θ). Used to identify a point on a plane by its distance, *r,* from the origin and its angle of inclination, θ (as measured counterclockwise from the x-axis).

2) Commonly used by Eskimos near the North Pole.

Polar form

Using polar coordinates (r, θ), the complex number $a + bi = r(\cos\theta + i \sin\theta) = r \text{ cis } \theta$ (polar form). Also called the trigonometric form.

Pole

The origin in Polar coordinates.

Polygon

1) The union of several line segments that are joined end to end so as to completely enclose an area.
2) A missing parrot.

Polyhedron

A solid that is bounded by plane polygons.

Polynomial

An algebraic expression in *x* of the *standard form*:

$$a_nx^n + a_{n-1}x^{n-1} + ... + a_3x^3 + a_2x^2 + a_1x + a_0$$

where $a_0, a_1, ..., a_n$ are constants that are the coefficients of the polynomial and *n* is a positive integer.

Position function

A function that relates time to distance.

Positional notation

Where the placement of a digit determines its value.

Positive number

Any real number greater than zero.

Postulate

A fundamental statement that is assumed to be true without proof.

Power

1) Of a number: indicates repeated multiplication. See **exponential.**
2) For infinite sets, see **cardinality**.

Power of the continuum

The number of real numbers; denoted by *c*.

Power series

A series of the following form where the *c's* are constant:

$$c_0 + c_1x + c_2x^2 + c_3x^3 + ...$$

Precedence

See **standard of precedence**.

Presupposition

A deep-seated conviction that governs how you interpret knowledge and reality; a belief that forms the foundation of your worldview.

Prime factors

Any composite number can be written as a product of two or more factors that are prime numbers.

Prime number

Ancient Greek classification denoting a natural number that has no integer factors other than itself and 1. See **composite number.**

Prime meridian

The meridian running through Greenwich, England, from which longitude east and west is reckoned.

Prime Number Theorem

The number of primes less than *n* is approximately *n* divided by the natural logarithm of *n*.

Primitive function

See **indefinite integral**.

Probability

The quantitative study of uncertainty.

Product

The result obtained when two numbers are multiplied.

Product law of exponents.

Let $a \in N$ and $m, n \in W$, then $a^{mn} = (a^m)^n$

Proof

A sequence of statements that show that a particular theorem is true.

Proper fraction

A fraction with a numerator smaller than the denominator.

Proportion

A fractional equation of the form $a/b = c/d$; e.g., $\frac{6}{7} = \frac{42}{49}$.

Proportional
If $x = ky$, where *k* is a constant, then *x* is said to be proportional to *y*.

Proposition
A statement that can be assigned to be either true or false.

Protractor
A device for measuring the size of angles.

Public key
See **asymmetric cryptosystem**.

Pythagorean identity
A fundamental equation reflecting the connection between circular functions (or trigonometric rations).

Pythagorean Theorem
In a right-angled triangle where *c* represents the side opposite the right angle (the hypotenuse) and *a* and *b* are the sides adjacent to the right angle, then $c^2 = a^2 + b^2$.

Pythagorean triple
Three natural numbers that make $c^2 = a^2 + b^2$ true.

Oblique
Slanting or sloping (neither perpendicular or parallel).

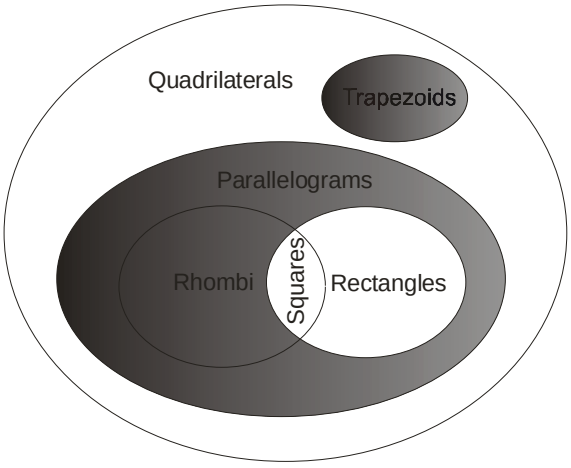
QED
quad erat demonstrandum meaning "which was to be shown"; put at the end of a proof to signify that the proof has been completed.

Quadrant
In the Cartesian coordinate system: one of four disjoint regions the x- and y-axes divide a plane.

Quadratic equation
An equation involving a term of the second degree, but no higher degree, of an unknown *x*. The general form is $ax^2 + bx + c$.

Quadratic formula
The solution for *x* in the equation $ax^2 + bx + c$ is:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



Quadrilateral
A four-sided polygon. Specific types of quadrilaterals are trapezoids, parallelograms, rhombi, squares, and rectangles.

Quartic
A polynomial equation of degree 4. See **polynomial**.

Quantification
To express a quantity of amount.

Quintic
A polynomial equation of degree 5. See **polynomial**.

Quotient
The answer to a division problem.

Radian
1) Of an angle: the measure of the length of the intercepted arc divided by the radius of the circle. See **degree**.
2) 2π radians = 360°.

Radical
1) The symbol $\sqrt{}$ used to indicate the taking or extracting the root of a number.
2) Of an equation: where the variable appears as a radical.
3) What Pythagoras feared doing to 2.

Radicand
The expression that is inside the radical sign.

Radius
1) Of a circle: the distance from the center of the circle to a point on the circle.
2) Of a sphere: the distance from the center of the sphere to a point on the sphere.

Radius vector
The length of a ray segment from a point to the pole in Polar coordinates.

Random sample
In statistics, a group or set of item taken from a given population not according to pattern, purpose, or objective.

Range
1) In a function: the set of all possible values for the output of the function; it reflects the order generated by the rule given by that function. See **function**.
2) Of a list of numbers: a number equal to the largest value minus the smallest value.
3) For a cowboy: where his home is located.
4) For a wife: what she cooks on.

Ratio
Of any two real numbers *a* and *b;* a/b.

Rational
A method of thinking in which one thing or idea is logically compared to another thing or idea.

Rational number
1) A number that can be expressed as the ratio of two integers *a* and *b* where $b \neq 0$.
2) A really smart number.
3) As a group, they are really dense.

Rationalizing the denominator
1) The process of rewriting a fraction in an equivalent form that does not have an irrational number in the denominator.
2) How to make a fraction smart.

Ray
Half of a line; it has one endpoint with the other end extending to infinity.

Real numbers
The set of all numbers (rational and irrational) that can be represented by points on a number line.

Reciprocal
Of a number *a* where $a \neq 0$, equal to $1/a$.

Rectangle
1) A quadrilateral with four 90° angles.
2) An angle that is ruined.
3) Area = lw where l = length and w = width

Rectangular coordinates
See **Cartesian coordinate system**.

Recursion
The determination of a succession of elements (as numbers or functions) by operation on one or more of the preceding elements according to a rule or formula involving a finite number of steps.

Reducing fractions
Changing a given fraction to an equivalent fraction by dividing both the numerator and the denominator by the greatest common factor of the numerator and the denominator.

Reflexive property of equality
a = a.

Regular polygon
A polygon in which all the angles and all the sides are equal.

Regular polyhedron
A polyhedron where all faces are congruent regular polygons. There are only five types that meet this condition.

Relatively prime
Between two numbers, occurs when 1 is their greatest common factor.

Remainder
1) The number that is left over in a division problem.
2) Given *a*, *b*, *c*, and *r* are natural numbers. If $a = bc + r$, then the division problem a/b has the quotient of *c* and the remainder of *r*.
3) The computational bane of arithmetic students for which the calculator provides an easy rescue.

Repeating decimal
A decimal fraction in which the digits endlessly repeat a pattern.

Rhetorical algebra
Algebra without symbols; written entirely in words. See **syncopated algebra** and **symbolic algebra**.

Rhombus

An oblique-angled quadrilateral with four equal sides.

Right angle

1) An angle that measures 90° or $\pi/2$ radians.
2) An angle that is never wrong.

Right circular cone

A cone whose base is a circle located so that the line connecting the center of the circle to the vertex of the cone is perpendicular to the plane containing the circle. See **conic sections**.

Right-angled triangle or **right triangle**

A triangle that contains one right angle.

Rise

What someone does to an occasion. See **slope**.

Roman numerals

Any of the numerals formed with the characters I, V, X, L, C, D, and M in the ancient Roman system of numeration.

Root

1) Root of an equation, the solution to that equation.
2) Root of a number, the inverse process of raising a number to a power; also called extraction of roots.

Rounding

1) A way of approximating a number in a form with fewer digits.
2) In specific, let r = a given digit in a decimal expansion. When this digit is deleted at the right-hand extreme of a decimal expression, the digit q to its left (which becomes the new r after the old r is deleted) is not changed if $0 \leq r \leq 4$. If $5 \leq r \leq 9$ (r is between 5 and 9 inclusive), then q is increased by 1 (we call this "rounding up").

Run

What you do what someone is chasing you. See **slope**.

Scalene triangle

A triangle in which no two sides are equal.

Scalar

A quantity with magnitude as its only characteristic. See **vector.**

Scientific notation

A shorthand way of expressing very large or very small numbers. A number in scientific notation is expressed as a number between 1 and 10 multiplied by a power of 10; e.g., 3.25×10^{25}.

Secant

1) A line that intersects a circle or some other curve in two points.
2) A circular function; the reciprocal of the cosine function; e.g., $\sec \theta = 1/\cos \theta$.

Second

1) Units of measure of an angle equal to $1/60$ of a minute.
2) There are 60 of these intervals in a minute of time.

Second derivative

Finding the derivative of a derivative of a function.

Sector

1) In a circle, a region bounded by two radii of the circle and by the arc of the circle whose endpoints lie on those radii.
2) A slice of pie.

Segment

1) A part of a straight line having two endpoints.
2) Of a circle: the area bounded by an arc and the chord that connects the two endpoints of the arc.

Semicircle

1) "The figure contained by the diameter and the circumference cut off by it and the center of the semicircle is the same as that of the circle."
2) Half of a circle
3) The arc from one end of a diameter to the other.

Semiperimeter

Of a triangle, equal to ½ the perimeter of the triangle.

Sequence

A set of number in which the numbers reflect a patterned order.

Series

The sum of a sequence of numbers.

Set

A defined group of objects.

GLOSSARY

Sexagesimal system
A number system of base 60.

Sextant
A navigational instrument containing a graduated 60-degree arc, used for measuring the altitudes of celestial bodies.

Side
A line segment connection two adjacent vertices of a polygon.

Sieve of Eratosthenes
1) A method for determining all of the prime numbers less than a given number by filtering out all of the non-prime or composite numbers.
2) The kitchen utensil you use to remove water from your noodle concoction.

Sigma
The Greek capital letter sigma (Σ) used to indicate summation.

Sign
A symbol that denotes whether a number is positive (+) or negative (-); it does not denote whether a number is a member of the zodiac.

Significant digits
Expressed in measurement and indicates how precise that measurement is. A nonzero digit is always a significant digit. Trailing zeros to the left of the decimal point are not significant if there are no digits to the right of the decimal point. Trailing zeros to the right of the decimal point are significant; e.g., the number 186,000 has 3 significant digits (meaning the true value of the measurement is between 185,000 and 186,500). 6.2400 has five significant digits meaning that the true value is between 6.23995 and 6.24005.

Similar
Two polygons of different sizes are similar if they have exactly the same shape.

Simple radical form
The square root of an integer is in simple radical form if the integer has no factors that are squares of integers other than 1 and -1.

Simultaneous equations
A group of two or more equations that must all be true at the same time.

Sine
A circular function; a function of an angle giving the ratio of he length of the opposite side to the length of the hypotenuse of a right triangle.

Slide rule
A calculating device consisting of two sliding logarithmic scales. With the advent of the pocket calculator, this device is now a museum piece.

Slope
The number that measure how steep a line is; on the Cartesian coordinate system is measures the ratio of the change is *y* (rise) over the change in *x* (run); i.e., $\Delta y / \Delta x$.

Solid
A three-dimensional geometric figure that completely encloses a volume of space.

Solution
The root of an equation, the value that makes the equation true.

Solve
Finding the roots (or solutions) to an equation.

Speed
The magnitude of the velocity of an object.

Sphere
1) The set of all points in three-dimensional space that a re a fixed distance from a given point (called the center of the sphere).
2) Volume = $\frac{4\pi r^3}{3}$ where r = radius
3) Surface area = $4\pi r^2$

Spherical trigonometry
A branch of mathematics that studies triangles located on the surface of a sphere.

Spiral
The graph of the equation $r = a\theta$ in the polar coordinate system.

Square
1) A quadrilateral with four 90° angles and four equal sides.

2) Of a number: found by multiplying the number by itself.
3) Of a person: dull and out of touch with reality.

Square number

Ancient Greek classification where a number can be pictured as a square array of dots. See **triangular number**.

Square root

Of a number *x*, the number, when multiplied by itself, gives *x;* e.g., the square root of 25 is 5.

Standard form

See **polynomial**.

Standard of precedence

To calculate a numeric expression that contains various operations such as addition, subtraction, multiplication, division, and raising to a power (exponentiation), you must perform the operations in the following order:

1. Simplify all expressions *within parentheses* from the inside out (in case there are more than one parenthetical grouping).
2. Perform all exponentiation, proceeding from left to right.
3. Perform all products and quotients, proceeding from left to right.
4. Perform all sums and differences, proceeding from left to right.

Statement

In *formal* mathematical terms, a statement is a declarative sentence that is either true or false.

A *conditional* statement is a statement consisting of two clauses, one of which begins with the word *if* or *when* or some equivalent word and the other of which begins with *then.*

An *equivalent* statement is a conditional statement written in another form.

Statistics

A branch of mathematics the study ways in which to analyze data.

Straight angle

1) An angle with the measure of 180°.
2) Also called a *rectilinear* angle.

Subscript

A small number or letter set slightly below another number or letter.

Substitution

In cryptography, replacing a plain text number or letter with a number. See **transposition**.

Substitution property

If a = b, then you can replace the express *a* anywhere it appears by *b.*

Subtraction

An arithmetical operation that is the opposite of addition.

Subtrahend

A number that is being subtracted from another number; e.g., in 25 – 7 = 18, 7 is the subtrahend.

Sum

The result obtained when two numbers are added.

Sum law of exponents.

Let $a \in N$ and $m, n \in W$, then $a^{m+n} = a^m + a^n$.

Sum rule for differentiation

The derivative of a polynomial is the derivative of each of its terms.

Summation notation

Provides a shorthand notation for expressing long sums that follow a pattern. The Greek capital letter sigma (Σ) is used to denote summation; e.g.,

$$\sum_{n=1}^{10} n = 1+2+3+4+5+6+7+8+9+10 = 55$$

Supplementary

Two angles are supplementary if the sum of their measure is 180°.

Surface

1) A two-dimensional set of points.
2) "That which has length and breadth [or width] only" – length, width, but no height.

Surface area

Of a solid; the measure of how much area the solid would have it you could break it apart and flatten it out.

Syllogism

If we have two premises in which the conclusion of one is the same as the hypothesis of the other ($a \rightarrow b$ and $b \rightarrow c$), then from them we can derive a third statement; i.e., $a \rightarrow c$. This statement, $a \rightarrow c$, the conclusion, follows logically from the first two statements (or premises), even though one or both of these premises *may* be false. Such an argument is called a syllogism (meaning "the word concerning thinking" or "a reasoned discourse"). See **statement**.

Symbolic algebra

Algebra written entirely in symbols. See **syncopated algebra** and **rhetorical algebra**.

Symbolic logic

Developed by George Boole (1815-1864), a treatment of formal logic in which a system of symbols is used to represent quantities and relationships.

Symmetric property of equality

If $a = b$, then $b = a$.

Symmetry

1) Exact correspondence of form and constituent configuration on opposite sides of a dividing line or plane or about a center or an axis.
2) Beauty as a result of balance or harmonious arrangement.

Symmetric cryptosystem

When the sender and receive use the same key. See **asymmetric cryptosystem.**

Syncopated algebra

Algebra using symbols to represent frequently used quantities, operations, and powers of variables. See **rhetorical algebra** and **symbolic algebra**.

System of equations

See simultaneous equations.

Tangent

1) A line that intersects a circle at one point.
2) A circular function; a function of an angle giving the ratio of he length of the opposite side to the length of the adjacent side of a right triangle.
3) The unrelated topics that preachers, professors, and speakers tend to pursue.

Tautology

A formal statement that is true independently of the truthfulness of the elementary statements constituting it or a disjunctional propositional form all of whose instances are true.

Term

1) Each of the members of which an expression, a series of quantities, or the like, is composed, as one of two or more parts of an algebraic expression.
2) Part of a polynomial. Addition or subtraction signs separate the different terms of a polynomial.
3) The division of a school year marked by dreaded exams.
4) Related to "of office" the limitations of which politicians abhor.

Terminating decimal

A fraction whose decimal expansion contains a finite number of digits.

Tetrahedron

A polyhedron with four faces.

Theorem

A statement that has been proved on the basis of explicit and accepted assumptions.

Topology

A branch of mathematics that studies the properties of geometric figures or solids that are not normally affected (remain **invariant**) by changes in size or shape; also called "rubber sheet" geometry.

Transcendent

Beyond human comprehensive or limits.

Transfinite number

The number of elements in an infinite set.

Transitive property

Of equality: This property states that if *a*, *b*, and c represent numbers, and if $a = b$ and $b = c$, then $a = c$.
Of inequality: If $a < b$ and $b < c$, then $a < c$ or if $a > b$ and $b > c$, then $a > c$.

Transformation

1) Another word for a function. See **function**.
2) Literally means "change."

Transposition

In cryptography, scrambling a substituted number with another number according to a mathematical rule. See **substitution**.

Transitive property of equality

If a = b and b = c, then a = c.

Transversal

A line that intersects two lines.

Trapezoid

1) A quadrilateral that has exactly two sides parallel.
2) Area = $\frac{(a+b)h}{2}$ where a, b = base and h = height

Traverse

To pass or move over, along, or through.

Triangle

1) A three-sided polygon.
2) Area = $\frac{1}{2}bh$ where b = base and h = height
3) Literally means "three angles."

Triangular number

Ancient Greek classification where a number can be pictured as a triangle of dots. See **square number**.

Triangulation

A surveying technique in which a region is divided into a series of triangles based upon a known or measurable distance (or line) so that distances that cannot be measured can be calculated by means of trigonometric ratios.

Trigonometric form

See **polar form**.

Trigonometry

A branch of mathematics the studies triangles located in an Euclidean plane.

Trilateral

A figure or a polygon with three sides.

Trinomial

The sum of three monomials.

Trisect

Cut into three equal parts.

Truncation

The process of truncation deletes all the numerals to the right of a certain point in the decimal expansion of a number.

Twin primes

Successive odd numbers that are prime numbers; they have not been born at the same time.

Union

Of two sets A and B; the set of all elements that are either members of A or members of B, or both, written as $A \cup B$.

Unit

The magnitude or amount of a specified quantity using a standard of measure (e.g., inch, pounds, grams).

Unit multiplier

Equivalent expressions used for converting from one unit to another unit (e.g., 1 inch = 2.54 centimeters).

Unity

An accord or harmony. The diverse things of God's creation are connected by unifying principles. See **universals.**

Universals

Including, relating to, or affecting all particular members of the class or group under consideration, a general statement connecting the particularity of God's created order. See **unity.**

Utilitarianism

Something is true because it works or it is practical.

Variable

The independent quantity in a functional relationship. If position is as function of time, then time is the variable

Vector

A quantity with two characteristics – magnitude and direction. See **scalar**.

Velocity

1) Average velocity is the total distance divide by the time it took to traverse that distance.

2) Instantaneous velocity is the speed and direction at one moment in time; it is the derivative of the position function for a moving object.

Velocity function
A function that relates time to speed.

Venn diagram
A picture that illustrates the relationships between sets.

Vertex
Of an angle: the point where two sides of the angle intersect.

Vertical angles
Two parts of vertical angles are formed when two lines intersect.

Volume
Of a solid: the measure of how much space it occupies.

Whole numbers
The set of numbers that includes zero and all the natural numbers; e.g., 0, 1, 2, 3, 4,….

Worldview
How you view the created reality; specifically related to issues involving epistemology, metaphysics, and ethics.

X-axis
The horizontal axis in the Cartesian coordinate system.

X-intercept
Of a curve, the value of x at the point where the curve crosses the x-axis.

Y-axis
The vertical axis in the Cartesian coordinate system.

Y-intercept
Of a curve: the value of y at the point where the curve crosses the y-axis.

Zero
1) Nothing; the baseball team did not score any runs.
2) The identity element for addition.
3) In the base 10 system, 0 serves as a placeholder in the decimal representation of a number.
4) The origin of the number line.
5) The solution of an equation.