| **Required Course Numbers** | | | | | | | | | | | | | | | |
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| **Test Content Categories** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Principles of Algebra (38%) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| A. Understands how to write algebraic expressions in equivalent forms |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Interprets the parts of an expression (e.g., terms, factors, coefficients) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses the structure of an expression to identify ways to rewrite it |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Understands how to rewrite quadratic expressions for specific purposes (e.g., factoring/finding zeros, completing the square/finding maxima or minima) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses the properties of exponents to rewrite expressions for exponential functions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how to perform arithmetic operations on polynomials |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Adds, subtracts, and multiplies polynomials |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how to create equations and inequalities that describe relationships |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Creates equations and inequalities in one variable and uses them to solve problems and graph solutions on the number line |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Creates equations and inequalities to represent relationships between quantities, solves problems, and graphs them on the coordinate plane with labels and scales |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Represents constraints by equations, inequalities, or systems of equations and/or inequalities and interprets solutions as viable or nonviable options in a modeling context |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Rearranges formulas to highlight a quantity of interest (e.g., solve *d* = *rt* for *t*) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how to justify the reasoning process used to solve equations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Explains each step in solving a simple equation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how varied techniques   (e.g., graphical, algebraic) are used to  solve equations and inequalities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Solves linear equations and inequalities, including equations with coefficients represented by letters |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses the method of completing the square to transform any quadratic equation in *x* into the equivalent form (*x* - *p*)^2=*q* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Solves equations using a variety of methods (e.g., using graphs, using the quadratic formula, factoring) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses different methods (e.g., discriminant analysis, graphical analysis) to determine the nature of the solutions of a quadratic equation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how varied techniques   (e.g., graphical, algebraic) are used to  solve systems of equations and inequalities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Explains why, when solving a system  of two equations using the elimination method, replacing one or both equations with a scalar multiple produces a system with the same solutions as the solutions  of the original system |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Solves a system consisting of two linear equations in two variables algebraically and graphically |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Solves a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Explains why the x-coordinates of the intersection points of the graphs of *y = f*(*x*) and *y = g*(*x*) are the solutions of *f*(*x*) *= g*(*x*) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Finds the solutions of *f*(*x*) *= g*(*x*) approximately (e.g., uses technology to graph the functions, makes tables of values, finds successive approximations); includes cases where *f*(*x*) and/or *g*(*x*) are linear, quadratic, or exponential functions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Graphs the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality) and graphs the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands the concept of rate of change of nonlinear functions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Calculates and interprets the average rate of change of a function presented symbolically, numerically, or graphically over a specified interval |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands the concepts of intercept(s) of a line and slope as a rate of change |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Calculates and interprets the intercepts of a line |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Calculates and interprets the slope of a line presented symbolically, numerically, or graphically |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Estimates the rate of change of a linear function from a graph |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Functions (30%) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands the function concept   and the use of function notation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Understands that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses function notation, evaluates functions, and interprets statements that use function notation in terms of a context |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Determines the domain and range of a function from a function rule (e.g.,  *f*(*x*) = 2*x* + 1), graph, set of ordered pairs, or table |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how function behavior   is analyzed using different representations  (e.g., graphs, mappings, tables) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. For a function that models a relationship between two quantities, interprets  key features of graphs and tables  (e.g., increasing/decreasing, maximum/minimum) in terms of the quantities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Given a verbal description of a relation, sketches graphs that show key features  of that relation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Graphs functions (i.e., linear, quadratic, exponential, piecewise, absolute value, step) expressed symbolically and identifies key features of the graph |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Writes a function that is defined by an expression in different but equivalent forms to reveal different properties of  the function (e.g., zeros, extreme values, symmetry of the graph) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Interprets the behavior of exponential functions (e.g., growth, decay) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Understands how to determine whether a function is odd, even, or neither, and any resulting symmetries |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how functions and relations are used to model relationships between quantities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Writes a function that relates two quantities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Determines an explicit expression or a recursive process that builds a function from a context |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Writes arithmetic and geometric sequences both recursively and with an explicit formula, and uses them to model situations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Translates between recursive and explicit forms of arithmetic and geometric sequences |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how new functions are   obtained from existing functions  (e.g., transformations, inverses) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Describes how the graph of *g*(*x*) is related to the graph of *f*(*x*), where *g*(*x*) = *f*(*x*) + *k*, *g*(*x*) = *k f*(*x*), *g*(*x*) = *f*(*kx*), or *g*(*x*) = *f*(*x* + *k*) for specific values of *k* (both positive and negative) and finds the value of *k* given the graphs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Determines whether a function has an inverse and writes an expression for the inverse |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Combines standard function types using arithmetic operations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Performs domain analysis on functions resulting from arithmetic operations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands differences between linear, quadratic, and exponential models, including how their equations are created and used to solve problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Understands that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes situations in which one quantity changes at a constant rate per unit interval relative to another |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Constructs linear and exponential functions, including arithmetic and geometric sequences, given a graph,  a description of a relationship, or two ordered pairs (including reading these from a table) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Observes that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Interprets the parameters in a linear or exponential function in terms of a context (e.g., *A*(*t*)=*P e*^(*rt*)) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses quantities that are inversely related to model phenomena |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Number and Quantity; Probability and Statistics (32%) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| A. Understands the properties of radicals and exponents |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Performs operations involving exponents, including negative and rational exponents |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Demonstrates an understanding of the properties of exponential expressions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses the properties of radicals and exponents to rewrite expressions that have radicals or rational exponents |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Represents and compares very large  and very small numbers (e.g., scientific notation, orders of magnitude) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses order of magnitude to estimate  very large and very small numbers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Performs calculations on numbers in scientific notation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands the properties of rational   and irrational numbers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes that the sum or product of two rational numbers is rational |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes that the sum of a rational number and an irrational number is irrational |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes that the product of a nonzero rational number and an irrational number is irrational |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes that the sum or product of two irrational numbers can be rational or irrational |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how to reason quantitatively and use units to solve problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses units as a way to understand problems and guide the solution of multistep problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Chooses and interprets units consistently in formulas |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Chooses and interprets the scale and the origin in graphs and data displays |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes the reasonableness of results within the context of a given problem |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Chooses a level of accuracy appropriate to limitations on measurement when reporting quantities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how to summarize, represent,   and interpret data collected from measurements on a single variable (e.g., boxplots, dotplots, normal distributions) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Represents data with plots on the real number line (e.g., dotplots, histograms, and boxplots) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses statistics appropriate to the shape of the data distribution to compare center (e.g., median, mean) and spread (e.g., interquartile range, standard deviation) of two or more different data sets |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Interprets differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how to summarize, represent, and interpret data collected from measurements on two variables, either categorical or quantitative (e.g., scatterplots, time series) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Summarizes and interprets categorical data for two categories in two-way frequency tables (e.g., joint, marginal, conditional relative frequencies) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Recognizes possible associations and trends in the data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Represents data for two quantitative variables on a scatterplot, and describes how the variables are related |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how to create and interpret linear regression models (e.g., rate of change, intercepts, correlation coefficient) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses technology to fit a function to data (i.e., linear regression) and determines a linear correlation coefficient |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Uses functions fitted to data to solve problems in the context of the data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Assesses the fit of a function by plotting and analyzing residuals |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Interprets the slope and the intercept of a regression line in the context of the data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Interprets a linear correlation coefficient |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Distinguishes between correlation and causation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * 1. Understands how to compute probabilities of simple and compound events |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| * + 1. Calculates probabilities of simple and compound events |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |