

Instructional Words

C

calculate: Figure out the number that answers a question; compute

clarify: Make a statement easier to understand; provide an example

classify: Put things into groups according to a rule and label the groups; organize into categories

compare: Look at two or more objects or numbers and identify how they are the same and how they are different (e.g., Compare the numbers 6.5 and 5.6. Compare the size of the students' feet. Compare two shapes.)

conclude: Judge or decide after reflection or after considering data

construct: Make or build a model; draw an accurate geometric shape (e.g., Use a ruler and a protractor to construct an angle.)

create: Make your own example or problem

D

describe: Tell, draw, or write about what something is or what something looks like; tell about a process in a step-by-step way

determine: Decide with certainty as a result of calculation, experiment, or exploration

draw: 1. Show something in picture form (e.g., Draw a diagram.)

2. Pull or select an object (e.g., Draw a card from the deck. Draw a tile from the bag.)

E

estimate: Use your knowledge to make a sensible decision about an amount; make a reasonable guess (e.g., Estimate how long it takes to cycle from your home to school. Estimate how many leaves are on a tree. What is your estimate of $3210 + 789$?)

evaluate: 1. Determine if something makes sense; judge
2. Calculate the value as a number

explain: Tell what you did; show your mathematical thinking at every stage; show how you know

explore: Investigate a problem by questioning, brainstorming, and trying new ideas

extend: 1. In patterning, continue the pattern
2. In problem solving, create a new problem that takes the idea of the original problem further

J

justify: Give convincing reasons for a prediction, an estimate, or a solution; tell why you think your answer is correct

M

measure: Use a tool to describe an object or determine an amount (e.g., Use a ruler to measure the height or distance around something. Use a protractor to measure an angle. Use balance scales to measure mass. Use a measuring cup to measure capacity. Use a stopwatch to measure the time in seconds or minutes.)

model: Show or demonstrate an idea using objects and/or pictures (e.g., Model addition of integers using red and blue counters.)

P

predict: Use what you know to work out what is going to happen (e.g., Predict the next number in the pattern 1, 2, 4, 7,....)

R

reason: Develop ideas and relate them to the purpose of the task and to each other; analyze relevant information to show understanding

relate: Describe how two or more objects, drawings, ideas, or numbers are similar

represent: Show information or an idea in a different way that makes it easier to understand (e.g., Draw a graph. Make a model.)

S

show (your work): Record all calculations, drawings, numbers, words, or symbols that make up the solution

sketch: Make a rough drawing (e.g., Sketch a picture of the field with dimensions.)

solve: Develop and carry out a process for finding a solution to a problem

sort: Separate a set of objects, drawings, ideas, or numbers according to an attribute (e.g., Sort 2-D shapes by the number of sides.)

V

validate: Check an idea by showing that it works

verify: Work out an answer or solution again, usually in another way; show evidence of

visualize: Form a picture in your head of what something is like; imagine

Mathematical Words

A

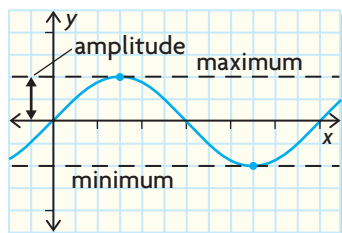
acute angle: An angle greater than 0° and less than 90°

adjacent sides: Two sides in a triangle or polygon that share a vertex with each other

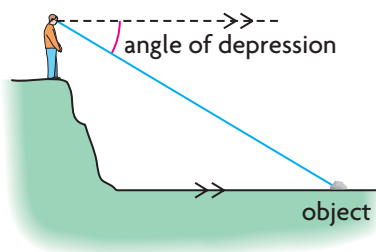
amortization: The process of gradually reducing a debt through instalment payments of principal and interest

amount: The sum of the original principal and the interest; given by $A = P + I$, where A is the amount, P is the principal, and I is the interest

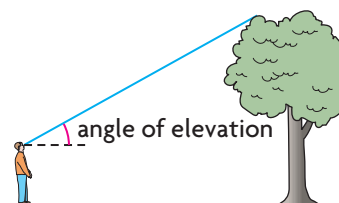
amplitude: The distance from the function's equation of the axis to either the maximum or the minimum value



angle of depression: The angle between the horizontal and the line of sight when one is looking down at an object

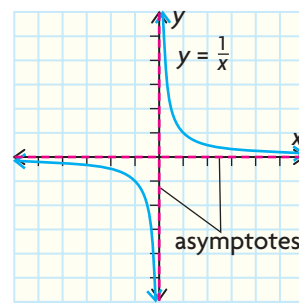


angle of elevation: The angle between the horizontal and the line of sight when one is looking up at an object



annuity: A series of equal deposits or payments made at regular intervals

asymptote: A line that a curve approaches, but never reaches on some part of its domain

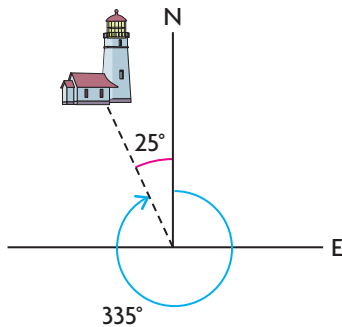


axis of symmetry: A line in a 2-D figure such that, if a perpendicular is constructed, any two points lying on the perpendicular and the figure are at equal distances from this line

B

base: The number that is used as a factor in a power (e.g., In the power 5^3 , 5 is the base.)

bearing: The direction in which you have to move in order to reach an object. A bearing is a clockwise angle from magnetic north. For example, the bearing of the lighthouse shown is 335°



binomial: An algebraic expression with two terms. For example, $3x + 2$

C

circumference: The boundary of a circle; the length of this boundary. The formula to calculate the length is $C = 2\pi r$, where r is the radius, or $C = \pi d$, where d is the diameter

coefficient: The factor by which a variable is multiplied. For example, in the term $3x$, the coefficient of x is 3. In the term $0.25y$, the coefficient of y is 0.25

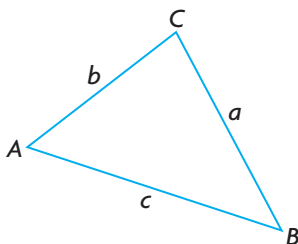
completing the square: The process of adding a constant to a given quadratic expression to form a perfect trinomial square. For example, $x^2 + 6x + 2$ is not a perfect square, but if 7 is added to it, it becomes $x^2 + 6x + 9$, which is $(x + 3)^2$

compounding period: Each period over which compound interest is earned or charged in an investment or loan

compound interest: Interest calculated at regular periods and added to the principal for the next period

contained angle: The angle between two known sides

cosine law: In any acute $\triangle ABC$,
 $c^2 = a^2 + b^2 - 2ab \cos C$



curve of best fit: The curve that best describes the distribution of points in a scatter plot. Typically found using regression analysis

curve of good fit: A curve that approximates or is close to the distribution of points in a scatter plot. Typically found using an informal process

cycle: A series of events that are regularly repeated; a complete set of changes, starting from one point and returning to the same point in the same way

D

decomposing: Breaking a number or expression into parts that make it up

decreasing function: A function whose y -values decrease as the x -values increase. The graph falls from left to right

degree: The degree of a polynomial with a single variable, say, x , is the value of the highest exponent of the variable. For example, for the polynomial $5x^3 - 4x^2 + 7x - 8$, the highest power or exponent is 3; the degree of the polynomial is 3

dependent variable: In an algebraic relation, the variable whose value depends on the value of another variable. Often represented by y

difference of squares: An expression of the form $a^2 - b^2$, which involves the subtraction of two squares

discrete: Consisting of separate and distinct parts. Discrete variables measure things that can be counted using whole numbers, such as books on a shelf, people in a room, or letters in a word. Continuous variables are not discrete; for example, the temperature of a room

discriminant: The expression $b^2 - 4ac$ in the quadratic formula

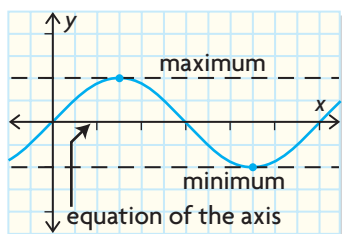
domain: The set of all values for which the independent variable is defined

down payment: The partial amount of a purchase paid at the time of purchase

E

equation of the axis: The equation of the horizontal line halfway between the maximum and the minimum is determined by

$$y = \frac{(\text{maximum value} + \text{minimum value})}{2}$$



expand: To write an expression in extended but equivalent form. For example, $3(5x + 2) = 15x + 6$

exponent: The number that tells how many equal factors are in a power

extrapolate: To predict a value by following a pattern beyond known values

F

factor: To express a number as the product of two or more numbers, or an algebraic expression as the product of two or more other algebraic expressions. Also, the individual numbers or algebraic expressions in such a product

factored form: A quadratic function in the form $f(x) = a(x - r)(x - s)$

function: A relation in which there is only one value of the dependent variable for each value of the independent variable (i.e., for every x -value, there is only one y -value)

function notation: $f(x)$ is called function notation and is used to represent the value of the dependent variable for a given value of the independent variable, x

future value: The final amount (principal plus interest) of an investment or loan when it matures at the end of the investment or loan period

G

Guaranteed Investment Certificate (GIC): A Guaranteed Investment Certificate is a secure investment that guarantees to preserve your money. Your investment earns interest, at either a set or a variable rate

H

hypotenuse: The longest side of a right triangle; the side that is opposite the right angle

I

increasing function: A function whose y -values increase as the x -values increase. The graph rises from left to right

independent variable: In an algebraic relation, a variable whose values may be freely chosen and upon which the values of the other variables depend. Often represented by x

integers: The set of integers, **I**, is the set consisting of the numbers $\dots, -3, -2, -1, 0, 1, 2, 3, \dots$. This statement is expressed mathematically within the set notation $\{x \in \mathbf{I}\}$

intercept: See **x -intercept**, **y -intercept**

interest: The cost of borrowing money or the money earned from an investment

interest rate: A percent of money borrowed or invested that is paid for a specified period of time

interpolate: To estimate a value between two known values

investment: A sum of money that is deposited into a financial institution that earns interest over a specified period of time

K

key points: Points of any function that define its general shape

Key Points of $f(x) = x^2$

x	$f(x) = x^2$
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

L

length: The measurement of the extent of an object or shape along its greatest dimension

like terms: Algebraic terms that have the same variables and exponents apart from their numerical coefficients. Like terms can be combined by adding or subtracting their numerical coefficients. For example, $2y + 8y = 10y$, $3x^2 - 5x^2 = -2x^2$, $3mr^2 + 6mr^2 = 9mr^2$

linear equation: An equation of the form $ax + b = 0$, or an equation that can be rewritten in this form. The algebraic expression involved is a polynomial of degree 1 (e.g., $2x + 3 = 6$ or $y = 3x - 5$)

line of best fit: The straight line that best describes the distribution of points in a scatter plot. Typically found using linear regression analysis

line of good fit: The straight line that reasonably describes the distribution of points in a scatter plot. Typically found using an informal process

loan: A sum of money that is borrowed from a financial institution that must be repaid with interest in a specified period of time

M

mapping diagram: A drawing with arrows to show the relationship between each value of x and the corresponding values of y

maturity: The final payment date of a loan or investment, after which point no further interest or principal is paid

maximum value: The greatest value taken by the dependent variable in a relation or function

minimum value: The least value taken by the dependent variable in a relation or function

N

negative correlation: This indicates that as one variable in a linear relationship increases, the other decreases and vice versa

O

oblique triangle: A triangle (acute or obtuse) that does not contain a right angle

opposite side: In a triangle or polygon, the side that is located opposite a specific angle

optimal value: The maximum or minimum value of the dependent variable

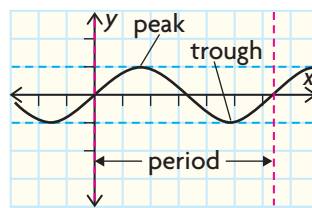
P

parabola: The graph of a quadratic relation of the form $y = ax^2 + bx + c$ ($a \neq 0$). The graph, which resembles the letter U, is symmetrical

peak: The highest point(s) on a graph

perfect square trinomial: A trinomial that has two identical binomial factors; for example, $x^2 + 6x + 9$ has the factors $(x + 3)(x + 3)$

period: The interval of the independent variable (often time) needed for a repeating action to complete one cycle



periodic function: A function whose values are repeated at equal intervals of the independent variable

positive correlation: This indicates that both variables in a linear relationship increase or decrease together

power: A numerical expression that shows repeated multiplication (e.g., The power 5^3 is a shorter way of writing $5 \times 5 \times 5$). A power has a base and an exponent; the exponent tells the number of equal factors there are in a power

present value: The principal that must be invested today to obtain a given amount in the future

principal: A sum of money that is borrowed or invested

Pythagorean theorem: The conclusion that, in a right triangle, the square of the length of the longest side is equal to the sum of the squares of the lengths of the other two sides

Q

quadratic equation: An equation that contains a polynomial whose highest degree is 2. For example, $x^2 + 7x + 10 = 0$

quadratic formula: A formula for determining the roots of a quadratic equation of the form $ax^2 + bx + c = 0$. The formula uses the coefficients of the terms in the quadratic equation:

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

quadratic function: A function that contains a polynomial whose highest degree is 2. Its graph is a parabola. For example, $f(x) = 2x^2 + 3x - 5$

quadratic regression: A process that fits the second-degree polynomial $ax^2 + bx + c$ to the data

R

radical: The indicated root of a quantity. For example, $\sqrt[3]{8} = 2$ since $2 \times 2 \times 2 = 2^3 = 8$

range: The set of all values of the dependent variable. All such values are determined from the values in the domain

rational number: A number that can be expressed as the quotient of two integers where the divisor is not 0

real numbers: The set of real numbers, \mathbf{R} , is the set of all decimals—positive, negative, and 0, terminating and nonterminating. This statement is expressed mathematically with the set notation $\{x \in \mathbf{R}\}$

reflection: A transformation in which a 2-D shape is flipped. Each point in the shape flips to the opposite side of the line of reflection, but stays the same distance from the line

relation: A relationship between two variables; values of the independent variable are paired with values of the dependent variable

right angle: An angle that measures 90°

root of an equation: A number that, when substituted for the unknown, makes the equation a true statement. For example, $x = 2$ is a root of the equation $x^2 - x - 2 = 0$ because $2^2 - 2 - 2 = 0$. The root of an equation is also known as a *solution* to that equation

S

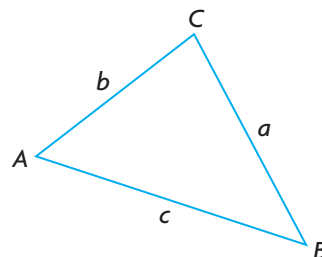
scatter plot: A graph that attempts to show a relationship between two variables by means of points plotted on a coordinate grid

set notation: A way of writing a set of items or numbers within curly brackets, $\{ \}$

simple interest: Interest earned or paid only on the original sum of money invested or borrowed

sine function: A sine function is the graph of $f(x) = \sin x$, where x is an angle measured in degrees. It is a periodic function

sine law: In any triangle, the ratios of each side to the sine of its opposite angle are equal



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

sinusoidal function: A type of periodic function created by transformations of $f(x) = \sin x$

solution to a quadratic equation: The value of a variable that makes the equation true

standard form: A quadratic function in the form $f(x) = ax^2 + bx + c$

surface area: The total area of all the faces of any 3-D shape

T

term deposit: An investment purchased from a bank, trust company, or credit union for a fixed period or term

transformations: Transformations are operations performed on functions to change the position or shape of the associated curves or lines

transformed functions: The resulting function when the shape and/or position of the graph of $f(x)$ is changed

translation: Two types of translations can be applied to the graph of a function $y = f(x - h) + k$:

- Horizontal translations—all points on the graph move to the right when $h > 0$ and to the left when $h < 0$
- Vertical translations—all points on the graph move up when $k > 0$ and down when $k < 0$

trend: A relationship between two variables for which the independent variable is time

trinomial: An algebraic expression with three terms. For example, $2x^2 - 6x + 7$

trough: The lowest point(s) on a graph

U

unlike terms: Algebraic terms that have different variables and/or exponents apart from their numerical coefficients. Unlike terms cannot be combined by adding or subtracting their numerical coefficients. For example, $3x^3$, $5y$, and $2x$

V

variable: A letter or symbol, such as a , b , x , or n , that represents a number (e.g., In the formula for the area of a rectangle, the variables A , l , and w represent the area, length, and width of the rectangle.)

vertex (plural vertices): The point at the corner of an angle or shape (e.g., A cube has eight vertices. A triangle has three vertices. An angle has one vertex.)

vertex form: A quadratic function in the form $f(x) = a(x - h)^2 + k$, where the vertex is (h, k)

vertical compression: When $0 < a < 1$, the graph of the function $af(x)$ is compressed vertically

vertical-line test: A test to determine whether the graph of a relation is a function. The relation is not a function if any vertical line drawn through the graph of the relation passes through two or more points

vertical reflection: When $a < 0$, the graph of the function $af(x)$ is reflected in the x -axis

vertical stretch: When $a > 1$, the graph of the function $af(x)$ is stretched vertically

vertical translation: When $d > 0$, the graph of the function $f(x) + d$ is shifted d units up. When $d < 0$, the graph of the function $f(x) + d$ is shifted d units down

X

x -intercept: The value at which a graph meets the x -axis. The value of y is 0 for all x -intercepts

Y

y -intercept: The value of the dependent variable when the independent variable is zero; sometimes called the initial value

Z

zeros of a relation: The values of x for which a relation has the value zero. The zeros of a relation correspond to the x -intercepts of its graph