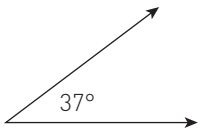
Glossary

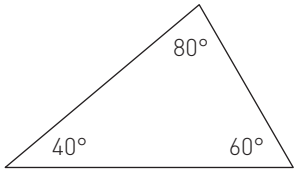
5-D Process An organized method to solve problems. The 5 D's stand for Describe/Draw, Define, Do, Decide, and Declare. This is a problem-solving strategy for which solving begins by making a prediction about the answer or one element of it (a trial), and then confirming whether the result of the trial is correct. If not, information is gained about how close the trial is to the correct value, so that adjustments to the trial value may be made. Being organized is extremely important to the success of this method, as well as writing a usable table. The 5-D Process leads to writing equations to represent word problems.

absolute value The absolute value of a number is the distance of the number from zero. Since the absolute value represents a distance, without regard to direction, absolute value is always non-negative. Thus, the absolute value of a negative number is its opposite, while the absolute value of a non-negative number is just the number itself. The absolute value of x is usually written "$|x|$." For example, $|-5| = 5$ and $|22| = 22$.

acute angle An angle with a measure greater than 0° and less than 90°. An example is shown.



acute triangle A triangle where all three angles measure less than 90°.



addition (+) An operation that tells how many objects there are when two sets are combined. The result is the number of objects in the two sets together which is called a sum. In arithmetic, the word "object" usually means "number."

additive identity The number 0 is called the additive identity because adding 0 to any number does not change the number. For example, $7 + 0 = 7$.

Additive Identity Property The Additive Identity Property states that adding zero to any expression leaves the expression unchanged. That is, $a + 0 = a$. For example, $-2 + 0 = -2$.

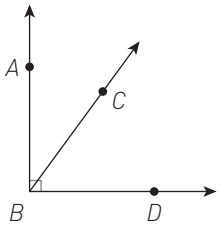
additive inverse The number you need to add to a given number to get a sum of 0. For example, the additive inverse of –3 is 3. It is also called the opposite.

Additive Inverse Property The Additive Inverse Property states that for every number a there is a number $-a$ such that $a + (-a) = 0$. For example, the number 5 has an additive inverse of –5; $5 + (-5) = 0$. The additive inverse of a number is often called its opposite. For example, 5 and –5 are opposites.

adjacent angles For two angles to be adjacent, they must satisfy these three conditions:

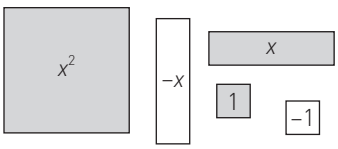
- The two angles must have a common side;
- They must have a common vertex; and
- They can have no interior points in common. This means that the common side must be between the two angles; no overlap between the angles is permitted.

In the example shown, $\angle ABC$ and $\angle CBD$ are adjacent angles.



algebra A branch of mathematics that uses variables to generalize the rules of numbers and numerical operations.

algebra tiles An algebra tile is a manipulative whose area represents a constant or variable quantity. The algebra tiles used in this course consist of large squares with dimensions x-by-x; rectangles with dimensions x-by-1; and small squares with dimensions 1-by-1. These tiles are named by their areas: x^2, x, and 1, respectively. The smallest squares are called "unit tiles." In this text, shaded tiles will represent positive quantities while unshaded tiles will represent negative quantities.

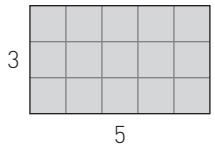


algebraic expression See *expression*.

algorithm A fixed rule for carrying out a mathematical procedure. For example, to determine the average of a set of values, calculate the sum of the values and divide by the number of values.

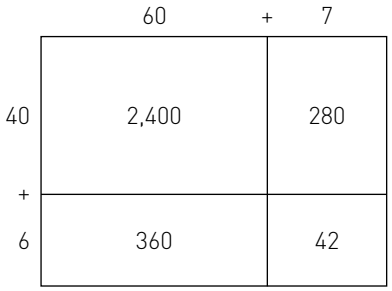
angle Generally, an angle is formed by two rays that are joined at a common endpoint (such as the obtuse angle in the diagram). Angles in geometric figures are usually formed by two segments that have a common endpoint (such as the angle marked in the quadrilateral shown). See *acute angle*, *obtuse angle*, and *right angle*.

area For this course, area is the number of square units needed to fill up a region on a flat surface. In later courses, the idea will be extended to cones, spheres, and more complex surfaces. In the example shown, the area of the figure is 15 square units. See *surface area*.



area model An area model is a way to visually represent and solve problems that involve multiplication and division. It can also represent and calculate probabilities. The total area of the rectangle is equal to the sum of the areas of the parts. That is, the larger problem can be broken down into smaller problems.

The image shows how an area model can be used to multiply 46 · 67. You can rewrite 46 as 40 + 6, and 67 as 60 + 7. Use these numbers as the dimensions of a large rectangle, as shown. Determine the area of each of the smaller rectangles and then calculate the sum of the four smaller areas. This sum is the answer to the original problem.



46 · 67 = (40 + 6)(60 + 7) = 2,400 + 280 + 360 + 42 = 3,082

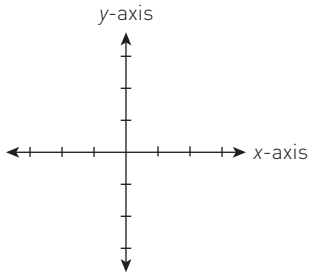
area of a triangle To calculate the area of a triangle, multiply the length of the base b by the height h and divide by 2: $A = \frac{1}{2}bh$.

Associative Property of Addition The Associative Property of Addition states that if a sum contains terms that are grouped, then the sum may be grouped differently with no effect on the total, that is, $a + (b + c) = (a + b) + c$. For example, 3 + (4 + 5) = (3 + 4) + 5.

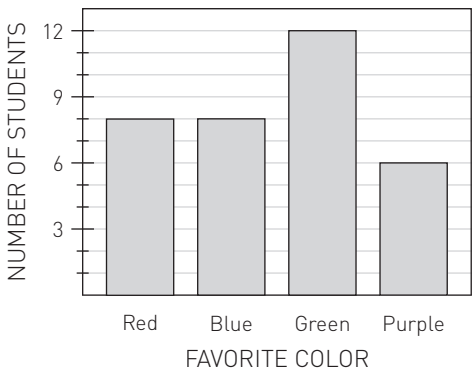
Associative Property of Multiplication The Associative Property of Multiplication states that if a product contains terms that are grouped, then the product may be grouped differently with no effect on the result, that is, $a(bc) = (ab)c$. For example, 2 · (3 · 4) = (2 · 3) · 4.

average The sum of given values divided by the number of values used in computing the sum. For example, the average of 1, 4, and 10 is $\frac{1 + 4 + 10}{3}$. See *mean*.

axis (plural: axes) On a coordinate plane, two number lines that meet at right angles at the origin (0, 0). The x-axis runs horizontally, and the y-axis runs vertically.



bar graph A bar graph is a set of rectangular bars that have height proportional to the number of data elements in each category. Each bar stands for all of the elements in a single distinguishable category (such as "red"). Bars are the same width and separated from each other. See *histogram*.



base of a geometric figure

(a) The base of a triangle: any side of a triangle to which a height is drawn. There are three possible bases in each triangle.

(b) The base of a trapezoid: either of the two parallel sides.

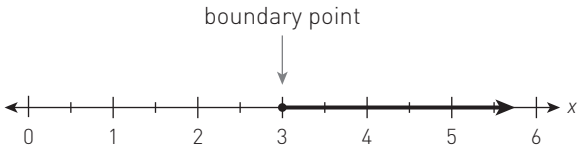
(c) The base of a parallelogram (including rectangle, rhombus, and square): any side to which a height is drawn. There are four possible bases.

(d) The base of a three-dimensional figure: see *prism* and *pyramid*.

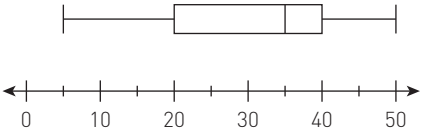
base of an exponent When working with an exponential expression in the form b^a, b is called the base. For example, 2 is the base in 2^5. (5 is the exponent, and 32 is the value.) See *exponent*.

bin An interval on a histogram.

boundary point The endpoint or endpoints of a ray or segment on a number line where an inequality is true, marked with a solid dot. For strict inequalities (that is, inequalities involving $<$ or $>$), the point is not part of the solution, and is marked with an open dot. Boundary points may be found by solving the equality associated with the given inequality. For example, the solution to the equation $2x = 6$ is $x = 3$, so the inequality $2x \geq 6$ has a boundary point at 3. A boundary point is also sometimes called a "dividing point."



box plot A graphic way of showing a summary of data using the median, quartiles, and extremes of the data.



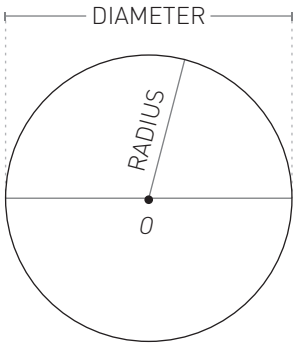
center of a circle On a flat surface, the fixed point from which all points on the circle are equidistant. See *circle*.

center (of a data distribution) Numbers that locate or approximate the center of a data set. Two of the ways to measure the center of a data set are the mean and the median. When dealing with measures of center, it is often useful to consider the distribution of the data. For symmetric distributions with no outliers, the mean can represent the middle, or "typical" value, of the data well. However, in the presence of outliers or non-symmetrical data distributions, the median may be a better measure. See *mean* and *median*.

certainty When an event will definitely happen. The probability of a certain event is 1.

chord A line segment with its endpoints on a circle. A chord that passes through the center of a circle is called a "diameter." See *circle*.

circle The set of all points on a flat surface that are the same distance from a fixed point. If the fixed point (center) is O, the symbol $\odot O$ represents a circle with center O. If r is the length of a circle's radius and d is the length of its diameter, the circumference of the circle is $C = 2\pi r$ or $C = \pi d$. The area of the circle is $A = \pi r^2$.

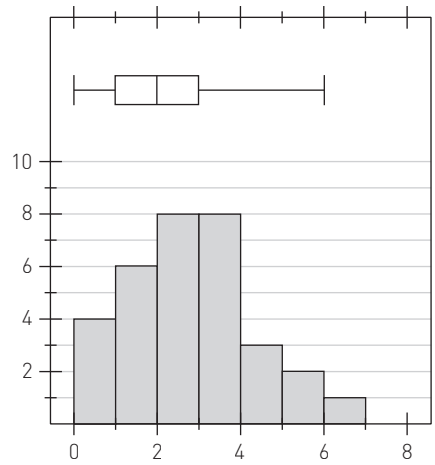


circumference The perimeter (distance around) of a circle.

cluster sample A subgroup of the population that has a similar characteristic of interest as that of the whole population. A cluster sample is one way to obtain a representative sample.

coefficient (numerical) A number multiplying a variable or product of variables. For example, –7 is the coefficient of $-7xy^2$.

combination histogram and box plot A way to visually represent a distribution of data. The box plot is drawn with the same x-axis as the histogram.



combining like terms Combining two or more like terms simplifies an expression by summing constants and summing those variable terms in which the same variables are raised to the same power. For example, combining like terms in the expression $3x + 7 + 5x – 3 + 2x^2 + 3y^2$ gives $8x + 4 + 2x^2 + 3y^2$. When working with algebra tiles, combining like terms involves putting together tiles with the same dimensions.

common Shared.

common factor A common factor is a factor that is the same for two or more terms. For example, x^2 is a common factor for $3x^2$ and $–5x^2y$.

common multiple A number that is a multiple of the two or more numbers. For example, 24 and 48 are common multiples of 3 and 8.

Commutative Property of Addition The Commutative Property of Addition states that if two terms are added, then the order may be reversed with no effect on the total. That is, $a + b = b + a$. For example, $7 + 12 = 12 + 7$.

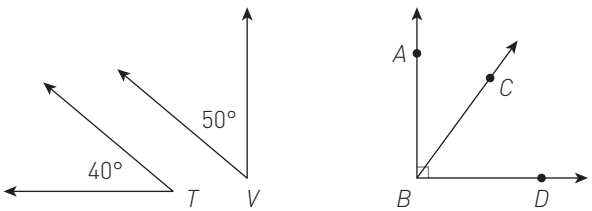
Commutative Property of Multiplication The Commutative Property of Multiplication states that if two expressions are multiplied, then the order may be reversed with no effect on the result. That is, $ab = ba$. For example, $5 \cdot 8 = 8 \cdot 5$.

comparison symbol See *inequality symbol*.

compass In this course, a compass is a tool used to draw circles.

complement The complement of an event is the set of all outcomes in the sample space that are not included in the event.

complementary angles Two angles whose measures add up to 90°. Angles T and V are complementary because $m\angle T + m\angle V = 90°$. Complementary angles may also be adjacent, like $\angle ABC$ and $\angle CBD$ in the diagram.



complex fraction A fraction with a fraction in the numerator and/or denominator.

composite number A number with more than two factors.

composite shape A shape made of several simpler shapes.

compound event A compound event in probability is an outcome that depends on two or more other events. For example, calculating the probability that both a red ball and also a blue block are drawn from a bag in two draws.

congruent Two shapes are congruent if they have exactly the same shape and size. Congruent shapes have a scale factor of 1.

conjecture An educated guess that often results from noticing a pattern.

consecutive integers Integers that are in order without skipping any integers. For example, 8, 9, and 10 are consecutive integers.

constant of proportionality (*k*) In a proportional relationship, equations are of the form $y = kx$, where k is the constant of proportionality.

constant term A number that is not multiplied by a variable. In the expression $2x + 3(5 - 2x) + 8$, the number 8 is a constant term. The number 3 is not a constant term because it is multiplied by a variable inside the parentheses.

construction (geometric) In mathematics, it is the process of using a straightedge and compass to create geometric diagrams.

convenience sample A subgroup of the population for which it was easy to collect data. A convenience sample is not a random sample.

coordinate The number corresponding to a point on the number line or an ordered pair (x, y) that corresponds to a point in a two-dimensional coordinate system. In an ordered pair, the x-coordinate appears first and the y-coordinate appears second. For example, the point (3, 5) has an x-coordinate of 3 and a y-coordinate of 5. See *ordered pair*.

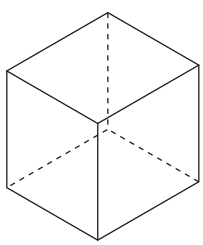
coordinate graph (system) A system of graphing ordered pairs of numbers on a coordinate plane. An ordered pair represents a point, with the first number giving the horizontal position relative to the x-axis and the second number giving the vertical position relative to the y-axis. See *ordered pair*.

corresponding parts Points, sides, edges, or angles in two or more figures that are images of each other with respect to a transformation. If two figures are congruent, then the corresponding parts of the figures are congruent to each other. See *congruent*.

counterexample An example showing that a statement has at least one exception; that is, a situation in which the statement is false. For example, the number 4 is a counterexample to the statement that all even numbers are greater than 7.

cross section The intersection of a three-dimensional solid and a plane.

cube A polyhedron of six faces, each of which is a square.



cubic unit A cube, each of whose edges measure 1 unit in length. Volume is measured in cubic units.

data display A visual way for organizing information. Some data displays used in this course are bar graphs, box plots, dot plots, histograms, scatter plots, and Venn diagrams.

decimal point The dot separating the whole number from the decimal portion, that is, the ones and tenths places in a decimal number.

degree A unit for measuring angles. Usually denoted by ° (the degree symbol). There are 360° in one full rotation.

denominator The lower part of a fraction, which expresses into how many equal parts the whole is divided.

dependent events Two events are dependent if the outcome of one event affects the probability of the other event. For example, if one card is drawn out of a deck of cards, then the probability that the first card is red is $\frac{26}{52} = \frac{1}{2}$ because 26 of the 52 cards are red. However, the probability of the second card now depends on the result of the first selection. If the first card was red, then there are now 25 red cards remaining in a deck of 51 cards, and the probability that the second card is red is $\frac{25}{51}$. The second event (selecting the second card) is dependent on the first event (selecting the first card).

diameter A line segment drawn through the center of a circle with both endpoints on the circle. The length of a diameter is usually denoted d. Note that the length of a circle's diameter is twice the length of its radius. See *circle*.

difference The result of subtraction.

dimensions The dimensions of a figure that is a flat region or space tell how far that the figure extends in each direction. For example, the dimensions of a rectangle might be 16 cm wide by 7 cm high.

Distributive Property For any a, b, and c, $a(b + c) = ab + ac$. For example, $10(7 + 2) = 10 \cdot 7 + 10 \cdot 2$.

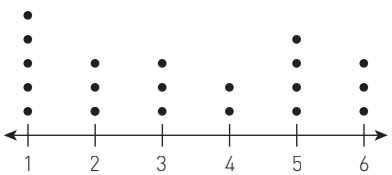
dividend A quantity to be divided. See *divisor*.

divisible A number is divisible by another if the remainder of the division is zero.

division (÷) The inverse operation to multiplication, or the operation that creates equal groups.

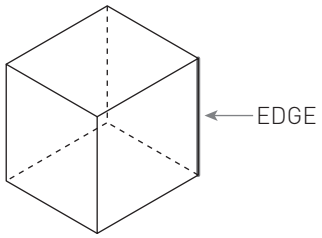
divisor The quantity by which another quantity is to be divided. Dividend ÷ divisor = quotient + remainder (if there is any).

dot plot A way of displaying data that has an order and can be placed on a number line. Dot plots are generally used when the data is discrete (separate and distinct) and numerous pieces of data fall on most values.



NUMBER ROLLED ON A DICE

edge In three dimensions, a line segment formed by the intersection of two faces of a polyhedron.



endpoint A point that marks the ends of a line segment or ray.

enlarge To make larger.

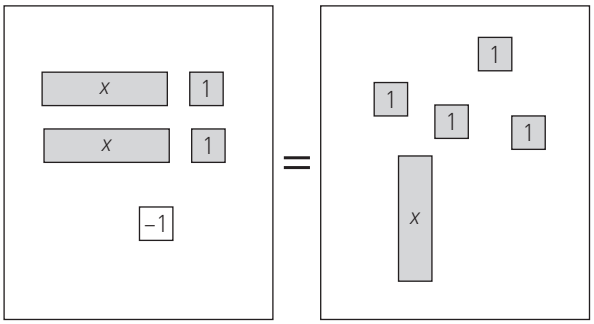
enlargement ratio The ratio comparing a figure to a scaled copy of that figure is often called the enlargement ratio. This ratio shows by what factor the first figure is enlarged to get the second figure.

equal (=) Two quantities are equal when they have the same value. For example, when $x = 4$, the expression $x + 8$ is equal to the expression $3x$ because the values of the expressions are the same.

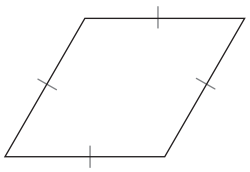
equally likely Outcomes or events are considered to be equally likely when they have the same probability.

equation A mathematical sentence that uses an equals sign (=) to show two expressions are the same. For example, the equation $7x + 4.2 = -8$ means that the value of $7x + 4.2$ equals -8. Equations can also represent rules that link two quantities, like $y = 4x - 3$, which calculates the area y of a tile pattern based on its figure number x.

Equation Mat An Equation Mat places two Expression Mats side-by-side to form an equation. By applying mathematically valid moves, you can determine the value(s) that makes the expressions equal. For example, the Equation Mat shown represents the equation $2(x + 1) - 1 = x + 4$ and can be solved to determine that when $x = 3$ both sides are equal. See *valid moves*.



equilateral A polygon is equilateral if all of its sides have equal length. The word "equilateral" comes from "equi" (meaning "equal") and "lateral" (meaning "side"). Equilateral triangles not only have sides of equal length, but also angles of equal measure. However, a polygon with more than three sides may be equilateral without having congruent angles. For example, see the rhombus shown.



equivalent expressions Two expressions are equivalent if they have the same value. For example, $2 + 3$ is equivalent to $1 + 4$.

equivalent fractions Two fractions are equivalent if they have the same numerical value. For example, $\frac{3}{6}$ and $\frac{5}{10}$ are equivalent fractions.

equivalent ratios Two ratios are equivalent if they have the same value when simplified.

evaluate (an expression) To determine the numerical value of. To evaluate an expression, substitute the value(s) given for the variable(s) and perform the operations according to the Order of Operations. For example, evaluating $2x + y - 10$ when $x = 4$ and $y = 3$ gives the value 1. See *expression*.

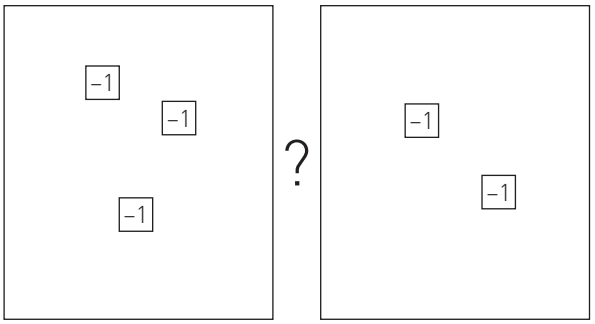
event One or more results of an experiment.

experimental probability The probability based on data collected in experiments. The experimental probability of an event is defined to be $\frac{\text{number of successful outcomes in the experiment}}{\text{total number of outcomes in the experiment}}$.

exponent In an expression of the form b^a, a is called the exponent. For example, in the expression 2^5, 5 is called the exponent (2 is the base, and 32 is the value). The exponent indicates how many times to use the base as a multiplier. For example, in 2^5, 2 is used 5 times: $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$. For exponents of zero, the rule is: for any number $x \neq 0$, $x^0 = 1$.

expression An expression is a combination of individual terms separated by plus or minus signs. Numerical expressions combine numbers and operation symbols; algebraic (variable) expressions include variables. For example, $4 + (5 - 3)$ is a numerical expression. In an algebraic expression, if each of the following terms, $6xy^2$, 24, and $\frac{y-3}{4+x}$, are combined, the result may be $6xy^2 + 24 - \frac{y-3}{4+x}$. An expression does not have an "equals" sign.

Expression Comparison Mat Two expressions can be compared by splitting an Expression Mat in half to create an Expression Comparison Mat. The expressions are placed side by side and compared to see which one is greater. For example, in the Expression Comparison Mat shown, the left side represents –3, while the right side represents –2. Since –2 > –3, the right side is greater.



Expression Mat An organizing tool used to visually represent an expression with algebra tiles.

face One of the flat surfaces of a polyhedron, including the base(s).

factor

(a) In arithmetic: when two or more integers are multiplied, each of the integers is a factor of the product. For example, 4 is a factor of 24, because $4 \cdot 6 = 24$.

(b) In algebra: when two or more algebraic expressions are multiplied together, each of the expressions is a factor of the product. For example, x^2 is a factor of $-17x^2y^3$, because $(x^2)(-17y^3) = -17x^2y^3$.

(c) To factor an expression is to write it as a product. For example, the factored form of $3x - 18$ is $3(x - 6)$.

fair game A game in which each player has an equally likely chance of winning.

family of fractions All fractions that are equivalent to each other form a family of fractions. See *equivalent fractions*.

first quartile (Q1) The median of the lower half of an ordered set of data is the lower quartile.

formula An equation that shows a mathematical relationship.

fraction The quotient of two quantities in the form $\frac{a}{b}$ where b is not equal to 0.

Fraction Busters "Fraction Busting" is a method of simplifying equations involving fractions that uses the Multiplicative Property of Equality to rearrange the equation so that no fractions remain. To use this method, multiply both sides of an equation by the common denominator of all the fractions in the equation. The result will be an equivalent equation with no fractions. For example, when given the equation $\frac{x}{7} + 2 = \frac{x}{3}$, we can multiply both sides by the "Fraction Buster" 21. The resulting equation, $3x + 42 = 7x$, is equivalent to the original but contains no fractions.

fraction greater than 1 A fraction in which the numerator is greater than the denominator.

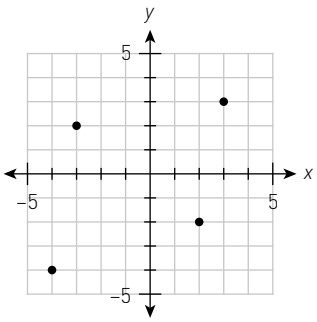
frequency The number of times that something occurs within an interval or data set.

Giant One A fraction that is equal to 1. Multiplying any fraction by a Giant One will create a new fraction equivalent to the original fraction. In the equation shown, $\frac{2}{2}$ is a Giant One.

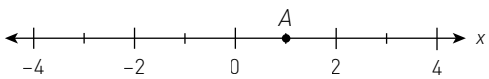
$$\frac{2}{3} \cdot \boxed{\frac{2}{2}} = \frac{4}{6}$$

graph A graph represents numerical information in a visual form. The numbers may come from a table, situation (pattern), or rule (equation or inequality). Most of the graphs in this course show points, lines, and/or curves on a two-dimensional coordinate system or on a single axis called a number.

TWO-DIMENSIONAL COORDINATE SYSTEM



NUMBER LINE



graphic organizer (GO) A visual representation of concepts or ideas you have learned. It helps with brainstorming and/or organizing information. It can make connections between ideas more clear. Examples are concept maps, charts, and Venn diagrams.

greater than One expression is greater than another if its value is larger. We indicate this relationship with the greater than symbol ">". For example, 4 + 5 is greater than 1 + 1. We write $4 + 5 > 1 + 1$.

greatest common factor (GCF) For integers, the greatest positive integer that is a common factor of two or more integers. For example, the greatest common factor of 28 and 42 is 14.

height

(a) Triangle: the length of a segment that connects a vertex of the triangle to a line containing the opposite base (side) and is perpendicular to that line.

(b) Trapezoid: the length of any segment that connects a point on one base of the trapezoid to the line containing the opposite base and is perpendicular to that line.

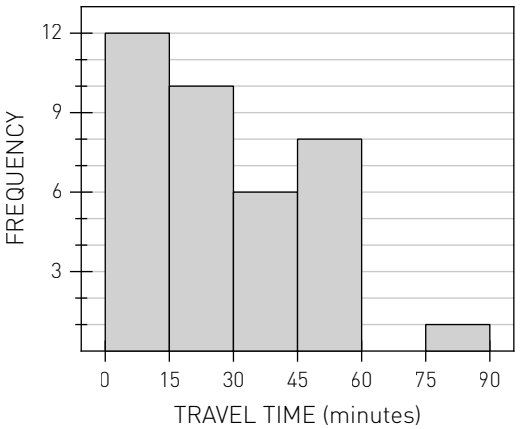
(c) Parallelogram (includes rectangle, rhombus, and square): the length of any segment that connects a point on one base of the parallelogram to the line containing the opposite base and is perpendicular to that line.

(d) Pyramid and cone: the length of the segment that connects the apex to a point in the plane containing the base of a figure and is perpendicular to that plane.

(e) Prism or cylinder: the length of a segment that connects one base of the figure to the plane containing the other base and is perpendicular to that plane.

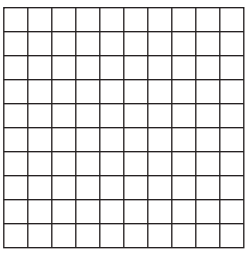
hexagon A polygon with six sides.

histogram A way of displaying data that is much like a bar graph in that the height of the bars is proportional to the number of elements. The difference is that each bar of a histogram represents the number of data elements in a range of values, such as the time it takes to get to school from 0 minutes up to, but not including, 90 minutes. Each range of values should have the same width. See *bar graph*.



horizontal Parallel to the horizon. The *x*-axis of a coordinate graph is the horizontal axis.

hundredths grid A square with an area of 1 unit in which each side is divided into tenths. The area of each small square is $\frac{1}{10}$ by $\frac{1}{10}$ or $\frac{1}{100}$.



Identity Property of Addition The Identity Property of Addition states that adding zero to any expression leaves the expression unchanged. That is, $a + 0 = a$. For example, $7 + 0 = 7$, and $-2y + 0 = -2y$.

Identity Property of Multiplication The Identity Property of Multiplication states that multiplying any expression by 1 leaves the expression unchanged. That is, $a(1) = a$. For example, $437x \cdot 1 = 437x$.

impossibility An event with a probability of zero.

improper fraction See *fraction greater than 1*.

independent events If the outcome of a probabilistic event does not affect the probability of another event, then the events are independent. For example, assume that a normal six-sided die is being rolled twice to determine the probability of rolling a 1 twice. The result of the first roll does not affect the probability of rolling a 1 on the second roll. Since the probability of rolling a 1 on the first roll is $\frac{1}{6}$ and the probability of rolling a 1 on the second roll is also $\frac{1}{6}$, then the probability of rolling two 1s in a row is $\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$.

inequality An inequality consists of two expressions on either side of an inequality symbol. For example, the inequality $7x + 4.2 < -8$ states that the expression $7x + 4.2$ has a value less than -8.

inequality symbols The symbol $\leq$ read from left to right means "less than or equal to," the symbol $\geq$ read from left to right means "greater than or equal to," and the symbols $<$ and $>$ mean "less than" and "greater than," respectively. For example, "$7 < 13$" means that 7 is less than 13.

inference A statistical prediction.

integers The set of numbers {..., –3, –2, –1, 0, 1, 2, 3, ...}.

interest An amount paid which is a percentage of an initial value (principal). For example, a savings account may offer 4% annual interest rate, which means they will pay $4.00 in interest for a principal of $100 kept in the account for one year.

interquartile range (IQR) A way to measure the spread of data. It is calculated by subtracting the first quartile from the third quartile.

interval A set of numbers between two given numbers.

inverse operation An operation that undoes another operation. For example, multiplication is the inverse operation for division.

isosceles trapezoid A trapezoid with two (non-parallel) sides of equal length.

isosceles triangle A triangle with two sides of equal length.

lateral face A (flat) side of a polyhedron. It is always a polygon.

least common multiple (LCM) The smallest common multiple of a set of two or more integers. For example, the least common multiple of 4, 6, and 8 is 24.

less than

(a) One expression is less than another if its value is not as large. This relationship is indicated with the less than symbol "<." For example, 1 + 1 is less than 4 + 5, so the comparison is written as $1 + 1 < 4 + 5$.

(b) Sometimes the comparison is made that one amount is a certain quantity less than another amount. For example, a student movie ticket might cost two dollars *less than* an adult ticket.

like terms Two or more terms that contain the same variable(s), with corresponding variables raised to the same power. For example, $5x^2$ and $2x^2$ are like terms. See *combining like terms*.

line A line is an undefined term in geometry. A line is one-dimensional and continues without end in two directions. A line is made up of points and has no thickness. A line may be named with a letter (such as l), but also may be labeled using two points on the line, such as $\overleftrightarrow{AB}$.

line segment The portion of a line between two points. A line segment is named using its endpoints. For example, the line segment shown may be named either $\overline{AB}$ or $\overline{BA}$.

lowest common denominator (LCD) The smallest common multiple of the denominators of two or more fractions. For example, the LCD of $\frac{5}{12}$ and $\frac{3}{8}$ is 24.

lowest terms of a fraction A fraction for which the numerator and the denominator have no common factor greater than 1.

mean The mean, or average, of several numbers is one way of defining the "middle" of the numbers. To calculate the average of a group of numbers, add the numbers together then divide by the number of numbers in the set. For example, the average of the numbers 1, 5, and 6 is $(1 + 5 + 6) \div 3 = 4$. The mean is generally the best measure of central tendency when there are no outliers in the data set. See *average*.

mean absolute deviation A method for measuring the spread (variability) in a set of data by calculating the average distance each data point is from the mean. Since the calculation is based on the mean, it is best to use this measure of spread when the distribution is symmetric.

measure of central tendency Mean and median are measures of central tendency, reflecting special statistical information about a set of data. See *center (of a data distribution)*.

measurement For the purposes of this course, a measurement is an indication of the size or magnitude of a geometric figure. For example, an appropriate measurement of a line segment would be its length. Appropriate measurements of a square would include not only the length of a side, but also its area and perimeter. The measure of an angle represents the number of degrees of rotation from one ray to the other about the vertex.

median The middle number of an ordered set of data. If there is no distinct middle, then the average of the two middle numbers is the median. The median is generally more accurate than the mean as a measure of central tendency when there are outliers in the data set.

mixed number (fraction) A number that consists of an integer and a fraction. For example, $3\frac{3}{8}$.

multiple The product of a whole number and any other (nonzero) whole number. For example, 15 is a multiple of 5.

multiple representations of a portion See *Portions Web*.

multiplication (·) An operation that reflects repeated addition. For example, $3 \cdot 4 = 4 + 4 + 4$.

multiplicative identity The number 1 is called the multiplicative identity because multiplying any number by 1 does not change the number. For example, $7(1) = 7$.

Multiplicative Identity Property The Multiplicative Identity Property states that multiplying any expression by 1 leaves the expression unchanged. That is, $a(1) = a$. For example, $437x \cdot 1 = 437x$.

multiplicative inverse The multiplicative inverse for a non-zero number is the number we can multiply by to get the multiplicative identity, 1. For example, for the number 5, the multiplicative inverse is $\frac{1}{5}$; for the number $\frac{2}{3}$ the multiplicative inverse is $\frac{3}{2}$.

multiplier The number you can multiply by in order to increase or decrease an amount. See *scale factor*.

mutually exclusive Two events are mutually exclusive if they have no outcomes in common.

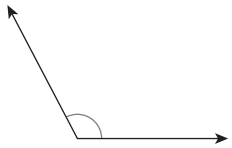
negative number A negative number is a number less than zero. Negative numbers are graphed on the negative side of a number line, which is to the left of the origin.

net A drawing of each of the faces of a prism or pyramid, as if it were cut along its edges and flattened out.

number line A diagram representing all real numbers as points on a line. All real numbers are assigned to points. The numbers are called the coordinates of the points and the point for which the number 0 is assigned is called the origin. See *boundary point*.

numerator The number above the bar in a fraction that tells the numbers of parts in relationship to the number of parts in the whole.

obtuse angle Any angle that measures between (but not including) 90° and 180°.



obtuse triangle A triangle with one obtuse angle.

octagon A polygon with eight sides.

odd number An integer that cannot be evenly divided by two.

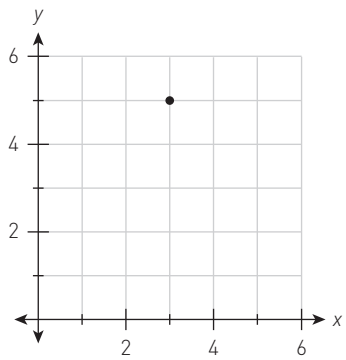
one-dimensional Something that does not have any width or depth. Lines and curves are one-dimensional.

operation A mathematical process such as addition, subtraction, multiplication, division, raising to a power, or taking a root.

opposite (of a number) The same number but with the opposite sign (+ or –). The additive inverse.

Order of Operations The specific order in which certain operations are to be carried out to evaluate or simplify expressions: parentheses (or other grouping symbols), exponents (powers or roots), multiplication and division (from left to right), and addition and subtraction (from left to right).

ordered pair Two numbers written in order as follows: (x, y). The primary use of ordered pairs in this course is to represent points in an xy-coordinate system. The first coordinate (x) represents the distance from the x-axis. The second coordinate (y) represents the distance from the y-axis. For example, the ordered pair (3, 5) can be represented by the point shown on the following graph.

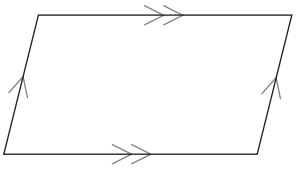


origin The point on a coordinate plane where the x-axis and y-axis intersect is called the origin. This point has coordinates (0, 0). The point assigned to zero on a number line is also called the origin. See *axis*.

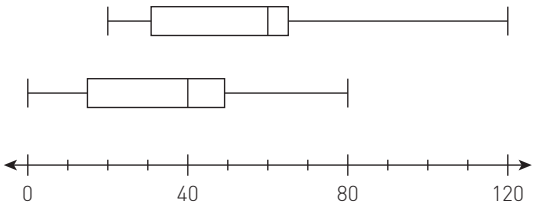
outcome Possible result in an experiment or consequence of an action.

outlier A number in a set of data that is much larger or much smaller than the other numbers in the set.

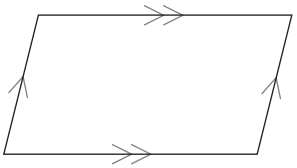
parallel Two or more straight lines on a flat surface that do not intersect (no matter how far they are extended) are parallel. Matching arrows on lines or line segments are used to indicate that those segments are parallel, like the ones on the parallelogram shown.



parallel box plot A way to visually compare multiple data distributions by drawing each of their box plots on the same axis.



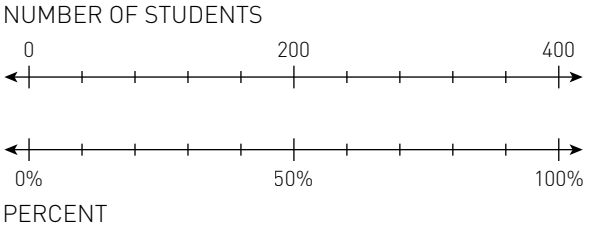
parallelogram A quadrilateral with two pairs of parallel sides.



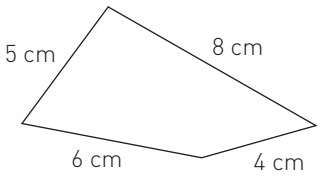
pentagon A polygon with five sides.

percent (%) A ratio that compares a number to 100. Percents are often written using the "%" symbol. For example, 0.75 is equal to $\frac{75}{100}$ or 75%.

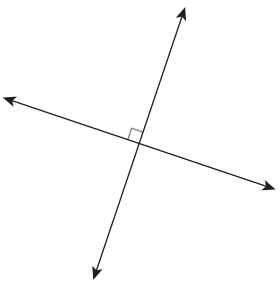
percent ruler A diagram like the one shown. It is used to visually aid in determining an amount that is a percent of a whole.



perimeter The distance around a figure on a flat surface. In the example shown, the perimeter is 5 + 8 + 4 + 6 = 23 cm.



perpendicular Two rays, line segments, or lines that meet (intersect) to form a right angle (90°) are called perpendicular. A line and a flat surface may also be perpendicular if the line does not lie on the flat surface but intersects the surface and forms a right angle with every line on the flat surface passing through the point of intersection. A small square at the point of intersection of two lines or segments indicates that the lines form a right angle and are therefore perpendicular.



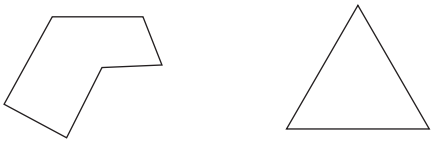
pi (π) The ratio of the circumference (C) of the circle to its diameter (d). For every circle, $\pi = \frac{C}{d}$. Numbers such as 3.14, 3.14159, or $\frac{22}{7}$ are approximations of π.

place value The number assigned to each place that a digit occupies.

plane A plane is a two-dimensional flat surface that extends without end. It is made up of points and has no thickness.

point An exact location in space. In two dimensions, an ordered pair specifies a point on a coordinate plane. See *ordered pair*.

polygon A two-dimensional closed figure of three or more line segments (sides) connected end to end. Each segment is a side and only intersects the endpoints of its two adjacent sides. Each point of intersection is a vertex. Shown are two examples of polygons.

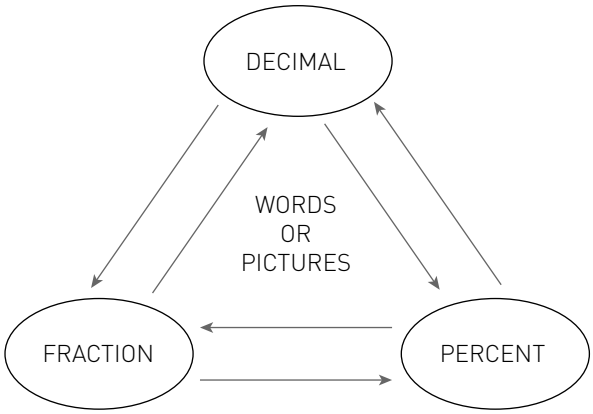


polyhedron A three-dimensional figure with no holes for which all faces are polygons.

population A collection of objects or group of people about whom information is gathered.

portion A part of something; a part of a whole.

Portions Web The web diagram shown illustrates that fractions, decimals, and percents are different ways to represent a portion of a number. Portions may also be represented in words, such as "four-fifths" or "seven-fourths," or as diagrams.



positive numbers Numbers that are greater than zero.

power A number or variable raised to an exponent in the form x^n. See *exponent*.

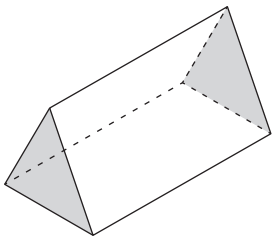
prime factor A factor that is a prime number.

prime factorization The expression of a number as the product of prime factors.

prime number A positive integer with exactly two factors. The only factors of a prime number are 1 and itself. For example, the numbers 2, 3, 17, and 31 are all prime.

principal Initial investment or capital. An initial value.

prism A three-dimensional figure with two parallel, congruent polygonal bases. The lateral faces are parallelograms that connect the corresponding vertices of the bases.



probability A number that represents how likely an event is to happen. When a event has a finite number of equally-likely outcomes, the probability that one of those outcomes, called *A*, will occur is expressed as a ratio and written as: $P(A) = \frac{\text{number of successful outcomes}}{\text{total number of possible outcomes}}$. For example, when flipping a coin, the probability of getting tails, *P*(tails), is $\frac{1}{2}$ because there is only one tail (successful outcome) out of the two possible equally likely outcomes (a head and a tail). Probability may be written as a ratio, decimal, or percent. A probability of 0 (or 0%) indicates that the occurrence of that outcome is impossible, while a probability of 1 (or 100%) indicates that the event must occur. Events that "might happen" will have values somewhere between 0 and 1 (or between 0% and 100%).

probability table See *area model*.

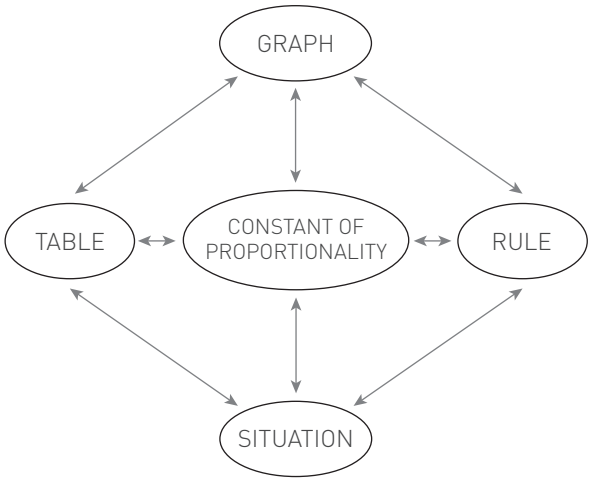
product The result of multiplying. For example, the product of 4 and 5 is 20.

proportion An equation stating that two ratios (fractions) are equal. For example, the equation $\frac{68 \text{ votes for Mr. Mears}}{100 \text{ people surveyed}} = \frac{34 \text{ votes for Mr. Mears}}{50 \text{ people surveyed}}$ is a proportion. A proportion is a useful type of equation to set up when solving problems involving proportional relationships.

proportional equation An equation stating that two ratios (fractions) are equal.

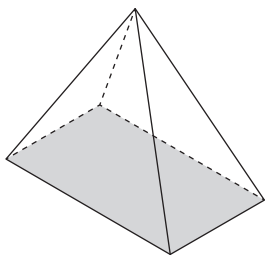
proportional relationship Two values are in a proportional relationship if a proportion may be set up that relates the values.

Proportions Web The web diagram shown illustrates the connections between different representations of the same proportional relationship.

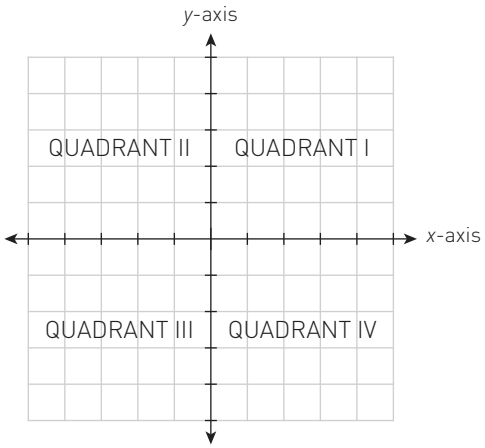


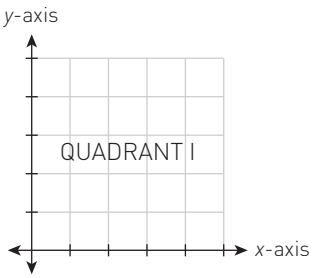
protractor A geometric tool used for physically measuring the number of degrees in an angle.

pyramid A three-dimensional figure with a base that is a polygon. The lateral faces are formed by connecting each vertex of the base to a single point (the vertex of the pyramid) that is above or below the surface that contains the base.

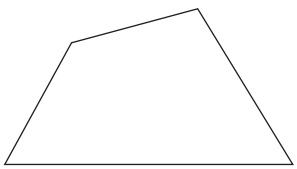


quadrants The coordinate plane is divided by its axes into four quadrants. The quadrants are numbered as shown in the first diagram shown. When graphing data that has no negative values, sometimes a graph that shows only the first quadrant is used.





quadrilateral A polygon with four sides. The following shape is a quadrilateral.



quartile Along with the median, the quartiles divide a set of data into four groups of the same size. See *box plot*.

quotient The result of a division problem.

radius (plural: radii) A line segment drawn from the center of a circle to a point on the circle.

random An event is random if its result cannot be known (and can only be guessed) until the event is completed. For example, the flip of a fair coin is random because the coin can either land on heads or tails and the outcome cannot be known for certain until after the coin is flipped.

random number A number generated by a process whose outcome does not follow any sort of pattern and thus the number cannot be predicted.

random number generator A computational device designed to generate a set of numbers that lack any pattern.

random sample A sample which was chosen as a result of a random process. A random sample can represent the whole population well.

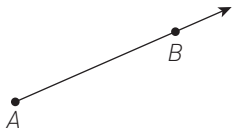
range The range of a set of data is the difference between the highest and lowest values.

rate A ratio comparing two quantities, often a comparison of time. For example, miles per hour.

ratio A ratio compares two quantities by division. A ratio may be written using a colon, but is more often written as a fraction. For example, the comparison may be made of the ratio of female students in a particular school to the total number of students in the school. This ratio could be written as 1,521:2,906 or as $\frac{\text{1,521 female students}}{\text{2,906 total students}}$.

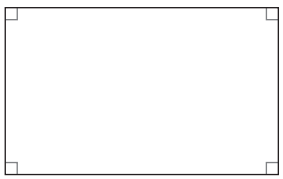
rational numbers Numbers that may be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$. For example, 0.75 is a rational number because 0.75 may be expressed in the form $\frac{3}{4}$.

ray A ray is part of a line that starts at one point and extends without end in one direction. In the example shown, ray $\overrightarrow{AB}$ is part of $\overleftrightarrow{AB}$ that starts at A and contains all of the points of $\overleftrightarrow{AB}$ that are on the same side of A as point B, including A. Point A is the endpoint of $\overrightarrow{AB}$.



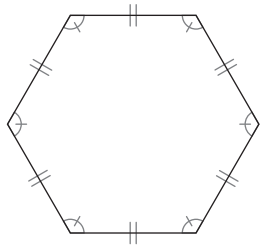
reciprocal The reciprocal of a nonzero number is its multiplicative inverse, that is, the reciprocal of x is $\frac{1}{x}$. For a number in the form $\frac{a}{b}$, where a and b are non-zero, the reciprocal is $\frac{b}{a}$. The product of a number and its reciprocal is 1. For example, the reciprocal of 12 is $\frac{1}{12}$, because $12 \cdot \frac{1}{12} = 1$.

rectangle A quadrilateral with four right angles.



reduce To make smaller.

regular polygon A polygon is regular if the polygon is a convex polygon with congruent angles and congruent sides. For example, the following shape is a regular hexagon.



repeating decimal A repeating decimal is a decimal that repeats the same sequence of digits forever from some point onward. For example, 4.56073073073... is a decimal for which the three digits 073 continue to repeat forever. Repeating decimals are always the decimal expansions of rational numbers.

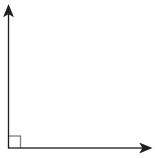
representative sample A subgroup of the population that has the similar characteristic of interest as that of the whole population. Representative samples are usually the result of random sampling.

remainder The amount left over when the divisor does not divide the dividend exactly. For example 63 ÷ 5 is 12 with a remainder of 3.

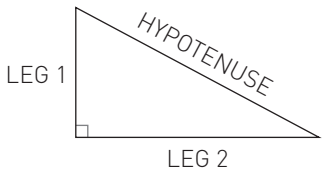
rewrite To rewrite an equation or expression is to write an equivalent equation or expression. Rewriting could involve using the Distributive Property, combining like terms, or using Fraction Busters. We usually rewrite in order to change expressions or equations into more useful forms or sometimes, just simpler forms.

rhombus A quadrilateral with four congruent sides. See *equilateral*.

right angle An angle that measures 90°. A small square is used to note a right angle, as shown in the example.



right triangle A triangle that has one right angle. The side of a right triangle opposite the right angle is called the "hypotenuse," and the two sides adjacent to the right angle are called "legs."



round (a number) To express an approximate value of a number that is exact to a given decimal place. For example, when 1,234.56 is rounded to the nearest whole number, the result is 1,235. When 1,234.56 is rounded to the nearest 100, the result is 1,200.

rule A rule is an equation or inequality that represents the relationship between two numerical quantities. A rule is often used to represent the relationship between quantities in a table, a pattern, a real-world situation, or a graph.

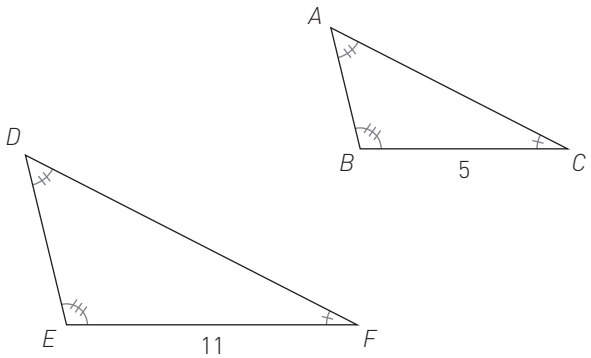
sample A subset (group) of a given population with the same characteristics as the whole population.

sample space The collection of all possible outcomes of an event.

scale (scaling) The ratio between a length of the representation (such as a map, model, or diagram) and the corresponding length of the actual object. For example, the map of a city may use one inch to represent one mile.

scale drawing A drawing that shows a real object with accurate sizes except they have all been reduced or enlarged by a certain amount (called the scale factor).

scale factor A ratio that compares the sizes of the parts of one figure or object to the sizes of the corresponding parts of a scaled copy of that figure or object. In this course it is also referred to as the multiplier. For example, for the triangles ΔABC and ΔDEF, where ΔDEF is a scaled copy ΔABC, the scale factor is $\frac{5}{11}$. The scale factor may also be called the enlargement ratio.

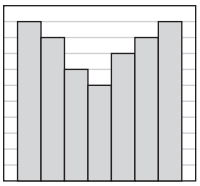


scale on axes The scale on an axis tells you what number each successive tick mark on the axis represents. A complete graph has the scale marked with numbers on each axis. Each axis should be scaled so that each interval represents the same amount.

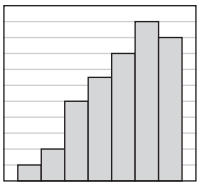
scalene triangle A triangle with no congruent sides.

set A collection of items.

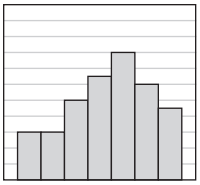
shape (of a data display) Some of the words statisticians use to describe the overall shape of a data distribution include: symmetric, skewed, single-peaked, double-peaked, and uniform. Examples are shown.



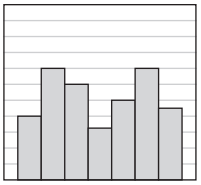
SYMMETRIC



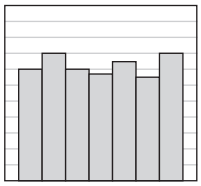
SKEWED



SINGLE-PEAKED



DOUBLE-PEAKED



UNIFORM

side of an angle One of the two rays that form an angle.

simple interest Interest paid on the principal alone.

simulation (probability) When conducting an experiment with an event that is unrealistic to perform, a simulation can be used. A simulation is a similar experiment that has the same probabilities as the original experiment.

single-peaked See *shape (of a data display)*.

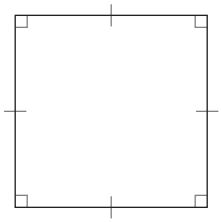
skewed (data display) See *shape (of a data display)*.

solution The number or numbers that when substituted into an equation or inequality make the equation or inequality true. For example, $x = 4$ is a solution to the equation $3x = 12$ because $3x$ equals 12 when $x = 4$.

solve To determine all the solutions to an equation or an inequality. The solution(s) may be number(s), variable(s), or an expression.

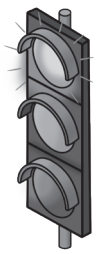
spread (data display) A measure of the amount of variability in a data set. Three ways to measure spread are the range, the mean absolute deviation, and the interquartile range.

square A quadrilateral with four right angles and four congruent sides.



square units The units used to describe the measure of an area in the form of 1 × 1 unit squares.

stoplight icon The icon shown will appear periodically throughout the text. Problems that display this icon contain errors of some type.



straight angle An angle that measures 180°. This occurs when the rays of the angle point in opposite directions, forming a line.

straightedge A tool used as a guide to draw lines, rays, and segments.

subproblems A problem solving strategy that breaks a problem into smaller parts that must be solved in order to solve the original, more complex problem.

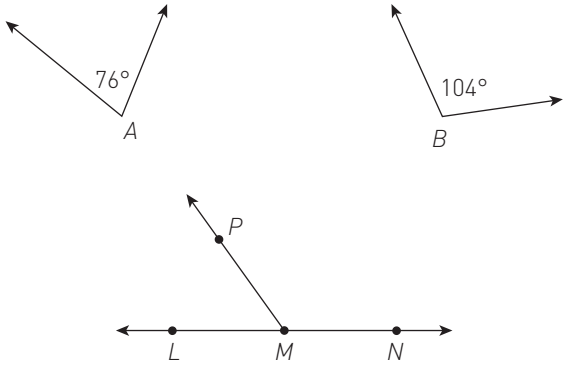
substitution Replacing one symbol with a number, a variable, or another algebraic expression of the same value. Substitution does not change the value of the overall expression. For example, suppose that the expression $13x - 6$ must be evaluated for $x = 4$. Since x has the value 4, 4 may be substituted into the expression wherever x appears, giving the equivalent expression $13(4) - 6$.

subtraction (–) An operation that gives the difference between two numbers.

sum The result of adding two or more numbers. For example, the sum of 4 and 5 is 9.

Super Giant One A Giant One in which either or both the numerator and denominator are fractions.

supplementary angles Two angles whose measures add up to 180°. Angles A and B are supplementary because $m\angle A + \angle B = 180°$. Supplementary angles may also be adjacent like $\angle LMP$ and $\angle PMN$ in the diagram.



surface area The sum of all the area(s) of the surface(s) of a three-dimensional solid. For example, the surface area of a prism is the sum of the areas of its top and bottom bases, and its vertical surfaces (lateral faces).

symmetric See *shape (of a data display)*.

systematic list A list created by following a system (organized process). When calculating probabilities, a systematic list helps to determine all outcomes of a sample space or event.

term A term is a single number, variable, or the product of numbers and variables, such as -45, $1.2x$, and $3xy^2$.

terminating decimal A terminating decimal is a decimal that has only a finite number of non-zero digits, such as 4.067. Terminating decimals are a particular kind of repeating decimal for which the repeating portion is zeros, so the example could be written 4.0670000000... but it is not necessary to write the zeros at the end.

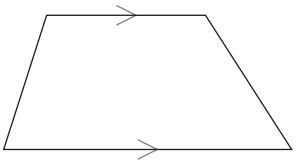
theoretical probability A calculated probability based on the possible outcomes when each outcome has the same chance of occurring: $\frac{\text{number of successful outcomes}}{\text{total number of possible outcomes}}$.

third quartile (Q3) The median of the upper half of an ordered set of data.

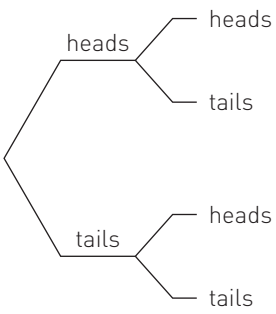
three-dimensional An object that has height, width, and depth.

tick mark A symbol that shows that a number line has been divided into intervals of equal length. See *number line*.

trapezoid A quadrilateral with at least one pair of parallel sides.

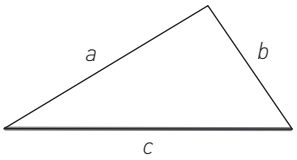


tree diagram Tree diagrams are useful for representing possible outcomes of probability experiments. For example, the following tree diagram represents the possible outcomes when a coin is flipped twice.



triangle A polygon with three sides.

Triangle Inequality In a triangle with side lengths a, b, and c, c must be less than the sum of a and b and greater than the difference of a and b. In the example shown, a is greater than b (that is, $a > b$), so the possible values for c are all numbers such that $c > a - b$ and $c < a + b$.



two-dimensional An object having length and width.

uniform See *shape (of a data display)*.

unit of measure A standard quantity (such as a centimeter, second, square foot, or gallon) that is used to measure and describe an object. A single object may be measured using different units of measure. For example, a pencil may be 80 mm long, meaning that the pencil is 80 times as long as a unit of 1 mm. However, the same pencil is 8 cm long, so that the pencil is the same length as 8 cm laid end-to-end. This is because 1 cm is the same length as 10 mm.

unit rate A rate with a denominator of one when simplified.

units digit The numeral in the ones place.

valid moves When working with an Equation Mat or Expression Comparison Mat, there are certain mathematically valid moves you can make with the algebra tiles that keep the relationship between the two sides of the mat intact. For example, removing an *x*-tile from the positive region of each side of an equation mat is a valid move; it keeps the expressions on each side of the mat equal. The valid moves are those justified by the properties of the real numbers.

variability See *spread*.

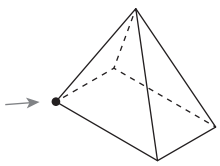
variable A symbol used to represent one or more numbers. In this course, letters of the English alphabet are used as variables. For example, in the expression $3x - (8.6xy + z)$, the variables are x, y, and z.

variable expression See *expression*.

vertex (plural: vertices)

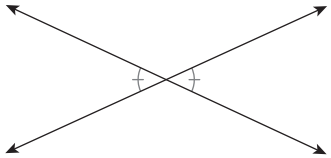
(a) For a two-dimensional geometric shape, a vertex is a point where two or more line segments or rays meet to form a corner, such as in a polygon or angle.

(b) For a three-dimensional polyhedron, a vertex is a point where the edges of the solid meet.



vertical At right angles to the horizon. On a coordinate graph, the *y*-axis runs vertically.

vertical angles The two opposite (that is, non-adjacent) angles formed by two intersecting lines. "Vertical" is a relationship between pairs of angles, so one angle cannot be called vertical. Angles that form a vertical pair are always congruent.



volume A measurement of the size of the three-dimensional region enclosed within an object. Volume is expressed as the number of $1 \times 1 \times 1$ unit cubes (or parts of cubes) that fit inside a solid.

voluntary response sample A subgroup of the population that chose to respond to a survey. A voluntary response sample is not a random sample.

***x*-axis** The horizontal number line on a coordinate graph. See *axis*.

***x*-coordinate** In an ordered pair, (x, y), that represents a point in the coordinate plane, x is the value of the x-coordinate. That is, the distance from the y-axis that is needed to plot the point.

***y*-axis** The vertical number line on a coordinate graph. See *axis*.

***y*-coordinate** In an ordered pair, (x, y), that represents a point in the coordinate plane, y is the value of the y-coordinate. That is, the distance from the x-axis that is needed to plot the point.

zero pair Two quantities whose sum is zero. A number and its opposite make a zero pair because their sum is 0.