Mathematics 7-12 Glossary DRAFT

The Mathematics 7-12 Glossary provides definitions and descriptions for words found in the Mathematics Grade-Level Expectations. The same word may appear in more than one grade level but have a slightly different definition because of context. The words in the glossary have been written to best match the focus and terminology for a particular grade level. This document is still in a draft format, with possible word changes and the addition of new terms to occur at a future date.

UPDATES 03/14/08

7th Grade	
equation: mathematical statement in which equal values appear to the right and left of an equal sign or comparisons written horizontally. Examples: 3 + 4 = 7, 5x = 3 + 7; 8^2 + 4 - 10 = 58. *Note:* 3 + 5 = 8 x 5 = 40 is a run on number sentence or string of numbers and not an equality therefore it is not an acceptable representation for an equation or for showing process.	
rule (for a pattern): a general statement written in numbers or words that describes how to determine any term in a pattern. Rules or generalizations for patterns may include both *recursive* and *explicit* notation. In the recursive form of pattern generalization, the rule focuses on the rate of change from one element to the next. Example: Next = Now + 2; Next = Now x 4. In the explicit form of pattern generalization, the formula or rule is related to the order of the terms in the sequence and focuses on the relationship between the independent variable (the number representing a term in the sequence) and the dependent variable (the number in the sequence). For example: 5t - 3 ; t – x; (t +1) x 5 Words may also be used to write a rule in recursive or explicit notation. Example: take the previous number and add two to get the next number; to find the total for any day multiple the day times five and subtract three.	
scale factor: the ratio between the lengths of two corresponding sides of similar figures.	Math on call. A mathematics handbook (p. 591). (1998). Wilmington, MA: Great Source Education Group, Inc.

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7th Grade	
box and whisker plots: a graph that uses a rectangle (or box) to represent the middle 50% of a set of data (the midquartile range) and line segments (or *whiskers*) at both ends to represent the remainder of the data.	*Algebra to Go: A mathematics handbook* (p. 480). (2000). Wilmington, MA: Great Source Education Group, Inc
compose or decompose numbers: flexibly using or knowing numbers through creating and breaking numbers apart to form equivalent representations. Grade 7 should include exponential notation. For example, 36 can be thought of as 32 + 4, 20 + 16, 40 – 4, 12 X 3, 2^2 x 3^2, etc.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 149).
conjectures: a mathematical statement which has neither been proved, nor denied by counterexample.	Karush, W. (1962)The Crescent Dictionary of Mathematics; p. 53; The Macmillan Company, New York
contraction: a transformation in which a similar image is formed by reducing its pre-image. The image and its pre-image are similar figures.	Simmons, Bruce Retrieved from http://www.mathwords.com
coordinate plane: a plane determined by the intersection of two perpendicular number lines in which the coordinates of a point are its distances from the number lines	*Geometry to go: A mathematics handbook*(p. 451). (2001). Wilmington, MA: Great Source Education Group, Inc
corresponding angles: angles in the same relative position in similar or congruent figures	*Geometry to go: A mathematics handbook*(p. 452). (2001). Wilmington, MA: Great Source Education Group, Inc.
corresponding sides: sides in the same relative position in similar or congruent figures	*Geometry to go: A mathematics handbook*(p. 452). (2001). Wilmington, MA: Great Source Education Group, Inc.
dilation: a transformation in which a similar image is formed by enlarging (magnification) or reducing (contraction) its pre-image. The image and its pre-image are similar figures	*Geometry to go: A mathematics handbook*(p. 454). (2001). Wilmington, MA: Great Source Education Group, Inc.
factor: an integer that will divide evenly into another number. 1, 2, 3, 4, 6, 12 are all factors of 12, since 12 is divisible by each.	*Math at hand: A mathematics handbook* (p. 524). (1999). Wilmington, MA: Great Source Education Group, Inc.
function: a mathematical rule between two sets which assigns to each number of the first, exactly one member of the second.	McGraw -Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 94). New York, NY: McGraw
graphical representation – the plot of points in the plane which constitute the graph of a given real function or a pictorial diagram depicting the interdependence of variables.	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 102). New York, NY: McGraw
histogram: A histogram is a bar graph that shows how many data values fall into a certain interval. The number of data items in an interval is a frequency. The width of the bar represents the interval, while the height indicates the number of data items, or frequency, in that interval..	Intermath http://www.intermath-uga.gatech.edu/dictnary/related.asp?termid=167

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Informal transformations: transformations such as reflections(flips), rotations(turns), and translations(slides) completed by using physical objects, figures traced on paper, mirrors or other reflective surfaces, etc.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 232, 235). Reston, VA: Author
interquartile range: the difference between the upper quartile and the lower quartile.	*Algebra to Go: A mathematics handbook* (p. 491). (2000). Wilmington, MA: Great Source Education Group, Inc
isometric drawing: drawings that provide a corner view of an object, thus showing three dimensions. Use isometric dot paper to make these views	*Geometry to go: A mathematics handbook*(p. 459). (2001). Wilmington, MA: Great Source Education Group, Inc
linear: a relationship between two variables that can be expressed as an equation and drawn as a straight line.	*Schaum's A -Z Mathematics* (2003). Berry, J, p.132, London, England, McGraw
magnification: a transformation in which a similar image is formed by enlarging its pre-image. The image and its pre-image are similar figures	*Geometry to go: A mathematics handbook*(p. 454). (2001). Wilmington, MA: Great Source Education Group, Inc
measures of center: (or measures of central tendency) values intended to indicate the typical value in a collection of data. The mean, median, and mode are measures of central tendency.	*Algebra to Go: A mathematics handbook* (p. 494). (2000). Wilmington, MA: Great Source Education Group, Inc
model: a representation of a given situation that can be used to describe the present situation or predict some aspect of the situation in the future. A mathematical model is a representation in the form of a mathematical quantity such as a number, a vector, a formula, an inequality, a graph, a table of values, etc	*Schaum's A-Z Mathematics* (2003). Berry, J, p.146, London, England, McGraw-Hill
multiple: the product of a whole number and any other whole number. Multiples of 5 include 0, 5, 10, 15, … etc.	*Math on call: A mathematics handbook* (p. 584). (1998). Wilmington, MA: Great Education Source Group, Inc.
nonlinear: a relationship between two variables x and y is described as nonlinear if it is not of the form $y = ax + b$. The graphs will not be straight lines, the equation will not be of the first degree. For example, $y = e^x$ and $y = x^2$ are nonlinear relationships..	*Schaum's A Z Mathematics* (2003). Berry, J, p.154, London, England, McGraw
numerically: pertaining to numbers.	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 170). New York, NY: McGraw-Hill, Inc.
precision: an indication of how finely a measurement was made. When you calculate with measured values, you may need to round to the smallest place in the roughest actual measurements.	*Algebra to Go: A mathematics handbook* (p. 499). (2000). Wilmington, MA: Great Source Education Group, Inc
properties of operations: associative and commutative properties of addition and multiplication, the distributive property of multiplication over addition to simplify computations; order of operations should be followed. Example: $3(3+5^2)\div7+1 = 3(3+25)\div7+1 = 3(28)\div7+1=84\div7+1=12+1=13$	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 214). Reston, VA: Author
properties of shapes: should include ideas such as	*Geometry to go: A mathematics handbook*(p.

equality of sides, parallel sides, symmetry, angle relationships, or other ways that can distinguish one shape from another.	459). (2001). Wilmington, MA: Great Source Education Group, Inc
recursive notation: a process that is inherently repetitive, with the result of each repetition usually depending upon those of the previous repetition. **Added Note** – Recursive notation requires the previous term (or information to begin) to generate the next term. This type of function follows a pattern that "reoccurs	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 210). New York, NY: McGraw-Hill, Inc
representations: the ways that mathematical ideas are represented, i.e. physical objects, drawings, charts, graphs, and symbols.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 280). Reston, VA: Author
similar polygons: polygons that have the same shape, but not necessarily the same size. Corresponding sides of similar polygons are proportional. Corresponding angles are congruent	*Geometry to go: A mathematics handbook*(p. 459). (2001). Wilmington, MA: Great Source Education Group, Inc
symbolic rules: rules that use variables and numbers to describe a pattern or express a relationship. For example the rule 3X + 2 describes 5, 8 ,11, 14, 17, …	*Navigating through algebra in grades 6–8* (p. 3) (2001). Reston, VA: National Council of Teachers of Mathematics
visual models: models such as networks that could be used in analyzing and solving real problems such as those concerned with efficiency. The models of 2 and 3 dimensional objects may also assist students reasoning about spatial relationships	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 237). Reston, VA: Author
8th Grade	
compose or decompose numbers: flexibly using or knowing numbers through creating and breaking numbers apart to form equivalent representations. Grade 8 should include scientific notation. For example, 36 can be thought of as 32 + 4, 20 + 16, 40 – 4, 12 X 3, 2^2 x 3^2 , 3.6 x 10^1 etc.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 149).
conjectures: a mathematical statement which has neither been proved, nor denied by counterexample.	Karush, W. (1962)The Crescent Dictionary of Mathematics; p. 53; The Macmillan Company, New York
corresponding angles: angles in the same relative position in similar or congruent figures	*Geometry to go: A mathematics handbook*(p. 452). (2001). Wilmington, MA: Great Source Education Group, Inc.
corresponding sides: sides in the same relative position in similar or congruent figures	*Geometry to go: A mathematics handbook*(p. 452). (2001). Wilmington, MA: Great Source Education Group, Inc.
cross section: a plane shape formed when a plane cuts through a three dimensional figure.	*Algebra to Go: A mathematics handbook* (p. 484). (2000). Wilmington, MA: Great Source Education Group, Inc
dilation: a transformation in which a similar image is formed by enlarging (magnification) or reducing (contraction) its pre-image. The image and its pre-image are similar figures	*Geometry to go: A mathematics handbook*(p. 454). (2001). Wilmington, MA: Great Source Education Group, Inc.
factor: an integer that will divide evenly into another	*Math at hand: A mathematics handbook* (p.

number. 1, 2, 3, 4, 6, 12 are all factors of 12, since 12 is divisible by each.	524). (1999). Wilmington, MA: Great Source Education Group, Inc.
formal transformations: transformations which include reflections, rotations, and translations performed on a coordinate grid.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 232, 235). Reston, VA: Author
function: a mathematical rule between two sets which assigns to each number of the first, exactly one member of the second.	McGraw -Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 94). New York, NY: McGraw
graphical representation: the plot of points in the plane which constitute the graph of a given real function or a pictorial diagram depicting the interdependence of variables.	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 102). New York, NY: McGraw
interquartile range: the difference between the upper quartile and the lower quartile.	*Algebra to Go: A mathematics handbook* (p. 491). (2000). Wilmington, MA: Great Source Education Group, Inc
isometric drawing**:** drawings that provide a corner view of an object, thus showing three dimensions. Use isometric dot paper to make these views	*Geometry to go: A mathematics handbook*(p. 459). (2001). Wilmington, MA: Great Source Education Group, Inc
mat plans: drawings of the base of a cube, with numbers on the squares to show how high each stack of cubes is.	Lappan, G. Frey, J. T., Fitzgerald, W. M., Friel, S. N., & Phillips, E. D. (2002). Ruins of Montarek spatial visualization. *Connected mathematics* (p. 9). Glenview, IL: Prentice Hall.
measures of center: (or measures of central tendency) values intended to indicate the typical value in a collection of data. The mean, median, and mode are measures of central tendency.	*Algebra to Go: A mathematics handbook* (p. 494). (2000). Wilmington, MA: Great Source Education Group, Inc
model: to represent a mathematical situation with manipulatives (objects), pictures, numbers or symbols.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 95). Reston, VA: Author
multiple: the product of a whole number and any other whole number.	*Math on call: A mathematics handbook* (p. 584). (1998). Wilmington, MA: Great Education Source Group, Inc.
numerical: pertaining to numbers. **Note:** patterns expressed numerically typically are a list: 1, 4, 9, 16, …	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 170). New York, NY: McGraw-Hill, Inc.
outlier: data that are more than 1.5 times the interquartile range from the quartiles.	Price, J., Rath, J., Leschensky, W., Malloy, C., Alban, Y., (1997). Pre-Algebra An Integrated Transition to Algebra $ Geometry. (P. 792). The McGraw-Hill Companies, Inc. New York, New York
precision: an indication of how finely a measurement was made. When you calculate with measured values, you may need to round to the smallest place in the roughest actual measurements.	*Algebra to Go: A mathematics handbook* (p. 499). (2000). Wilmington, MA: Great Source Education Group, Inc
properties of linear functions: defining characteristics such as slope, y-intercept, rate of change, overall picture of linearity, and how a change in value of one parameter affects the graph, table, and equation of	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 224-225). Reston, VA: Author

the function.	
properties of operations: associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations; including order of operations	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 214). Reston, VA: Author
properties of right triangles: mathematical ideas such as: • Right triangles have exactly one right angle. • The acute angles of a right triangle are complementary. • The square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs.	*Geometry to go: A mathematics handbook*(p. 150-152). (2001). Wilmington, MA: Great Source Education Group, Inc
properties of shapes: should include ideas such as equality of sides, parallel sides, symmetry, angle relationships, or other ways that can distinguish one shape from another.	*Geometry to go: A mathematics handbook*(p. 459). (2001). Wilmington, MA: Great Source Education Group, Inc
recursive notation: a process that is inherently repetitive, with the result of each repetition usually depending upon those of the previous repetition. Added Note – Recursive notation requires the previous term (or information to begin) to generate the next term. This type of function follows a pattern that "reoccurs	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 210). New York, NY: McGraw-Hill, Inc
reflex angle: an angle that measures more than 180^0.	*Algebra to Go: A mathematics handbook* (p. 502). (2000). Wilmington, MA: Great Source Education Group, Inc
representations: the ways that mathematical ideas are represented, i.e. physical objects, drawings, charts, graphs, and symbols.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 280). Reston, VA: Author
scatter plot: a graph with one point for each item being measured. The coordinates of a point represent the measures of two attributes of each item.	*Algebra to Go: A mathematics handbook* (p. 503). (2000). Wilmington, MA: Great Source Education Group, Inc
similar polygons**:** polygons that have the same shape, but not necessarily the same size. Corresponding sides of similar polygons are proportional. Corresponding angles are congruent	*Geometry to go: A mathematics handbook*(p. 459). (2001). Wilmington, MA: Great Source Education Group, Inc
symbolic algebra: using variables and numbers to characterize and represent mathematical situations	*Navigating through Algebra in grades 6–8* (p. 59) (2001). Reston, VA: National Council of Teachers of Mathematics
symbolic rules: rules that use variables and numbers to describe a pattern or express a relationship. For example the rule 3X + 2 describes 5, 8 ,11, 14, 17, …	*Navigating through Algebra in grades 6–8* (p. 3) (2001). Reston, VA: National Council of Teachers of Mathematics

visual models: models such as networks that could be used in analyzing and solving real problems such as those concerned with efficiency. The models of 2 and 3 dimensional objects may also assist students reasoning about spatial relationships	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 237). Reston, VA: Author
9th Grade	
conjecture: a mathematical statement which has neither been proved, nor denied by counterexample.	Karush, W. (1962)The Crescent Dictionary of Mathematics; p. 53; The Macmillan Company, New York
explicit function: An explicit function of x is a function whose values are given by an explicit expression (algebraic or otherwise) in x. For example, the equation y=2x-3 gives values of y as an explicit function of x(solving for x in terms of y would express the value of x as an explicit function of y). **Note:** An explicit function that could be used to describe the nth stage (or term) would be Area = 2xstage number – 1. Using this type of function allows one to "jump" to the stage in question. For example if you wanted the 7^{th} stage substitute 7 in for stage number meaning Area = 2x7 – 1 = 14 – 1 = 13, or the 20^{th} stage would be Area = 2x20 – 1 = 40 – 1 = 39.	Karush, W. (1962)The Crescent Dictionary of Mathematics; p. 101; The Macmillan Company, New York
exponential function: a function of the form $f(x) = ab^x$, where $a \neq 0$, $b > 0$, $b \neq 1$, and x is a real number.. Note: e^x is called the natural exponential function where e is the irrational number 2.718281828 correct to ten significant figures. It is often shown on a calculator as "exp" and the exponential function is often written as exp(x).	*Schaum's A-Z Mathematics* (2003). Berry, J, p.87, London, England, McGraw-Hill
function: a mathematical rule between two sets which assigns to each number of the first, exactly one member of the second.	McGraw -Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 94). New York, NY: McGraw
line of best fit: a line, segment, or ray drawn on a scatter plot to estimate the relationship between two sets of data.	*Algebra to Go: A mathematics handbook* (p. 492). (2000). Wilmington, MA: Great Source Education Group, Inc
linear function: a relationship between two variables that can be expressed as an equation and drawn as a straight line.	*Schaum's A-Z Mathematics* (2003). Berry, J, p.132, London, England, McGraw-Hill.
network: a collection of points which may or may not be connected by edges.	Geometry to Go: A mathematics handbook (p.463). (2001). Wilmington, MA: Great Source Education Group, Inc
one-variable quantitative data: data which takes numerical values for which arithmetic operations such as adding and averaging makes sense.	Yates, D., Starnes, D., Moore, D., (2005) *Statistics Through Applications;* p.206; W.H. Freeman and Company, New York
parameter: a single number that describes some	National Council of Teachers of Mathematics. (2000). *Principles and standards for school*

aspect of an entire population. Whereas, a statistic is an estimate of that value computed from some sample of the population.	*mathematics* (p. 329). Reston, VA: Author
precision: an indication of how finely a measurement was made. When you calculate with measured values, you may need to round to the smallest place in the roughest actual measurements.	*Algebra to Go: A mathematics handbook* (p. 499). (2000). Wilmington, MA: Great Source Education Group, Inc
properties of exponents: rules applied when operations are performed on algebraic expressions containing exponents. In general: $a^0 = 1; a \neq 0$, $a^m a^n = a^{m+n}$, $(ab)^n = a^n b^n$, $(a^m)^n = a^{mn}$, etc. .	Bellmann, A., Bragg, S., Charles, R., Handlin, W., Kennedy, D.(2004); Prentice Hall *Algebra 2,* p. 362, Upper Saddle River, New York, Pearson Education, Inc.
recursive notation: A process that is inherently repetitive, with the result of each repetition usually depending upon those of the previous repetition. **Added Note** - Recursive notation requires the previous term (or information to begin) to generate the next term. This type of function follows a pattern that "reoccurs". The power of this type of function is not in solving this particular problem, rather in helping students use patterns to generate conclusions as well as bring meaning to explicit functions. One example of a recursive function that could be used to solve this problem is $Next = Now + 2$ starting with *Now* = 1. This function works by putting the Now value into the function in this case beginning with 1 + 2 giving the Next value to be 3 which will be the value substituted back into the function. This is not efficient to find many terms beyond the initial values, but when students use this structure they generate greater understanding of this linear pattern. The fact that you are continuing to add 2 matches the slope in the explicit equation form. This seems to make more sense as you are in fact adding with the change rather than multiplying as the explicit form "looks".	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 210). New York, NY: McGraw-Hill, Inc..
representations: : the ways that mathematical ideas are represented, i.e. physical objects, drawings, charts, graphs, and symbols.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 280). Reston, VA: Author
sample space: the set of all possible outcomes of an experiment. The sample space is typically denoted by *S* and may take any number of forms: a list, a tree diagram, a lattice grid system, and so on.	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 191; Thompson Learning, Inc., USA
symbolic algebra: using variables and numbers to characterize and represent mathematical situations	*Navigating through algebra in grades 6–8* (p. 59) (2001). Reston, VA: National Council of Teachers of Mathematics
unit analysis: keeping track of units during computation to assure accurate and appropriate reporting of information.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 322). Reston, VA: Author

vertex-edge graphs: a network of vertices and edges. The edges, vertices, or both may be assigned specific values, labels, or colors, in which case the graph is called a labeled graph. The edges may also be imbued with directedness or may be left unlabeled. Vertex edge graphs are used to find optimal solutions to problems involving paths, networks, or relationships among a finite number of objects.	Weisstein, Eric W., "Vertex-Edge Graph," From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/Vertex-EdgeGraph.html National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 322). Reston, VA: Author
visual models**:** models such as networks that could be used in analyzing and solving real problems such as those concerned with efficiency. The models of 2 and 3 dimensional objects may also assist students reasoning about spatial relationships	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 237). Reston, VA: Author
10th Grade	
bivariate: the values of two different variables that are obtained from the same population element.	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 130; Thompson Learning, Inc., USA
categorical data: a variable that describes or categorizes an element of a population; also referred to as qualitative or attribute variables.	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 14; Thompson Learning, Inc., USA
conditional probability: P(A | B) represents the probability that A will occur given that B has occurred. This is called a conditional probability.	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 209; Thompson Learning, Inc., USA
conjecture: a mathematical statement which has neither been proved, nor denied by counterexample.	Karush, W. (1962)The Crescent Dictionary of Mathematics; p. 53; The Macmillan Company, New York
explicit function: an explicit function of x is a function whose values are given by an explicit expression (algebraic or otherwise) in x. For example, the equation y=2x-3 gives values of y as an explicit function of x(solving for x in terms of y would express the value of x as an explicit function of y). **Note:** An explicit function that could be used to describe the nth stage (or term) would be Area = 2·stage number – 1. Using this type of function allows one to "jump" to the stage in question. For example if you wanted the 7^{th} stage substitute 7 in for stage number meaning Area = 2·7 – 1 = 14 – 1 = 13, or the 20^{th} stage would be Area = 2·20 – 1 = 40 – 1 = 39.	Karush, W. (1962)The Crescent Dictionary of Mathematics; p. 101; The Macmillan Company, New York
exponential function: a function of the form $f(x) = ab^x$, where $a \neq 0$, $b > 0$, $b \neq 1$, and x is a real number.. Note: e^x is called the natural exponential function where e is the irrational number 2.718281828 correct to ten significant figures. It is often shown on a calculator as "exp" and the exponential function is often written as exp(x).	*Schaum's A-Z Mathematics* (2003). Berry, J, p.87, London, England, McGraw-Hill
function: a mathematical rule between two sets which assigns to each number of the first, exactly one member of	McGraw -Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 94). New York, NY:

the second.	McGraw
independent events: two events are independent events if and only if the occurrence (or nonoccurrence) of one does not affect the probability assigned to the occurrence of the other.	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 209; Thompson Learning, Inc., USA
informal inference: to use information contained in the sample data to increase our knowledge of the sampled population.	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 340; Thompson Learning, Inc., USA
linear function: a relationship between two variables that can be expressed as an equation and drawn as a straight line.	*Schaum's A-Z Mathematics* (2003). Berry, J, p.132, London, England, McGraw-Hill.
one-variable quantitative data: data which takes numerical values for which arithmetic operations such as adding and averaging makes sense.	Yates, D., Starnes, D., Moore, D., (2005) *Statistics Through Applications;* p.206; W.H. Freeman and Company, New York
parameter: a single number that describes some aspect of an entire population. Whereas, a statistic is an estimate of that value computed from some sample of the population.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 329). Reston, VA: Author
precision: an indication of how finely a measurement was made. When you calculate with measured values, you may need to round to the smallest place in the roughest actual measurements.	*Algebra to Go: A mathematics handbook* (p. 499). (2000). Wilmington, MA: Great Source Education Group, Inc
probability distribution: a distribution of the probabilities associated with each of the values of a random variable. The probability distribution is a theoretical distribution; it is used to represent populations.	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 236; Thompson Learning, Inc., USA
properties of exponents: rules applied when operations are performed on algebraic expressions and equations containing exponents. In general: $a^0 = 1, a \neq 0$, $a^m a^n = a^{m+n}$, $(ab)^n = a^n b^n$, $(a^m)^n = a^{mn}$, etc. $3x^3y^2 + 4x^3y^2 = 7x^3y^2$; $3x^3y^2(4x^3y^2) = 12x^6y^4$; $(3x^3y^2)^3 = 27\ x^9y^6$, etc	Bellmann, A., Bragg, S., Charles, R., Handlin, W., Kennedy, D.(2004); Prentice Hall *Algebra 2,* p. 362, Upper Saddle River, New York, Pearson Education, Inc.
quadratic function: a function whose value is given by a quadratic polynomial. The graph of the function is the graph of $y = ax^2 + bx + c$; it is a parabola with a vertical axis; the vertex is the low point or high point according to whether a is positive or negative. The solutions of the quadratic equation $ax^2 + bx + c = 0$ are called the zeros of the quadratic function; they specify the points of the graph where y = 0 (the intersection with the x-axis). The graph crosses the x-axis twice, once, or not at all according to whether the discriminant $b^2 - 4ac$ of the quadratic equation is positive, zero, or negative.	*The crescent Dictionary of Mathematics* (1962). Karush, W., p. 218, The Macmillan Company, New York.
recursive notation: a process that is inherently repetitive, with the result of each repetition usually depending upon those of the previous repetition.	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 210). New York, NY: McGraw-Hill, Inc..

Added Note - Recursive notation requires the previous term (or information to begin) to generate the next term. This type of function follows a pattern that "reoccurs". The power of this type of function is not in solving this particular problem, rather in helping students use patterns to generate conclusions as well as bring meaning to explicit functions. One example of a recursive function that could be used to solve this problem is $Next = Now + 2$ starting with *Now* = 1. This function works by putting the Now value into the function in this case beginning with 1 + 2 giving the Next value to be 3 which will be the value substituted back into the function. This is not efficient to find many terms beyond the initial values, but when students use this structure they generate greater understanding of this linear pattern. The fact that you are continuing to add 2 matches the slope in the explicit equation form. This seems to make more sense as you are in fact adding with the change rather than multiplying as the explicit form "looks".	
representations: the ways that mathematical ideas are represented, i.e. physical objects, drawings, charts, graphs, and symbols.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 280). Reston, VA: Author
sample space: the set of all possible outcomes of an experiment. The sample space is typically denoted by *S* and may take any number of forms: a list, a tree diagram, a lattice grid system, and so on.	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 191; Thompson Learning, Inc., USA
sampling distributions: of a statistic tells us what values the statistic takes in repeated samples from the same population and how often it takes those values. Sampling distributions assign probabilities to the values the statistic can take.	Yates, D., Starnes, D., Moore, D., (2005) *Statistics Through Applications;* p.432; W.H. Freeman and Company, New York
similar objects: solids that have exactly the same shape but not necessarily the same size.	Boyd, C., Cummins, J., Malloy, C., Carter, J., Flores, A., (2005) *Geometry*; p. 707; The McGraw-Hill Companies, Inc. ; Columbus, OH
symbolic algebra: using variables and numbers to characterize and represent mathematical situations	*Navigating through algebra in grades 6–8* (p. 59) (2001). Reston, VA: National Council of Teachers of Mathematics
visual models**:** models such as networks that could be used in analyzing and solving real problems such as those concerned with efficiency. The models of 2 and 3 dimensional objects may also assist students reasoning about spatial relationships	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 237). Reston, VA: Author
11th Grade	
composition of functions: (composite function) is a combination of two functions such that the output from the first function becomes the input for the second function.	Bellmann, A., Bragg, S., Charles, R., Handlin, W., Kennedy, D.(2004); Prentice Hall *Algebra 2,* p. 876, Upper Saddle River, New York, Pearson Education, Inc.
compound events: combinations of more than one simple event. There are three basic categories: the	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 202; Thompson

probability that event A or event B will occur, P(A or B), the probability that both events A and B will occur, P(A and B), and the probability that event A will occur given that event B has occurred, P(A | B).	Learning, Inc., USA
expected value: the value of a random phenomenon that has numerical outcomes is found by multiplying each outcome by its probability and then summing over all possible outcomes. In symbols, if the possible outcomes are a_1, a_2, …., a_k. and their probabilities are p_1, p_2, …,p_k , the expected value is = $a_1p_1 + a_2p_2 + \ldots\_ a_kp_k$.	Yates, D., Starnes, D., Moore, D., (2005) *Statistics Through Applications;* p.467; W.H. Freeman and Company, New York
explicit function: an explicit function of x is a function whose values are given by an explicit expression (algebraic or otherwise) in x. For example, the equation y=2x-3 gives values of y as an explicit function of x(solving for x in terms of y would express the value of x as an explicit function of y). Note: An explicit function that could be used to describe the nth stage (or term) would be Area = 2·stage number – 1. Using this type of function allows one to "jump" to the stage in question. For example if you wanted the 7^{th} stage substitute 7 in for stage number meaning Area = 2·7 – 1 = 14 – 1 = 13, or the 20^{th} stage would be Area = 2·20 – 1 = 40 – 1 = 39.	Karush, W. (1962)The Crescent Dictionary of Mathematics; p. 101; The Macmillan Company, New York
exponential function: a function of the form $f(x) = ab^x$, where $a \neq 0$, $b > 0$, $b \neq 1$, and x is a real number.. Note: e^x is called the natural exponential function where e is the irrational number 2.718281828 correct to ten significant figures. It is often shown on a calculator as "exp" and the exponential function is often written as exp(x).	*Schaum's A-Z Mathematics* (2003). Berry, J, p.87, London, England, McGraw-Hill
function: a mathematical rule between two sets which assigns to each number of the first, exactly one member of the second.	McGraw -Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 94). New York, NY: McGraw
intensity levels: strength, power, force, or concentration of measures such as decibels and ph, often displayed on a logararithimic scale.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 321-322). Reston, VA: Author
inverse function: if f^{-1} is a function such that $f(x) = y$, then the inverse of f, denoted f^{-1} is such that $f^{-1}(y) = x$. The domain of the function f becomes the range of the inverse function f^{-1} and the range of f becomes the domain of f^{-1}. It is important to note that a function will only have an inverse if the function is a one to one and not a many to one mapping.	*Schaum's A-Z Mathematics* (2003). Berry, J, p.124, London, England, McGraw-Hill
linear function: a function of the form $f(x) = mx + b$ where m and b are some fixed numbers. The names "m" and "b" are traditional. Functions of this kind are called "linear" because their graphs are straight lines.	Mathematics Dictionary www.shodor.org/interactivate/dictionary/l.html

Mathematics 7-12 Glossary DRAFT

logarithmic function: functions that involve logarithms, for example: $f(x) = 4 \log (x + 1)$	*Schaum's A-Z Mathematics* (2003). Berry, J, p.134, London, England, McGraw-Hill.
one-variable quantitative data: data which takes numerical values for which arithmetic operations such as adding and averaging makes sense.	Yates, D., Starnes, D., Moore, D., (2005) *Statistics Through Applications;* p.206; W.H. Freeman and Company, New York
parameter: a single number that describes some aspect of an entire population. Whereas, a statistic is an estimate of that value computed from some sample of the population.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 329). Reston, VA: Author
parametric relationship: a pair of continuous functions that define the x- and y-coordinates of points in a coordinate plane in terms of a third variable, the parameter.	Hungerford, T., Jovell, I., Mayberry, B., (2004); *Pre-Calculus A Graphing Approach*; p. 1049; Holt, Rinehart, Winston; Austin, Texas
properties of logarithms: for any positive numbers, M, N, and b, $b \neq 1$, $\log_b MN = \log_b M + \log_b N$ Product Property $\log_b M/.N = \log_b M - \log_b N$ Quotient Property $\log_b M^x = x \log_b M$ Power Property	Bellmann, A., Bragg, S., Charles, R., Handlin, W., Kennedy, D.(2004); Prentice Hall *Algebra 2,* p. 446, Upper Saddle River, New York, Pearson Education, Inc
quadratic function: a function whose value is given by a quadratic polynomial. The graph of the function is the graph of $y = ax^2 + bx + c$; it is a parabola with a vertical axis; the vertex is the low point or high point according to whether a is positive or negative. The solutions of the quadratic equation $ax^2 + bx + c = 0$ are called the zeros of the quadratic function; they specify the points of the graph where y = 0 (the intersection with the x-axis). The graph crosses the x-axis twice, once, or not at all according to whether the discriminant $b^2 – 4ac$ of the quadratic equation is positive, zero, or negative.	*The crescent Dictionary of Mathematics* (1962). Karush, W., p. 218, The Macmillan Company, New York.
recursive notation: a process that is inherently repetitive, with the result of each repetition usually depending upon those of the previous repetition. Added Note - Recursive notation requires the previous term (or information to begin) to generate the next term. This type of function follows a pattern that "reoccurs". The power of this type of function is not in solving this particular problem, rather in helping students use patterns to generate conclusions as well as bring meaning to explicit functions. One example of a recursive function that could be used to solve this problem is $Next = Now + 2$ starting with *Now* = 1. This function works by putting the Now value into the function in this case beginning with 1 + 2 giving the Next value to be 3 which will be the value substituted back into the function. This is not efficient to find many terms beyond the initial values, but when students use this structure they generate greater understanding of this linear pattern. The fact that you are	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 210). New York, NY: McGraw-Hill, Inc..

continuing to add 2 matches the slope in the explicit equation form. This seems to make more sense as you are in fact adding with the change rather than multiplying as the explicit form "looks".	
representations: the ways that mathematical ideas are represented, i.e. physical objects, drawings, charts, graphs, and symbols.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 280). Reston, VA: Author
sampling distributions: of a statistic tells us what values the statistic takes in repeated samples from the same population and how often it takes those values. Sampling distributions assign probabilities to the values the statistic can take.	Yates, D., Starnes, D., Moore, D., (2005) *Statistics Through Applications;* p.432; W.H. Freeman and Company, New York
summary statistics: statistics used to summarize a set of observations, in order to communicate as much as possible as simply as possible. Statisticians commonly try to describe the observations in 1) a measure of location, or central tendency, such as the arithmetic mean, median, mode, or interquartile mean; 2) a measure of statistical dispersion like the standard deviation, variance, range, or interquartile range, or absolute deviation; 3) a measure of the shape of the distribution like.	http://www.mywiseowl.com/articles/Summary_statistics
symbolic algebra: using variables and numbers to characterize and represent mathematical situations	*Navigating through algebra in grades 6–8* (p. 59) (2001). Reston, VA: National Council of Teachers of Mathematics
unit analysis: keeping track of units during computation to assure accurate and appropriate reporting of information.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 322). Reston, VA: Author
visual models: models such as networks that could be used in analyzing and solving real problems such as those concerned with efficiency. The models of 2 and 3 dimensional objects may also assist students reasoning about spatial relationships	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 237). Reston, VA: Author
12th Grade	
basic statistical techniques: reasoning about the relationship between the characteristics of a sample and the population from which it is drawn in order to draw conclusions or make predictions.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 331). Reston, VA: Author
composition of functions: (composite function) is a combination of two functions such that the output from the first function becomes the input for the second function.	Bellmann, A., Bragg, S., Charles, R., Handlin, W., Kennedy, D.(2004); Prentice Hall *Algebra 2,* p. 876, Upper Saddle River, New York, Pearson Education, Inc.
empirical probability: experimental or observed probability, denoted with prime notation. P'(A) = n(A)/n or probability of A = number of times A occurred / number of trials	Johnson, Robert and Kuby, Patricia (2004). Elementary Statistics; p. 191; Thompson Learning, Inc., USA
explicit function: an explicit function of x is a function whose values are given by an explicit expression	Karush, W. (1962)The Crescent Dictionary of Mathematics; p. 101; The Macmillan Company,

(algebraic or otherwise) in x. For example, the equation y=2x-3 gives values of y as an explicit function of x(solving for x in terms of y would express the value of x as an explicit function of y). **Note:** An explicit function that could be used to describe the nth stage (or term) would be Area = 2·stage number – 1. Using this type of function allows one to "jump" to the stage in question. For example if you wanted the 7^{th} stage substitute 7 in for stage number meaning Area = 2·7 – 1 = 14 – 1 = 13, or the 20^{th} stage would be Area = 2·20 – 1 = 40 – 1 = 39.	New York
exponential function: a function of the form $f(x) = ab^x$, where $a \neq 0$, $b > 0$, $b \neq 1$, and x is a real number.. Note: e^x is called the natural exponential function where e is the irrational number 2.718281828 correct to ten significant figures. It is often shown on a calculator as "exp" and the exponential function is often written as exp(x).	*Schaum's A-Z Mathematics* (2003). Berry, J, p.87, London, England, McGraw-Hill
function: a mathematical rule between two sets which assigns to each number of the first, exactly one member of the second.	McGraw -Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 94). New York, NY: McGraw
inverse function: if f^{-1} is a function such that $f(x) = y$, then the inverse of f, denoted f^{-1} is such that $f^{-1}(y) = x$. The domain of the function f becomes the range of the inverse function f^{-1} and the range of f becomes the domain of f^{-1}. It is important to note that a function will only have an inverse if the function is a one to one and not a many to one mapping.	*Schaum's A-Z Mathematics* (2003). Berry, J, p.124, London, England, McGraw-Hill
logarithmic function: functions that involve logarithms, for example: $f(x) = 4 \log (x + 1)$	*Schaum's A-Z Mathematics* (2003). Berry, J, p.134, London, England, McGraw-Hill.
parametric: a pair of continuous functions that define the x- and y-coordinates of points in a coordinate plane in terms of a third variable, the parameter.	Hungerford, T., Jovell, I., Mayberry, B., (2004); *Pre-Calculus A Graphing Approach*; p. 1049; Holt, Rinehart, Winston; Austin, Texas
periodic function: a function that repeats itself at regular intervals. The trigonometric functions are periodic.	*Algebra to Go: A mathematics handbook* (p. 498). (2000). Wilmington, MA: Great Source Education Group, Inc
polynomial function: a function whose values are given by a polynomial. The function is linear, quadratic, cubic, etc., according as the polynomial is. The graph of a linear function (in one variable) is a line, and of a quadratic polynomial is a parabola, etc. In general, the graph of a polynomial function p(x) may contain several peaks and troughs (maxima and minima), but the largest possible number of these is one less than the degree.	*The crescent Dictionary of Mathematics* (1962). Karush, W., p. 204, The Macmillan Company, New York.
properties of functions: the characteristics which define different classes of functions from one another , such as linear functions graphing as a straight line,	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (pp. 297-299). Reston, VA: Author

quadratic as a parabola, etc. Properties also include getting a snapshot of the graph by viewing the equation or how the values of the parameters shape the graph, i.e. orientation on the coordinate plane, slope, intercepts, opening up/down, etc.	
rational function: a quotient of two polynomials P(z) and Q(z), R(z), is called a rational function, or sometimes a rational polynomial function.	Weisstein, Eric W., "rational function," From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/RationalFunction.html
recursive notation: a process that is inherently repetitive, with the result of each repetition usually depending upon those of the previous repetition. **Added Note** - Recursive notation requires the previous term (or information to begin) to generate the next term. This type of function follows a pattern that "reoccurs". The power of this type of function is not in solving this particular problem, rather in helping students use patterns to generate conclusions as well as bring meaning to explicit functions. One example of a recursive function that could be used to solve this problem is $Next = Now + 2$ starting with *Now* = 1. This function works by putting the Now value into the function in this case beginning with 1 + 2 giving the Next value to be 3 which will be the value substituted back into the function. This is not efficient to find many terms beyond the initial values, but when students use this structure they generate greater understanding of this linear pattern. The fact that you are continuing to add 2 matches the slope in the explicit equation form. This seems to make more sense as you are in fact adding with the change rather than multiplying as the explicit form "looks".	McGraw-Hill Dictionary of Mathematics (1997), Parker, S. editor. (p. 210). New York, NY: McGraw-Hill, Inc..
representations: the ways that mathematical ideas are represented, i.e. physical objects, drawings, charts, graphs, and symbols.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 280). Reston, VA: Author
symbolic algebra: using variables and numbers to characterize and represent mathematical situations	*Navigating through algebra in grades 6–8* (p. 59) (2001). Reston, VA: National Council of Teachers of Mathematics
unit analysis: keeping track of units during computation to assure accurate and appropriate reporting of information.	National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p. 322). Reston, VA: Author
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