Glossary

acute angle An angle whose measure is less than 90°. (Lesson 1.3)

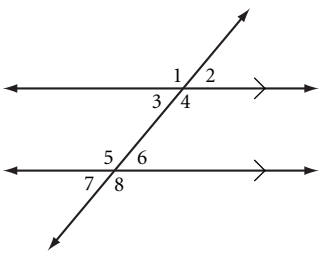
acute triangle A triangle with three acute angles. (Lesson 1.5)

adjacent angles Two non-overlapping angles with a common vertex and exactly one common side. (Lesson 1.3)

adjacent interior angle The interior angle that forms a linear pair with a given exterior angle of a triangle. (Lesson 4.3)

adjacent side (of an angle in a polygon) One of the two sides of the polygon that form the sides of an angle. (Lesson 12.1)

alternate exterior angles $\angle 1$ and $\angle 8$, and $\angle 2$ and $\angle 7$ are pairs of alternate exterior angles in the figure below. *See* **transversal**. (Lesson 2.6)



alternate interior angles $\angle 3$ and $\angle 6$, and $\angle 4$ and $\angle 5$ are pairs of alternate interior angles in the figure above. *See* **transversal**. (Lesson 2.6)

altitude A line segment drawn from the vertex of a figure perpendicular to its base or the line containing the base, or the length of the altitude segment. *See* **cone**, **cylinder**, **parallelogram**, **prism**, **pyramid**. (Lessons 3.3, 8.1, 10.1)

angle Two noncollinear rays (the sides of the angle) having a common endpoint (the angle's vertex). (Lesson 1.2)

angle (of a polygon) An angle having its vertex at one of the polygon's vertices, and having two of the polygon's sides as its sides. (Lesson 1.4)

angle bisector A ray that has the vertex of the angle as its endpoint, and that divides the angle into two congruent angles. (Lessons 1.2, 3.4)

angle of depression (of an object lower than the viewer) The angle with its vertex at the viewer's eye, one side horizontal, and the viewer's line of sight to the object as the other side. (Lesson 12.2)

angle of elevation (of an object higher than a viewer) The angle with its vertex at the viewer's eye, one side horizontal, and the viewer's line of sight to the object as the other side. (Lesson 12.2)

angle of rotation The angle between a point and its image under a rotation, with its vertex at the center of the rotation and sides that go through the point and its image. Also, the measure of the angle. (Lesson 7.1)

angular velocity (of an object moving around a circle) The rate of change, with respect to time, of the measure of the central angle that intercepts the arc between the object and a fixed point. (Lesson 6.7)

annulus The region between two concentric circles of unequal radius. (Lesson 8.6)

antecedent The first or "if" part of a conditional statement. (Chapter 12, Exploration: Three Types of Proof)

antiprism A polyhedron resulting from rotating one base of a prism and connecting the vertices so that the lateral faces are triangles. (Lesson 10.1)

apothem (of a regular polygon) A line segment between the center of the polygon's circumscribed circle to a side of the polygon that is also perpendicular to that side. Also, the length of that line segment. (Lesson 8.4)

arc (of a circle) Two points on the circle (the endpoints of the arc) and the points of the circle between them. An angle intercepts an arc if the sides of the angle intersect the circle at the endpoints of the arc. The arc is included by the chord with the same endpoints. (Lessons 1.6, 6.3)

arc measure The measure of the central angle that intercepts an arc, measured in degrees. *See* **central angle**. (Lesson 1.6)

Archimedean tiling *See* **semiregular tessellation**. (Lesson 7.4)

area (of a plane figure) A measure of the size of the interior of a figure. (Lesson 8.1)

assume To accept as true without facts or proof. (Lesson 1.5)

auxiliary line An extra line or line segment drawn in a figure to help in a proof. (Lesson 4.1)

axis (of a cylinder) The line segment connecting the centers of the bases. (Lesson 10.1)

base A side of a polygon or face of a solid used for reference when drawing an altitude or other feature. S*ee* **cone**, **cylinder**, **isosceles triangle**, **parallelogram**, **prism**, **pyramid**, **trapezoid**. (Lessons 1.5, 5.3, 10.1)

base angles (of an isosceles triangle) The two angles opposite the two congruent sides. (Lessons 1.5, 4.2)

base angles (of a trapezoid) A pair of angles with a base of the trapezoid as a common side. (Lesson 5.3)

bearing (of a direction of travel) The clockwise measure of the angle between due north and the path of travel. (Lesson 6.1)

biconditional statement A statement that includes both a conditional statement and its converse, usually written in "if and only if" form. (Lesson 4.8)

bilateral symmetry Reflectional symmetry with only one line of symmetry. (Lesson 0.1)

bisect To divide into two congruent parts. (line segment: Lesson 1.1; angle: Lesson 1.2)

center (of a circle or sphere) The point from which all points on the figure are the same distance. (circle: Lessons 1.6, 6.1, 6.4; sphere: Lesson 10.1)

center of gravity The balancing point of an object. (Lesson 3.8)

central angle (of a chord or arc) An angle whose vertex is the center of a circle and whose sides pass through the endpoints of a chord or arc. (Lessons 1.6, 6.3)

centroid The point of concurrency of a triangle's three medians. (Lesson 3.8)

chord A line segment whose endpoints lie on a circle. (Lessons 1.6, 6.1)

circle The set of all points in a plane at a given distance (the radius) from a given point (the center). (Lesson 1.6)

circumcenter The point of concurrency of a triangle's three perpendicular bisectors. (Lesson 3.7)

circumference The distance around a circle, given by the formula $C = 2\pi r$, where r is the radius of the circle. (Lesson 6.5)

circumscribed Passing through each vertex of a figure, usually referring to circles circumscribed around polygons or spheres circumscribed around polyhedra. The figure inside is inscribed in the circumscribed figure. (Lesson 3.7)

classify To categorize something according to some chosen characteristics. (Lesson 1.3)

clinometer A tool for measuring angle of elevation or depression, consisting of an edge to sight along, a plumb line, and a protractor. (Chapter 12, Exploration: Indirect Measurement)

coincide Lying exactly on top of each other. Line segments that coincide are identical; they have all the same points. (Lesson 3.2)

collinear Lying on the same line. (Lesson 1.1)

compass A tool used to construct circles. (Lesson 0.2)

complementary angles Two angles whose measures have the sum 90°. (Lesson 1.3)

composition (of transformations) The transformation that results when one transformation is applied after another transformation. (Lesson 7.3)

concave polygon A polygon having at least one diagonal lying outside the polygon; not convex. (Lesson 1.4)

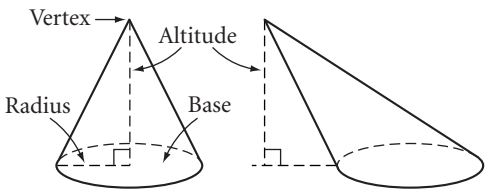
concentric (circles) Having the same center. (Lesson 1.6)

concurrent Intersecting at a single point (called the point of concurrency). (Lesson 3.7)

conditional proof A proof of a conditional statement. (Chapter 12, Exploration: Three Types of Proof)

conditional statement A statement that can be expressed in if-then form. (Chapter 10, Exploration: Sherlock Holmes and Forms of Valid Reasoning)

cone A solid whose surface consists of a circle and its interior, and all points on line segments that connect points on the circle to a single point (the cone's vertex) that is not coplanar with the circle. The circle and its interior form the base of the cone. The radius of a cone is the radius of the base. The altitude of a cone is the line segment from the vertex to the plane of the base and perpendicular to it. The height of a cone is the length of its altitude. If the line segment connecting the vertex of a cone with the center of its base is perpendicular to the base, then the cone is a right cone; otherwise it is oblique. The figures below show a right cone and an oblique cone. (Lessons 1.8, 8.7, 10.3)



congruent Identical in shape and size. Two figures are congruent if one is the image of the other under an isometry. (line segments: Lesson 1.1; angles: Lesson 1.2; polygons: Lesson 1.4)

conjecture A guess, usually made as a result of inductive reasoning. (Lesson 2.1)

consecutive angles (of a polygon) Two angles that have a side of the polygon as a common side. (Lesson 1.4)

consecutive sides (of a polygon) Two sides that have a common vertex. (Lesson 1.4)

consecutive vertices (of a polygon or polyhedron) Two vertices that are connected by a side or edge. (Lesson 1.4)

consequent The second or "then" part of a conditional statement. (Chapter 12, Exploration: Three Types of Proof)

contrapositive (of a conditional statement) The statement formed by exchanging and negating the antecedent and the consequent. The contrapositive of the contrapositive of a statement is the statement itself. (Chapter 11, Exploration: Two More Forms of Valid Reasoning)

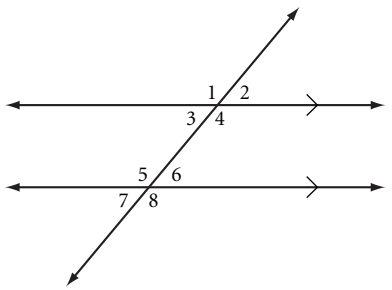
converse (of a conditional statement) The statement formed by exchanging the antecedent and the consequent. (Lesson 2.5)

convex polygon A polygon having no diagonal lying outside the polygon. (Lesson 1.4)

coordinate proof A proof using coordinate geometry. (Chapter 13, Using Your Algebra Skills 10)

coplanar Lying in the same plane. (Lesson 1.1)

corresponding angles $\angle 1$ and $\angle 5$, $\angle 2$ and $\angle 6$, $\angle 3$ and $\angle 7$, and $\angle 4$ and $\angle 8$ are pairs of corresponding angles in the figure below. *See* **transversal**. (Lesson 2.6)



cosine (of an acute angle) The ratio of the length of the adjacent side to the length of the hypotenuse in any right triangle containing the angle. (Lesson 12.1)

counterexample An example that shows that a conjecture is incorrect or that a definition is inadequate. (Lesson 1.3)

cube A regular polyhedron with six faces. *See* **hexahedron**. (Lesson 10.1)

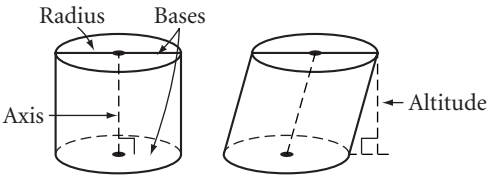
cycle (of a periodic curve) One section of a curve that, when laid out repeatedly end-to-end, forms the entire curve. (Chapter 6, Exploration: Cycloids)

cyclic quadrilateral A quadrilateral that can be inscribed in a circle. (Lesson 6.3)

cycloid The locus or path of a point on a circle as the circle rolls along a straight line. (Chapter 6, Exploration: Cycloids)

cylinder A solid whose surface consists of all points on two circles in two parallel planes, along with points in their interiors (the bases of the

cylinder), and all points on line segments joining the two circles. The axis of the cylinder is the line segment that joins the centers of the bases. The radius of the cylinder is the radius of a base. An altitude of a cylinder is a line segment between and perpendicular to the planes of the bases. The height of a cylinder is the length of an altitude. If the axis is perpendicular to the bases, then the cylinder is a right cylinder; otherwise, it's oblique. The figures below show a right cylinder and an oblique cylinder. (Lessons 1.8, 10.1)



Right cylinder Oblique cylinder

data Information used as a basis for reasoning. (Lesson 2.1)

decagon A ten-sided polygon. (Lesson 1.4)

deductive reasoning Reasoning accepted as logical from agreed-upon assumptions and proven facts. (Lesson 2.2)

deductive system An arrangement of premises and theorems, in which each theorem can be proved by deductive reasoning using only the premises and previous theorems, and in which each definition uses only terms that have been defined previously in the system. (Lesson 13.1)

definition A statement that clarifies or explains the meaning of a word or phrase. (Lesson 1.1)

degree A unit of measure for angles and arcs equivalent to $\frac{1}{360}$ of rotation around a circle. A right angle measures 90 degrees, symbolized by 90°. (Lesson 1.2)

density The ratio of the mass of an object to its volume. (Lesson 10.5)

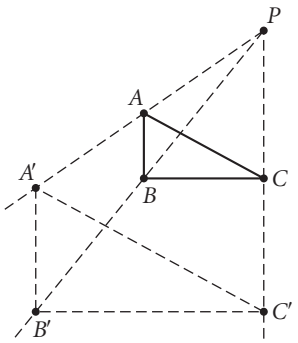
determine To know, or make it possible to know, all the characteristics of a figure. For example, three sides determine a triangle; three angles do not determine a triangle. (Lesson 3.6)

diagonal A line segment connecting two nonconsecutive vertices of a polygon or polyhedron. (Lesson 1.4)

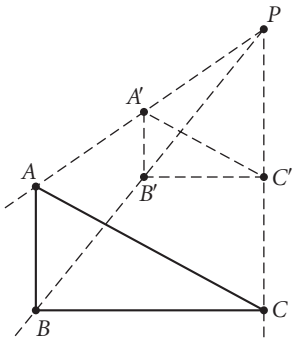
diameter (of a circle) A chord of a circle that contains its center. (Lesson 1.6)

differentiate To distinguish from other members of a class, based upon some chosen properties or criteria. (Lesson 1.3)

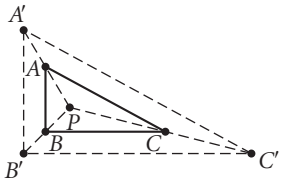
dilation A nonrigid transformation that enlarges or reduces a geometric figure by a scale factor relative to a point (the center of the dilation). In the figure below, three dilations of $\triangle ABC$, with respect to point P, change the size and the location of the image in different ways depending on whether the positive scale factor k is greater than one or less than one. (Lesson 11.1)



$k > 1$



$0 < k < 1$



$k > 1$

direct proof A proof in which you state premises, then use valid forms of reasoning to arrive directly at a conclusion. *See* **indirect proof**. (Chapter 12, Exploration: Three Types of Proof)

displacement The volume of fluid that rises above the original fluid line when a solid object is placed into the fluid. (Lesson 10.5)

dissection The result of dividing a figure into pieces. (Lesson 9.1)

distance (between two points) The length of the line segment between two points. (Lesson 9.5)

distance (from a line or plane to a point) The length of the line segment from the point to the line or plane and perpendicular to it. (Lesson 3.3)

distance (of a translation) The length of the translation vector between a figure and its image. (Lesson 7.1)

dodecagon A 12-sided polygon. (Lesson 1.4)

dodecahedron A polyhedron with 12 faces. Often refers to a regular dodecahedron, one of the Platonic solids. (Lesson 10.1)

dual (of a tessellation) The new tessellation formed by connecting (with line segments) the centers of polygons with a common edge in another tessellation. (Lesson 7.4)

edge (of a solid) The intersection of two faces. (Lesson 10.1)

elliptic geometry A geometry in which there are no parallel lines. (Chapter 13, Exploration: Non-Euclidean Geometries)

endpoints The points at the ends of a line segment or arc. (line segment: Lesson 1.1; arc: Lesson 1.6)

epicycloid The locus or path of a point on a circle as it rolls around another circle. (Chapter 6, Exploration: Cycloids)

equiangular polygon A polygon whose angles are congruent. (Lesson 1.4)

equilateral polygon A polygon whose sides are congruent. (polygon: Lesson 1.4; triangle: Lesson 1.5)

Euler line The line through a triangle's circumcenter, orthocenter, and centroid. Named after Swiss mathematician and physicist Leonhard Euler. (Chapter 3, Exploration: The Euler Line)

Euler segment The line segment containing the centroid of a triangle, whose endpoints are the orthocenter and the circumcenter of the triangle. (Chapter 3, Exploration: The Euler Line)

exterior angle (of a polygon) An angle that forms a linear pair with one of the interior angles of a polygon. (Lesson 5.2)

externally tangent (circles) Intersecting at exactly one point, with neither circle inside the other. *See* **tangent circles.** (Lesson 6.2)

face (of a polyhedron) One of the polygons and its interior forming the surface of a polyhedron. (Lesson 10.1)

flowchart A concept map that shows a step-by-step process. Boxes represent the steps, and arrows connect the boxes to order the process. (Lesson 4.7)

flowchart proof A logical argument presented in the form of a flowchart. (Lesson 4.7)

fractal A self-similar geometric figure. (Chapter 2, Exploration: Patterns in Fractals)

frustum Part of a cone formed by cutting off, or truncating, the vertex with a plane parallel to the base. (Lesson 8.7)

function rule A rule that, when applied to one set of numbers, the input, generates another set of numbers, the output. (Lesson 2.3)

geometric mean The non-negative number whose square is the product of two given non-negative numbers; the side of a square having the same area as a rectangle whose length and width are given. (Lesson 13.7)

glide reflection An isometry that is a composition of a translation (glide) and a reflection over a line that is parallel to the translation vector. (Lesson 7.3)

glide-reflectional symmetry The property of a geometric figure that it coincides with its image under some glide reflection. (Lesson 7.3)

golden ratio The ratio of two numbers (larger number: smaller number) whose ratio to each other equals the ratio of their sum to the larger number. (Lessons 11.3, 11.5)

golden rectangle A rectangle in which the ratio of the length to the width is the golden ratio. (Lesson 11.6)

golden spiral A spiral through vertices of nested golden rectangles. (Lesson 11.6)

great circle The intersection of a sphere with a plane that passes through its center. (Lesson 10.1)

height (of a triangle, rectangle, parallelogram, trapezoid, cone, cylinder, prism, or pyramid) The length of an altitude. (triangle: Lesson 3.3; rectangle, parallelogram: Lesson 8.1; trapezoid: Lesson 8.2; solids: Lesson 10.1)

hemisphere Half of a sphere including a great circle as its base. (Lessons 1.8, 10.1)

heptagon A seven-sided polygon. (Lesson 1.4)

hexagon A six-sided polygon. (Lesson 1.4)

hexahedron A polyhedron with six faces. A regular hexahedron is a cube, one of the Platonic solids. (Lesson 10.1)

horizon line A horizontal line representing eye level in a perspective drawing, containing one or two vanishing points, toward which lines from foreground to background converge. (Chapter 3, Exploration: Perspective Drawing)

hyperbolic geometry A geometry in which, through a point not on a line, there are infinitely many lines parallel to the given line. (Chapter 13, Exploration: Non-Euclidean Geometries)

hypotenuse The side opposite the right angle in a right triangle. The other two sides are called legs. (Lesson 9.1)

icosahedron A polyhedron with 20 faces. Usually refers to a regular icosahedron, one of the Platonic solids. (Chapter 10, Exploration: The Five Platonic Solids)

if-then statement *See* **conditional statement**. (Chapter 10, Exploration: Sherlock Holmes and Forms of Valid Reasoning)

image The result of a transformation acting on a given figure. (Lesson 7.1)

incenter The point of concurrency of a triangle's three angle bisectors. (Lesson 3.7)

included angle An angle formed between two given sides of a triangle. (Lesson 4.4)

included side A side of a triangle between two given angles. (Lesson 4.4)

incoming angle The angle formed between the path of an approaching object (a billiard ball, a light ray) and the surface it rebounds against (a cushion, a mirror). *See* **outgoing angle**. (Lesson 1.2)

indirect measurement Finding a distance or length by using properties of similar triangles or trigonometry. (Lessons 11.3, 12.1)

indirect proof A proof that begins by assuming the conclusion is not true and leads to a contradiction of either the assumption or a previously proved theorem. (Chapter 12, Exploration: Three Types of Proofs)

inductive reasoning The process of observing data, recognizing patterns, and making conjectures about generalizations. (Lesson 2.1)

inscribed (in a circle, a semicircle, or a sphere) Having each vertex on the circle, semicircle, or sphere. Usually referring to polygons inscribed in circles, right triangles inscribed in semicircles, or polyhedra inscribed in spheres. (Lesson 6.3)

inscribed (in a polygon or polyhedron) Intersecting each side or face of a figure exactly once. Usually referring to circles inscribed in polygons or spheres inscribed in polyhedra. The figure outside is circumscribed around the inscribed figure. (Lesson 3.7)

inscribed angle An angle formed by two chords of the circle with a common endpoint (the vertex of the angle). (Lesson 6.1)

internally tangent (circles) Intersecting at exactly one point, with one circle inside the other. *See* **tangent circles.** (Lesson 6.2)

invalid reasoning An argument that reaches its conclusion through unaccepted forms of reasoning. (The conclusion may or may not be true.) (Lesson 2.2; Chapter 10, Exploration: Sherlock Holmes and Forms of Valid Reasoning; Chapter 11, Exploration: Two More Forms of Valid Reasoning)

inverse (of a conditional statement) The statement formed by negating the antecedent and the consequent. (Chapter 11, Exploration: Two More Forms of Valid Reasoning)

inverse sine, cosine, or **tangent** (of a number) The acute angle whose sine, cosine, or tangent is the given number. (Lesson 12.1)

isometric drawing A type of drawing that shows three faces of a three-dimensional object in one view. The isometric drawing of a cube shows all the edges equal, but each square face is represented as a 60°-120°-60°-120° rhombus. (Lesson 1.8; Chapter 10, Exploration: Orthographic Drawing)

isometry A transformation that preserves all distances and so preserves size and shape. (Note: *iso-* means "same" and *-metry* means "measure.") The image of a figure under an isometry is always congruent to the original figure. Also called a rigid transformation. (Lesson 7.1)

isosceles trapezoid A trapezoid whose two nonparallel sides are congruent. (Lesson 5.3)

isosceles triangle A triangle with at least two congruent sides. If a triangle has exactly two congruent sides, they are called the legs and the angle between them is called the vertex angle. The side opposite the vertex angle is called the base. The nonvertex angles are called the base angles. (Lessons 1.5, 4.2)

kite A quadrilateral with exactly two distinct pairs of congruent consecutive sides. The angles between the pairs of congruent sides are called the vertex angles. The angles between the pairs of non-congruent sides are called the nonvertex angles. (Lessons 1.5, 5.3)

lateral edge (of a prism or pyramid) The intersection of two lateral faces. (Lesson 10.1)

lateral face (of a prism or pyramid) A face other than a base. (Lesson 10.1)

Law of Contrapositive The type of valid reasoning that concludes the truth of a statement from the truth of its contrapositive. (Chapter 11, Exploration: Two More Forms of Valid Reasoning)

Law of Cosines The theorem that, for any triangle with angles of measure A, B, and C, and sides of lengths a, b, and c (a opposite A, b opposite B, and c opposite C), $c^2 = a^2 + b^2 - 2ab\cos C$. (Lesson 12.4)

Law of Sines The theorem that, for any triangles with angles of measure A, B, and C, and sides of lengths a, b, and c (a opposite A, b opposite B, and c opposite C), $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$. (Lesson 12.3)

Law of Syllogism The type of valid reasoning that uses "if P then Q" and "if Q then R" to conclude that "if P then R." (Chapter 11, Exploration: Two More Forms of Valid Reasoning)

legs (of an isosceles triangle) The two congruent sides of a nonequilateral isosceles triangle. (Lesson 4.2)

legs (of a right triangle) The two sides that are not the hypotenuse. (Lesson 9.1)

lemma A theorem whose importance is primarily as part of a proof of another theorem. (Lesson 13.4)

length of an arc The portion of the circumference of the circle described by an arc, measured in units of length. (Lesson 6.7)

line An undefined term in most deductive systems. A straight arrangement of infinitely many points. A line has no thickness and is therefore considered one-dimensional. (Lesson 1.1)

line of best fit Given a collection of points, a line that passes closest to all of them, as measured by some given criterion. (Lesson 2.3)

line of reflection The line over which every point of a figure is moved by a reflection. (Lesson 7.1)

line segment Two points (the endpoints of the line segment) and all the points between them that are on the line containing them. The line segment connects the points. The measure of a line segment is its length. (Lesson 1.1)

line of symmetry The line of reflection of a figure having reflectional symmetry. (Lessons 0.1, 7.1)

linear function A function that, when applied to consecutive whole numbers, generates a sequence with a constant difference between consecutive terms. (Lesson 2.3)

linear pair of angles Two adjacent angles whose distinct sides lie on the same line. (Lesson 1.3)

locus The path of a moving point; the set of all points in a plane satisfying some given condition or property. (Lesson 1.7)

logical argument A set of premises followed by statements each of which relies on the premises or on previous statements, and ending with a final statement called a conclusion. An argument is valid if the conclusion has been arrived at through deductive reasoning. (Chapter 10, Exploration: Sherlock Holmes and Forms of Valid Reasoning)

major arc An arc whose measure is greater than the measure of a semicircle. (Lesson 1.6)

mandala A circular design arranged in concentric arcs. (Chapter 0 Review, Lesson 11.2)

mathematical model A mathematical object (such as a geometric figure, graph, table, or equation) representing a real-world situation. In mathematical modeling the real-world situation is abstracted to a model, the related mathematical problem is posed and solved, and the mathematical solution is interpreted back into the real-world situation as a solution to the real-world problem. (Lesson 2.4)

mean The result of summing a set of numbers then dividing by the number of numbers in the set. Often called the average or the arithmetic mean. (Chapter 7, Using Your Algebra Skills 7)

measure (of an angle) The smallest amount of rotation necessary to rotate from one ray of the angle to the other, usually measured in degrees. (Lesson 1.2)

median (of a triangle) A line segment connecting a vertex to the midpoint of the opposite side. (Lesson 3.2)

midpoint (of a line segment) The point on the line segment that is the same distance from both endpoints. (Lessons 1.1, 3.2)

midsegment (of a trapezoid) The line segment connecting the midpoints of the two nonparallel sides. (Lesson 5.4)

midsegment (of a triangle) A line segment connecting the midpoints of two sides. (Lessons 3.2, 5.4)

minimal path The path of shortest length, as when finding the shortest path from one point to another by way of a fixed line. (Lesson 7.2)

minor arc An arc whose measure is less than the measure of a semicircle. (Lesson 1.6)

Modus Ponens The type of valid reasoning that uses "if P then Q" and the statement P to conclude that Q must be true. (Chapter 10, Exploration: Sherlock Holmes and Forms of Valid Reasoning)

Modus Tollens The type of valid reasoning that uses "if P then Q" and statement "not Q" to conclude that "not P" must be true. (Chapter 10, Exploration: Sherlock Holmes and Forms of Valid Reasoning)

monohedral tiling A tessellation in which all tiles are congruent. (Lesson 7.4)

negation (of a statement) A statement that is false if the original statement is true, and true if the original statement is false. The negation can usually be made by appropriately adding the word *not* to the statement, or by preceding the statement with the phrase "It is not the case that. . . ." A double negation of a statement is a negation of the negation of that statement. (Chapter 10, Exploration: Sherlock Holmes and Forms of Valid Reasoning)

net A two-dimensional pattern that you can cut out and fold to form a three-dimensional figure. (Lesson 1.7)

network A collection of designated points connected by paths. (Chapter 2, Exploration: The Seven Bridges of Konigsberg)

***n*-gon** An *n*-sided polygon. (Lesson 5.1)

nonagon A nine-sided polygon. (Lesson 1.4)

nonrigid transformation A transformation that does not preserve the size and shape of the original figure. (Lesson 7.1)

nonvertex angles (of a kite) The two angles between consecutive noncongruent sides of a kite. (Lesson 5.3)

***n*th term** The number that a function rule generates as output for a counting number *n*. (Lesson 2.3)

numerical name *See* **vertex arrangement**. (Lesson 7.4)

oblique Not having an axis perpendicular to the base or bases. *See* **cone**, **cylinder**, **prism**, and **pyramid**. (Lessons 1.8, 10.1)

obtuse angle An angle whose measure is greater than 90°, but less than 180°. (Lesson 1.3)

obtuse triangle A triangle with an obtuse angle. (Lesson 1.5)

octagon An eight-sided polygon. (Lesson 1.4)

octahedron An eight-sided polyhedron. The regular octahedron is one of the Platonic solids. (Chapter 10, Exploration: Euler's Formula for Solids)

opposite angle (of a side of a triangle) The angle that doesn't contain the side. (Lesson 12.1)

opposite side (of an angle of a triangle) The side that is not a side of the angle. (Lesson 12.1)

ordered pair rule A rule that uses ordered pairs to describe a transformation. For example, the ordered pair rule $(x, y) \rightarrow (x + h, y + k)$ describes a translation horizontally by h units and vertically by k units. (Lesson 7.2)

orthocenter The point of concurrency of a triangle's three altitudes (or of the lines containing the altitudes). (Lesson 3.7)

orthographic drawing A drawing of the top, front, and right side views of a solid that preserves their sizes and shapes. *Ortho*-means "straight;" the views of an orthographic drawing show the faces of a solid as if you were viewing them "head-on." (Chapter 10, Exploration: Orthographic Drawing)

outgoing angle The angle formed between the path of a rebounding object (a billiard ball, a light ray) and the surface it collided with (a cushion, a mirror). *See* **incoming angle**. (Lesson 1.2)

overlapping angles property The property that, if two angles have the same vertex and overlap so that the nonoverlapping parts of the angles are congruent, then the angles are congruent. (Lesson 2.3)

overlapping segments property The property that, if two line segments on the same line overlap so that the nonoverlapping parts are congruent, then the line segments are congruent. (Lesson 2.2)

paragraph proof A logical argument presented in the form of a paragraph. (Lesson 2.5)

parallel (lines, rays, or line segments) Lying in the same plane and not intersecting. (Lessons 1.3, 3.5)

parallel (planes or figures) Planes or figures that are parallel have the same perpendicular distance everywhere. (Lesson 10.1)

parallelogram A quadrilateral in which both pairs of opposite sides are parallel. Any of the sides, or its length, can be designated as a base. An altitude is a line segment from the base, ending at and perpendicular to a line containing the opposite side. The height is the length of an altitude. (Lesson 1.5)

pentagon A five-sided polygon. (Lesson 1.4)

period The horizontal distance between corresponding points on adjacent cycles of a periodic curve. (Chapter 6, Exploration: Cycloids; Chapter 12, Exploration: Trigonometric Ratios and the Unit Circle)

periodic curve A curve that repeats in a regular pattern (Chapter 6, Exploration: Cycloids; Chapter 12, Exploration: Trigonometric Ratios and the Unit Circle)

perpendicular Intersecting at right angles. (Lesson 1.3)

perpendicular bisector (of a line segment) A line that divides the line segment into two congruent

parts (bisects it) and is also perpendicular to it. (Lesson 3.2)

perspective A technique of representing three-dimensional relationships realistically in a drawing, by drawing objects smaller as they recede into the distance. (Lesson 3.6)

plane An undefined term in most deductive systems. A flat surface that extends infinitely. A plane has length and width but no thickness and is therefore considered two-dimensional. (Lesson 1.1)

Platonic solids The five regular polyhedrons: regular tetrahedron, regular icosahedron, regular octahedron, regular hexahedron, and regular dodecahedron. Plato identified each with one of the five "atoms"—fire, water, air, earth, and cosmos. (Chapter 10, Exploration: The Five Platonic Solids)

point An undefined term in most deductive systems. It has no size, only location and is therefore considered zero-dimensional. You can think of geometric figures as sets of points. In a Cartesian coordinate system, a point's location is represented by a pair of numbers (x, y). (Lesson 1.1)

point of concurrency The point at which more than two concurrent lines, line segments, or rays intersect. (Lesson 3.7)

point symmetry The property of a geometric figure that it coincides with its image under a rotation of 180°. (Lesson 7.1)

point of tangency (of a circle) The single point where a tangent touches a circle. (Lesson 1.6)

polygon A closed planar geometric figure consisting of line segments (the sides), each of which intersects exactly two others at endpoints forming the polygon's angles. Each point of intersection is a vertex of the polygon. (Lesson 1.4)

polyhedron A solid whose surface consists of polygons and their interiors, each of which is a face. A line segment where two faces intersect is an edge. A point of intersection of three or more edges is a vertex. (Lesson 10.1)

postulates Premises in a deductive system accepted without proof. (Lesson 13.1)

premises (in a deductive system) Statements (including undefined terms, definitions, properties of algebra and equality, postulates, and theorems) used to prove further conclusions. (Lesson 13.1)

prism A polyhedron with two congruent polygons in parallel planes as bases. Line segments (lateral edges) connect the corresponding bases to form lateral faces, which are parallelograms. An altitude is a line segment between, and perpendicular to, the planes of the bases. The height is the length of an altitude. If the lateral edges are perpendicular to the bases, the prism is a right prism; otherwise it is oblique. (Lessons 1.8, 10.1)

probability (of an event) Its likely outcome, expressed as the ratio of the number of successful outcomes of the event to the number of possible outcomes. (Chapter 1, Exploration: Geometric Probability I)

proportion A statement of equality between two ratios. (Lesson 11.1)

protractor A tool used to measure the size of an angle in degrees. (Lesson 1.2)

pyramid A polyhedron with a polygon base and line segments connecting the vertices of the base with a single point (the vertex of the pyramid) that is not coplanar with the base. The altitude is the line segment from the vertex ending at and perpendicular to the plane of the base. The height is the length of the altitude. If the line segment connecting the vertex to the center of the base is perpendicular to the base, then the pyramid is right; otherwise it is oblique. (Lessons 1.8, 10.1)

Pythagorean Theorem The theorem that says that, in a right triangle, the sum of the squares of the lengths of the legs equals the square of the length of the hypotenuse. (Lesson 9.1)

Pythagorean triple Three positive integers with the property that the sum of the squares of two of the integers equals the square of the third. If the three integers have no common integer factors, then the triple is primitive. If the three integers have a common factor, then the triple is a multiple. (Lesson 9.2)

quadrilateral A four-sided polygon. Pairs of nonconsecutive sides are opposite sides. (Lesson 1.4)

radius A line segment from the center to a point on a circle or a sphere, or the length of such a line segment. (Lessons 1.6, 10.1)

ratio The quotient of two numbers. (Chapter 11, Using Your Algebra Skills 9)

ray All points on a line that lie on one side of a specified point, the ray's endpoint. A ray is referred to by giving the names of two points, first the endpoint and then any point on the ray. (Lesson 1.1)

rectangle An equiangular parallelogram. (Lessons 1.5, 5.6)

rectify Make a shape into a rectangle by cutting and reassembling it. (Lesson 8.6)

recursion The process of generating a sequence (or pattern) by specifying a first term and then applying a rule to obtain any succeeding term from the previous term. (Chapter 2, Exploration: Patterns in Fractals)

recursive rule A rule used to find terms in number sequences using recursion. (Chapter 2, Exploration: Patterns in Fractals)

reflection An isometry under which every point and its image are on opposite sides of a fixed line (the line of reflection, or mirror line) and are the same distance from the line. (Lesson 7.1)

reflectional symmetry The property of a figure that it coincides with its image under at least one reflection. Also called line symmetry or mirror symmetry. (Lessons 0.1, 7.1)

reflexive property of congruence The property of every geometric object that it is congruent to itself. (Lesson 13.1)

regular hexagon A six-sided figure whose sides are of equal length and whose angles are of equal measure. (Lesson 0.3)

regular polygon A polygon that is both equilateral and equiangular. (Lesson 1.4)

regular polyhedron A polyhedron whose faces are enclosed by congruent, regular polygons that meet at all vertices in exactly the same way. (Lesson 10.1)

regular tessellation An edge-to-edge tessellation in which tiles are congruent regular polygons. (Lesson 7.4)

remote interior angles (of the exterior angle of a triangle) The two interior angles that do not share a vertex with the exterior angle. (Lesson 4.3)

resultant vector The result of combining two vectors. To find the resultant vector, slide the original vectors so that their tails intersect. The resultant vector's tail is the common tail. Its head is the image of the head of one of the vectors after you translate it along the other vector. Also known as a vector sum. (Lesson 5.5)

rhombus An equilateral parallelogram. (Lesson 1.5)

right angle An angle whose measure is 90°. (Lesson 1.3)

right cone *See* **cone**. (Lesson 10.1)

right cylinder *See* **cylinder**. (Lesson 10.1)

right prism *See* **prism**. (Lesson 10.1)

right triangle A triangle with a right angle. The side opposite the right angle is the hypotenuse. The other two sides are the legs. (Lesson 1.5)

rigid transformation *See* **isometry**. (Lesson 7.1)

rotation In effect, a rotation is a turning of the plane about a point (the center of rotation) by an angle (the angle of rotation). Formally, a rotation is an isometry that is the composition of reflections through two lines that intersect at the center of the rotation. The angle of rotation has twice the measure of the smaller angle formed by the lines. (Lesson 7.1)

rotational symmetry The property of a geometric figure that it coincides with its image under some rotation. If the angle of rotation measures $\frac{360}{n}$ degrees for some positive integer n, the symmetry is n-fold rotational symmetry. (Lessons 0.1, 7.1)

scale factor The ratio of corresponding lengths in similar figures. (Lesson 11.1)

scalene triangle A triangle with three sides of different lengths. (Lesson 1.5)

secant A line that intersects a circle in two points. (Lesson 6.3)

section (of a solid) An intersection with a plane. (Lesson 1.8)

sector (of a circle) The region between a central angle and the arc it intercepts. (Lesson 8.6)

segment *See* **line segment**. (Lesson 1.1)

segment (of a circle) The region between a chord and the included arc. (Lesson 8.6)

segment bisector A line, ray, or segment that passes through the midpoint of a line segment. (Lesson 3.2)

self-similar The property of a figure that it is similar to, or approximately similar to, a part of itself. (Chapter 2, Exploration: Patterns in Fractals)

semicircle An arc of a circle included by a diameter. (Lesson 1.6)

semiregular tessellation A tessellation consisting of regular polygons all of whose vertices lie on other vertices, and in which every vertex is surrounded by the same arrangement of polygons (of one or more kinds) in the same order. Also called a 1-uniform tiling. (Lesson 7.4)

side (of a polygon) A line segment connecting consecutive vertices of a polygon. (Lesson 1.4)

sides (of an angle) The two rays, having a common endpoint, that form an angle. (Lesson 1.2)

Sierpiński triangle A type of fractal. (Chapter 2, Exploration: Patterns in Fractals)

similar figures Figures that have the same shape but not necessarily the same size. Their corresponding sides are proportional. (Lesson 11.1)

similar polygons Polygons whose corresponding angles are congruent and whose corresponding sides are proportional. (Lesson 11.1)

sine (of an acute angle) The ratio of the length of the opposite side to the length of the hypotenuse in any right triangle containing the angle. (Lesson 12.1)

skew lines Lines that are not in the same plane and do not intersect but are not parallel. (Lesson 1.8)

slant height The height of each triangular lateral face of a pyramid. (Lesson 8.7)

slope of a line (or line segment) In a coordinate plane, the amount of vertical change (change in y) for each unit of horizontal change (change in x). The slope of a vertical line is undefined. You can calculate the slope m of a line (or line segment) through points with coordinates (x_1, y_1) and (x_2, y_2) where $x_1 \neq x_2$ using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. (Chapter 2, Using Your Algebra Skills 2)

slope triangle A right triangle used to help find the slope of a line or line segment through two points, which are used as the endpoints of the hypotenuse. The length of the triangle's vertical leg is the "rise." The length of the horizontal leg is the "run." Signs are attached to each quantity depending on the direction of travel along the legs between the points. (Chapter 2, Using Your Algebra Skills 2)

solid A geometric figure that completely encloses a region of space. (Lesson 1.8)

solid of revolution A solid formed by rotating a two-dimensional figure about a line. (Lesson 1.8)

space An undefined term in most deductive systems. The set of all points, usually taken to be three-dimensional. (Lesson 1.8)

sphere The set of all points in space at a given distance (the radius) from a given point (the center). (Lessons 1.8, 10.1)

square An equiangular rhombus; equivalently, an equilateral rectangle. (Lessons 1.5, 5.6)

straightedge A tool used to construct straight lines. (Lesson 0.2)

supplementary angles Two angles whose measures have the sum 180°. (Lesson 1.3)

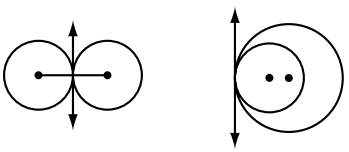
surface area (of a solid) The sum of the areas of all the surfaces. (Lesson 8.7)

symmetric property of congruence The property of congruent figures that, if one geometric figure is congruent to a second figure, then the second figure is congruent to the first. (Lesson 13.1)

symmetry The property of a geometric figure that it coincides with its image under some isometry. (Lesson 0.1)

tangent (of an acute angle) The ratio of the length of the opposite side to the length of the adjacent side in any right triangle containing the angle. (Lesson 12.1)

tangent circles Circles that are tangent to the same line at the same point. They can be internally tangent or externally tangent. (Lesson 6.2)



Externally tangent Internally tangent

tangent line A line that lies in the plane of a circle and that intersects the circle at exactly one point (the point of tangency). (Lesson 1.6)

tangent segment A line segment that lies on a tangent line to a circle, with one endpoint at the point of tangency. (Lesson 6.2)

tangential velocity (of an object moving in a circle) The speed of the moving object in the direction it would take if it left the circle along a tangent line. (Lesson 6.7)

tessellation An arrangement of shapes (called tiles) that completely covers a plane without overlaps or gaps. (Lessons 0.6, 7.4)

tetrahedron A polyhedron with four faces. The regular tetrahedron is one of the Platonic solids. (Lesson 10.1)

theorem A statement that has been proved within a deductive system. (Lessons 9.1, 13.1)

tile, tiling *See* **tessellation**. (Lessons 0.6, 7.4)

transformation (of a plane) A rule that assigns to each point in the plane another point in the plane, called its image. (Lessons 0.1, 7.1, 11.1)

transitive property of congruence The property that, if one geometric object is congruent to a second object, which in turn is congruent to a third, then the first and third objects are congruent to each other. (Lesson 13.1)

translation An isometry under which the vectors (any of which is a translation vector) between each point and its image are all parallel (determining the direction of the translation), and have the same length (the distance of the translation). (Lesson 7.1)

translation vector *See* **translation** (Lesson 7.1)

transversal A line intersecting two or more other coplanar lines. At least eight angles are formed. Any pair of those angles that are translations of each other along the transversal are corresponding angles. The four angles lying between the two lines are interior angles and the four outside those lines are exterior angles. *See* **alternate exterior angles** and **alternate interior angles**. (Lesson 2.6)

trapezoid A quadrilateral with exactly one pair of parallel sides. The parallel sides are called bases. A pair of angles that have a base as a common side are called a pair of base angles. (Lessons 1.5, 5.3)

tree diagram A concept map in the form of the branches of a tree. You can use it to show the relationships among members of a family of concepts. (Lesson 1.7)

triangle A three-sided polygon. (Lesson 1.5)

triangular numbers Numbers of dots that can be put into triangular arrangements; equivalently, sums of consecutive positive integers beginning with 1. (Lesson 2.4)

trigonometry The study of the relationships between the measures of sides and angles of triangles. (Lesson 12.1)

truncate Cut off part of a solid with a plane parallel to its base. (Lesson 13.2)

truncated pyramid Part of a pyramid remaining after truncating the vertex with a plane parallel to the base. (Lesson 13.2)

two-column proof A form of proof in which each statement in the argument is written in the left column, and the reason for each statement is written directly across from it in the right column. (Chapter 12, Exploration: Three Types of Proofs)

two-point perspective A method of perspective drawing that uses two vanishing points. (Chapter 3, Exploration: Perspective Drawing)

undecagon An 11-sided polygon. (Lesson 1.4)

undefined term In a deductive system, terms that are assumed, and assigned no properties, and whose meaning is derived only from the postulates or axioms that use them. In our (Euclidean) system, the undefined terms are point, line, plane, and space. (Lessons 1.1, 13.1)

unit circle A circle on the coordinate plane with center (0, 0) and radius 1 unit. (Chapter 12, Exploration: Trigonometric Ratios and the Unit Circle)

valid reasoning An argument that reaches its conclusion through accepted forms of reasoning. (Lesson 2.2; Chapter 10, Exploration: Sherlock Holmes and Forms of Valid Reasoning; Chapter 11, Exploration: Two More Forms of Valid Reasoning)

vanishing point A point toward which lines in a perspective drawing converge if they represent parallel lines that recede from the foreground to the background. (Chapter 3, Exploration: Perspective Drawing)

vector A directed line segment, usually represented by an arrow with a head and tail. The vector's direction is indicated from the tail to the head. The vector's length is the length of the line segment. (Lesson 5.5)

vector sum *See* **resultant vector**. (Lesson 5.5)

Venn diagram A circle diagram used to show the relationships among members of different sets. (Lesson 1.7)

vertex A point of intersection of two or more rays or line segments in a geometric figure. *See* **angle**, **polygon**, and **polyhedron**. (Lessons 1.1, 1.4, 10.1)

vertex angle (of an isosceles triangle) The angle between the two congruent sides. (Lesson 1.5)

vertex angles (of a kite) The angles between the pairs of congruent sides. (Lesson 5.3)

vertex arrangement A notation that uses positive integers and other symbols to describe the arrangement of regular polygons about vertices of a semiregular tessellation. Also called the numerical name. (Lesson 7.4)

vertical angles Two nonadjacent angles formed by two intersecting lines. (Lesson 1.3)

volume A measure of the amount of space contained in a solid. (Lesson 10.2)

work The result of force applied over some distance, given by the formula $w = fd$, where $w =$ work, $f =$ force, and $d =$ distance. (Lesson 9.4)

***y*-intercept** The y-coordinate of the point at which a line crosses the y-axis. (Chapter 4, Using Your Algebra Skills 4)