Calculator Instructions

Calculator

Calculator Instructions

1.3 Graphing a Function

You can use a graphing calculator to graph a function.

Step 1: Press **Y=**. Your cursor should be blinking on the line **\Y1=**. Enter the equation. To enter a variable like *x*, press the key with **X, T, Ø, n** once.

Step 2: Press **WINDOW** to set the bounds and intervals you want displayed.

Step 3: Press **GRAPH** to view the graph.

1.3 Graphing a Piecewise Function

You can use a graphing calculator to graph piecewise functions.

Step 1: Press **Y=**. Enter the first section of the function within parentheses. Then press the division button.

Step 2: Press the (key twice and enter the first part of the compound inequality within parentheses.

Step 3: Enter the second part of the compound inequality within parentheses and then type two closing parentheses.

Press **GRAPH** here to see the first section of the piecewise function.

Step 4: Enter the remaining sections of the piecewise functions as Y_2 and Y_3.

2.2 Completing a Table of Values

You can use a graphing calculator to complete a table of values for a given function.

Step 1: Press **Y=**

Step 2: Enter the function. Press **ENTER**.

Step 3: Press **2ND TBLSET** (above **WINDOW**).

TblStart is the starting data value for your table. Enter this value.

ΔTbl (read "delta table") is the increment. This value tells the table what intervals to count by for the independent quantity. If **ΔTbl** = 1 then the values in your table would go up by 1s. If **ΔTbl** = -1, the values would go *down* by 1s. Enter the **ΔTbl**.

Step 4: Press **2ND TABLE** (above **GRAPH**). Use the up and down arrows to scroll through the data.

Calculator

2.2 Using the Value Feature

You can use the **value** feature on a graphing calculator to determine an exact data value on a graph.

Step 1: Press **Y=**. Enter your function.

Step 2: Press **WINDOW**. Set appropriate values for your function. Then press **GRAPH**.

Step 3: Press **2ND** and then **CALC**. Select **1:value**.Press **ENTER**. Then type the given independent value next to **X=** and press **ENTER**. The cursor moves to the given independent value and the corresponding dependent value is displayed at the bottom of the screen.

2.2 Using the Intersect Feature

You can use the **intersect** feature to determine an independent value when given a dependent value.

Step 1: Press **Y=**. Enter the two equations, one next to **Y_1=** and one next to **Y_2=**.

Step 2: Press **WINDOW**. Set appropriate bounds so you can see the intersection of the two equations. Then press **GRAPH**.

Step 3: Press **2ND CALC** and then select **5:intersect**. The cursor should appear somewhere on one of the graphs, and at the bottom of the screen you will see **First curve?** Press **ENTER**.
The cursor should then move to somewhere on the other graph, and you will see **Second curve?** Press **ENTER**.
You will see **Guess?** at the bottom of the screen. Move the cursor to where you think the intersection point is and Press **ENTER**. The intersection point will appear.

Calculator

3.1 Graphing a Function Using a Table of Values

You can use a graphing calculator to represent a data set.

Step 1: Press **STAT** and then press **ENTER** to select **1:Edit**. In the **L1** column, enter the independent quantity values by typing each value followed by **ENTER**.

Step 2: Use the right arrow key to move to the **L2** column. Enter the dependent quantity values.

Step 3: Press **2ND** and **STAT PLOT**. Press **4** to turn off any plots. Press **ENTER**. Then press **2ND** and **STAT PLOT** again. Press **ENTER** to access the information about Plot 1. The cursor should be on the word **On**. Press **ENTER** to turn on Plot 1.

Step 4: Use the arrow keys to move down to **Xlist**. Press **2ND L1** to set your L1 values as your *x*-values. Scroll to **Ylist** and Press **2ND L2** to set your L2 values as your y-values.

Step 5: Press **WINDOW** to set the bounds of your graph. Press **GRAPH** to create a graph of the data.

Step 6: Use the **TRACE** feature and the left and right arrow keys to move between the points on the plot.

3.1 Determining a Linear Regression

You can use a graphing calculator to determine the linear regression equation of a data set.

Step 1: **Diagnostics** must be turned on so that all needed data is displayed. Press **2nd CATALOG** to display the catalog. Scroll to **DiagnosticOn** and press **ENTER**. Then press **ENTER** again. The calculator should display the word **Done**.

Step 2: Press **STAT** and use the right arrow key to show the **CALC** menu. Type **4** to choose **LinReg(ax+b)** and press **ENTER**.

Step 3: Make sure **L1** is listed next to **Xlist** and **L2** is listed next to **Ylist**. Scroll down to **Calculate** and press **ENTER**.

The calculator should show $y = ax + b$ as well as four values labeled **a**, **b**, **r^2**, and **r**.

Step 4: Press **Y=**. Enter the linear regression equation next to **Y_1=**. Then press **GRAPH** to see the line of best fit.

The calculator will automatically copy the linear regression equation to Y1 if you enter LinReg(*ax* + *b*) **Y1**. Repeat Step 2 to enter LinReg(*ax* + *b*), then press **VARS** and use the right arrow keys to show **Y-VARS**. Press **FUNCTION** and select **Y1**. When you press **ENTER** the equation will appear in **Y1**.

Calculator

4.3 Generating Two Sequences

You can use a graphing calculator to generate two sequences at the same time in order to determine a certain term in a sequence.

Step 1: Within a set of brackets, enter the first term number followed by a comma and then the first term value of the sequence. The **2ND** key is used to enter the brackets. Press **ENTER**.

Step 2: Provide direction to the calculator on how to generate each term of the sequence.

Press **2ND{2NDANS(1)** and then indicate how the term numbers will increase or decrease, and by how much by entering the plus or minus sign and the amount of increase or decrease.

Then press **,2ND ANS(2)** and enter the common difference of the term values. Then close the brackets by pressing **2ND}** and press **ENTER**.

The calculator will display the next term number and value.

Step 3: Press **ENTER** and the next term number and value will be displayed.

Step 4: Continue pressing **ENTER** until you reach the *n*th term number and value you want to determine.

Calculator

7.2 Graphing a System of Linear Inequalities

You can use a graphing calculator to graph a system of linear inequalities.

Step 1: Press **Y=** and enter the two inequalities as Y_1 and Y_2.

Step 2: While still in the **Y=** window, access the inequality function by moving your cursor to the left until the \ flashes. Press **ENTER** to select the appropriate inequality symbol (◣ or ◥).

Step 3: Press **WINDOW** and set the bounds.

Step 4: Press **GRAPH**.

8.2 Constructing a Box-and-Whisker Plot

You can use a graphing calculator to construct a box-and-whisker plot.

Step 1: Press **STAT** and then press **ENTER** to select **1:**Edit.

Step 2: Enter the data values of the data set in List 1.

Step 3: Press **2nd** and **STAT PLOT**, which is above the **Y=** button.

Step 4: Select **1:** and press **ENTER**. Then highlight **PLOT 1** and press **ENTER** to turn Plot 1 on. Then scroll down to **Type:** and select the box-and-whisker icon. Press **ENTER**.

Step 5: Make sure the **XList** is using the correct list. Then press **GRAPH**.

8.4 Determining Standard Deviation

You can use a graphing calculator to determine the standard deviation of a data set.

Step 1: Press **STAT** and then **ENTER** to select **1:**Edit. Enter each data set into its own List.

Step 2: Press **STAT** then scroll to the right to highlight **CALC**. Press **ENTER** to select **1:**Var-Stats. Press **ENTER**.

Step 3: Your screen should display 1-Var Stats. Press **2ND** then the list you want the calculator to use for these calculations.

Step 4: Your calculator should display the same data values as when you determined the mean. However, this time use the value for σx.

Calculator

9.4 Comparing a Data Set With Its Linear Regression

You can use a graphing calculator to show how the actual values of a data set differ from the values predicted by a linear regression.

Step 1: Enter the data values, press **STAT**, select **CALC**, and then select **4:LinReg(ax+b)**. Scroll down to **Store RegEQ:** Press **VARS**, select **Y-VARS** at the top, and then press **1** two times. Then select **Calculate**.

Step 2: Press **STAT** and then **1**. Then press the right arrow key until you get to **L6**. Press the up arrow key and then the right arrow key.

Step 3: If the list of residuals is not already displayed, press **2ND** and then **LIST**. Select **7↓RESID**. Press **ENTER**.

Step 4: Press **2ND**, **STAT PLOT**, **1** to turn on the plot and choose the type of display for the graph. Press **ZOOM** and then **9** to show the data and the line of best fit.

You can also use a graphing calculator to graph a residual plot.

Step 5: Press **STAT** and then **1**. Copy the data from the residuals list to L6. You can round the data values if you wish.

Step 6: Press **2ND**, **STAT PLOT**, and then **1**. Make sure L1 is entered next to **Xlist** and L6 is entered next to **Ylist**.

Step 7: Press **STAT**, select **CALC**, and then select **2:2-Var Stats**. Make sure L1 is entered next to **Xlist** and L6 is entered next to **Ylist**. Select **Calculate** and then press **ZOOM**, **9** to see the residual plot.

11.3 Determining an Exponential Regression Equation

You can use a graphing calculator to determine the exponential regression equation for a data set.

Step 1: Press **STAT** and select **1:Edit**. Enter the data set with the independent variable in **L1** and the dependent variable in **L2**.

Step 2: Press **STAT** and scroll to **CALC**. Then scroll down to **0:ExpReg**. Press **ENTER** twice.

The calculator will display the values of each variable in the form $y = a \cdot b^x$.

Step 3: The r-value displayed represents the correlation coefficient.

Glossary

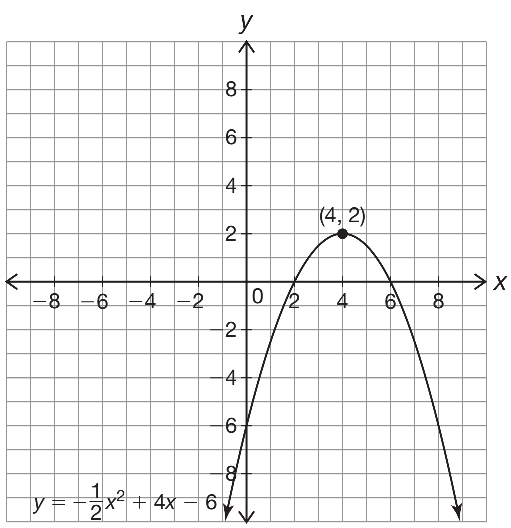
A

absolute maximum

A function has an absolute maximum if there is a point that has a y-coordinate that is greater than the y-coordinates of every other point on the graph.

Example

The ordered pair (4, 2) is the absolute maximum of the graph of the function $f(x) = -\frac{1}{2}x^2 + 4x - 6$.

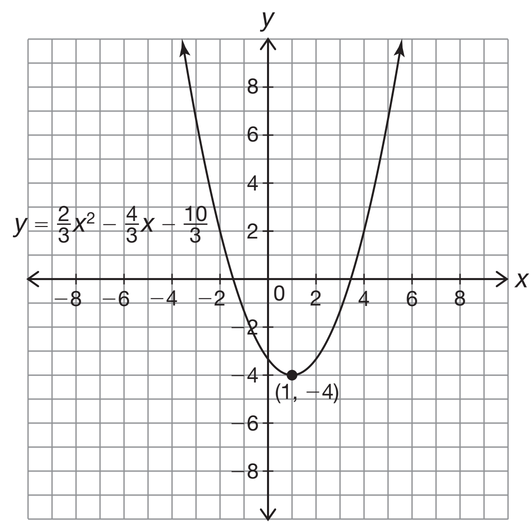


absolute minimum

A function has an absolute minimum if there is a point that has a y-coordinate that is less than the y-coordinates of every other point on the graph.

Example

The ordered pair (1, −4) is the absolute minimum of the graph of the function $y = \frac{2}{3}x^2 - \frac{4}{3}x - \frac{10}{3}$.



absolute value

The absolute value of a number is its distance from zero on the number line.

Examples

$|5| = 5$ because 5 is 5 units from 0 on the number line.
$|-3| = 3$ because −3 is 3 units from 0 on the number line.

angle

An angle is formed by two rays that share a common endpoint.

Glossary

Angle-Angle-Side Congruence Theorem

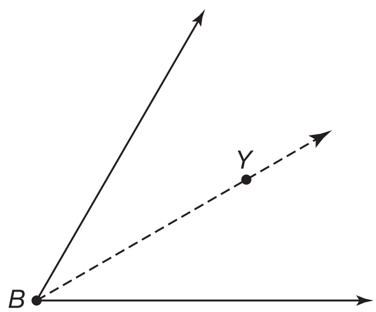
The Angle-Angle-Side Theorem states that if two angles and a non-included side of one triangle are congruent to the corresponding angles and the corresponding non-included side of a second triangle, then the triangles are congruent.

angle bisector

An angle bisector is a ray drawn through the vertex of an angle that divides the angle into two angles of equal measure, or two congruent angles.

Example

Ray *BY* is an angle bisector.



angle of rotation

The angle of rotation is the measure of the amount the figure is rotated about the point of rotation.

Angle-Side-Angle Congruence Theorem

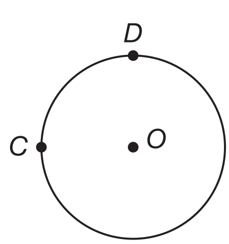
The Angle-Side-Angle Congruence Theorem states that if two angles and the included side of one triangle are congruent to the corresponding two angles and the included side of another triangle, then the triangles are congruent.

arc

An arc is a part of a circle that is the curve between two points on the circle.

Example

Arc *CD* is an arc of circle *O*.



argument of a function

The argument of a function is the variable on which the function operates.

Example

In the function $f(x + 5) = 32$, the argument is $x + 5$.

arithmetic sequence

An arithmetic sequence is a sequence of numbers in which the difference between any two consecutive terms is a constant.

Example

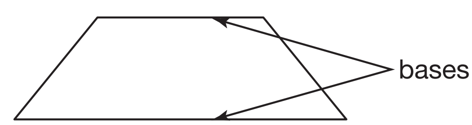
The sequence 1, 3, 5, 7 is an arithmetic sequence with a common difference of 2.

B

bases of a trapezoid

The parallel sides of a trapezoid are known as the bases of the trapezoid.

Example



basic function

A basic function is the simplest function of its type.

Examples

The basic linear function is $f(x) = x$.
The basic exponential function is $g(x) = 2^x$.
The basic quadratic function is $h(x) = x^2$.

biconditional statement

When a conditional statement and its converse are both true, they can be combined and written as a single statement using "if and only if." This statement is called a biconditional statement.

bin

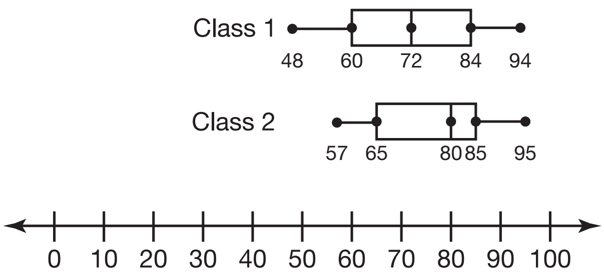
The width of a bar in a histogram represents an interval of data and is often referred to as a bin.

box-and-whisker plot

A box-and-whisker plot displays a data distribution based on a five number summary.

Example

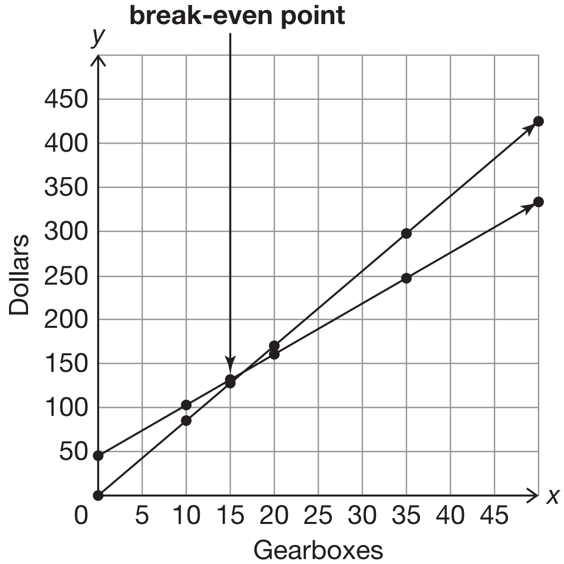
The box-and-whisker plots compare the test scores from two algebra classes.



break-even point

The break-even point is the point where two functions are equal.

Example



C

categorical data

Data that can be grouped into categories are called categorical data.

causation

Causation is when one event causes a second event.

common difference

The difference between any two consecutive terms in an arithmetic sequence is called the common difference. It is typically represented by the variable d.

Example

The sequence 1, 3, 5, 7 is an arithmetic sequence with a common difference of 2.

common ratio

The ratio between any two consecutive terms in a geometric sequence is called the common ratio. It is typically represented by the variable r.

Example

The sequence 2, 4, 8, 16 is a geometric sequence with a common ratio of 2.

common response

A common response is when a variable other than the ones measured cause the same result as the one observed in the experiment.

composite figure

A composite figure is a figure that is formed by combining different shapes.

compound inequality

A compound inequality is an inequality that is formed by the union, “or,” or the intersection, “and,” of two simple inequalities.

Example

The statement “$x > 5$ or $x < -5$” is a compound inequality.

compound interest

In a compound interest account, the interest earned at the end of each year is a percent of the account balance at the beginning of the year.

Example

Sonya opens a savings account with $100. She earns $4 in interest the first year. The compound interest y is found by using the equation $y = 100(1 + 0.04)^t$, where t is the time in years.

Glossary

conclusion

The conclusion of a conditional statement is the variable *q*.

conditional statement

A conditional statement is a statement that can be written in the form "If *p*, then *q*." This form is also known as the propositional form.

confounding variable

A confounding variable is when there are other variables in an experiment that are unknown or unobserved.

congruent

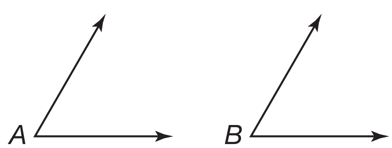
Congruent means to have the same size, shape, and measure. The symbol $\cong$ indicates that two figures are congruent.

congruent angles

Congruent angles are angles that are equal in measure.

Example

Angles *A* and *B* are congruent angles.

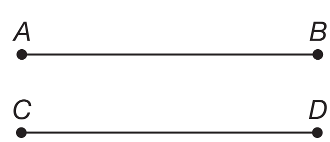


congruent line segments

Line segments that have the same length are called congruent line segments.

Example

Line segments *AB* and *CD* are congruent line segments.



conjunction

A compound inequality in the form $a < x < b$, where *a* and *b* are any real numbers, is a conjunction.

Example

The compound inequality "$x \leq 1$ and $x > -3$" is a conjunction.

consistent systems

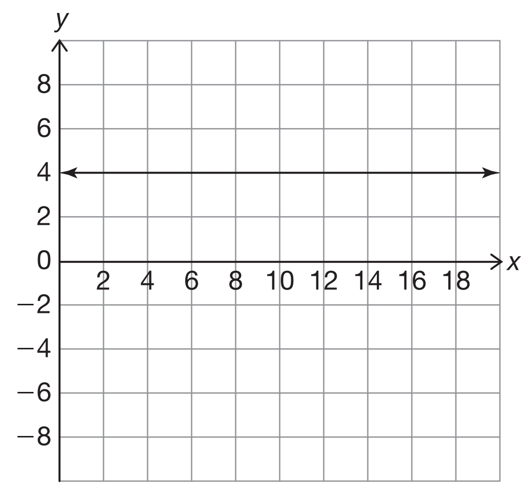
Systems that have one or many solutions are called consistent systems.

constant function

If the dependent variable of a function does not change or remains constant over the entire domain, then the function is called a constant function.

Example

The function shown is a constant function.



constraints

In a system of linear inequalities, the inequalities are known as constraints because the values of the expressions are "constrained" to lie within a certain region on the graph.

continuous data

Continuous data are data which can take any numerical value within a range.

continuous graph

A continuous graph is a graph of points that are connected by a line or smooth curve on the graph.

contrapositive

The contrapositive of a conditional statement of the propositional form "If *p*, then *q*" is the statement of the form "If not *q*, then not *p*."

Glossary

converse

The converse of a conditional statement of the form "If p, then q" is the statement of the form "If q, then p."

coordinate notation

Coordinate notation is a notation that uses ordered pairs to describe a transformation on a coordinate plane.

Example

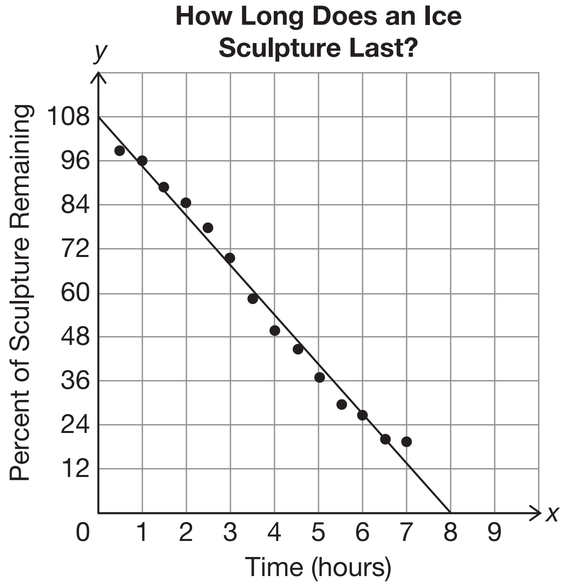
The coordinate notation $(x, y) \rightarrow (x + a, y)$, where a is a real number, indicates a horizontal translation.

correlation coefficient

The correlation coefficient indicates how closely the data points form a straight line.

Example

The correlation coefficient for these data is -0.9935. The value is negative because the equation has a negative slope. The value is close to -1 because the data are very close to forming a straight line.

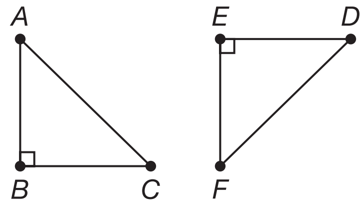


corresponding angles

Corresponding angles are angles that have the same relative positions in geometric figures.

Example

Angle B and Angle E are corresponding angles.

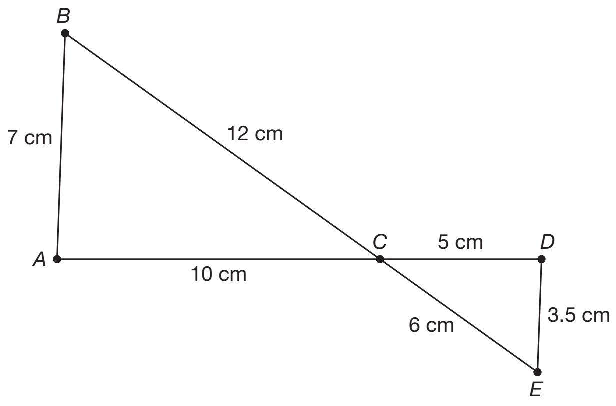


corresponding sides

Corresponding sides are sides that have the same relative positions in corresponding geometric figures.

Example

Side lengths AB and DE are corresponding sides in similar triangles ABC and DEC.



cube root

A number b is a cube root of a number a if $b^3 = a$.

Example

The cube root of 8 is 2.

Glossary

D

data distribution

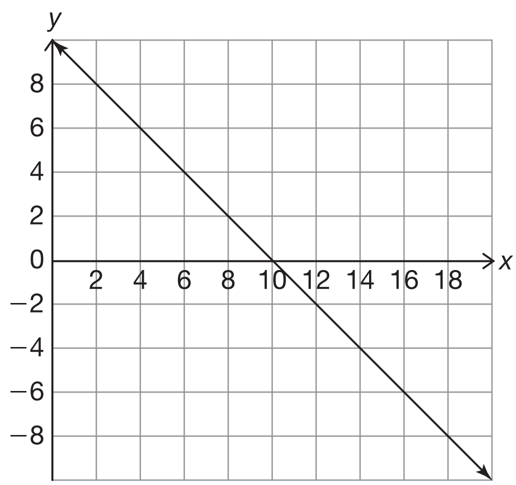
A data distribution is the way in which data are spread out or clustered together.

decreasing function

If a function decreases across the entire domain, then the function is called a decreasing function.

Example

The function shown is a decreasing function.



deduction

Deduction is reasoning that involves using a general rule to make a conclusion.

dependent quantity

When one quantity depends on another in a problem situation, it is said to be the dependent quantity.

Example

In the relationship between driving time and distance traveled, distance is the dependent quantity, because distance depends on the driving time.

discrete data

Discrete data are data that has only a finite number of values or data that can be "counted."

discrete graph

A discrete graph is a graph of isolated points.

disjunction

A compound inequality in the form $x < a$ or $x > b$, where a and b are any real numbers, is a disjunction.

Example

The compound inequality "$x < -2$ or $x > 1$" is a disjunction.

Distance Formula

The Distance Formula states that if (x_1, y_1) and (x_2, y_2) are two points on the coordinate plane, then the distance d between (x_1, y_1) and (x_2, y_2) is given by $d = \sqrt{[x_2 - x_1]^2 + [y_2 - y_1]^2}$.

Example

To find the distance between the points $(-1, 4)$ and $(2, -5)$, substitute the coordinates into the Distance Formula.

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

$$d = \sqrt{(2 + 1)^2 + (-5 - 4)^2}$$

$$d = \sqrt{3^2 + (-9)^2}$$

$$d = \sqrt{9 + 81}$$

$$d = \sqrt{90}$$

$$d \approx 9.49$$

So, the distance between the points $(-1, 4)$ and $(2, -5)$ is approximately 9.49 units.

domain

The domain is the set of input values in a relation.

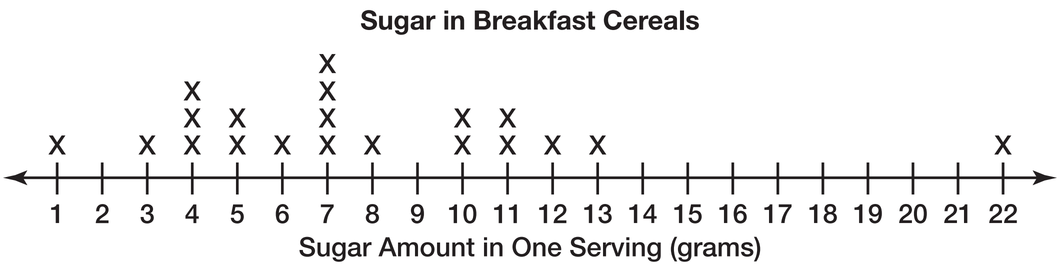
Example

The domain of the function $y = 2x$ is the set of all real numbers.

dot plot

A dot plot is a graph that shows how discrete data are graphed using a number line.

Example



E

equivalent compound inequalities

An equivalent compound inequality is a compound inequality that is the equivalent of an absolute value inequality.

Examples

Absolute Value Inequality	Equivalent Compound Inequality
$\lvert ax + b \rvert < c$	$-c < ax + b < c$
$\lvert ax + b \rvert \leq c$	$-c \leq ax + b \leq c$
$\lvert ax + b \rvert > c$	$ax + b < -c$ or $ax + b > c$
$\lvert ax + b \rvert \geq c$	$ax + b \leq -c$ or $ax + b \geq c$

explicit formula

An explicit formula of a sequence is a formula for calculating the value of each term of a sequence using the term's position in the sequence.

Example

The sequence 1, 3, 5, 7, 9, . . . can be described by the rule $a_n = 2n - 1$ where n is the position of the term. The fourth term of the sequence a_4 is $2(4) - 1$, or 7.

exponential functions

The family of exponential functions includes functions of the form $f(x) = a \cdot b^x$, where a and b are real numbers, and b is greater than 0 but is not equal to 1.

Example

The function $f(x) = 2^x$ is an exponential function.

extrapolation

To make predictions for values of x that are outside of the data set is called extrapolation.

F

finite sequence

If a sequence terminates, it is called a finite sequence.

Example

The sequence 22, 26, 30 is a finite sequence.

first differences

First differences are the values determined by subtracting consecutive y-values in a table when the x-values are consecutive integers.

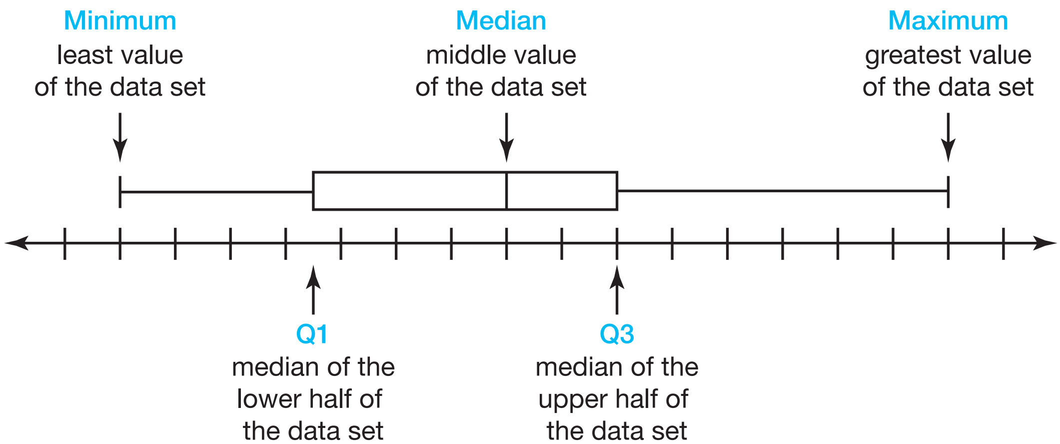
Example

	Time (minutes)	Height (feet)	First Differences
	0	0	
1 − 0 = 1			1800 − 0 = 1800
	1	1800	
2 − 1 = 1			3600 − 1800 = 1800
	2	3600	
3 − 2 = 1			5400 − 3600 = 1800
	3	5400	

five number summary

The five number summary consists of the minimum value, the first quartile (Q1), the median, the third quartile (Q3), and the maximum value of a data set.

Example



frequency

The height of each bar in a histogram indicates the frequency, which is the number of data values included in any given bin.

frequency distribution

A frequency distribution displays the frequencies for categorical data in a two-way table.

Example

Favorite Meals of Students

Grade Level		Burgers	Chicken Nuggets	Pizza	Salad Bar
	9th grade	4	1	3	5
	10th grade	3	7	3	4

frequency marginal distribution

A frequency marginal distribution displays the total of the frequencies of the rows or columns of a frequency distribution.

Favorite Meals of Students

Grade Level		Burgers	Chicken Nuggets	Pizza	Salad Bar	Total
	9th grade	4	1	3	5	13
	10th grade	3	7	3	4	17
	Total	7	8	6	9	30

function

A function is a relation between a given set of elements, such that for each element in the domain there exists exactly one element in the range.

Example

The equation $y = 2x$ is a function. Every value of x has exactly one corresponding y-value.

function family

A function family is a group of functions that share certain characteristics.

Examples

Linear functions and exponential functions are examples of function families.

function notation

Function notation is a way of representing functions algebraically.

Example

In the function $f(x) = 0.75x$, f is the name of the function, x represents the domain, and $f(x)$ represents the range.

G

geometric sequence

A geometric sequence is a sequence of numbers in which the ratio between any two consecutive terms is a constant.

Example

The sequence 2, 4, 8, 16 is a geometric sequence with a common ratio of 2.

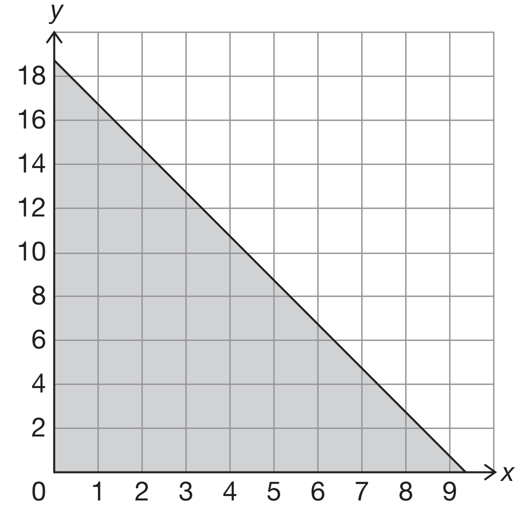
H

half-plane

The graph of a linear inequality is a half-plane, or half of a coordinate plane.

Example

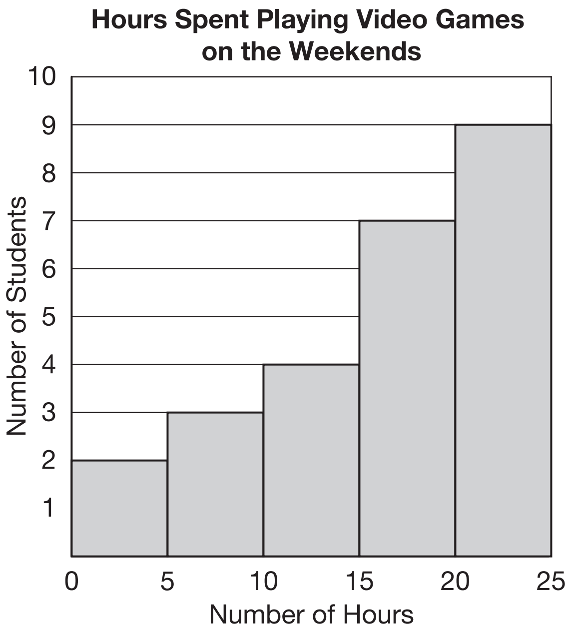
The shaded portion of the graph is a half-plane.



histogram

A histogram is a graphical way to display quantitative data using vertical bars.

Example



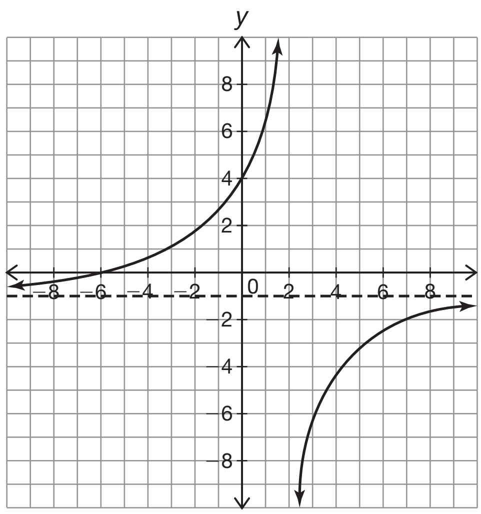
Glossary

horizontal asymptote

A horizontal asymptote is a horizontal line that a function gets closer and closer to, but never intersects.

Example

The graph shows a horizontal asymptote at $y = -1$.

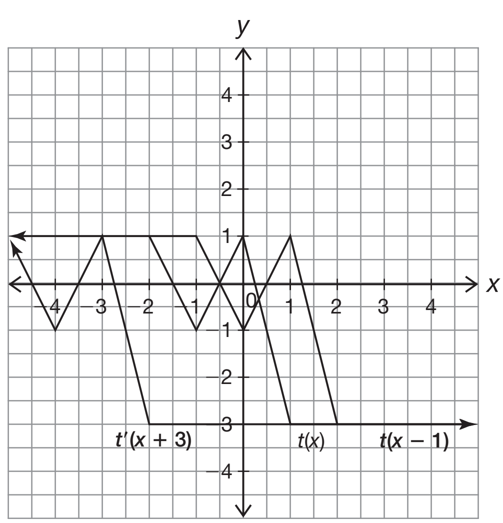


horizontal translation

A horizontal translation of a graph is a shift of the entire graph left or right. A horizontal translation affects the *x*-coordinate of each point on the graph.

Examples

The graphs of $t(x + 3)$ and $t(x - 1)$ are horizontal translations of the graph of $t(x)$.



hypothesis

The hypothesis of a conditional statement is the variable *p*.

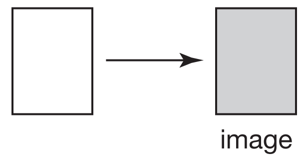
I

image

The new figure created from a transformation is called the image.

Example

The image of a rectangle under a translation is shown.



included angle

An included angle is the angle formed by two sides of a triangle.

included side

An included side is the side between two angles of a triangle.

inconsistent systems

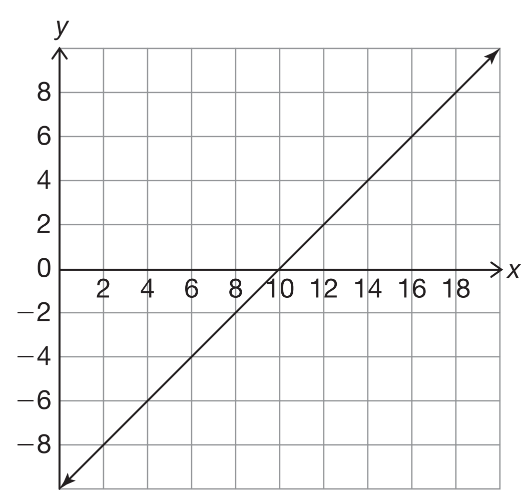
Systems with no solution are called inconsistent systems.

increasing function

If a function increases across the entire domain, then the function is called an increasing function.

Example

The function shown is an increasing function.



independent quantity

The quantity that the dependent quantity depends upon is called the independent quantity.

Example

In the relationship between driving time and distance traveled, driving time is the independent quantity, because it does not depend on any other quantity

index

The index is the position of a term (its term number) in a sequence. Also, the value that sits outside the radical is called the index of the radical.

Examples

In the sequence 125, 143, 161 . . . the term 125 has an index of 1.
In the radical expression $\sqrt[4]{16}$, the number 4 is the index.

induction

Induction is reasoning that involves using specific examples to make a conclusion.

infinite sequence

If a sequence continues on forever, it is called an infinite sequence.

Example

The sequence 22, 26, 30, 34 . . . is an infinite sequence.

interpolation

Using a linear regression to make predictions within the data set is called interpolation.

interquartile range (IQR)

The interquartile range, IQR, measures how far the data are spread out from the median.

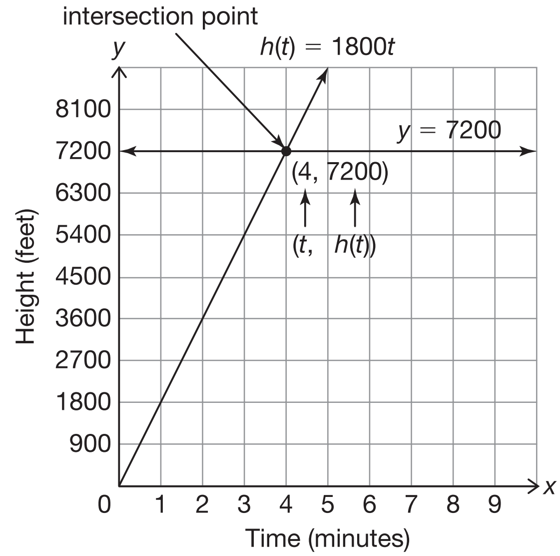
Example

In the data set 13, 17, 23, 24, 25, 29, 31, 45, 46, 53, 60, the median, 29, divides the data into two halves. The first quartile, 23, is the median of the lower half of the data. The third quartile, 46, is the median of the upper half of the data. The interquartile range is 46 − 23, or 23.

intersection point

If you have intersecting graphs, a solution is the ordered pair that satisfies both functions at the same time, or the intersection point of the graphs.

Example



inverse

The inverse of a conditional statement of the proposition form "If p, then q" is the statement of the form "If not p, then not q.

J

joint frequency

Any frequency recorded within the body of a two-way frequency table is known as a joint frequency.

Glossary

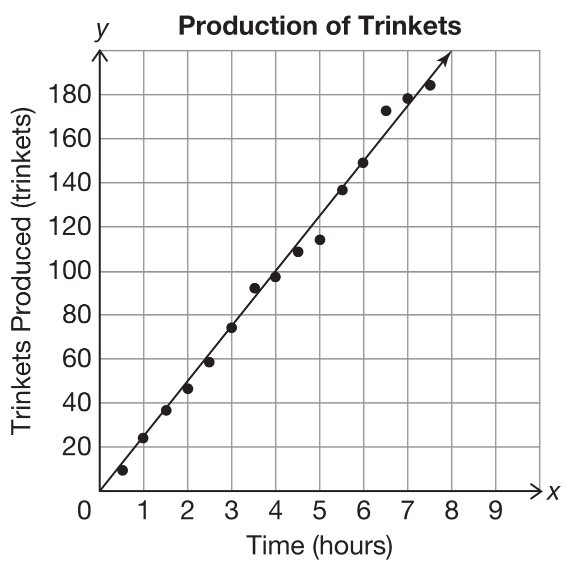
L

least squares regression line

A least squares regression line is the line of best fit that minimizes the squares of the distances of the points from the line.

Example

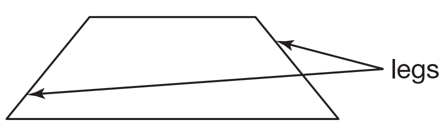
The line shown is a least squares regression line for these data.



legs of a trapezoid

The non-parallel sides of a trapezoid are known as the legs of the trapezoid.

Example



linear absolute value equation

An equation in the form $|x + a| = c$ is a linear absolute value equation.

Example

The equation $|x - 1| = 6$ is a linear absolute value equation.

linear absolute value functions

The family of linear absolute value functions includes functions of the form $f(x) = a|x + b| + c$, where a, b, and c are real numbers, and a is not equal to 0.

Example

The function $f(x) = |x - 3| - 2$ is a linear absolute value function.

linear absolute value inequality

An inequality in the form $|x + a| < c$ is a linear absolute value inequality.

Example

The inequality $|w - 145.045| \leq 3.295$ is a linear absolute value inequality.

linear combinations method

The linear combinations method is a process used to solve a system of equations by adding two equations together, resulting in an equation with one variable.

Example

Solve the following system of equations by using the linear combinations method:

$$\begin{cases} 6x - 5y = 3 \\ 2x + 2y = 12 \end{cases}$$

First, multiply the second equation by -3. Then, add the equations and solve for the remaining variable. Finally, substitute $y = 3$ into the first equation and solve for x. The solution of the system is (3, 3).

linear functions

The family of linear functions includes functions of the form $f(x) = mx + b$, where m and b are real numbers.

Example

The function $f(x) = 3x + 2$ is a linear function.

linear piecewise functions

Linear piecewise functions include functions that have equation changes for different parts, or pieces, of the domain.

Example

The function $f(x)$ is a linear piecewise function.

$$f(x) = \begin{cases} x + 5 & x \le -2 \\ -2x + 1 & -2 < x \le 2 \\ 2x - 9 & x > 2 \end{cases}$$

linear programming

Linear programming is a branch of mathematics that determines the maximum and minimum value of linear expressions on a region produced by a system of linear inequalities.

linear regression

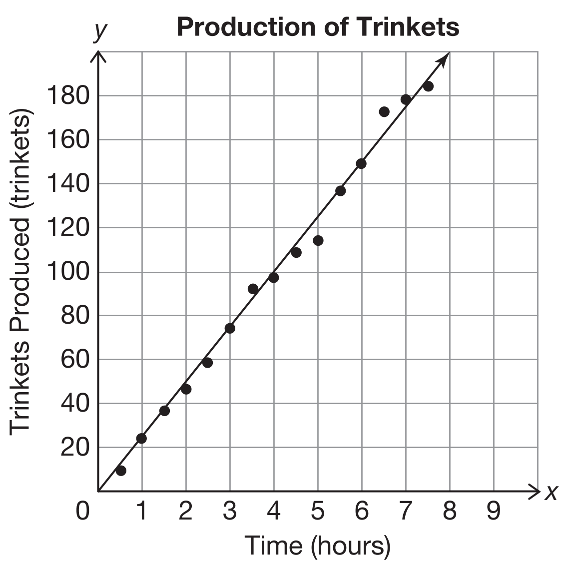
A linear regression models the relationship between two variables in a data set by producing a line of best fit.

linear regression equation

The equation that describes the line of best fit is called the linear regression equation.

Example

The linear regression equation for these data is $y = 25x$.

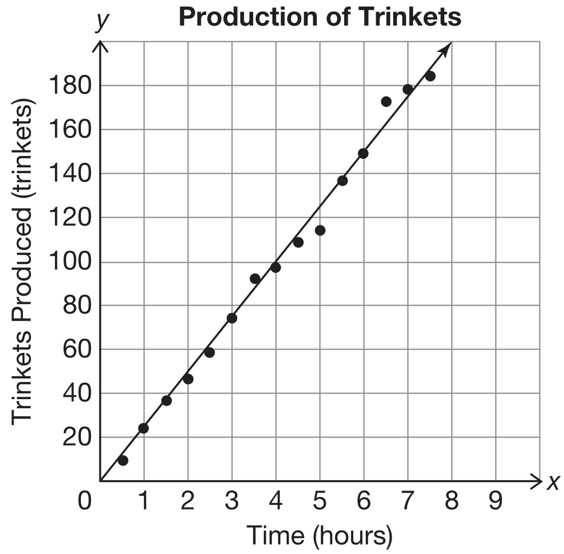


line of best fit

A line of best fit is the line that best approximates the linear relationship between two variables in a data set.

Example

The line shown is a line of best fit for these data.

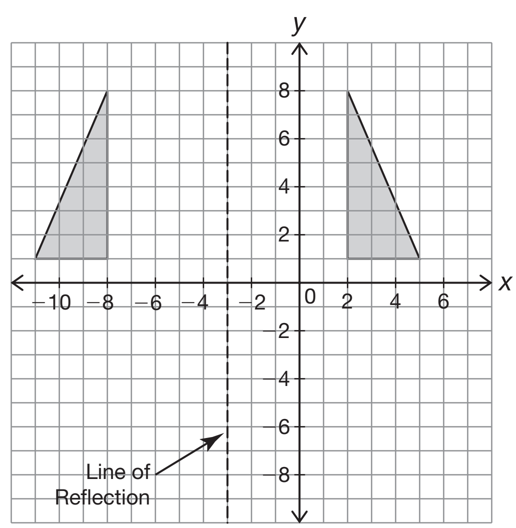


line of reflection

A line of reflection is the line that the graph is reflected about.

Example

The triangle on the left was reflected over the line $x = -3$ to create the triangle on the right.



Glossary

literal equation

Literal equations are equations in which the variables represent specific measures.

Examples

The equations $I = Prt$ and $A = lw$ are literal equations.

logically equivalent

Two proposition forms are logically equivalent if they have the same truth values for corresponding values of the propositional variables.

lower fence

The value of Q1 − (IQR · 1.5) is known as the lower fence for a data set.

M

measure of central tendency

A measure of central tendency is the numerical values used to describe the overall clustering of data in a set.

Examples

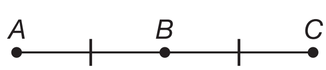
The mean, median, and mode are the most common measures of central tendency.

midpoint

A midpoint is a point that is exactly halfway between two given points.

Example

Because point B is the midpoint of segment AC, segment AB is congruent to segment BC.



Midpoint Formula

The Midpoint Formula states that if (x_1, y_1) and (x_2, y_2) are two points on the coordinate plane, then the midpoint of the line segment that joins these two points is given by $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

Example

To find the midpoint between the points (−1, 4) and (2, −5), substitute the coordinates into the Midpoint Formula.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{-1 + 2}{2}, \frac{4 - 5}{2}\right)$$
$$= \left(\frac{1}{2}, \frac{-1}{2}\right)$$

So, the midpoint between the points (−1, 4) and (2, −5) is $\left(\frac{1}{2}, -\frac{1}{2}\right)$.

N

necessary condition

A correlation is a necessary condition for causation, meaning that for one variable to cause another, they must be correlated.

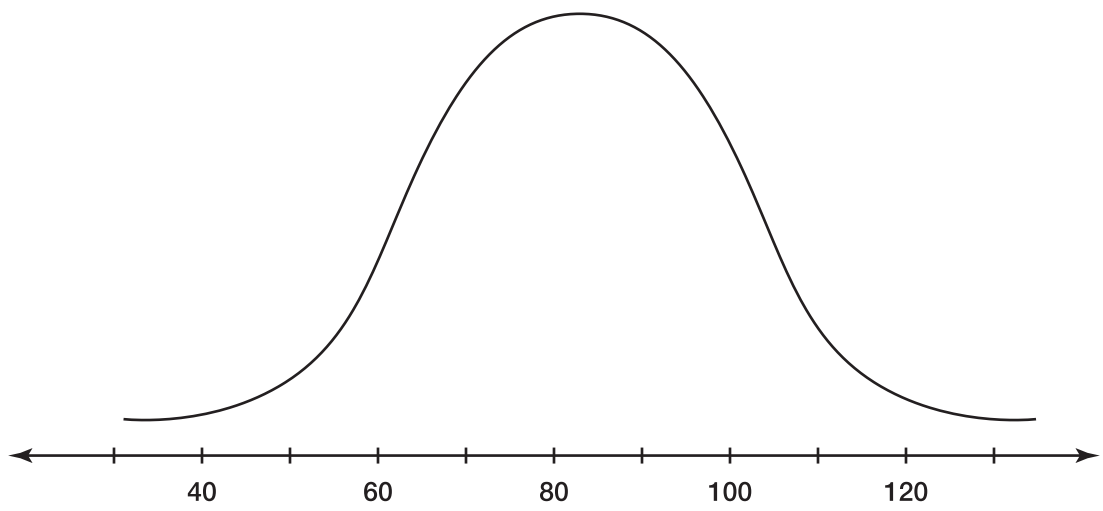
non-included side

The non-included side is a side that is *not* located between the two angles.

normal distribution

A normal distribution is a collection of many data points that form a bell-shaped curve.

Example



*n*th root

If n represents a positive number, then a number b is the nth root of a if $b^n = a$.

Example

The number 2 is the 4th root of 16, because $2^4 = 16$.

O

opposites

Two numbers that are an equal distance, but are in different directions, from zero on the number line are called opposites.

Example

The opposite of -3 is 3. Both numbers are 3 units from 0 on the number line.

outlier

An outlier is a data value that is significantly greater or lesser than other data values in a data set.

Example

In the data set 1, 1, 3, 3, 4, 4, 5, 1000, the outlier is 1000.

P

point of rotation

The fixed point about which a figure is rotated is called the point of rotation.

point-slope form

The point-slope form of the equation of the line that passes through (x_1, y_1) and has slope m is $y - y_1 = m(x - x_1)$.

postulate

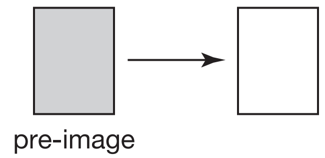
A postulate is a mathematical statement that cannot be proved but is considered true.

pre-image

The original figure in a transformation is called the pre-image.

Example

The pre-image of a rectangle under a translation is shown.



Glossary

proof by contradiction

To prove a statement using proof by contradiction, assume that the conclusion is false. Then show that the hypothesis is false, or a contradiction.

propositional form

A statement written in the form "If *p*, then *q*" is written in propositional form. This statement is also known as a conditional statement.

propositional variables

The variables *p* and *q* in a conditional statement written in propositional form are propositional variables.

Q

quadratic functions

The family of quadratic functions includes functions of the form $f(x) = ax^2 + bx + c$, where *a*, *b*, and *c* are real numbers, and *a* is not equal to 0.

Examples

The equations $y = x^2 + 2x + 5$ and $y = -4x^2 - 7x + 1$ are quadratic functions.

R

radicand

The value that is inside a radical is called the radicand.

Example

In the radical expression $\sqrt{25}$, the number 25 is the radicand.

range

The range is the set of output values in a relation.

Example

The range of the function $y = x^2$ is the set of all numbers greater than or equal to zero.

rational exponent

A rational exponent is an exponent that is a rational number written as a fraction.

Example

In the expression $x^{\frac{2}{3}}$, the value $\frac{2}{3}$ is a rational exponent.

recursive formula

A recursive formula expresses each new term of a sequence based on the preceding term in the sequence.

Example

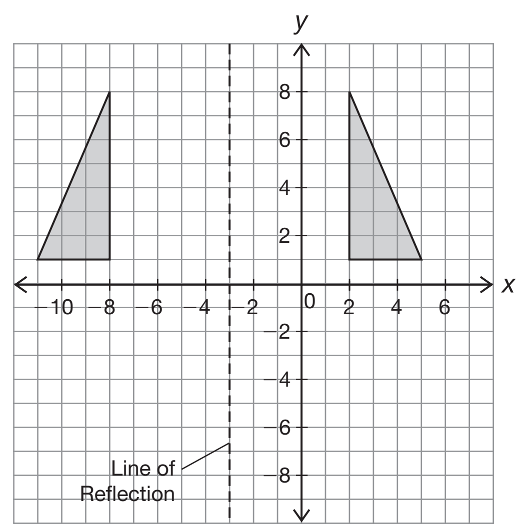
The formula $a_n = a_{n-1} + 2$ is a recursive formula. Each successive term is calculated by adding 2 to the previous term. If $a_1 = 1$ then $a_2 = 1 + 2 = 3$.

reflection

A reflection of a graph is a mirror image of the graph about a line of reflection.

Example

The triangle on the right is a reflection of the triangle on the left.



regular polygon

A regular polygon is a polygon whose sides all have the same length and whose angles all have the same measure.

relation

A relation is the mapping between a set of input values called the domain and a set of output values called the range.

Example

The set of points {(0, 1), (1, 8), (2, 5), (3, 7)} is a relation.

Glossary

relative frequency conditional distribution

A relative frequency conditional distribution is the percent or ratio of occurrences of a category given the specific value of another category.

Grades of Mr. Lewis's Science Students

Science Classes	A	B	C	D	F	Total
Biology	$\frac{6}{20} = 30\%$	$\frac{6}{20} = 30\%$	$\frac{5}{20} = 25\%$	$\frac{1}{20} = 5\%$	$\frac{2}{20} = 10\%$	$\frac{20}{20} = 100\%$
Chemistry	$\frac{4}{30} \approx 13.3\%$	$\frac{8}{30} \approx 26.7\%$	$\frac{12}{30} = 40\%$	$\frac{4}{30} \approx 13.3\%$	$\frac{2}{30} \approx 6.7\%$	$\frac{30}{30} = 100\%$
Physics	$\frac{2}{15} \approx 13.3\%$	$\frac{5}{15} \approx 33.3\%$	$\frac{6}{15} = 40\%$	$\frac{1}{15} \approx 6.7\%$	$\frac{1}{15} \approx 6.7\%$	$\frac{15}{15} = 100\%$

relative frequency distribution

Representing the relative frequencies for joint data displayed in a two-way table is called a relative frequency distribution. The relative frequency distribution provides the ratio of occurrences in each category to the total number of occurrences.

Activities Preferred During Hot Weather

	Sports	Movies	Reading	Walking
Students Age 18 Years Old and Under	$\frac{20}{280} \approx 7.1\%$	$\frac{30}{280} \approx 10.7\%$	$\frac{22}{280} \approx 7.9\%$	$\frac{8}{280} \approx 2.9\%$
Adults Age 19 Thru 50 Years Old	$\frac{10}{280} \approx 3.6\%$	$\frac{32}{280} \approx 11.4\%$	$\frac{25}{280} \approx 8.9\%$	$\frac{43}{280} \approx 15.4\%$
Adults Over 50 Years Old	$\frac{5}{280} \approx 1.8\%$	$\frac{20}{280} \approx 7.1\%$	$\frac{35}{280} \approx 12.5\%$	$\frac{30}{280} \approx 10.7\%$

relative frequency marginal distribution

Displaying the relative frequencies for the rows or columns in a two-way table is called a relative frequency marginal distribution. The relative frequency marginal distribution provides the ratio of total occurrences for each category to the total number of occurrences.

Activities Preferred During Hot Weather

	Sports	Movies	Reading	Walking	Total
Students Age 18 Years Old and Under	$\frac{20}{280} \approx 7.1\%$	$\frac{30}{280} \approx 10.7\%$	$\frac{22}{280} \approx 7.9\%$	$\frac{8}{280} \approx 2.9\%$	$\frac{80}{280} \approx 28.6\%$
Adults Age 19 Thru 50 Years Old	$\frac{10}{280} \approx 3.6\%$	$\frac{32}{280} \approx 11.4\%$	$\frac{25}{280} \approx 8.9\%$	$\frac{43}{280} \approx 15.4\%$	$\frac{110}{280} \approx 39.3\%$
Adults Over 50 Years Old	$\frac{5}{280} \approx 1.8\%$	$\frac{20}{280} \approx 7.1\%$	$\frac{35}{280} \approx 12.5\%$	$\frac{30}{280} \approx 10.7\%$	$\frac{90}{280} \approx 32.1\%$
Total	$\frac{35}{280} \approx 12.5\%$	$\frac{82}{280} \approx 29.3\%$	$\frac{82}{280} \approx 29.3\%$	$\frac{81}{280} \approx 28.9\%$	$\frac{280}{280} = 100\%$

residual

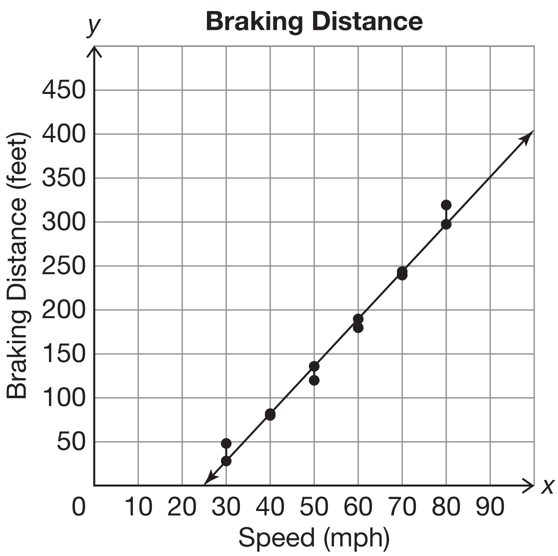
A residual is the distance between an observed data value and its predicted value using a regression equation.

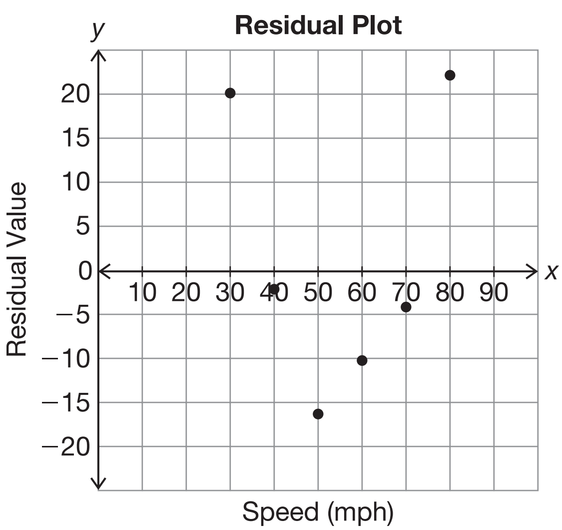
residual plot

A residual plot is a scatter plot of the independent variable on the *x*-axis and the residuals on the *y*-axis.

Example

The graph at bottom shows a residual plot of the braking distance data.





rigid motion

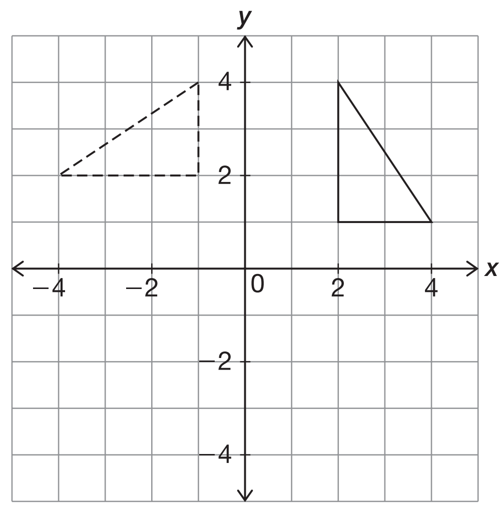
A rigid motion is a transformation of points in space.

rotation

A rotation is a rigid motion that turns a figure about a fixed point.

Example

The figure has been rotated 90° counterclockwise about the point (0, 0).



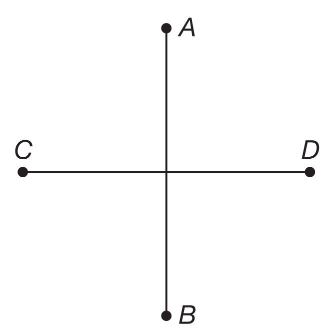
S

segment bisector

A segment bisector is a line, line segment, or ray that divides a line segment into two line segments of equal measure, or two congruent line segments.

Example

AB is a segment bisector of *CD*.



sequence

A sequence is a pattern involving an ordered arrangement of numbers, geometric figures, letters, or other objects.

Example

The numbers 1, 1, 2, 3, 5, 8, 13 form a sequence.

Glossary

Side-Angle-Side Congruence Theorem

The Side-Angle-Side Congruence Theorem states that if two sides and the included angle of one triangle are congruent to the corresponding sides and the included angle of the second triangle, then the triangles are congruent.

side-by-side stem-and-leaf plot

A side-by-side stem-and-leaf plot allows a comparison of two data sets. The two data sets share the same stem, but have leaves to the left and right of the stem.

Example

Difference in Departure Times (minutes)		
My Air Airlines		**Fly High Airlines**
5 0	0	7 8
9 5 1	1	4 5 6
6 0 0	2	4 7 9
4 3 3	3	0 2
0	4	5 9

2|4 = 24 minutes

Side-Side-Side Congruence Theorem

The Side-Side-Side Congruence Theorem states that if three sides of one triangle are congruent to the corresponding sides of another triangle, then the triangles are congruent.

significant digits

Significant digits are digits that carry meaning contributing to a number's precision.

simple interest

In a simple interest account, the interest earned at the end of each year is a percent of the original deposited amount (also known as the original principal).

Example

Tonya deposits $200 in a 3-year certificate of deposit that earns 4% interest. The amount of interest that Tonya earns can be found using the simple interest formula.

$I = (200)(0.04)(3)$

$I = 24$

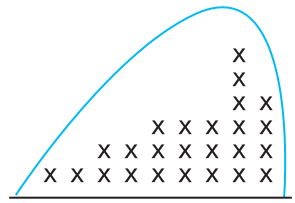
Tonya earns $24 in interest.

skewed left distribution

In a skewed left distribution of data, the peak of the data is to the right side of the graph. There are only a few data points to the left side of the graph.

Example

These data show a skewed left distribution.



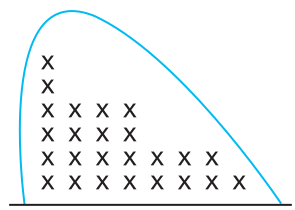
Skewed left

skewed right distribution

In a skewed right distribution of data, the peak of the data is to the left side of the graph. There are only a few data points to the right side of the graph.

Example

These data show a skewed right distribution.



Skewed right

slope-intercept form

The slope-intercept form of a linear equation is $y = mx + b$ where b is the y-intercept and m is the slope.

Example

The linear equation $y = 2x + 1$ is written in slope-intercept form. The slope of the line is 2 and the y-intercept is 1.

solution

The solution of a linear equation is any value that makes the open sentence true.

Example

The solution of the equation $3x + 4 = 25$ is 7 because 7 makes the equation true: $3(7) + 4 = 25$, or $25 = 25$.

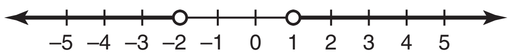
Glossary

solution of a compound inequality

The solution of a compound inequality is the part or parts of the solutions that satisfy both of the inequalities.

Example

The number line shows the solution of the compound inequality $x < -2$ or $x > 1$.



$x < -2$ or $x > 1$

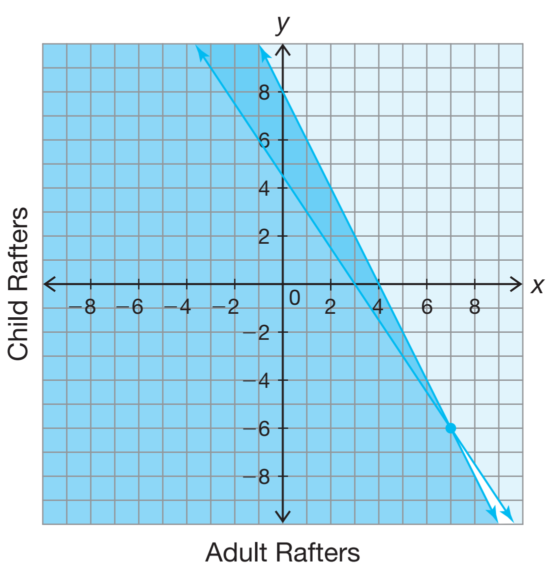
solution of a system of linear inequalities

The solution of a system of linear inequalities is the intersection of the solutions to each inequality. Every point in the intersection region satisfies the solution.

Example

The solution of this system of linear inequalities is shown by the shaded region, which represents the intersection of the solutions to each inequality.

$$\begin{cases} 200a + 100c \le 800 \\ 75(a - 1) + 50c \ge 150 \end{cases}$$



solve an inequality

To solve an inequality means to determine the values of the variable that make the inequality true.

Example

The inequality $x + 5 > 6$ can be solved by subtracting 5 from each side of the inequality. The solution is $x > 1$. Any number greater than 1 will make the inequality $x + 5 > 6$ true.

standard deviation

Standard deviation is a measure of how spread out the data are from the mean. The formula

$$\sigma = \frac{\sqrt{\sum_{i=1}^{n}(X_i - \overline{X})^2}}{n}$$

can be used to determine the standard deviation of a data set.

standard form

The standard form of a linear equation is $Ax + By = C$ where A, B, and C are constants and A and B are not both zero.

Example

The linear equation $2x + 3y = 5$ is written in standard form.

statistic

Statistics are numerical characteristics of data.

stem-and-leaf plot

A stem-and-leaf plot is a graphical method used to represent ordered numerical data.

Example

The stem-and-leaf plot represents the data set 55, 62, 73, 75, 76, 79, 80, 83, 86, 87, 87, 88, 88, 89, 89, 89.

Stems	Leaves
1	
2	
3	
4	
5	5
6	2
7	3 5 6 9
8	0 3 6 7 7 8 8 9 9 9

7 | 3 = 73

substitution method

The substitution method is a process of solving a system of equations by substituting a variable in one equation with an equivalent expression.

Example

Solve the following system of equations by using the substitution method:

$$\begin{cases} x - 3y = 4 \\ 2x + 5y = -14 \end{cases}$$

First, solve the first equation for x. Then, substitute in the second equation. Next, substitute $y = -2$ into the equation $x - 3y = 4$. The solution of the system is $(-2, -2)$.

sufficient condition

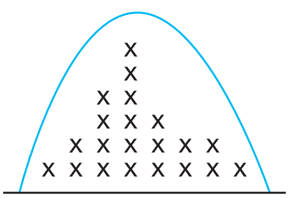
A correlation is not a sufficient condition for causation, meaning that a correlation between two variables is not enough to establish that one variables causes another.

symmetric distribution

In a symmetric distribution of data, the left and right halves of the graph are nearly mirror images of each other. There is often a "peak" in the middle of the graph.

Example

These data show a symmetric distribution.



Symmetric

system of linear equations

When two or more equations define a relationship between quantities, they form a system of linear equations.

Example

The equations $y = 3x + 7$ and $y = -4x$ are a system of equations.

T

term of a sequence

A term of a sequence is an individual number, figure, or letter in the sequence.

Example

In the sequence 2, 4, 6, 8, 10, the first term is 2, the second term is 4, and the third term is 6.

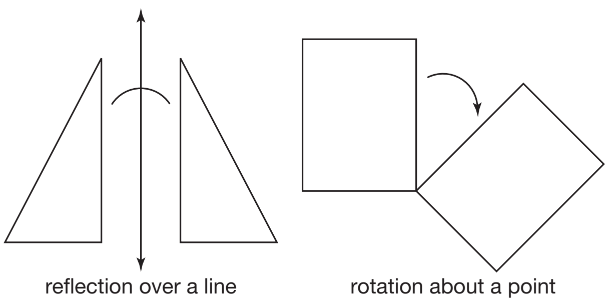
theorem

A theorem is a statement that can be proven true using definitions, postulates, or other theorems.

transformation

A transformation is the mapping, or movement, of all the points of a figure in a plane according to a common operation.

Example



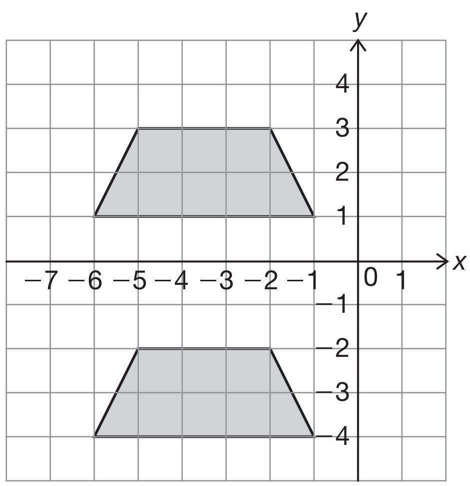
Glossary

translation

A translation is a rigid motion that "slides" each point of a figure the same distance and direction.

Example

The top trapezoid is a vertical translation of the bottom trapezoid by 5 units.



truth table

A truth table is a table that summarizes all possible truth values for a conditional statement $p \rightarrow q$.

truth value

The truth value of a conditional statement is whether the statement is true or false.

two-way frequency table

A two-way frequency table displays categorical data by representing the number of occurrences that fall into each group for two variables.

Example

Favorite Meals of Students

Grade Level		Burgers	Chicken Nuggets	Pizza	Salad Bar
	9th grade	////	/	///	~~////~~
	10th grade	///	~~////~~ //	///	////

Glossary

U

upper fence

The value of Q3 + (IQR · 1.5) is known as the upper fence of a data set.

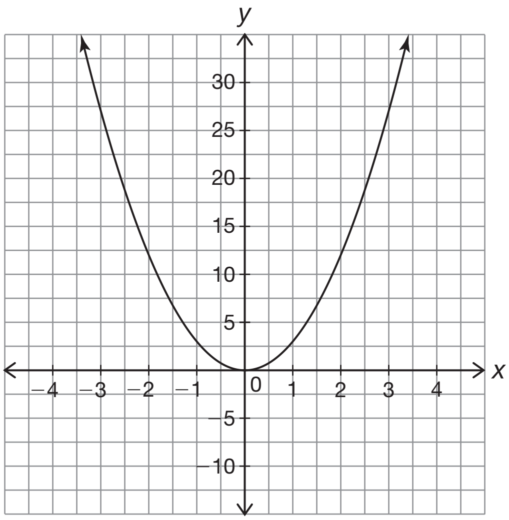
V

Vertical Line Test

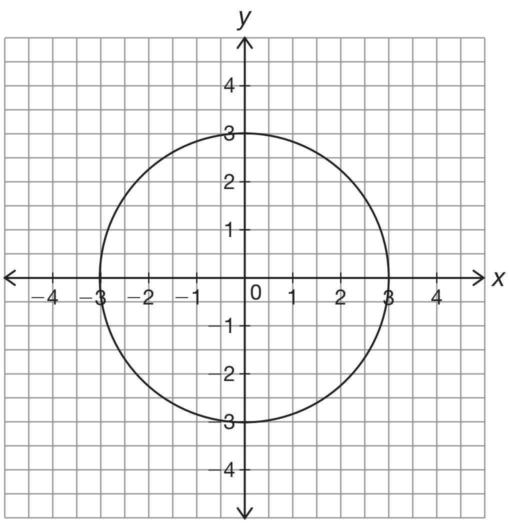
The Vertical Line Test is a visual method used to determine whether a relation represented as a graph is a function.

Examples

The equation $y = 3x^2$ is a function, because the graph of the function passes the Vertical Line Test.



The equation $x^2 + y^2 = 9$ is not a function, because the graph of the function fails the Vertical Line Test.

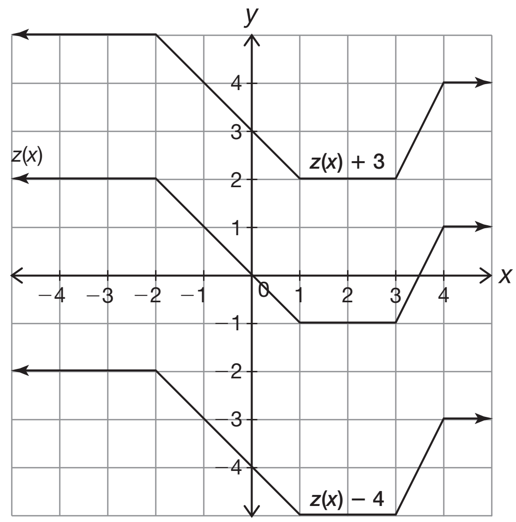


vertical translation

A vertical translation is a type of transformation that shifts the entire graph up or down. A vertical translation affects the *y*-coordinate of each point on the graph.

Example

The graphs of $z(x) + 3$ and $z(x) - 4$ are vertical translations of the graph of $z(x)$.



Glossary

Glossary

Index

D

E

Index

H

I

J

K

L

Index

Index

Q

R

S

T

U

V

X

Y

Index

Index