

Mathematical Process Standards

8AM.1 Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding.

Tools to Know

- 8AM.1(A) apply mathematics to problems arising in everyday life, society, and the workplace
 8AM.1(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution
 8AM.1(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems

Linear Functions

- 8AM.2 Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations.
8AM.3 Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations.
8AM.4 Linear functions, equations, and inequalities. The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data.
8AM.5 Linear functions, equations, and inequalities. The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions.
8AM.12 Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions.

Student Expectations

- 8AM.2(A) determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real-world situations, both continuous and discrete; and represent domain and range using inequalities (**A.2A**)
 8AM.2(B) write linear equations in two variables in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points (**A.2B**)
 8AM.2(C) write linear equations in two variables given a table of values, a graph, and a verbal description (**A.2C**, **8.5I**)
 8AM.2(D) write and solve equations involving direct variation (**A.2D**, **8.5E**)
 8AM.2(E) write the equation of a line that contains a given point and is parallel to a given line (**A.2E**)
 8AM.2(F) write the equation of a line that contains a given point and is perpendicular to a given line (**A.2F**)
 8AM.2(G) write an equation of a line that is parallel or perpendicular to the x- or y-axis and determine whether the slope of the line is zero or undefined (**A.2G**)
 8AM.2(H) write linear inequalities in two variables given a table of values, a graph, and a verbal description (**A.2H**)
 8AM.3(A) use similar right triangles to develop an understanding that slope, m , given as the rate comparing the change in y-values to the change in x-values, $(y_2 - y_1) / (x_2 - x_1)$, is the same for any two points (x_1, y_1) and (x_2, y_2) on the same line (**8.4A**)
 8AM.3(B) graph proportional relationships, interpreting the unit rate as the slope of the line that models the relationship (**8.4B**)
 8AM.3(C) determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$ (**A.3A**)
 8AM.3(D) calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems (**A.3B**)
 8AM.3(E) use data from a table or graph to determine the rate of change or slope and y-intercept in mathematical and real-world problems (**8.4C**)
 8AM.3(F) graph linear functions on the coordinate plane and identify key features, including x-intercept, y-intercept, zeros, and slope, in mathematical and real-world problems (**A.3C**)
 8AM.3(G) graph the solution set of linear inequalities in two variables on the coordinate plane (**A.3D**)
 8AM.3(H) determine the effects on the graph of the parent function $f(x) = x$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of a , b , c , and d (**A.3E**)
 8AM.4(A) construct a scatterplot and describe the observed data to address questions of association such as linear, non-linear, and no association between bivariate data (**8.11A**)
 8AM.4(B) contrast bivariate sets of data that suggest a linear relationship with bivariate sets of data that do not suggest a linear relationship from a graphical representation (**8.5C**)
 8AM.4(C) use a trend line that approximates the linear relationship between bivariate sets of data to make predictions (**8.5D**)
 8AM.4(D) calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association (**A.4A**)
 8AM.4(E) compare and contrast association and causation in real-world problems (**A.4B**)
 8AM.4(F) write, with and without technology, linear functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems (**A.4C**)

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Student Expectations

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- 8AM.5(A) solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides (A.5A)
- 8AM.5(B) solve linear inequalities in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides (A.5B)
- 8AM.12(A) identify functions using sets of ordered pairs and mappings (8.5G)
- 8AM.12(B) decide whether relations represented verbally, tabularly, graphically, and symbolically define a function (A.12A)
- 8AM.12(C) evaluate functions, expressed in function notation, given one or more elements in their domains (A.12B)
- 8AM.12(D) identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes (A.12C)
- 8AM.12(E) write a formula for the n^{th} term of arithmetic and geometric sequences, given the value of several of their terms (A.12D)
- 8AM.12(F) solve mathematic and scientific formulas, and other literal equations, for a specified variable (A.12E)

Systems of Equations and Inequalities

- 8AM.2 Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations.
- 8AM.3 Linear functions, equations, and inequalities.** The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations.
- 8AM.5 Linear functions, equations, and inequalities.** The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions.

Student Expectations

- 8AM.2(I) write systems of two linear equations given a table of values, a graph, and a verbal description (A.2I)
- 8AM.3(I) graph systems of two linear equations in two variables on the coordinate plane and determine the solutions if they exist (A.3F, 8.9A)
- 8AM.3(J) estimate graphically the solutions to systems of two linear equations with two variables in real-world problems (A.3G)
- 8AM.3(K) graph the solution set of systems of two linear inequalities in two variables on the coordinate plane (A.3H)
- 8AM.5(C) solve systems of two linear equations with two variables for mathematical and real-world problems (A.5C)

Simplifying Expressions

- 8AM.10 Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions.
- 8AM.11 Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite algebraic expressions into equivalent forms.

Student Expectations

- 8AM.10(A) add and subtract polynomials of degree one and degree two (A.10A)
- 8AM.10(B) multiply polynomials of degree one and degree two (A.10B)
- 8AM.10(C) determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend (A.10C)
- 8AM.10(D) rewrite polynomial expressions of degree one and degree two in equivalent forms using the distributive property (A.10D)
- 8AM.10(E) factor, if possible, trinomials with real factors in the form $ax^2 + bx + c$, including perfect square trinomials of degree two (A.10E)
- 8AM.10(F) decide if a binomial can be written as the difference of two squares and, if possible, use the structure of a difference of two squares to rewrite the binomial (A.10F)
- 8AM.11(A) simplify numerical radical expressions involving square roots (A.11A)
- 8AM.11(B) simplify numeric and algebraic expressions using the laws of exponents, including integral and rational exponents (A.11B)

Quadratic Functions

8AM.6	Quadratic functions and equations. The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations.
8AM.7	Quadratic functions and equations. The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations.
8AM.8	Quadratic functions and equations. The student applies the mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data.
8AM.12	Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions.

Student Expectations

8AM.6(A)	determine the domain and range of quadratic functions and represent the domain and range using inequalities (A.6A)
8AM.6(B)	write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form ($f(x) = a(x - h)^2 + k$), and rewrite the equation from vertex form to standard form ($f(x) = ax^2 + bx + c$) (A.6B)
8AM.6(C)	write quadratic functions when given real solutions and graphs of their related equations (A.6C)
8AM.7(A)	graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry (A.7A)
8AM.7(B)	describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions (A.7B)
8AM.7(C)	determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of a , b , c , and d (A.7C)
8AM.8(A)	solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula (A.8A)
8AM.8(B)	write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems (A.8B)
8AM.12(B)	decide whether relations represented verbally, tabularly, graphically, and symbolically define a function (A.12A)
8AM.12(C)	evaluate functions, expressed in function notation, given one or more elements in their domains (A.12B)

Exponential Functions

8AM.9	Exponential functions and equations. The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data.
8AM.12	Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions.

Student Expectations

8AM.9(A)	determine the domain and range of exponential functions of the form $f(x) = ab^x$ and represent the domain and range using inequalities (A.9A)
8AM.9(B)	interpret the meaning of the values of a and b in exponential functions of the form $f(x) = ab^x$ in real-world problems (A.9B)
8AM.9(C)	write exponential functions in the form $f(x) = ab^x$ (where b is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay (A.9C)
8AM.9(D)	graph exponential functions that model growth and decay and identify key features, including y-intercept and asymptote, in mathematical and real-world problems (A.9D)
8AM.9(E)	write, using technology, exponential functions that provide a reasonable fit to data and make predictions for real-world problems (A.9E)
8AM.12(B)	decide whether relations represented verbally, tabularly, graphically, and symbolically define a function (A.12A)
8AM.12(D)	identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes (A.12C)
8AM.12(E)	write a formula for the n^{th} term of arithmetic and geometric sequences, given the value of several of their terms (A.12D)

Mathematical Process Standards

8AM.1	Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding.
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Tools to Know

8AM.1(D)	communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate
8AM.1(E)	create and use representations to organize, record, and communicate mathematical ideas
8AM.1(F)	analyze mathematical relationships to connect and communicate mathematical ideas
8AM.1(G)	display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication